

CLASS 409, GEAR CUTTING, MILLING, OR PLANING

SECTION I - CLASS DEFINITION

This class is the home for a patent directed to the method of or a machine for penetrating material without substantially reshaping the flow of such material by means of a solid tool whose edge defines a line of cut, where in the device is intended to: (a) form a product from a workpiece, which product includes protuberances intended to interfit with pockets in a cooperating member, generally for the transmission of motive force from one of the members to the other; (b) cut by a rotating cutter that forms a shaped surface on the workpiece; or (c) cut by a cutter that reciprocates relative to a workpiece and forms a shaped surface on the workpiece).

See the Search This Class, Subclass references below for specific subclass references

SECTION II - SUBCLASS REFERENCES TO THE CURRENT CLASS

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 1+, for a device intended to form a product from a workpiece, which product includes protuberances intended to interfit with pockets in a cooperating member, generally for the transmission of motive force from one of the members to the other .
- 64+, for a device intended to cut by a rotating cutter that forms a shaped surface on the workpiece.
- 243+, 288, for a device intended to cut by a cutter that reciprocates relative to a workpiece and forms a shaped surface on the workpiece.

SECTION III - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

- 29, Metal Working, (a) appropriate subclasses for gear cutting, milling, or planing combined with another work-treating operation, particularly subclasses 90.01+, when the other operation is burnishing; (b) subclasses 1.01-179 (as appearing in the class schedule) for cutting to shape peculiar to the manufacture of a device provided for in that group of subclasses. (This note may be applied to numerous classes not set forth in these search notes, i.e., a device peculiar to the manufacture of a certain article

will be found in the class providing for the manufacture of that article.)

- 30, Cutlery, for a hand tool used to cut work to shape.
- 82, Turning, for cutting to shape of a rotating workpiece; and subclasses 46+ for cutting to subdivide by use of a cutter orbiting about an axis passing through the work.
- 83, Cutting, for subdividing of two portions of work, generally. Search subclasses 875+ for grooving with the removal of material by use of a cutter providing no intentional shape to the bottom of the groove. As a practical matter, grooving of Class 83, subclasses 875+ is limited to the action of a saw blade. Search subclass 879 for scoring of a workpiece with no removal of chips. A cutting machining or method or both cut to shape and cut to subdivide with the same or different tools will be found in class (409).
- 144, Woodworking, for cutting limited to the shaping of wood. (This note may be applied to numerous classes not set forth in these notes, i.e., a device peculiar to shaping of certain material will be found in the class providing for shaping of that material).
- 157, Wheelwright Machines, subclass 13 for apparatus for or method of treating the outer periphery of a rubber tire casing by a slitting or machining operation.
- 173, Tool Driving or Impacting, for subject matter directed to driving or impacting a tool, when such subject matter includes combined features peculiar to tool driving, but does not include features limiting the subject matter to a specific tool art, such as specific shape of the work contacting portion of a tool, related tools, or an opposed work support.
- 269, Work Holders, the residual locus for a device for clamping, supporting, and/or holding an article(s) in position to be operated on or treated. See the notes thereunder for other related loci.
- 279, Chucks or Sockets, for a work or tool holder of general utility adapted to approach the member being held by jaws converging thereupon.
- 407, Cutters, for Shaping, for a tool element adapted to be attached to a machine of this class. A tool combined with any other work recognizing (engaging) structure or with means to drive or support the tool and move relative to the tool will be found in this class (409) rather than Class 407.

- 408, Cutting by Use of Rotating Axially Moving Tool, for a machine for or process of cutting by use of a tool turning about an axis and moving along that axis toward a workpiece wherein no additional motion is imparted to the cutting edge of the tool during operation; especially subclasses 26+ for the combination of cutting in the manner of that class (408) with cutting in the manner of this class (409). A device which may be converted from an operation of this class to an operation of Class 408 is to be found in this class (409).
- 451, Abrading, for shaping a crystalline cutting, particularly subclasses 67+ for abrading combined with cutting to shape. Class 409 is considered to be superior to Class 451, so that a patent including a claim proper for this class and another claim proper for Class 451 will be classified in this class. Similarly, a disclosure of both abrading to shape and cutting to shape with no claim specific to the type of cutting tool will be found in Class 409.
- 483, Tool Changing, generally for a process or apparatus including a tool transfer means combined with a tool support or storage means.

SUBCLASSES

- 1 GEAR CUTTING:**
This subclass is indented under the class definition. Apparatus or method particularly adapted to form an element on a workpiece body, which element is intended to intermesh with an element on another body whereby motive force may be transmitted from one of the bodies to the other.
- (1) Note. A gear pump rotor is considered to transmit force to the other rotor. Also, the drive element sprocket of a gear driven chain is considered to be similar to a gear tooth.
- SEE OR SEARCH CLASS:
- 74, Machine Element or Mechanism, subclasses 640+ for a gear formed by the apparatus or process of this subclass.
- 407, Cutters, for Shaping, subclasses 20+ for a cutting tool to be used in the apparatus or process of this subclass.

2 With regulation of operation by use of templet, card or other replaceable information supply:

This subclass is indented under subclass 1. Apparatus or method for detecting the characteristics (e.g., physical, electrical, etc.) of a member carrying operating instructions for the apparatus, which member is separate from both the workpiece and the organized structure of the apparatus.

- (1) Note. This subclass includes utilizing a prepared information supply that is to be removably placed in the apparatus. This subclass does not include utilizing the characteristics of a permanent part of the apparatus, such as a cam or gear, to influence the operation of other parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 67, for similar control combined with a milling machine for generating a thread or helix.
- 79, for similar control combined with milling, generally.
- 289, for similar control combined with planing.

SEE OR SEARCH CLASS:

- 408, Cutting by Use of Rotating Axially Moving Tool, subclass 3 for similar control structure for a boring or drilling machine.

3 Including follower for templet:

This subclass is indented under subclass 2. Apparatus or method including means for detecting the physical surface configuration of the separate information member.

4 And burnishing simultaneously:

This subclass is indented under subclass 1. Apparatus for or method of performing the operation of ... combined with condensing, compacting, smoothing, or polishing the surface of the workpiece usually by rubbing the workpiece with a smooth tool having a surface of greater hardness than that of the workpiece wherein forming and condensing, etc., are performed at the same time.

SEE OR SEARCH CLASS:

29, Metal Working, subclasses 90.01+ for gear cutting combined with burnishing wherein the operations can be performed independently.

5 With compensation for backlash in drive means:

This subclass is indented under subclass 1. Apparatus or method including provision for transmission of force to a workpiece or to a cutting tool wherein a first drive member transmits force and movement of a second drive member, including provision to adjust, eliminate, or make other allowance for undesired relative movement between the drive members and the workpiece or the cutting tool resulting from clearance between the drive member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

146, for compensation for backlash in the drive means of a milling machine.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 409 for means to eliminate backlash in an element of a gear train; and subclasses 440+ for means to eliminate backlash in sectional gears.

6 With work or product advancing:

This subclass is indented under subclass 1. Apparatus or method including a work station and including means to move a workpiece to that station or including means to move the product that has been shaped at the work station away from that station.

(1) Note. Means to transfer material from one work station to another work station is considered to be proper for this subclass since the material is the product of the first station and is the work of the second station.

SEE OR SEARCH THIS CLASS, SUBCLASS:

72, for thread or helix milling means combined with work or product advancing means.

159+, for a milling machine including means to infeed the work to the cutter

and with means to advance the work or product.

172+, for a milling machine, broadly, combined with means to advance work or product.

174, for a milling machine, broadly, combined with means to manipulate the work.

SEE OR SEARCH CLASS:

82, Turning, subclasses 124+ for a lathe with work feeding and/or removing mechanism.

221, Article Dispensing, for a method of or apparatus for dispensing or feeding an article not otherwise classified; and especially subclasses 239 and 294 for an article dispenser or feeder delivering to a clamp or holddown. See the class definition of Class 221 for a statement of the lines between the classes and for the disposition of other related art.

226, Advancing Material of Indeterminate Length, for a method of or apparatus for feeding material without utilizing the leading or trailing end to effect movement of the material.

414, Material or Article Handling, for work advancing, including single or multiple, nominal shaping stations. Generally, work handling to present a workpiece to a named shaping means will be found in Class 414.

470, Threaded, Headed Fastener, or Washer Making: Process and Apparatus, subclasses 164+ for a miscellaneous machine for feeding nail blanks, screw blanks, nut blanks, nail plates, or other stock specialized to performing the various steps in the manufacture of an article of that class.

7 Utilizing transfer arm:

This subclass is indented under subclass 6. Apparatus or method including the utilization of means to advance a workpiece to the tool station comprising use of a horizontally extending cantilever structure adapted to carry and position the workpiece into operating position in the securing portion of the work holder.

SEE OR SEARCH CLASS:

901, Robots, subcollection 6+ for a robot which cooperates with another machine.

8 Gear chamfering or deburring:

This subclass is indented under subclass 1. Apparatus or method including a cutting tool to (a) form a generally straight surface intersecting two surfaces previously formed on an intermeshing element (gear tooth) or (b) sever off any protruding edge unintentionally formed on an intermeshing element during formation thereof.

- (1) Note. The apparatus or process of this subclass is somewhat different from that of the remainder of the subclasses under subclass 1 in that the cutting edge of the cutting tool of this subclass does not form the basic shape of the element for transmitting motive force, rather the apparatus or process of this subclass is for the ancillary treatment of such an element of removal of unwanted surface irregularities or protuberances.

SEE OR SEARCH CLASS:

83, Cutting, subclass 869 for chamfering, generally.

9 Using relatively reciprocating or oscillating cutter:

This subclass is indented under subclass 8. Apparatus or method wherein the means to form or sever is a cutting tool adapted to move to-and-fro along a straight or arcuate line with respect to the workpiece during cutting.

- (1) Note. A rotary cutting on a reciprocating carriage is not considered to be "reciprocating or oscillating" for this subclass.

10 Gear tooth shape generating:

This subclass is indented under subclass 1. Apparatus or method including formation of an intermeshable element by a cutting tool making several cutting passes through a workpiece with relative repositioning of the workpiece and the cutting tool between cutting passes so that a first portion of the final configuration of the intermeshable element is formed by a first

cutting pass and a second portion is formed by a subsequent pass.

- (1) Note. Cutting a spline on a shaft is considered to be proper for this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

65, for similar formation of a thread or helix.

SEE OR SEARCH CLASS:

407, Cutters, for Shaping, subclass 28 for a cutting element to be used in the apparatus or process of this subclass.

11 Hobbing:

This subclass is indented under subclass 10. Apparatus or method in which the cutting tool is adapted to turn about an axis, the cutting tool including at least three radially outwardly directed cutting teeth positioned spirally about the cutting tool axis, each tooth including a cutting edge formed by intersecting planar surfaces one of which surfaces is generally parallel to and radiates from the cutting tool axis, said surface directing a chip formed by the cutting operation away from the cutting edge wherein the cutting tool is rotated and the cutting tool and workpiece are moved relative to each other thus causing the cutting edge to form the intermeshable element on the workpiece, wherein all intermeshable elements of a gear are generated as a continuous operation.

SEE OR SEARCH CLASS:

407, Cutters, for Shaping, subclass 20 for a cutter element to be used in the machine or process of this subclass.

12 Process:

This subclass is indented under subclass 11. Method of forming a gear .

13 Generating tooth for bevel gear:

This subclass is indented under subclass 12. Method wherein the body on which the intermeshable element is formed is adapted to rotate about an axis and wherein the intermeshable element is formed so that it extends to a greater radial distance at one axial end than at the other.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 27+, for apparatus for hobbing a bevel gear by milling with a radial faced tool.
43+, for apparatus for cutting a bevel gear by use of a reciprocating or oscillating cutter.

14 Including means to shift hob between cutting passes:

This subclass is indented under subclass 11. Apparatus wherein the cutting tool is adjustable relative to the workpiece, when out of engagement with the workpiece, by being repositioned along the cutter axis.

- (1) Note. The adjustment of this subclass is usually to bring about more uniform wear of the teeth of the hob.

15 With control means energized in response to activator stimulated by condition sensor:

This subclass is indented under subclass 11. Apparatus including means for: (a) detecting any of the following characteristics; a state or property, a change in a state or property, or the occurrence of a predetermined event in any of the following: the workpiece, the product of the apparatus, the apparatus itself, or the environment of the apparatus affecting the operation thereof; and (b) initiating (as a direct result of that detection) a signal other than that generated or transmitted by the detected means, and (c) regulating or modifying (as a direct result of said initiation) the operation of the means to affect the cutting.

- (1) Note. The activator (or initiating means) of this subclass serves to trigger a source of energy other than energy of the sensed condition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 147, for control means combined with a milling machine having work infeed.
186, for control means combined with a milling machine having axial cutter infeed.
193, for control means combined with a milling machine having cutter infeed, generally.

- 207, for control means combined with a milling machine having means to adjustably position the cutter.
245, for control means combined with a broaching machine.

SEE OR SEARCH CLASS:

- 408, Cutting by Use of Rotating Axially Moving Tool, subclass 8 for similar structure for regulating the operation of a machine of that class type.

16 Plural hobs:

This subclass is indented under subclass 11. Apparatus including a first cutting tool and a second cutting tool each for performing the operation of that subclass wherein the cutting tools are capable of relative movement as assembled in the apparatus with respect to each other during the shaping operation.

- (1) Note. A first cutting bit and a second cutting bit mounted on the same cutting tool holder are considered to be two edges of the same cutting tool rather than plural cutting tools.

17 Including infeed means:

This subclass is indented under subclass 11. Apparatus including means to support the cutting tool and means to support the workpiece and including means to cause relative approach of the cutting tool and workpiece to effect the cutting operation.

18 To infeed along axis of work rotation:

This subclass is indented under subclass 17. Apparatus including means to support the workpiece for rotation about an axis during cutting thereof wherein the relative approach effected has a component in the direction parallel to that axis.

19 Infeed of cutter:

This subclass is indented under subclass 18. Apparatus including a support adapted to carry the cutting tool wherein the cutting tool is moved relative to the support and relative to the workpiece to effect the cutting operation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 23, for means for feeding a hob radially of the work axis.

- 20 And infeed radially of axis of work rotation:**
This subclass is indented under subclass 19. Apparatus wherein the relative approach effected also has a component in the direction toward or away from the axis about which the workpiece turns.
- (1) Note. Included herein is a cutter moving relative to the workpiece diagonally (to form a tapered product) as well as a cutter first moving directly radially toward the workpiece and then purely in the direction of the work axis.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
22+, for means to feed a gear-cutting hob relative to a workpiece toward an axis with no component in the direction of the work axis.
- 21 Vertically:**
This subclass is indented under subclass 19. Apparatus wherein the workpiece is supported to turn about an axis extending generally up and down with respect to the earth and wherein the cutting tool is moved relative to the support and relative to the workpiece along the axis to effect the cutting operation.
- 22 To infeed radially of axis of work rotation:**
This subclass is indented under subclass 17. Apparatus including means to support the workpiece for rotation about an axis during cutting thereof wherein the relative approach effected has a component in the direction toward or away from that axis.
- 23 Infeed of cutter:**
This subclass is indented under subclass 22. Apparatus including a support adapted to carry the cutting tool wherein the cutting tool is moved relative to the support and relative to the workpiece to effect the cutting operation.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
19, for means for feeding a hob along work axis.
- 24 And infeed tangentially of work axis:**
This subclass is indented under subclass 23. Apparatus wherein the cutting tool is moved relative to the workpiece in a straight line that does not pass through the axis of the workpiece to effect the cutting operation.
- 25 Milling with radial faced tool:**
This subclass is indented under subclass 10. Apparatus or method for formation of an intermeshable element by use of a cutting tool adapted to rotate about an axis, the cutting tool including a planar surface normal to and extending across that axis from which surface extends a protrusion having a sharp cutting edge wherein the cutting tool is unsupported from the end having the planar surface and is supported for rotation from the opposite axial end.
- 26 Process:**
This subclass is indented under subclass 25. Method of forming a gear .
- 27 Adapted to cut bevel gear:**
This subclass is indented under subclass 25. Apparatus wherein the body on which the intermeshable element is formed is adapted to rotate about an axis and wherein the intermeshable element is formed so that it extends to a greater radial distance at one axial end than at the other.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
13, for the process of generating a bevel gear by hobbing.
43+, for apparatus for cutting a bevel gear by use of a reciprocating or oscillating cutter.
- 28 With means to continuously rotate work and means to co-form all teeth of gear:**
This subclass is indented under subclass 27. Apparatus including means to support and turn the workpiece about an axis relative to the cutting tool such that a first intermeshable element is partially formed, then a second intermeshable element is partially formed, then a third, etc., until all the intermeshable elements of the gear being formed are partially formed, then all the elements are further formed until all the

elements have been completed during the final rotation of the workpiece.

29 Bevel gear having nonparallel opposing tooth flanks:

This subclass is indented under subclass 27. Apparatus including means to relatively move the cutting tool and workpiece so that the resulting groove between adjacent intermeshable elements has walls that are deliberately formed so that if extended, they would meet.

- (1) Note. In the generation of a bevel gear by use of a radial face mill, normally, there will be more slight inherent variation in the spacing of the walls of the groove formed between adjacent intermeshable elements; included in this subclass is that structure wherein there is a deliberate effort to bring about additional taper of the groove.

30 Including rotary cutter cradle:

This subclass is indented under subclass 27. Apparatus wherein the workpiece is supported for rotation about an axis and means are included to support the cutting tool for rotation during the cutting operation about an axis that is offset from the cutting tool to thereby cause the cutting tool to arcuately traverse the rotating workpiece and engage the perimeter of the workpiece so that the peripheral velocity of the workpiece equals the traversing velocity of the cutting tool.

31 By relative axial movement between synchronously indexing or rotating work and cutter:

This subclass is indented under subclass 10. Apparatus or method including supporting the cutting tool having a cutting edge for continuous or intermittent rotation about a first axis and supporting the workpiece for continuous or intermittent rotation about a second axis and effecting relative movement between the cutting edge and the workpiece generally along the axis of the cutting tool, including controlling the continuous or intermittent rotation of the cutting tool and the continuous or intermittent rotation of the workpiece to cause the cutting tool to form the final configuration of the intermeshable element in more than one engagement by the cutting edge.

32 Crowning:

This subclass is indented under subclass 31. Apparatus or method wherein the formed element is generally ridgelike and is generally higher in the central portion thereof than at the ends.

- (1) Note. The height of the ridgelike element is the distance from a base if the product is a rack, is the distance from the axis if the product is a spur gear, is the distance from the vanishing crest cone if the product is a bevel gear, etc.

33 Displacing cutter axially relative to work (e.g., gear shaving, etc.):

This subclass is indented under subclass 31. Apparatus or method including means for moving the entire cutting tool relative to the workpiece generally along the axis of the cutting tool.

34 Using gear shaper-cutter:

This subclass is indented under subclass 33. Apparatus or method including structure to support a workpiece and structure to support a cutting tool with provision to cause the cutting tool to be reciprocated to pass to-and-fro relative to the workpiece to effect the cutting operation, which cutting tool support structure also includes provision to cause the cutting tool to be turned about an axis generally parallel to the direction of reciprocation between passes, for generating an intermeshable element in a series of passes.

SEE OR SEARCH CLASS:

407, Cutters, for Shaping, subclass 28 for a cutting tool to be used in the machine or process of this subclass.

35 Plural distinct cutting edges:

This subclass is indented under subclass 34. Apparatus or method including a first and a second sharp edge for cutting to shape, wherein either (a) the first sharp edge is part of a cutting tool that is separate from the cutting tool of which the other sharp edge is a part or (b) the first and second sharp edges are members of the same cutting tool but are axially spaced along the axis about which the cutter is adapted to index or rotate.

- 36 Cutting rotating work, the axis of which lies in a plane intersecting the cutter axis:**
This subclass is indented under subclass 34. Apparatus or method wherein the workpiece is supported for movement about axis during cutting action relative to the cutting tool and wherein the cutting tool is adapted to be indexed between cutting passes about a second axis, in which apparatus to process the cutting tool axis is neither parallel to nor intersecting of the axis of the workpiece so that the two axes are not lying in a common plane.
- 37 Gear shaving:**
This subclass is indented under subclass 10. Apparatus or method including use of a finishing cutter to cut away a small amount of material from the surface of a previously formed gear tooth.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
33, for gear shaving by a cutter synchronously rotating with a workpiece.
34, for gear shaving by a cutter synchronously indexing with and reciprocating relative to a workpiece.
49, for gear shaving, generally.
- 38 Using rotary cutter:**
This subclass is indented under subclass 10. Apparatus or method including supporting of the cutting tool to turn about an axis through more than 360° during cutting relative to the workpiece and relative to the base of the machine.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
50, for apparatus or method of using a rotary cutter to form a gear tooth, generally.
- 39 Having axially directed cutting edge:**
This subclass is indented under subclass 38. Apparatus or method including use of a sharp cutting edge intended to be brought into engagement with the workpiece by relative movement of the cutter and workpiece along the axis of the cutting tool.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
25, for a similar cutter wherein the cutter includes a radial face and wherein the cutting edge is a part of a protuberance extending out of that radial face.
- 40 Plural rotary cutters:**
This subclass is indented under subclass 38. Apparatus or method including supporting a first cutting tool for movement through more than 360° during cutting and including supporting a second cutting tool for movement through more than 360° during cutting, wherein the first and second cutting tools are relatively movable as assembled in the apparatus.
- (1) Note. A first cutting bit and a second cutting bit mounted on the same cutting tool holder are considered to be two edges of the same cutting tool rather than plural cutters.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
55, for use of plural rotary cutters to form gear teeth, generally.
- 41 On reciprocating carriage:**
This subclass is indented under subclass 38. Apparatus or method including support of the cutting tool to turn about an axis on a member and including moving that member and the cutting to-and-fro relative to the workpiece during the cutting operation.
- 42 Using reciprocating or oscillating cutter:**
This subclass is indented under subclass 10. Apparatus or method including supporting and guiding the cutting tool to move to-and-fro either along a straight or arcuate line with respect to the workpiece during cutting.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
38, for supporting of a cutting tool for rotation to-and-fro more than 360° during cutting.
58, for general forming of a gear by use of a reciprocating or oscillating cutter.

43 Bevel gear cutting:

This subclass is indented under subclass 42. Apparatus or method wherein the body on which the intermeshable element is formed is adapted to rotate about an axis and wherein the intermeshable element is formed so that it extends to a greater radial distance at one axial end than the other.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 13, for the process of generating a bevel gear by hobbing.
27+, for apparatus for hobbing a bevel gear by milling with a radial faced tool.

44 Dual cutters:

This subclass is indented under subclass 43. Apparatus or method including the use of a first cutting tool for formation of an intermeshable element and the use of a second distinct cutting tool for formation of an intermeshable element, wherein the second cutting tool is of similar or generally allochiral shape to the first cutting tool and wherein the first and second cutting tools are relatively movable as assembled in the apparatus.

- (1) Note. The second cutting tool of this subclass may cut the same workpiece as the first but at a different location, may cut a second workpiece in the same manner as the first cutting tool cuts the first workpiece, or may cut a surface cut by the first cutting tool.
- (2) Note. "Allochiral" may be defined as (a) reversely congruent, (b) mirror image-like or, (c) similar but opposite, as the right hand is similar but opposite to the shape of the left hand.

45 Double acting cutter:

This subclass is indented under subclass 43. Apparatus or method wherein the cutting tool is adapted to cut in the first direction of movement over the work and is adapted to cut in the return direction of movement over the work.

46 Rectilinearly reciprocating cutter:

This subclass is indented under subclass 42. Apparatus or method wherein the cutting tool is limited to move to-and-fro along a straight path.

47 Cutter comprising a rack:

This subclass is indented under subclass 46. Apparatus or method wherein the cutting tool is generally elongated in a first direction with a plurality of cutting teeth extending laterally from one long side thereof, which cutting tool is adapted to be moved laterally relative to the work so that in a cutting pass each tooth engages the workpiece without following another tooth.

48 Making a noncircular gear, worm, rotor, or a planar-faced gear:

This subclass is indented under subclass 10. Apparatus or method wherein the intended product comprises: (a) A rotary driving member including a plurality of intermeshable elements intended to sequentially engage similar elements on another similar member wherein the elements on the member being formed are positioned in a path that is other than circular about the axis of the rotary member; (b) a rotary driving member including a ridge-like intermeshable element extending helically about the axis thereof, which member is intended to transmit rotary motion to another member; (c) a rotary member including an element intended to intermesh with a similar element on another member, wherein the members are not actually intended to transmit force to one another, but rather are intended to transmit force to something else (as in the case of the rotary members of a gear-type pump), or (d) a rotary driving member including a face normal to the rotary axis thereof and including an intermeshable element extending generally axially therefrom.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 65+, for generating a screw thread on a nongearlike member.

49 Gear shaving:

This subclass is indented under subclass 1. Apparatus or method including use of a finishing cutter to cut away a small amount of mate-

- rial from the surface of a previously formed gear tooth.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
37, for gear shaving by generating.
- SEE OR SEARCH CLASS:
407, Cutters, for Shaping, subclass 27 for a rotary gear shaving tool.
- 50 Using rotary cutter:**
This subclass is indented under subclass 1. Apparatus or method including supporting of the cutting tool to turn about an axis through more than 360° during cutting relative to the workpiece and relative to the base of the machine.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
38, for apparatus or method for using a rotary cutter to generate a gear tooth.
- SEE OR SEARCH CLASS:
483, Tool Changing, subclass 18 for a rotating work machine tool combined with a means to transfer a tool to or from a rotary spindle tool support.
- 51 Process:**
This subclass is indented under subclass 50. Method of forming a gear.
- 52 End mill:**
This subclass is indented under subclass 50. Apparatus including a cutting tool adapted to turn about an axis, which cutting tool has a distal end provided with a cutting protuberance terminating in an axially directed cutting edge.
- SEE OR SEARCH CLASS:
407, Cutters, for Shaping, subclass 21 for a cutting tool, per se, for cutting of a gear by an axially directed cutting edge.
408, Cutting by Use of Rotating Axially Moving Tool, for structure for cutting by a rotating tool moving only axially relative to the work.
- 53 Radially faced:**
This subclass is indented under subclass 52. Apparatus wherein the cutting tool is provided at the distal end with a planar surface generally normal to the axis thereof from which the cutting protuberance extends.
- 54 Using plural, selectively usable tools:**
This subclass is indented under subclass 53. Apparatus including a first cutting tool and a second cutting tool, wherein only one of the cutting tools is intended to be used at a given time.
- 55 Plural rotary cutters:**
This subclass is indented under subclass 50. Apparatus including means for supporting a first cutting tool for movement through more than 360° during cutting and including means for supporting a second cutting tool for movement through more than 360° during cutting, wherein the first and second cutting tools are relatively movable as assembled in the apparatus.
- (1) Note. A first cutting bit and a second cutting bit mounted on the same cutting tool holder are considered to be two edges of the same cutting tool rather than plural cutters.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
40, for use of plural rotary cutters to generate gear teeth.
- 56 Cutting action along work axis:**
This subclass is indented under subclass 50. Apparatus in which the product is intended to turn about an axis during inter meshing, i.e., the work axis, and wherein during formation of the intermeshable element, the cutting edge of the cutting tool engages the workpiece and cutting moves along this axis.
- SEE OR SEARCH CLASS:
408, Cutting by Use of Rotating Axially Moving Tool, for a cutting machine or cutter per se adapted to cut by use of a tool that does not move other than about an axis and along that axis with respect to the workpiece during shaping thereof.

57 Cutting action intersecting work axis:
This subclass is indented under subclass 56. Apparatus wherein as the cutting edge moves along the work axis it also moves toward or away from the work axis.

- (1) Note. The cutting tool of this subclass forms the teeth of a bevel gear.

58 Using reciprocating or oscillating cutter:
This subclass is indented under subclass 1. Apparatus or method including supporting and guiding the cutting tool to move to-and-fro either along a straight or arcuate line with respect to the workpiece during cutting.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 42, for generating a gear by use of a reciprocating or oscillating cutter.

59 Broach:
This subclass is indented under subclass 58. Apparatus or method including use of a cutting tool having a plurality of sequentially acting protuberances on each of which there is a cutting edge, adapted to move in a path with respect to the workpiece so that a first protuberance makes a shaping cut into the surface of the workpiece and is followed by a second protuberance which makes a deeper shaping cut into that surface of the workpiece, so that the actions of sequentially acting protuberances is cumulative.

- (1) Note. A rodlike cutting tool which moves along the axis thereof is considered to move in a path even if the cutting tool rotates to cut a helical groove.

SEE OR SEARCH CLASS:

- 407, Cutters, for Shaping, subclass 13 for a broaching cutting tool without drive structure or work recognizing structure.

60 Including circumferentially disposed cutting edges:
This subclass is indented under subclass 58. Apparatus or method for simultaneously forming multiple protuberances about the periphery of a generally circular workpiece, wherein the cutting tool includes a first cutting edge for

forming a first intermeshable element and includes a second cutting edge spaced about the workpiece from the first cutting edge for forming a second intermeshable element.

- (1) Note. The gear formed by the cutting tool of this subclass may have radially outwardly or radially inwardly extending gear teeth.

61 Work dividing or checking of work position or division:

This subclass is indented under subclass 1. Apparatus or method including (a) determining of the precise spacing of the intermeshable elements to be formed along the surface of the workpiece body, (b) determining the precise location of the workpiece in an intermeshable element forming machine, or (c) determining that the formed intermeshable elements are properly spaced about the surface of the body.

62 With work clamping:

This subclass is indented under subclass 1. Apparatus or method including immobilization of the workpiece relative to a machine part.

63 WITH FURBISHING OF CUTTER:

This subclass is indented under the class definition. Apparatus or method including restoring the cutting tool to better operating condition.

- (1) Note. Included herein is treatment of the tool, per se. For example, sharpening of the tool is furbishing, adjustment of the tool is not.

64 MILLING:

This subclass is indented under the class definition. Apparatus or method comprising use of a cutting tool rotatably driven through more than 360° to form a shaped surface on a workpiece.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 243+, for a rotary broaching machine. Note that a rotary broach normally turns through no more than 360° to form a shaped surface on a workpiece and is therefore excluded from this and the indented subclasses.

SEE OR SEARCH CLASS:

- 408, Cutting by Use of Rotating Axially Moving Tool, for a machine for cutting by use of a tool turning about an axis and moving along that axis toward a workpiece wherein no additional motion is imparted to the cutting edge of the tool during operation. Especially subclasses 26+ for the combination of cutting in the manner of that class (408) with cutting in the manner of this class (409). The use of a tool to cut in the manner of Class 408 and then in the manner of this class will be found in this class (409).
- 451, Abrading, subclasses 119+ for an abrading machine using a rotating tool which also has reciprocating motion and subclasses 177+ for an abrading machine using a rotating abrading tool in which the work is manipulated relative to the tool.
- 470, Threaded, Headed Fastener, or Washer Making: Process and Apparatus, subclasses 60+ for a machine for milling a driving slot in the head of a screw; subclass 107 for a machine for finishing the sides of a rough nut blank by means of a milling cutter; and subclass 161 for a machine for milling a slot in the shank of a rivet to from a split rivet.
- 483, Tool Changing, subclasses 30+ for apparatus including a rotary spindle machine tool combined with a tool transfer means.

65 Thread or helix generating:

This subclass is indented under subclass 64. Apparatus or method for formation of a recess extending about and spirally along a rodlike or tubelike workpiece by a rotating cutting tool making several cutting passes through the workpiece with relative positioning of the workpiece and the cutting tool between cutting passes so that the cutting action of each pass is such that the final configuration of the recess is formed by more than one cutting pass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 10, for similar formation of the intermeshing elements of a gear.

- 48, for generating a screw thread on a worm, i.e., a device for transmitting rotary movement to a gear.

SEE OR SEARCH CLASS:

- 29, Metal Working, subclasses 33+ for apparatus for thread or helix milling combined with nonmilling metal working.
- 65, Glass Manufacturing, subclass 309 for a glass press-molding machine providing screw threads on a product, see the notes thereunder.
- 72, Metal Deforming, subclasses 88+ for thread rolling between "platens"; and subclasses 95+ and 102+ for forming a thread in a tube body by spirally corrugating the tube body.
- 76, Metal Tools and Implements, Making, subclasses 101.1+ for a process of making a tool, particularly subclasses 108.1+ for a process of making a drill bit.
- 82, Turning, subclasses 110+ for a screw cutting lathe.
- 142, Wood Turning, subclasses 23, 26+, and 35 for cutting a spiral groove in wood.
- 408, Cutting by Use of Rotating Axially Moving Tool, for cutting a screw thread by a cutter that turns about an axis and moves along that axis toward a workpiece with no additional motion during operation.
- 451, Abrading, particularly subclass 47 and 48 for a method of grinding to form a worm or screw thread and subclasses 95+ for the corresponding apparatus.
- 470, Threaded, Headed Fastener, or Washer Making: Process and Apparatus, subclasses 57+ for a machine for forming a thread on a bolt or screw.

66 Process:

This subclass is indented under subclass 65. Method of forming a thread or helix .

SEE OR SEARCH CLASS:

- 451, Abrading, subclass 48 for a process of grinding a thread or helical surface.

67 With means to regulate operation by use of templet, card, or other replaceable information supply:

This subclass is indented under subclass 65. Apparatus or method for detecting the characteristics (e.g., physical, electrical, etc.) of a member carrying operating instructions for the apparatus, which member is separate from both the workpiece and the organized structure of the apparatus.

- (1) Note. This subclass includes utilizing a prepared information supply that is to be removably placed in the apparatus. This subclass does not include utilizing the characteristics of a permanent part of the apparatus, such as a cam or gear, to influence the operation of other parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 2, for similar control combined with gear cutting apparatus.
79, for similar control combined with milling, generally.
289, for similar control combined with planing.

SEE OR SEARCH CLASS:

- 408, Cutting by Use of Rotating Axially Moving Tool, subclass 3 for similar control structure for a boring or drilling machine.

68 Complete cycle:

This subclass is indented under subclass 67. Apparatus intended to move from an inactive or loading position through the intended operation and then return to the inactive or loading position of the apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 83, for a cyclical machine used in the manufacture of a lock key.

69 To regulate cutting depth (e.g., relief, taper, etc.):

This subclass is indented under subclass 67. Apparatus wherein, in response to the replaceable information supply, the degree of projection of the cutting tool toward the work is regulated.

- (1) Note. Variation in the degree of projection of the cutting tool may follow an axial pattern as in generating a thread or helix on a tapered surface or a circumferential pattern as in producing a relieved helical cutting tool.

70 To regulate rate of motion (e.g., stopping, etc.):

This subclass is indented under subclass 67. Apparatus wherein, in response to the replaceable information supply, the velocity of the parts is regulated.

- (1) Note. To start or stop movement is considered to regulate the velocity of the parts.

71 With nonthread or nonhelix generating, milling cutter:

This subclass is indented under subclass 65. Apparatus including a first rotating cutting tool for formation of a recess about, and spirally along, a rodlike or tubelike workpiece by several generating passes and including a second rotating cutting tool adapted to rotate and form a shaped surface on a workpiece wherein the second cutting tool is not intended to cut a recess about and spirally along a workpiece.

SEE OR SEARCH CLASS:

- 29, Metal Working, subclasses 33+ for a machine including a cutting tool of this class type combined with a cutting tool of another class type.

72 This subclass is indented under subclass 65. With means to advance work or product: Apparatus including a work station and including means to move a workpiece to that station or including means to move the product that has been shaped at the work station away from that station.

- (1) Note. Means to transfer material from one work station to another work station is considered to be proper for this subclass since the material is the product of the first station and is the work of the second station.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 6, for gear cutting combined with work or product advancing.
- 159+, for a milling machine including means to infeed the work to the cutter and with means to advance the work or product.
- 172+, for a milling machine, broadly, combined with means to advance work or product.
- 174, for a milling machine, broadly, combined with means to manipulate the work.

SEE OR SEARCH CLASS:

- 82, Turning, subclasses 124+ for a lathe with work feeding and/or removing mechanism.
- 221, Article Dispensing, for a method of or apparatus for dispensing or feeding an article, not otherwise classified, and especially subclasses 239 and 294 for an article dispenser or feeder delivering to a clamp or holddown. See the class definition of Class 221 for a statement of the lines between the classes and for the disposition of other related art.
- 226, Advancing Material of Indeterminate Length, for a method of or apparatus for feeding material without utilizing the leading or trailing end to effect movement of the material.
- 414, Material or Article Handling, for work advancing, including single or multiple, nominal shaping operations. Generally, work handling to present a workpiece to a named shaping means will be found in Class 414.
- 470, Threaded, Headed Fastener, or Washer Making: Process and Apparatus, subclasses 164+ for a miscellaneous machine for feeding nail blanks, screw blanks, nut blanks, nail plates, or other stock specialized to performing the various steps in the manufacture of an article of that class.

73 Plural cutters or work holders:

This subclass is indented under subclass 65. Apparatus including a first cutting tool for formation of a recess extending about and spirally

along a rodlike or tubelike workpiece with relative positioning of the workpiece between cutting passes and including a second cutting tool for formation of a recess extending about and spirally along a rodlike or tubelike workpiece by making several cutting passes through that workpiece with relative positioning of the workpiece between cutting passes; or, including a first means for grippingly engaging a first workpiece to present that workpiece to a cutter and including a second means for grippingly engaging a second workpiece to present that workpiece to a cutter.

- (1) Note. The first and second cutting tool may act on the same or different workpieces; the first and second gripping means may present the workpiece to the same or different cutting tools.
- (2) Note. Included in this subclass is a thread milling machine having a tool turret or a blank turret.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 71, for a machine including a thread or helix generating milling cutter combined with a nonthread or nonhelix generating milling cutter.

SEE OR SEARCH CLASS:

- 29, Metal Working, subclasses 33+ for a machine which can perform diverse operations, frequently by utilizing a plurality of cutters or blank holders.

74 With planetary cutter:

This subclass is indented under subclass 65. Apparatus including movable means to support the cutting tool for rotation about a first axis and including provision to allow rotation of the movable support means about a second axis, the second axis being generally coextensive with the central axis of the rodlike or tubelike workpiece, wherein the cutting tool is adapted to orbit about the workpiece during formation of the helical recess therein.

75 With means to move work axially and means to interrelate work movement with cutter rotation:

This subclass is indented under subclass 65. Apparatus including means to cause the cutting tool to turn about an axis and including means to displace the workpiece relative to the cutting tool along the axis of the workpiece; also including means to cause the cutting tool to rotate a prescribed number of revolutions for a prescribed amount of axial displacement.

76 With means to rotate work and means to interrelatedly infeed the work relative to the cutter:

This subclass is indented under subclass 65. Apparatus including a base, including means to cause the workpiece to rotate about the axis thereof relative to the cutting tool and relative to the base, and including means to cause relative motion between the rotating cutter and the workpiece to thereby bring about the cutting action, further including means to cause the cutting tool to approach the workpiece a prescribed distance for a prescribed number of revolutions of the workpiece.

77 Means to infeed the cutter:

This subclass is indented under subclass 76. Apparatus wherein the means to cause relative approach of the cutting tool and the workpiece acts on the cutting tool so that it also moves relative to the base of the apparatus.

78 With means to circumferentially adjust the position of the cutter with respect to the work:

This subclass is indented under subclass 65. Apparatus wherein means is provided to alter the position of the work relative to the cutting tool so that the location of the recess formed in the workpiece can be selected.

79 With regulation of operation by use of templet, card, or other replaceable information supply:

This subclass is indented under subclass 64. Apparatus or method for detecting the characteristics (e.g., physical, electrical, etc.) of a member carrying operating instructions for the apparatus, which member is separate from both the workpiece and the organized structure of the apparatus.

- (1) Note. This subclass includes utilizing a prepared information supply that is to be removably placed in the apparatus. This subclass does not include utilizing the characteristics of a permanent part of the apparatus, such as a cam or gear, to influence the operation of other parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 2, for similar control combined with gear cutting apparatus.
67, for similar control combined with a milling machine for generating a thread or helix.
289, for similar control combined with planing.

SEE OR SEARCH CLASS:

- 408, Cutting by Use of Rotating Axially Moving Tool, subclass 3 for similar control structure for a boring or drilling machine.

80 With sensing of numerical information and regulation without mechanical connection between sensing means and regulated means (i.e., numerical control):

This subclass is indented under subclass 79. Apparatus or method including detection of information on the separate member which information is of a prescribed magnitude and is other than a physical shape or outline, wherein the detected information is transmitted to the apparatus for performing the shaping operation by means other than a mechanical linkage.

- (1) Note. This subclass is the home for milling combined with "numerical control" using a tape, card, etc., as the replaceable information supply.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 289, for planing combined with numerical control.

81 To cut lock key:

This subclass is indented under subclass 79. Apparatus or method intended to form the raised portions on a member used to precisely position lock tumblers and actuate a lock cylinder.

- 82 Using templet other than a key:**
This subclass is indented under subclass 81. Apparatus or method including detecting the characteristics of a member not identical to the member being formed, i.e., the member detected is not intended to be used to precisely position lock tumblers and actuate a lock cylinder.
- 83 Complete cycle:**
This subclass is indented under subclass 81. Apparatus or method intended to move from an inactive or loading position through the intended operation and then return to the inactive or loading position of the apparatus.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
68, for similar structure used in thread or helix generating.
- 84 Process:**
This subclass is indented under subclass 79. Method of milling.
- 85 Reproducing means:**
This subclass is indented under subclass 79. Apparatus particularly adapted to generate substantially the form of a separate member, i.e., a pattern member, of the same or different size.
- (1) Note. An image on a planar element may be considered to be the form of the separate element for this subclass.
 - (2) Note. Included herein is shaping in which the product corresponds to the shape of the pattern element in a relief or intaglio relationship or in which the shape of the pattern member is produced repeatedly on the same workpiece.
 - (3) Note. Production of a mirror image of the pattern is included in this subclass.
 - (4) Note. A change in part of the dimensions of the workpiece without a corresponding change in the remaining dimensions is included in this subclass, e.g., the reproduction of a peripheral surface on a flat plate without corresponding change in the thickness thereof.
- 86 Including pantograph cutter-carrier:**
This subclass is indented under subclass 85. Apparatus including four rigid links joined in parallelogram form for carrying the cutting tool and for carrying a follower adapted to trace over the surface of the pattern member and thereby reproduce the form of the pattern member on the workpiece.
- 87** This subclass is indented under subclass 86. And means to move work at work station: Apparatus including a base adapted to support the apparatus and including means to cause the workpiece to change positions with respect to the base.
- 88 About work axis:**
This subclass is indented under subclass 87. Apparatus wherein the means to cause the workpiece to change positions acts to cause the workpiece to turn about a pivot point.
- (1) Note. The point about which the workpiece is moved may be within or outside the confines of the workpiece.
- 89** This subclass is indented under subclass 86. Pivotaly supported for vertical movement: Apparatus wherein the four rigid links are attached to the apparatus so that during operation the cutting tool and the follower are directed to move in a vertical plane.
- 90 And means to counterbalance carrier:**
This subclass is indented under subclass 86. Apparatus including means to counteract and lift against the weight of the four rigid links joined in parallelogram form to cause the rigid links to function as if their weight has been reduced.
- 91 Including plural cutters:**
This subclass is indented under subclass 86. Apparatus including a first cutting tool adapted to perform a shaping operation and including a second cutting tool adapted to perform a shaping operation, wherein the first and second cutting tools are relatively movable as assembled in the apparatus.
- (1) Note. A first cutting bit and a second cutting bit mounted on the same cutting tool holder are considered to be two

edges of the same cutting tool rather than plural cutters.

92 By use of pivotally supported tracer:
This subclass is indented under subclass 85. Apparatus including a follower adapted to move over the surface of the pattern member and including means to support the follower to swing about a fixed point during operation thereof.

93 Duplicating means:
This subclass is indented under subclass 85. Apparatus adapted to generate the form of the pattern member in substantially the same size.

94 With means for operation without manual intervention:
This subclass is indented under subclass 93. Apparatus including provision to allow operation thereof, once started, to continue at least until completion of a prescribed operation, without any further input from an operative.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 113, for a reproducing machine with provision for circumferential movement of the cutter with respect to the workpiece adapted to operate without manual intervention.
- 116, for a reproducing machine, generally, for operation without manual intervention.
- 117, for a milling machine with regulation by a replaceable information supply, generally, including means to permit operation without manual intervention.

95 To make a double curvature foil:
This subclass is indented under subclass 94. Apparatus particularly adapted to form an elongated member having an upper smoothly formed surface and a lower smoothly formed surface wherein provision is made to establish that the curvature of the formed surfaces be related, but different, and not allochiral.

- (1) Note. Included herein is formation of an aircraft wing, the propeller for an air or water vessel, or a turbine blade.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 119, for apparatus to mill a double curvature foil utilizing plural tracers or plural templets without duplicating.
- 120, for apparatus to mill a double curvature foil without plural tracers or plural templets and without duplicating.

96 Including means to sense optical or magnetic image:
This subclass is indented under subclass 94. Apparatus including means to detect the form of the pattern member, which detector means is particularly adapted to note light waves of magnetic energy emanating therefrom.

97 With means to support templet above or under work:
This subclass is indented under subclass 94. Apparatus with means to hold the pattern member and the workpiece against gravity and adjacent each other so that the pattern member is either directly above or directly below the workpiece.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 110, for similar apparatus not in a machine for operation without manual intervention.

98 Including tracer adapted to trigger electrical energy:
This subclass is indented under subclass 94. Apparatus including means having a follower adapted to ride over the form of the pattern member, which means is adapted to be connected to a supply of electricity to regulate the flow of the electricity.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 114, for a tracer adapted to trigger electrical energy in a reproducing means with provision for circumferential relative movement of cutter and work and adapted for operation without manual intervention.
- 126, for a tracer, per se, for a milling machine, adapted to trigger electrical energy.

99 To actuate electrically driven work or tool moving means:

This subclass is indented under subclass 98. Apparatus including means utilizing electricity to reposition or drive the cutting tool or the workpiece, wherein the electricity regulated serves to control the movement of the repositioning or driving means.

100 To actuate fluid driven work or tool moving means:

This subclass is indented under subclass 98. Apparatus including means utilizing hydraulic energy to reposition or drive the cutting tool or the workpiece, wherein the electricity regulated serves to control the movement of the repositioning or driving means.

101 Including tracer adapted to trigger fluid energy:

This subclass is indented under subclass 94. Apparatus including means having a follower adapted to ride over the form of the pattern member, which means is adapted to be connected to a supply of gas or liquid to regulate the flow of that gas or liquid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

114, for a tracer adapted to trigger fluid energy in a reproducing means with provision for circumferential relative movement of cutter and work and adapted for operation without manual intervention.

129, for a tracer, per se, for a milling machine, adapted to trigger fluid energy.

102 To actuate fluid driven work or tool moving means:

This subclass is indented under subclass 101. Apparatus including means utilizing hydraulic or pneumatic energy to reposition or drive the cutting tool or the workpiece, wherein the gas or liquid regulated serves to control the movement of the repositioning or driving means.

103 Including cutter and tracer fixed to move laterally together:

This subclass is indented under subclass 102. Apparatus including structure to support the cutting tool and structure to support the fol-

lower such that any movement of the follower is accompanied by a corresponding equal movement of the cutting tool supporting structure.

104 And provision for circumferential relative movement of cutter and work:

This subclass is indented under subclass 94. Apparatus particularly adapted to shape a workpiece that is generally circular in cross section, wherein the cutting tool is supported for rotation about its axis and for arcuate translatory movement about the circumference of the workpiece.

SEE OR SEARCH THIS CLASS, SUBCLASS:

111, for similar structure in combination with a duplicating machine, generally.

112, for similar structure in combination with a reproducing machine.

122, for similar structure for use in a machine using a replaceable information supply, which machine is intended to operate without manual intervention.

123, for similar structure for use in a machine using a replaceable information supply.

105 Including plural cutters:

This subclass is indented under subclass 104. Apparatus including a first cutting tool adapted to perform a shaping operation and including a second cutting tool adapted to perform a shaping operation, wherein the first and second cutting tools are relatively movable as assembled in the apparatus.

(1) Note. A first cutting bit and a second cutting bit mounted on the same cutting tool holder are considered to be two edges of the same cutting tool rather than plural cutters.

SEE OR SEARCH THIS CLASS, SUBCLASS:

91, for plural milling cutters supported by a pantograph cutter-carrier.

106 Including plural cutters:

This subclass is indented under subclass 94. Apparatus including a first cutting tool adapted to perform a shaping operation and including a

second cutting tool adapted to perform a shaping operation, wherein the first and second cutting tools are relatively movable as assembled in the apparatus.

- (1) Note. A first cutting bit and a second cutting bit mounted on the same cutting tool holder are considered to be two edges of the same cutting tool rather than plural cutters.

107 Including cross-slide tool carrier:

This subclass is indented under subclass 94. Apparatus including a first guideway for supporting the rotating cutting tool allowing that cutting tool to move in a first straight line thereon and including a second guideway for supporting the first guideway and allowing that first guideway to move in a second straight line normal to the first straight line, so that the cutting tool can be moved in any direction within a plane by the cumulative action of the first and second guideways.

- (1) Note. The straight line movement of this definition is in addition to movement of the cutting tool about an axis and along that axis for presentation to the work.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 109, for use of a cross-slide tool carrier in a duplicating machine, generally.

108 Including plural cutters:

This subclass is indented under subclass 93. Apparatus including a first cutting tool adapted to perform a shaping operation and including a second cutting tool adapted to perform a shaping operation, wherein the first and second cutting tools are relatively movable as assembled in the apparatus.

- (1) Note. A first cutting bit and a second cutting bit mounted on the same cutting tool holder are considered to be two edges of the same cutting tool rather than plural cutters.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 91, for plural milling cutters supported by a pantograph cutter-carrier.

109 Including cross-slide tool carrier:

This subclass is indented under subclass 93. Apparatus including a first guideway for supporting the rotating cutting tool allowing that cutting tool to move in a first straight line thereon and including a second guideway for supporting the first guideway and allowing the first guideway to move in a second straight line normal to the first straight line, so that the cutting tool can be moved in any direction within a plane by the cumulative action of the first and second guideways.

- (1) Note. The straight line movement of this definition is in addition to movement of the cutting tool about an axis and along that axis for presentation to the work.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 107, for use of a cross-slide tool carrier in a duplicating machine for operation without manual intervention.

110 With means to support templet above or under work:

This subclass is indented under subclass 93. Apparatus with means to hold the pattern member and the workpiece against gravity and adjacent each other so that the pattern member is either directly above or directly below the workpiece.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 97, for similar structure in a machine for operation without manual intervention.

111 With provision for circumferential relative movement of cutter and work:

This subclass is indented under subclass 93. Apparatus particularly adapted to shape a workpiece that is generally circular in cross section, wherein the cutting tool is supported for rotation about its axis and for relative arcuate translatory movement about the circumference of the workpiece.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 104, for similar structure in combination with a duplicating machine for operation without manual intervention.
- 112, for similar structure in combination with a reproducing machine.
- 122, for similar structure for use in a machine using a replaceable information supply, which machine is intended to operate without manual intervention.
- 123, for similar structure for use in a machine using a replaceable information supply.

112 With provision for circumferential relative movement of cutter and work:

This subclass is indented under subclass 85. Apparatus particularly adapted to shape a workpiece that is generally circular in cross section, wherein the cutting tool is supported for rotation about its axis and for relative arcuate translatory movement about the circumference of the workpiece.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 104, for similar structure in combination with a duplicating machine for operation without manual intervention.
- 111, for similar structure in combination with a duplicating machine, generally.
- 122, for similar structure for use in a machine using a replaceable information supply, which machine is intended to operate without manual intervention.
- 123, for similar structure for use in a machine using a replaceable information supply.

113 And means for operation without manual intervention:

This subclass is indented under subclass 112. Apparatus including provision to allow operation thereof, once started, to continue at least until completion of a prescribed operation, without any further input from an operative.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 94, for a duplicating machine for operation without manual intervention.
- 116, for a reproducing machine, generally, for operation without manual intervention.
- 117, for a milling machine with regulation by a replaceable information supply, generally, including means to permit operation without manual intervention.

114 Including tracer adapted to trigger electrical or fluid energy:

This subclass is indented under subclass 113. Apparatus including means having a follower adapted to ride over the form of the pattern member, which means is adapted to be connected to (a) a supply of electricity to regulate the flow of the electricity or to (b) a supply of gas or liquid so as to regulate the flow of that gas or liquid.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 98, for a tracer adapted to trigger electrical energy in a duplicating, milling means adapted to operate without manual intervention.
- 101, for a tracer adapted to trigger fluid energy in a duplicating, milling means adapted to operate without manual intervention.
- 127, for a tracer, per se, for a milling machine, adapted to trigger electrical energy.
- 129, for a tracer, per se, for a milling machine, adapted to trigger fluid energy.
- 290, for a tracer adapted to trigger electrical or fluid energy in a planing means adapted to operate by regulation from a replaceable information supply.

115 For using planar templet in cutting profile (e.g., contour map from planar map, etc.):

This subclass is indented under subclass 85. Apparatus adapted to utilize a generally two-dimensional pattern member on which there are a plurality of forms wherein the apparatus is adapted to utilize a first form to guide the cutting tool to shape at a location on the work-

piece and is adapted to utilize a second form to guide the cutting tool to shape at a depth in the workpiece, so that the final result of the workpiece is a three-dimensional figure.

116 Including means for operation without manual intervention:

This subclass is indented under subclass 85. Apparatus including provision to allow operation thereof, once started, to continue at least until completion of a prescribed operation, without any further input from an operative.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 94, for a duplicating machine for operation without manual intervention.
- 113, for a reproducing machine with provision for circumferential movement with respect to the workpiece adapted to operate without manual intervention.
- 117, for a milling machine with regulation by a replaceable information supply, generally, including means to permit operation without manual intervention.

117 Including means for operation without manual intervention:

This subclass is indented under subclass 79. Apparatus including provision to allow operation thereof, once started, to continue at least until completion of a prescribed operation, without any further input from an operative.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 94, for a duplicating machine for operation without manual intervention.
- 113, for a reproducing machine with provision for circumferential movement of the cutter with respect to the workpiece adapted to operate without manual intervention.
- 116, for a reproducing machine, generally, for operation without manual intervention.

118 Including simultaneously usable plural tracers or including tracer adapted to simultaneously use plural templets:

This subclass is indented under subclass 117. Apparatus including either (a) multiple followers adapted to ride over the form of the pattern member or (b) provision to use multiple pattern members, wherein the cutting tool is caused to move relative to the workpiece and yield a product that is the result of neither a follower nor a pattern member individually, but is the result of two followers or of two pattern members collectively.

119 To make a double curvature foil:

This subclass is indented under subclass 118. Apparatus particularly adapted to form an elongated member having an upper smoothly formed surface and a lower smoothly formed surface wherein provision is made to establish that the curvature of the formed surfaces be related, but different, and not allochiral.

- (1) Note. Included herein is formation of an aircraft wing, the propeller for an air or water vessel, or a turbine blade.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 95, for apparatus to mill a double curvature foil by duplicating.
- 120, for apparatus to mill a double curvature foil without plural tracers or plural templets, and without duplicating.

120 To make a double curvature foil:

This subclass is indented under subclass 117. Apparatus particularly adapted to form an elongated member having an upper formed surface and a lower formed surface wherein provision is made to establish that the curvature of the formed surfaces be related, but different, and not allochiral.

- (1) Note. Included herein is formation of an aircraft wing, the propeller for an air or water vessel, or a turbine blade.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 95, for apparatus to mill a double curvature foil by duplicating.

- 119, for apparatus to mill a double curvature foil utilizing plural tracers or plural templets, without duplicating.
- 121 Including cutter and tracer fixed to move together:**
This subclass is indented under subclass 117. Apparatus including a follower adapted to ride over the form of the pattern member, which follower is secured to structure carrying the rotating cutting tool so that any movement of the follower is accompanied by corresponding equal movement of the cutting tool.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 124, for a similar cutter and tracer fixed to move together but not in a machine for operation without manual intervention.
- 122 With provision for circumferential relative movement of cutter and work:**
This subclass is indented under subclass 117. Apparatus particularly adapted to shape a workpiece that is generally circular in cross section, wherein the cutting tool is supported for rotation about its axis and for relative arcuate translatory movement about the circumference of the workpiece.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 104, for similar structure in combination with a duplicating machine for operation without manual intervention.
111, for similar structure in combination with a duplicating machine, generally.
112, for similar structure in combination with a reproducing machine.
123, for similar structure for use in a machine using a replaceable information supply.
- 123 And provision for circumferential relative movement of cutter and work:**
This subclass is indented under subclass 79. Apparatus particularly adapted to shape a workpiece that is generally circular in cross section, wherein the cutting tool is supported for rotation about its axis and for relative arcuate translatory movement about the circumference of the workpiece.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 104, for similar structure in combination with a duplicating machine for operation without manual intervention.
111, for similar structure in combination with a duplicating machine, generally.
112, for similar structure in combination with a reproducing machine.
122, for similar structure for use in a machine using a replaceable information supply, which machine is intended to operate without manual intervention.
- 124 Including cutter and tracer fixed to move together:**
This subclass is indented under subclass 79. Apparatus including a follower adapted to ride over the form of the pattern member which follower is secured to the structure carrying the rotating cutting tool so that any movement of the follower is accompanied by corresponding equal movement of the cutting tool.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 121, for a similar cutter and tracer fixed to move together but in a machine for operation without manual intervention.
- 125 Templet, tracer, or cutter:**
This subclass is indented under subclass 64. Subcombinational apparatus or method comprising (a) pattern means or the use of pattern means that is separate from the workpiece and is separate from a milling machine, which pattern means is to be used to determine the operation of the milling machine; (b) a follower or the use of a follower to ride over the form of a pattern and thereby determine the operation of a milling machine; or (c) a cutting tool or the use of such a cutting tool adapted to shape the surface of the workpiece, wherein the subcombinational structure includes sufficient interrelationship to a milling machine as to exclude the apparatus or method from any class limited to the subcombination.

- SEE OR SEARCH CLASS:
 234, Selective Cutting (e.g., Punching), subclass 89 for a pattern or pattern sensor usable with a pattern controlled selective cutting machine.
 407, Cutters, for Shaping, for a cutting tool, per se, with limited features so as to be distinct from a milling machine.
- 126 Tracer:**
 This subclass is indented under subclass 125. Subcombinational apparatus or method comprising a follower or the use of a follower to ride over the form of a pattern and thereby determine the operation of a milling machine, including sufficient interrelationship to a milling machine as to exclude the apparatus or method from any class limited to the subcombination.

 SEE OR SEARCH THIS CLASS, SUBCLASS:
 79, for a combined machine or process of milling including use of a templet.
- 127 Adapted to trigger electrical energy:**
 This subclass is indented under subclass 126. Subcombinational apparatus or method in which the follower is adapted to be connected to a supply of electricity so as to regulate the flow of that electricity.

 SEE OR SEARCH THIS CLASS, SUBCLASS:
 98, and 101, for a tracer adapted to trigger electrical energy combined with a duplicating machine.
 114, for a tracer adapted to trigger electrical energy combined with a reproducing machine.
- 128 Photocell:**
 This subclass is indented under subclass 127. Subcombinational apparatus or method wherein the control of electricity is done in response to the degree of illumination.
- 129 Adapted to trigger fluid energy:**
 This subclass is indented under subclass 126. Subcombinational apparatus or method in which the follower is adapted to be connected to a supply of gas or liquid so as to regulate the flow of that gas or liquid.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 101, for a tracer adapted to trigger fluid energy in combination with a duplicating machine.
 114, for a tracer adapted to trigger fluid energy in combination with a reproducing machine.
- 130 Templet:**
 This subclass is indented under subclass 125. Subcombinational apparatus or method comprising pattern means or the use of pattern means that is separate from the workpiece and is separate from a milling machine and is to be used to determine the operation of the milling machine, including sufficient interrelationship to the milling machine as to exclude the apparatus or method from any class limited to the subcombination.
- 131 Process:**
 This subclass is indented under subclass 64. Method of milling.
- 132 Including infeeding:**
 This subclass is indented under subclass 131. Method including causing relative translatory movement of a milling tool and a workpiece to effect the shaping operation.

 SEE OR SEARCH THIS CLASS, SUBCLASS:
 145, for a milling means including provision to infeed the workpiece.
 183, for a milling means including provision to infeed the cutting tool.
- 133 With means to weigh or test work or product:**
 This subclass is indented under subclass 64. Apparatus combined with means to measure the gravitational attraction of the workpiece or of the shaped article, or combined with means to determine another condition of the workpiece or of the shaped article.
- 134 With means to protect operative or machine (e.g., guard, safety device, etc.):**
 This subclass is indented under subclass 64. Apparatus combined with means intended to physically prevent encounter of a man operating the apparatus or of an element of the appa-

ratus with an undesirable particle or unsafe condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

254, for similar structure used in broaching.

135 With means to control temperature or lubricate:

This subclass is indented under subclass 64. Apparatus combined with means intended to regulate the thermal condition of the apparatus or of the workpiece, or combined with means to apply a friction reducing fluent material to the apparatus or to the workpiece.

136 Cutter or work:

This subclass is indented under subclass 135. Apparatus particularly adapted to regulate the thermal condition of the cutting tool or of the workpiece, or particularly adapted to apply a lubricating material to the cutting edge of the cutting tool or to the workpiece.

137 With means to remove chip:

This subclass is indented under subclass 64. Apparatus combined with means adapted to move relative to the cutting tool to carry non-shaped material removed from the shaped material away from the milling station.

SEE OR SEARCH THIS CLASS, SUBCLASS:

253, for a broaching machine combined with means to remove chips formed thereby.

138 Means to trim edge:

This subclass is indented under subclass 64. Apparatus particularly adapted to remove material from the perimeter bounding a generally planar area of a workpiece.

(1) Note. Included in this subclass is an apparatus adapted to cut the edge portion of a workpiece into chips.

SEE OR SEARCH THIS CLASS, SUBCLASS:

303, for a planing machine intended to trim the edge of a workpiece.

SEE OR SEARCH CLASS:

83, Cutting, for subdividing the edge portion from the remainder of a workpiece, particularly subclass 869, for edge trimming, e.g., bevelling, without specific shaping of the formed edge.

139 Means to remove scale or raised surface imperfection:

This subclass is indented under subclass 64. Apparatus particularly adapted to remove a coating off a workpiece or particularly adapted to remove an undesirable, relatively small raised portion from the surface of a workpiece.

SEE OR SEARCH CLASS:

15, Brushing, Scrubbing, and General Cleaning, for means to remove a coating off a workpiece by means other than a milling cutter.

140 Means to remove flash or burr:

This subclass is indented under subclass 139. Apparatus particularly adapted to remove the extraneous material formed during a previous shaping, molding, or welding operation.

(1) Note. Flash is the ridge formed at the abutment line of a pair of mold components or is formed by a weld line and is considered to be that portion of a product of the molding or welding operation that extends beyond the desired surface of the product.

SEE OR SEARCH THIS CLASS, SUBCLASS:

258, for broaching apparatus to remove flash or burr.

297, for planing apparatus to remove flash or burr.

141 With means to dampen vibration:

This subclass is indented under subclass 64. Apparatus including means to impart to the cutting tool a vibration characteristic that is different from that imparted by the reaction of the cutting tool and the workpiece such that the resultant vibration of the cutting tool is reduced, or including means specifically intended to absorb the energy of a vibrating cutting tool.

142 Means to mill epitrochoidal shape:

This subclass is indented under subclass 64. Apparatus particularly adapted to form the shape on the workpiece that would be generated by a point fixed to a radius of a rotating, generating circle, which circle rolls without slipping over the surface of a fixed, base circle.

- (1) Note. The shapes formed by a milling machine of this subclass include that of the interior of the combustion chamber of a “Wankel” engine.

143 Means for internal milling:

This subclass is indented under subclass 64. Apparatus particularly adapted to cutting on an inwardly facing surface of a generally enclosed or shell-like workpiece.

144 With detachable or auxiliary cutter support to convert cutting action:

This subclass is indented under subclass 64. Apparatus including (a) means to hold the cutting tool against gravity and against the force of the shaping action, which means is adapted to be removed and repositioned to allow the cutting tool to be mounted to approach and engage the workpiece in a different manner, or including (b) a first means to hold the cutting tool against gravity and against the force of the shaping action and a second means to alternatively hold the cutting tool against gravity and against the force of a different shaping action.

145 This subclass is indented under subclass 64. Including means to infeed work to cutter: Apparatus including a base upon which the apparatus is supported against gravity and including means to cause the workpiece to move relative to the axis of the cutting tool and relative to the base during a shaping stroke.

- (1) Note. “Infeed” is the relative approach of the cutting tool and the workpiece during a cutting stroke and is not intended to include the relative approach of these members at other times of the operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 132, for a milling method including infeeding.

146 With compensation for backlash in drive means:

Apparatus under subclass 145 including means for transmission of force to a workpiece or to a cutting tool wherein a first drive member transmits force and movement to a second drive member, including provision to adjust, eliminate, or make other allowance for any undesired relative movement between the drive members and the workpiece or the cutting tool.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 5, for compensation for backlash in the drive means of a gear cutting machine.

SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, subclass 409 for means to eliminate backlash in an element of a gear train; and subclasses 440+ for means to eliminate backlash in sectional gears.

147 With control means energized in response to activator stimulated by condition sensor:

This subclass is indented under subclass 145. Apparatus including means for: (a) detecting any of the following characteristics: a state or property, a change in a state or property, or the occurrence of a predetermined event in any of the following: the workpiece, the product of the apparatus, the apparatus itself, or the environment of the apparatus affecting the operation thereof; and (b) initiating (as a direct result of that detection) a signal other than that generated or transmitted by the detecting means; and (c) regulating or modifying (as a direct result of said initiation) the operation of the means to affect the cutting.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 15, for control means combined with a gear hobbing machine.
186, for control means combined with a milling machine having axial cutter infeed.
193, for control means combined with a milling machine having cutter infeed, generally.

- 207, for control means combined with a milling machine having means to adjustably position the cutter.
- 245, for control means combined with a broaching machine.
- SEE OR SEARCH CLASS:
- 408, Cutting by Use of Rotating Axially Moving Tool, subclass 8 for similar structure for regulating the operation of a machine of that class type.
- 148 In response to cutter or cutter carriage:**
This subclass is indented under subclass 147. Apparatus including means for detecting the characteristics of the cutting tool or structure supporting the cutting tool for movement, initiating as a result of that detection a signal and thereby regulating the operation of the apparatus.
- 149 In response to work or work carriage:**
This subclass is indented under subclass 147. Apparatus including means for detecting the characteristics of the workpiece or structure supporting the workpiece for movement, initiating as a result of that detection a signal and thereby regulating the operation of the apparatus.
- 150 To control rate of infeed or return:**
This subclass is indented under subclass 149. Apparatus including means to regulate the velocity of the workpiece as it moves relative to the cutting tool during the shaping stroke, or the velocity of the workpiece on the stroke back to the beginning point, in response to the sensed condition.
- 151 To control limit of infeed:**
This subclass is indented under subclass 149. Apparatus including means to establish the starting point, or the ending point of the cutting stroke, in response to the sensed condition.
- 152 Adapted to hydraulically or pneumatically stimulate control:**
This subclass is indented under subclass 151. Apparatus wherein the means for regulating the operation receives the initiating impulse from the transmission of fluid pressure.
- 153 Adapted to electrically stimulate control:**
This subclass is indented under subclass 151. Apparatus wherein the means for regulating the operation receives the initiating impulse from the transmission of electrical energy.
- 154 To control rate of infeed or return:**
This subclass is indented under subclass 147. Apparatus including means to regulate the velocity of movement of the cutting tool toward the workpiece during the cutting stroke, or the velocity of the cutting tool on the stroke back to the beginning point for the next cutting stroke, in response to the sensed condition.
- 155 To effect stopping of infeed:**
This subclass is indented under subclass 147. Apparatus in which means are provided to bring the means to infeed the workpiece to a halt.
- (1) Note. Means to cause the infeed means to reverse directions is not considered to halt the infeed means.
- 156 With means to change rate of infeed:**
This subclass is indented under subclass 145. Apparatus with specific provision to alter the speed of relative approach of the workpiece and the cutting tool during the shaping stroke.
- 157** This subclass is indented under subclass 145. Means to mill indeterminate length work: Apparatus particularly adapted to shape a workpiece that is effectively infinite in length.
- (1) Note. The infeed means of this subclass engages the workpiece at the sides thereof, at the leading end, or at the trailing end, but, in no instance recognizes (i.e., engages) both ends of a single workpiece. A workpiece formed in a closed loop intended to turn through a milling apparatus is considered to be of indeterminate length for this subclass.
- (2) Note. Work infeed means for this subclass are those in the immediate area of the cutting tool; similar structure remote from the cutting tool is considered to be work advancing means.

SEE OR SEARCH CLASS:

226, Advancing Material of Indeterminate Length, for similar work handling structure without a milling means.

158 Multiple work station:

This subclass is indented under subclass 145. Apparatus including a first rotating cutting tool at a first location to form a shaped surface on a workpiece and including a second rotating cutting tool at a second location to form a shaped surface on a workpiece.

159 This subclass is indented under subclass 145. With means to advance work or product: Apparatus including a work station and including means to move a workpiece to that station or including means to move the product that has been shaped at the work station away from that station.

- (1) Note. Means to transfer material from one work station to another work station is considered to be proper for this subclass since the material is the product of the first station and is the work of the second station.

SEE OR SEARCH THIS CLASS, SUBCLASS:

6, for gear cutting combined with work or product advancing.
 72, for thread or helix milling means combined with work or product advancing means.
 172+, for a milling machine, broadly, combined with means to advance work or product.
 174, for a milling machine, broadly, combined with means to manipulate the work.

SEE OR SEARCH CLASS:

82, Turning, subclasses 124+ for a lathe with work feeding and/or removing mechanism.
 221, Article Dispensing, for a method of or apparatus for dispensing or feeding an article not otherwise classified; and especially subclasses 239 and 294 for an article dispenser or feeder delivering to a clamp or hold-down. See the class definition of Class 221 for a

statement of the lines between the classes and for the disposition of other related art.

226, Advancing Material of Indeterminate Length, for method of or apparatus for feeding material without utilizing the leading or trailing end to effect movement of the material.

414, Material or Article Handling, for work advancing, including single or multiple, nominal shaping operations. Generally, work handling to present a workpiece to a named shaping means will be found in Class 414.

470, Threaded, Headed Fastener, or Washer Making: Process and Apparatus, subclasses 164+ for a miscellaneous machine for feeding nail blanks, screw blanks, nut blanks, nail plates, or other stock specialized to performing the various steps in the manufacture of an article of that class.

160 Vertically:

This subclass is indented under subclass 159. Apparatus including a base adapted to support the means for guiding or transporting the workpiece or the product against gravity, wherein the guiding or transporting means is adapted to direct the workpiece or product to move in a direction either up or down.

SEE OR SEARCH THIS CLASS, SUBCLASS:

172, for a milling machine combined with vertically acting work or product advancing means, generally.

161 Endless or orbital work or product advancing means:

This subclass is indented under subclass 159. Apparatus comprising transport means including a surface adapted to carry a workpiece, which transport means is constructed of a flacid, pliant belt or of a series of chainlike links and is adapted to move in a closed loop in a manner to carry the workpiece toward or away from the cutting station.

SEE OR SEARCH THIS CLASS, SUBCLASS:

173, for a milling machine combined with an endless or orbital work carrier generally.

- 162 To reciprocate or oscillate work:**
This subclass is indented under subclass 145. Apparatus wherein the means to move the workpiece to effect the shaping stroke is also intended to cyclically return with the workpiece generally along the path of the shaping stroke to the starting point.
- (1) Note. The return movement of the workpiece may also be a shaping stroke.
- 163 With work holder:**
This subclass is indented under subclass 145. Apparatus combined with means to support the workpiece against the force of gravity and/or against the force of the cutting tool during the shaping stroke.
- 164 And means to selectively position work:**
This subclass is indented under subclass 163. Apparatus combined with means to shift the position of the workpiece from one predetermined position to another predetermined position between shaping strokes, to allow the cutting tool to engage a different portion of the workpiece on a subsequent shaping stroke.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
174, for a milling machine with means to reposition the workpiece, generally.
- 165 Including means to support work for rotation during operation:**
This subclass is indented under subclass 163. Apparatus wherein the structure for moving the workpiece toward the cutting tool to effect shaping of the workpiece is provided with means to hold that workpiece against gravity and against the force of the tool while allowing the workpiece to turn continuously about an axis when presented to be shaped by the rotating cutting tool.
- (1) Note. Rotation of the work support to cause the periphery of the workpiece to move past the cutting tool is considered to be "infeed" for this subclass.
- SEE OR SEARCH CLASS:
82, Turning, for similar work supporting and rotating means combined with a nonrotary cutter.
- 166 And including means to infeed cutter toward work axis:**
This subclass is indented under subclass 165. Apparatus including structure to cause the rotating cutting tool to be displaced toward the axis about which the workpiece turns to effect the cutting action.
- (1) Note. Cutting may be effected by both the rotation of the workpiece and by the infeed of the cutting tool.
- 167 With linear axial movement of work:**
This subclass is indented under subclass 165. Apparatus wherein the work supporting structure is also intended to carry the workpiece axis.
- 168 With angular movement of work:**
This subclass is indented under subclass 165. Apparatus wherein the support structure is mounted to be pivoted from the first to a second position about an axis which is other than parallel to the workpiece axis to change the position of the workpiece for different presentation to the cutting tool.
- 169 Including friction gearing drive:**
This subclass is indented under subclass 145. Apparatus wherein the means to cause the workpiece to move toward the cutting tool during the shaping stroke includes a rotary driving member having a generally smooth circular or annular surface and a rotary driven member having a generally smooth circular or annular surface adapted to rollingly engage the corresponding surface of the driving member, whereby moving force is transmitted to the workpiece.
- 170 Including fluid drive:**
This subclass is indented under subclass 145. Apparatus wherein the means to cause the workpiece to move toward the cutting tool during the shaping stroke includes means adapted to be impelled by the force of flowing liquid or gas acting thereupon, whereby moving force is transmitted to the workpiece.

171 With means to effect stopping upon completion of operation:

This subclass is indented under subclass 64. Apparatus in which means is provided which is intended to bring movement of the apparatus to a halt upon completion of the shaping operation.

- (1) Note. All movement of the apparatus need not stop for classification in this subclass, only so much as is necessary to terminate shaping of the workpiece.

172 This subclass is indented under subclass 64. With means to advance work or product: Apparatus including a work station and including means to move a workpiece to that station or including means to move the product that has been shaped at the work station away from that station.

- (1) Note. Means to transfer material from one work station to another work station is considered to be proper for this subclass since the material is the product of the first station and is the work of the second station.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 6, for gear cutting combined with work or product advancing.
 72, for thread or helix milling means combined with work or product advancing means.
 159+, for a milling machine including means to infeed the work to the cutter and with means to advance the work or the product.
 174, for a milling machine, broadly, combined with means to manipulate the work.

SEE OR SEARCH CLASS:

- 82, Turning, subclasses 124+ for a lathe with work feeding and/or removing mechanism.
 221, Article Dispensing, for a method of or apparatus for dispensing or feeding an article not otherwise classified; and especially subclasses 239 and 294 for an article dispenser or feeder delivering to a clamp or hold-down. See the

class definition of Class 221 for a statement of the lines between the classes and for the disposition of other related art.

- 226, Advancing Material of Indeterminate Length, for a method of or apparatus for feeding material without utilizing the leading or trailing end to effect movement of the material.
 414, Material or Article Handling, for work advancing, including single or multiple, nominal shaping operations. Generally, work handling to present a workpiece to a named shaping means will be found in Class 414.
 470, Threaded, Headed Fastener, or Washer Making: Process and Apparatus, subclasses 164+ for a miscellaneous machine for feeding nail blanks, screw blanks, nut blanks, nail plates, or other stock specialized to performing the various steps in the manufacture of an article of that class.
 901, Robots, subcollection 6+ for a robot which cooperates with another machine.

173 Endless or orbital work or product advancing means:

This subclass is indented under subclass 172. Apparatus comprising transport means including a surface adapted to carry a workpiece, which transport means is constructed of a flacid, pliant belt or a series of chainlike links and is adapted to move in a closed loop in a manner to carry the workpiece toward or away from the cutting station.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 161, for a milling machine with an endless or orbital work carrier and with work infeed means.

174 With means to precisely reposition work:

This subclass is indented under subclass 64. Apparatus combined with means to move the workpiece from a first position to a second exact position.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 164, for a milling machine including an infeed means and including means to

index the workpiece from one predetermined position to another between shaping strokes.

SEE OR SEARCH CLASS:

- 82, Turning, subclasses 124+ for a lathe with work feeding and/or removing mechanism.
- 221, Article Dispensing, for a method of or apparatus for dispensing or feeding an article not otherwise classified; and especially subclasses 239 and 294 for an article dispenser or feeder delivering to a clamp or hold-down. See the class definition of Class 221 for a statement of the lines between the classes and for the disposition of other related art.
- 226, Advancing Material of Indeterminate Length, for a method of or apparatus for feeding material without utilizing the leading or trailing end to effect movement of the material.
- 414, Material or Article Handling, for work advancing, including single or multiple, nominal shaping operations. Generally, work handling to present a workpiece to a named shaping means will be found in Class 414.
- 470, Threaded, Headed Fastener, or Washer Making: Process and Apparatus, subclasses 164+ for a miscellaneous machine for feeding nail blanks, screw blanks, nut blanks, nail plates, or other stock specialized to performing the various steps in the manufacture of an article of that class.

175 Randomly manipulated, work supported, or work following device:

This subclass is indented under subclass 64. Apparatus comprising: (a) a cutting device which is capable of movement in a path instantaneously under the control of the operative during cutting, including a cutting device suspended or supported near the workpiece; (b) a cutting device which as an entirety is disclosed as deriving from the work a substantial amount of its support against gravity during cutting; or (c) a cutting device which is intended to move across the workpiece in a direction dictated by conditions of the workpiece.

- (1) Note. A cutting device mounted at one end of a flexible shaft whose other end is anchored to a table, or a cutting device mounted on a steerable vehicle is included under clause (a) of this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

296, for similar structure used in planing.

SEE OR SEARCH CLASS:

30, Cutlery, for a randomly manipulated, work supported, or following cutting device generally.

176 For machining commutator:

This subclass is indented under subclass 175. Apparatus particularly adapted to be used in shaping the surface of a segmented annular member to be utilized in an electromotive device to transfer electrical current from a stationary part to a rotary part.

SEE OR SEARCH THIS CLASS, SUBCLASS:

302, for a planing device for machining a commutator.

177 For cutting longitudinal groove in shaft (e.g., keyway, etc.):

This subclass is indented under subclass 175. Apparatus particularly adapted to cut a rod or rodlike workpiece that is generally elongated and circular in cross-section about a central axis, wherein the cutting tool is adapted to form a recess in the surface of the workpiece extending generally along the central axis.

178 With work supported guide means:

This subclass is indented under subclass 175. Apparatus combined with means adapted to rest on the workpiece, which means includes a surface intended to direct the movement of the cutting tool when making the cutting stroke by engagement of the cutting tool supporting structure with the directing surface.

179 To guide tool to move in arcuate path:

This subclass is indented under subclass 178. Apparatus particularly adapted to direct the movement of the cutting tool to be in a curved route during the stroke.

180 With work follower:

This subclass is indented under subclass 175. Apparatus comprising a cutting device which is intended to move across the workpiece in a direction dictated by conditions of the workpiece.

181 Randomly manipulated:

This subclass is indented under subclass 175. Apparatus comprising a cutting device which is capable of movement in a path instantaneously under the control of the operative during the cutting stroke, including a cutting device suspended or supported near the workpiece.

182 End mill (e.g., router, etc.):

This subclass is indented under subclass 181. Apparatus including structure to support and rotate the cutting tool about an axis such that that axis passes through the workpiece, wherein no portion of the supporting structure engages the cutting tool axially beyond the work engaging (cutting edge) portion thereof.

SEE OR SEARCH CLASS:

- 144, Woodworking, subclass 134 and 136 for similar structure particularly adapted to the shaping of wood.
407, Cutters, for Shaping, subclasses 53+ for a cutting tool to be used in the apparatus of this subclass.

183 Including means to infeed rotary cutter toward work:

This subclass is indented under subclass 64. Apparatus including a base and structure to support the cutting tool for rotation about an axis and including means to carry the tool and its support and to move the cutting tool relative to the base and relative to the workpiece to thereby effect the shaping stroke.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 132, for a milling method including infeeding.

184 This subclass is indented under subclass 183. With means to limit penetration into work: Apparatus including means specifically intended to be used to physically restrict the depth of cut by the tool into the workpiece.

185 Axially:

This subclass is indented under subclass 183. Apparatus comprising means to move the cutting tool and its support in the direction parallel to the axis of the cutting tool with respect to the base and the workpiece.

186 With infeed control means energized in response to activator stimulated by condition sensor:

This subclass is indented under subclass 185. Apparatus including means for: (a) detecting any of the following characteristics: a state or property, a change in a state or property, or the occurrence of a predetermined event in any of the following; the workpiece, the product of the apparatus, the apparatus itself, or the environment of the apparatus affecting the operation thereof; and (b) initiating (as a direct result of that detection) a signal other than that generated or transmitted by the detecting means; and (c) regulating or modifying (as a direct result of said initiation) the operation of the means to affect the cutting.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 15, for similar control means combined with a gear hobbing machine.
147, for similar control means combined with work infeed in a milling machine.
193, for similar control means combined with nonaxial tool infeed in a milling machine.
245, for similar control means combined with a broaching machine.

SEE OR SEARCH CLASS:

- 408, Cutting by Use of Rotating Axially Moving Tool, subclass 8 for similar structure for regulating the operation of a machine of that class type.

187 In response to cutter condition:

This subclass is indented under subclass 186. Apparatus including means for detecting any of the following characteristics; a state or property, a change in a state or property, or the occurrence of a predetermined event in the cutting tool.

188 In response to work condition:

This subclass is indented under subclass 186. Apparatus including means for detecting any of the following characteristics: a state or property, a change in a state or property, or the occurrence of a predetermined event in the workpiece.

189 With work holder:

This subclass is indented under subclass 185. Apparatus with means to support the workpiece against the force of gravity or against the force of the cutting tool during the shaping stroke.

190 And laterally:

This subclass is indented under subclass 185. Apparatus wherein the means to move the cutting tool and its support in the direction parallel to the axis of the cutting tool also serves to move the cutting tool and its support in the direction normal to the axis of the cutting tool.

191 Simultaneously:

This subclass is indented under subclass 190. Apparatus wherein the means to carry the cutting tool and its support moves in both the direction parallel to the tool axis in the direction normal to the tool axis at the same time, so that the resultant cutting tool movement during the shaping stroke is diagonal with respect to the cutting axis.

192 Plural cutters:

This subclass is indented under subclass 185. Apparatus including a first cutting tool adapted to perform a shaping operation and including a second cutting tool adapted to perform a shaping operation, wherein the first and second cutting tools are relatively movable as assembled in the apparatus.

- (1) Note. A first cutting bit and second cutting bit mounted in the same cutting tool holder are considered to be two edges of the same cutting tool rather than plural cutters.

193 With infeed control means energized in response to activator stimulated by condition sensor:

This subclass is indented under subclass 183. Apparatus including means for: (a) detecting any of the following characteristics: a state or property, a change in a state or property, or the occurrence of a predetermined event in any of the following: the workpiece, the product of the apparatus, the apparatus itself, or the environment of the apparatus affecting the operation thereof; and (b) initiating (as a direct result of that detection) a signal other than that generated or transmitted by the detecting means; and (c) regulating or modifying (as a direct result of said initiation) the operation of the means to affect the cutting.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 15, for control means combined with a gear hobbing machine.
- 147, for control means combined with work infeed in a milling machine.
- 186, for control means combined with axial tool infeed in a milling machine.
- 245, for control means combined with a broaching machine.

SEE OR SEARCH CLASS:

- 408, Cutting by Use of Rotating Axially Moving Tool, subclass 8 for similar structure for regulating the operation of a machine of that class type.

194 In response to cutter condition:

This subclass is indented under subclass 193. Apparatus including means for detecting any of the following characteristics: a state or property, a change in a state or property, or the occurrence of a predetermined event in the cutting tool.

195 In response to work condition:

This subclass is indented under subclass 193. Apparatus including means for detecting any of the following characteristics: a state or property, a change in a state or property, or the occurrence of a predetermined event in the workpiece.

196 With means to change rate of infeed:

This subclass is indented under subclass 183. Apparatus including means to selectively cause the shaping operation to occur at a first rate or at a second different rate.

(1) Note. In the device of this subclass, the rate of cutter infeed may be changed during the cutting stroke or between cutting strokes.

(2) Note. An idle return stroke is not considered to be part of the cutting stroke.

197 With work holder:

This subclass is indented under subclass 183. Apparatus combined with means to support the workpiece against the force of gravity or against the force of the cutting tool during the shaping stroke.

198 Indexable:

This subclass is indented under subclass 197. Apparatus including work supporting structure adapted to be fixed in a first definite position and adapted to be fixed in a second definite position to present the workpiece differently to the cutting tool.

SEE OR SEARCH THIS CLASS, SUBCLASS:

221, for similar structure without means to infeed a rotary cutter toward the work.

199 Machining arcuate surface:

This subclass is indented under subclass 183. Apparatus wherein the movement of the cutting tool with respect to the workpiece is such as to give the workpiece a curved surface.

(1) Note. To be proper for this subclass, the device must bring about the arcuate characteristics to the workpiece by relative movement of the work and cutting tool rather than by the arcuate shape of the cutting tool.

200 With means to move cutter eccentrically:

This subclass is indented under subclass 199. Apparatus with means to support the cutting tool for rotation and means to move the cutting tool on the support about a second axis that is

generally parallel to, but offset from, the cutter axis.

201 Angularly adjustable cutter head:

This subclass is indented under subclass 183. Apparatus including structure adapted to support the cutting tool, which support structure is mounted on other structure in such a way that it can be pivotably repositioned thereon.

202 Including gantry-type cutter-carrier:

This subclass is indented under subclass 183. Apparatus including an armlike structure and including a carriage adapted to rotatably support the cutting tool and be translated along the armlike structure to carry the cutting tool over the top of the workpiece and to thereby effect the shaping operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

212, for a gantry-type cutter-carrier used with a work infeed means.

203 Plural cutters:

This subclass is indented under subclass 183. Apparatus including a first cutting tool adapted to perform a shaping operation and including a second cutting tool adapted to perform a shaping operation, wherein the first and second cutting tools are relatively movable as assembled in the apparatus.

(1) Note. A first cutting bit and a second cutting bit mounted in the same cutting tool holder are considered to be two edges of the same cutting tool rather than plural cutters.

204 Including means to adjustably position cutter:

This subclass is indented under subclass 64. Apparatus including a base, including means to rotatably support the cutting tool in a first position for presentation to the workpiece, and including provision to allow movement of the cutting tool and its support from the first position to a second position for different presentation to the workpiece.

205 With work holder or guide:

This subclass is indented under subclass 204. Apparatus combined with means to support the workpiece against the force of gravity or

against the force of the cutting tool during the shaping operation, or combined with passive means to physically limit movement of the workpiece to be along a prescribed path.

206 Linear adjustment:

This subclass is indented under subclass 204. Apparatus wherein the support for the cutting tool is such that the cutting tool can be moved to at least three separate positions for presentation of the cutting tool to the workpiece, wherein the three positions are in a straight line.

207 With control for adjustment means responsive to activator stimulated by condition sensor:

This subclass is indented under subclass 206. Apparatus including means for: (a) detecting any of the following characteristics: a state or property, a change in a state or property, or the occurrence of a predetermined event in any of the following: the workpiece, the product of the apparatus, the apparatus itself, or the environment of the apparatus affecting the operation thereof; and (b) initiating (as a direct result of that detection) a signal other than that generated or transmitted by the detecting means; and (c) regulating or modifying (as a direct result of said initiation) the operation of the adjustment means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 15, for control means combined with gear hobbing machine.
- 147, for control means combined with milling machine having work infeed.
- 186, for control means combined with a milling machine having axial cutter infeed.
- 193, for control means combined with a milling machine having cutter infeed, generally.
- 245, for control means combined with a broaching machine.

SEE OR SEARCH CLASS:

- 408, Cutting by Use of Rotating Axially Moving Tool, subclass 8 for similar structure for regulating the operation of a machine of that class type.

208 Responsive to position of cutter:

This subclass is indented under subclass 207. Apparatus including means for detecting the physical location of the cutting tool.

209 And means to clamp cutter support in adjusted position:

This subclass is indented under subclass 207. Apparatus including structure to secure the means to movable means to rotatably support the cutting tool in a fixed position.

210 With position indicator or limit means:

This subclass is indented under subclass 206. Apparatus including structure intended to designate to the operative the location of a portion of the apparatus, or including a repositionable device intended to physically abut the cutting tool or tool support structure and thereby restrict the location of the cutting tool in the apparatus.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 214, for similar structure with positioning of the cutter other than linearly.

211 And angular adjustment:

This subclass is indented under subclass 206. Apparatus wherein the support for the cutting tool can be repositioned to present the cutting tool to the workpiece in at least three positions in a straight line and can be repositioned to present the cutting tool to the workpiece in a first position with the cutting tool turning about a first axis or selectively in a second position with the cutting tool turning about a second axis that is inclined (i.e., not parallel) to the first axis.

212 Including gantry-type cutter-carrier:

This subclass is indented under subclass 206. Apparatus including an armlike structure and including a carriage adapted to rotatably support the cutting tool and be translated along the armlike structure to carry the cutting tool over the top of the workpiece and to thereby effect the shaping operation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 202, for a gantry-type cutter-carrier used with a work infeed means.

213 Plural cutters:

This subclass is indented under subclass 206. Apparatus including a first cutting tool adapted to perform a shaping operation, and including a second cutting tool adapted to perform a shaping operation, wherein the first and second cutting tools are relatively movable as assembled in the apparatus.

- (1) Note. A first cutting bit and a second cutting bit mounted in the same cutting tool holder are considered to be two edges of the same cutting tool rather than plural cutters.

214 With position indicator or limit means:

This subclass is indented under subclass 204. Apparatus including structure intended to designate to the operative the location of a portion of the apparatus, or including a repositionable device intended to physically abut the cutting tool or tool support structure and thereby restrict the location of the cutting tool in the apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:
210, for similar structure with linear positioning of the cutter.

215 With right angle cutter device:

This subclass is indented under subclass 204. Apparatus including a first rotary shaft turning coaxially with the cutting tool to cause the cutting tool to turn and including a second rotary shaft adapted to engage the first rotary shaft and cause the first shaft to turn, wherein the second rotary shaft turns about an axis that is normal to the axis of the first rotary shaft.

216 Compound angular adjustment:

This subclass is indented under subclass 204. Apparatus including means to allow movement of the cutting tool from a first to a second position about a first axis or to a third position about a second axis.

217 Plural cutters:

This subclass is indented under subclass 204. Apparatus including a first cutting tool adapted to perform a shaping operation and including a second cutting tool adapted to perform a shaping operation, wherein the first and second cut-

ting tools are relatively movable as assembled in the apparatus.

- (1) Note. A first cutting bit and a second cutting bit mounted on the same cutting tool holder are considered to be two edges of the same cutting tool rather than plural cutters.

218 With limit means to aid in positioning of cutter bit or work (e.g., gauge, stop, etc.):

This subclass is indented under subclass 64. Apparatus including a device intended to physically abut the cutting tool or tool support structure and thereby restrict the location of a portion of the cutting tool including the cutting edge or of the workpiece.

219 Work support:

This subclass is indented under subclass 64. Apparatus including a device which, during a shaping operation, contacts a workpiece for the purpose of (a) supporting the workpiece against the force of gravity, (b) preventing movement of the workpiece in a particular direction or in all directions while such work is supported against the force of gravity, or (c) providing a surface juxtaposed to the workpiece for constraining the motion of the workpiece against the reaction of the cutting tool during the performance of a work shaping operation.

SEE OR SEARCH CLASS:

- 248, Supports, for a work holder mount, per se.
269, Work Holders, for similar structure not combined with milling or not particularly adapted to use with a milling cutter.

220 With position indicator or stop:

This subclass is indented under subclass 219. Apparatus including means to designate to the operative the location of the workpiece with respect to the apparatus or including means to abut the cutting tool or tool support structure and thereby prevent movement of the workpiece.

221 Indexable:

This subclass is indented under subclass 219. Apparatus including work supporting structure adapted to be fixed in a first definite position

and adapted to be fixed in a second definite position to present the work piece differently to the cutting tool.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 1+, particularly subclass 61 for gear cutting which commonly includes indexing.
- 198, for indexing in a milling machine wherein the cutter is infed toward the work.
- 224, for a work support movable about an axis wherein holding positions are not definite, i.e., not predetermined.

SEE OR SEARCH CLASS:

- 29, Metal Working, subclasses 35.5+ for plural tool and/or plural work holding means provided with means to position the holding means.
- 33, Geometrical Instruments, subclasses 19.1+ for a graduating scribe; and subclasses 501+ for a gauge to be used to establish desired angular position.
- 74, Machine Element or Mechanism, subclasses 813+ for an assembly with means to turn a shaft or rotatably mounted device about its axis to one or more selected loci including means to prevent or hold against rotation at such loci, and see (2) Note under subclass 813 for the line note.
- 408, Cutting by Use of Rotating Axially Moving Tool, subclasses 44+ and 70+ for intermittently operating work advancing means to sequentially present work to a tool of that class type.

222 Including dividing head:

This subclass is indented under subclass 221. Apparatus wherein the work supporting structure is supported to be pivoted about an axis from the first definite position to the second definite position, including an equally divided disk or cylinder (a) fixed to the work support so that movement of the work support is accompanied by a corresponding movement of the disk or cylinder relative to other structure, so that the divisions of the disk or cylinder serve to define the locations of the first and second positions of the work support or (b)

fixed to nonpivoting structure such that the divisions of the disk or cylinder serve to define the locations of the first and second positions of the relatively movable work support.

223 Multiple row dividing head:

This subclass is indented under subclass 222. Apparatus wherein the disk is divided differently at different distances from the axis thereof or the cylinder is divided differently at different axial positions therealong.

224 With angular adjustment:

This subclass is indented under subclass 219. Apparatus including a work supporting structure adapted to be fixed in a first position and adapted to be turned to be fixed in a second position to present the workpiece differently to the cutting tool.

225 With work holder or guide:

This subclass is indented under subclass 219. Apparatus including means to grippingly engage and immobilize the workpiece or including means to be slidingly engaged by the workpiece to direct movement of the workpiece therealong.

226 Including cutter limited to rotary motion:

This subclass is indented under subclass 225. Apparatus including a base on which the cutting tool is supported for rotation, wherein there is no relative movement, other than rotary, between the cutting tool and the base during the shaping operation.

227 With means to adjust work support vertically:

This subclass is indented under subclass 219. Apparatus including a base to support the work supporting structure against gravity and including means to cause the work supporting to move relative to the base to thereby present the workpiece to the cutting tool differently.

228 Including cutter limited to rotary motion:

This subclass is indented under subclass 64. Apparatus including a base on which the cutting tool is supported for rotation, wherein there is no relative movement, other than rotary, between the cutting tool and the base during shaping.

- 229 Cutter turning about vertical axis:**
This subclass is indented under subclass 228. Apparatus wherein the cutting tool is supported for rotation about an axis extending up and down with respect to the base of the apparatus.
- 230 Detachable or repositionable tool head:**
This subclass is indented under subclass 64. Apparatus including a base and including means secured to the base to support the cutting tool for rotation, which means is adapted to either be readily removed from the base or be moved from one position to another with respect to the base.
- SEE OR SEARCH CLASS:
483, Tool Changing, subclass 32 for a rotary spindle machine tool combined with means for transferring a tool head.
- 231 Cutter spindle or spindle support:**
This subclass is indented under subclass 64. Apparatus comprising means to support the cutting tool for rotation including a rotary shaft adapted to partake of all tool movement during the cutting operation; or comprising means to guidingly support such a rotary shaft.
- SEE OR SEARCH CLASS:
384, Bearings, subclasses 91+ for bearing used for supporting a spindle.
464, Rotary Shafts, Gudgeons, Housings, and Flexible Couplings for Rotary Shafts, subclasses 179+ for a rotary torque transmitting shaft.
- 232 With cutter holder:**
This subclass is indented under subclass 231. Apparatus comprising structure including or engaging a cutting bit, which structure is intended to be fixedly secured to the cutting bit and to participate of all movement of the cutting edge during the cutting operation.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
234, for a cutter holder without a spindle or spindle support.
- 233 And draw bar:**
This subclass is indented under subclass 232. Apparatus including means to fixedly secure the cutting bit to the supporting structure which is designed to be put in tension.
- 234 With cutter holder:**
This subclass is indented under subclass 64. Apparatus comprising structure including or engaging a cutting bit having a cutting edge, which structure is intended to be fixedly secured to the cutting bit and to participate of all movement of the cutting edge during the cutting operation.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
232, for a cutter holder with a spindle or spindle support.
- SEE OR SEARCH CLASS:
407, Cutters, for Shaping, subclasses 30+ for a cutting tool and/or cutting tool holder not including structure excluded from that class. (This subclass includes devices similar to those of Class 407, but including component parts of characteristics excluded from that class.)
- 235 Machine frame:**
This subclass is indented under subclass 64. Apparatus comprising structure supporting the weight of the cutting tool or the workpiece or for counteracting the thrust of the cutting tool, which structure is generally not in contact with the cutting tool or with the workpiece.
- 236 Overarm harness structure:**
This subclass is indented under subclass 235. Apparatus comprising structure for supporting a workpiece against gravity and including structure for cantilever support of the cutting tool above the workpiece which tool support includes an arm and a column connecting the arm to the work supporting structure.
- 237 Including counterbalancing means:**
This subclass is indented under subclass 235. Apparatus including means to counteract and lift against the weight of a portion of the apparatus, to cause movable structure to function as if lighter in weight.

238 Including means to compensate for deformation:

This subclass is indented under subclass 235. Apparatus including provision to modify the apparatus to overcome the strain of load on the apparatus.

- (1) Note. Strain is mechanical deformation resulting from stress.

239 Deflection of cutter spindle:

This subclass is indented under subclass 238. Apparatus including provision to modify the apparatus to overcome the strain of loading of the structure for supporting the cutting tool for rotation.

240 Convertible from lathe:

This subclass is indented under subclass 235. Apparatus particularly adapted to be used as a machine frame for a milling machine or for a lathe, i.e., a machine in which the workpiece rotates and the cutting tool remains generally stationary.

SEE OR SEARCH CLASS:

82, Turning, for a lathe, generally.

241 Including relatively movable components and means to relatively immobilize these components:

This subclass is indented under subclass 235. Apparatus wherein members thereof can be repositioned with respect to each other, including means to secure the otherwise movable members together.

SEE OR SEARCH THIS CLASS, SUBCLASS:

343, for similar frame and clamp structure for use as components of a planing machine.

242 Tailstock:

This subclass is indented under subclass 64. Apparatus comprising passive means for supporting the workpiece for rotary presentation to a milling tool.

- (1) Note. Included herein is a tailstock with an angularly adjustable center, or other tailstocks particularly adapted to use with a milling machine.

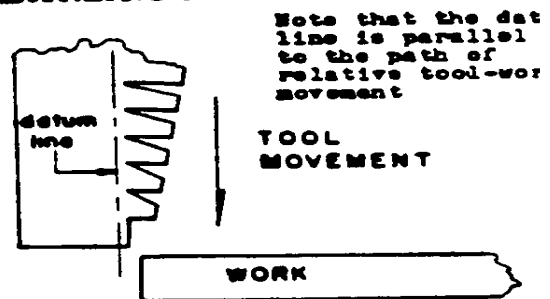
SEE OR SEARCH CLASS:

82, Turning, subclass 148 for a lathe tailstock.

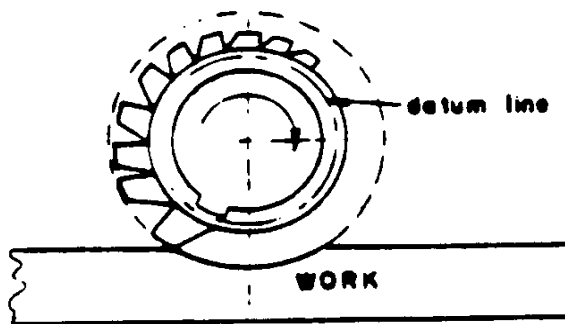
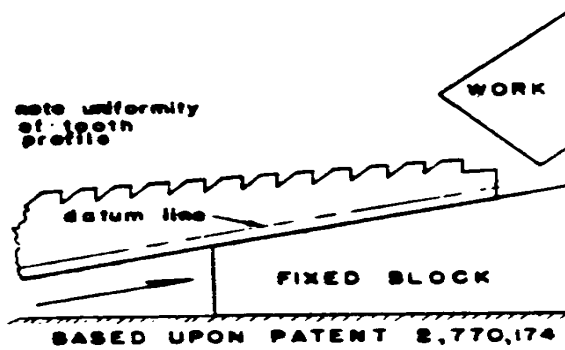
243 BROACHING:

This subclass is indented under the class definition. Apparatus or method (1) employing a multitoothed cutting tool characterized in that: (a) the functional edges of the tool teeth are so related to one another that the tip of one tooth extends further than that of an adjacent tooth from a datum line interior to the tool and paralleling the path of relative movement of tool and work (which extent is measured along the normal to such datum line through the tip); and (b) the differences in such extent between adjacent teeth are progressive from tooth to tooth (or group of teeth to group of teeth) along such path of relative movement, resulting in a stair-step arrangement of teeth (or groups of teeth) along such path and relative to the datum line of reference; and (2) in whose operation or performance the teeth successively engage the work in substantially overlying paths, each tooth removing a predetermined amount of material so that the work modification produced is congruent to the last acting tooth.

- (1) Note. Illustrative broach tools are shown in the accompanying drawings. (See accompanying drawings below).

ILLUSTRATIVE TOOL TYPES

BASED UPON PATENT 2,050,9



- (2) Note. In the case of rotary tool motion, it will be noted that the normal to the datum line (referred to in the definition) is the radius extending through the tooth tip.
- (3) Note. As indicated by the parenthetical material in part (1,b) of the above definition, the progressive extent of differences between the tips (or outer cutting edges) and the datum line is intended to include a tool comprising a plurality of groups or units of several teeth each, the tooth elements of each group having the same extent from the datum line and extending further therefrom than the tooth elements of the next preceding group, so as to form a stair-step arrangement of such groups.
- (4) Note. A patent directed to a tool having a unit of tooth elements of uniform characteristic (such as described in (3) Note, above) but intended to perform another function (such as scraping or burnishing)

will be found in the class relating to such other function(s).

- (5) Note. Included in this specific subclass, as at least a cross-reference copy, will be a patent claiming significant machine frame structure. Patents of this character are generally directed to adjustability of frame means for convertibility of the machine from or to a vertical or horizontal operation or for a push or pull operation, or to frame structure adapted to accentuate accessibility to machine parts, or to means for transferring broaching tool thrust to the machine bed.
- (6) Note. A patent wherein the work feed system imparts energy to the work support so as to absorb contemplated broach thrust will be found in subclass 269 below; an example of such will be a crank pin which positions a work table at the dead center position of such crank pin but wherein the drive force actuating the crank is above that necessary to obtain said dead center position.
- (7) Note. A single-edged cutter device for shaping work, though described as a broaching machine, is excluded from this and indented subclasses. Such devices are classified in Class 409, Gear Cutting, Milling, or Planing, subclasses 288+ (for which see (1) Note thereunder) and Class 83, Cutting, subclasses 875+.
- (8) Note. A patent to apparatus for combined machining operations, including broaching, is generally found in Class 29, Metal Working, subclasses 33+, except in some instances where the combination is specifically provided for in the class schedule of the other (i.e., non-broaching) machining operation.

SEE OR SEARCH CLASS:

- 29, Metal Working, subclasses 90.01+ for a broacher combined with a burnisher where the former is intended only to allow the latter to perform its function; and subclasses 33+ for a combined machine which broaches and performs another metal working operation.

- 83, Cutting, the generic residual class of cutting.
- 407, Cutters, for Shaping, subclass 12 and 13+ for a broaching tool, per se.
- 244 Process:**
This subclass is indented under subclass 243. Method including a step of broaching.
- SEE OR SEARCH CLASS:
29, Metal Working, subclasses 592+ for a manufacturing process not otherwise provided for.
- 245 With control means energized in response to activator stimulated by condition sensor:**
This subclass is indented under subclass 243. Apparatus including means for: (a) detecting any of the following characteristics: a state or property, a change in a state or property, or the occurrence of a predetermined event in any of the following: the workpiece, the product of the apparatus, the apparatus itself, or the environment of the apparatus affecting the operation thereof; and (b) initiating (as a direct result of that detection) a signal other than that generated or transmitted by the detecting means; and (c) regulating or modifying (as a direct result of said initiation) the operation of the apparatus.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
147, for automatic control means combined with a milling machine.
- SEE OR SEARCH CLASS:
83, Cutting, especially subclasses 58+ for cutting means combined with randomly acutated stopping means.
118, Coating Apparatus, subclasses 663+ for similar control means applied to a coating device.
192, Clutches and Power-Stop Control, for stopping means in general.
- 246** This subclass is indented under subclass 245. Responsive to condition of work or product: Apparatus including means for detecting the characteristics of the workpiece or of the product of the broaching operation, initiating as a direct result of that detection a signal and thereby regulating the operation of the apparatus.
- 247 With means to distribute cutter infeed force:**
This subclass is indented under subclass 243. Apparatus wherein the stress developed in a cutting tool by a required broaching force is divided or split-up, as distinguished from concentrated, by broach drive means effective to impart such force through the simultaneous application of a plurality of force applicator heads, e.g., push and pull heads.
- (1) Note. For a patent to be placed originally in this subclass, a claimed teaching of "force distribution" must be clear.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
264, and 280+, for related structure wherein a second head engaged by the tool merely functions as a tool guide or antichatter device.
- 248 With means to select cutter or to select or modify cutter drive:**
This subclass is indented under subclass 243. Apparatus including (1) a plurality of drive means to power a broaching machine and means to provide a choice of which drive means is functional, (2) a plurality of cutting tools and means to provide a choice of which receives the driving force, or (3) means to significantly vary the drive of the broaching machine.
- (1) Note. Under clause (3) a significant variation may, for instance, involve (a) a choice of either continuous or unicyclic operation or (b) variation of the limits of broach acceleration or deceleration either during the cutting stroke or during the idle return stroke.
- (2) Note. Excluded from this subclass is a patent directed to variable pulley or gear shift transmission means limited to a straight-line uniform speed of tool operation. Such a patent will be found in subclasses 280+.
- SEE OR SEARCH CLASS:
483, Tool Changing, subclasses 28+ for a reciprocating tool machine tool combined with a tool transfer means.

- 249 With means to clean, lubricate, or modify temperature of work or cutter:**
This subclass is indented under subclass 243. Apparatus including (a) structure to remove foreign material from the workpiece or from the cutting tool, (b) structure to apply a friction reducing fluent material to the workpiece or to the cutting tool or (c) structure to alter the thermal condition of the workpiece or the cutting tool.
- 250 With product handling means:**
This subclass is indented under subclass 243. Apparatus including means to move or affect the motion of broached material or scrap of a broaching operation.
- (1) Note. A single device to feed work to or remove product from a broaching station is considered to be work handling rather than product handling. However, similarly claimed apparatus disclosed as including a work handling means and a distinct product handling means will be found in this subclass.
- (2) Note. Means for continuous or incremental advance of material from a first broaching station to a sequentially acting second broaching station is considered to be a product handling means for this subclass.
- 251 Between plural broaching stations:**
This subclass is indented under subclass 250. Apparatus comprising means to continuously or incrementally advance material from a first broaching station to a sequentially acting second broaching station.
- 252 Means to eject broached product:**
This subclass is indented under subclass 250. Apparatus comprising means to remove the broached material from the apparatus at the shaping station.
- 253 Chip removal means:**
This subclass is indented under subclass 250. Apparatus wherein the means to effect motion of the scrap material comprises means adapted to move relative to the cutting tool to carry nonshaped material removed from the shaped material away from the broaching station.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
137, for a milling machine combined with means to remove chips formed thereby.
- 254 With means to protect operative or machine (e.g., guard, safety device, etc.):**
This subclass is indented under subclass 243. Apparatus combined with means intended to physically prevent encounter of a man operating the apparatus or of an element of the apparatus with an undesirable particle or unsafe condition.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
134, for similar structure used in milling.
- 255 With safety means for overload or safety interlock:**
This subclass is indented under subclass 254. Apparatus including a protective device for the machine operative or machine which (a) functions in response to the development of operational stress that exceeds, or tends to exceed, the safe stress limit, to affect the operation of the apparatus of any machine component or (b) exercises a locking control over an element of the tool or motive system but is not itself a necessary part of such system.
- SEE OR SEARCH CLASS:
192, Clutches and Power-Stop Control, subclasses 116.5+ for the generic or residual interlock or safety device.
- 256 With work immobilizer and means to activate work immobilizer interrelated with cutter infeed, work infeed, or work advance:**
This subclass is indented under subclass 243. Apparatus combined with means to secure the workpiece in a stationary condition, which securing means is coupled with means to cause the cutting tool to move to perform the cutting stroke, with means to cause the cutting the workpiece to move to perform the cutting stroke, or with means to cause the workpiece to be moved toward the working station, so that movement of the securing means is dependent on the coupled means.

257 With work infeed or advancing means and means to clamp the work thereto, which clamping means is interrelated with work or cutter infeed:

This subclass is indented under subclass 243. Apparatus combined with means to cause the workpiece to move toward the cutting tool to effect the cutting stroke or with means to cause the workpiece to be moved toward the cutting station before the cutting stroke and with means to secure the workpiece to the moving means, wherein the securing action is dependent on the action of the cutting stroke effected by either movement of the workpiece or of the cutting tool.

258 Means to remove flash or burr:

This subclass is indented under subclass 243. Apparatus particularly adapted to remove the extraneous material formed during a previous shaping, molding, or welding operation.

- (1) Note. Flash is the ridge formed at the abutment line of a pair of mold components or is formed by a weld line and is considered to be that portion of a product of the molding or welding operation that extends beyond the desired surface of the product.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 140, for milling apparatus to remove flash or burr.
297, for planing apparatus to remove flash or burr.

259 Means for cutting groove:

This subclass is indented under subclass 243. Apparatus intended to form an elongated recess in a generally uniform surface of a workpiece, which elongated recess is of a prescribed cross-sectional shape.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 304, for means for cutting a groove by planing.

SEE OR SEARCH CLASS:

- 83, Cutting, subclasses 875+ for cutting a groove in a workpiece where no par-

ticular cross-sectional shape is given to the groove.

260 Arcuate groove in cylindrical surface:

This subclass is indented under subclass 259. Apparatus for forming an elongated recess that is curved into a surface that is generally circular and extends uniformly along the circular axis.

261 Rifling:

This subclass is indented under subclass 260. Apparatus consisting of means for cutting a spiral groove in the inner surface of the barrel of a small arms or ordnance device.

- (1) Note. The tool of this subclass normally turns gradually about the axis of the work (usually through less than 360); however, it is considered to be a broaching tool rather than a milling tool because it is driven axially rather than rotatable.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 64+, for milling by a rotating tool wherein the tool is driven to rotate.
306, for rifling a gun barrel by a planing tool.

SEE OR SEARCH CLASS:

- 29, Metal Working, subclasses 1.1+ for apparatus especially adapted for making a projectile throwing implement of metal, whether small arms or a large gun.
408, Cutting by Use of Rotating Axially Moving Tool, for cutting by a rotatably driven cutting tool that moves axially through or about a workpiece with no other movement with respect to the workpiece, as in the case of cutting screw threads on a bolt.

262 Orbital carrier for cutter:

This subclass is indented under subclass 243. Apparatus including means to support the cutting tool and move with the cutting tool wherein the movement is in a closed loop.

- (1) Note. A reciprocating cutter support that moves along a path in a first direction

- and then back along the same path is not considered to travel in a closed loop.
- 263 Orbital carrier for work:**
This subclass is indented under subclass 243. Apparatus including means to support the workpiece and move with the workpiece wherein the movement is in a closed loop.
- (1) Note. A reciprocating workpiece support that moves along a path in a first direction and then back along the same path is not considered to travel in a closed loop.
- 264 With means to cyclically manipulate cutter or cutter support:**
This subclass is indented under subclass 243. Apparatus comprising a machine intended to function through a series of operations so that normally the machine will return to the starting position, combined with cutting tool handling structure to function as a part of the normal series of operations to: (a) transfer the cutting tool between machine parts; (b) apply or remove a tool support; (c) reorient a cutting tool relative to the subsequent and successive cutting path of such tool; (d) remove or introduce a cutting tool (from or to operating position) between successive shaping operation; or (e) reorient, or facilitate reorientation of, the cutting tool with respect to its path of cut.
- 265 To reorient, introduce, or remove cutter:**
This subclass is indented under subclass 264. Apparatus wherein the butting tool handling structure is effective to (1) realign the cutting tool between successive shaping strokes so as to follow a path of cut different from that of its prior cutting stroke or (2) either (a) position for a subsequent shaping operation a cutting tool not used in the last preceding shaping operation or (b) prepare for the next subsequent shaping operation by removing a cutting tool which has just performed its cutting function.
- 266 Cutter released to interim support at termination of cutting stroke:**
This subclass is indented under subclass 264. Apparatus including means functional at the end of a cutting stroke to permit transfer of the cutting tool to an inactive tool support.
- 267 To remove and return cutter to cutter support:**
This subclass is indented under subclass 264. Apparatus comprising means to disconnect the cutting tool from the member used to support the cutting tool during the cutting stroke and including means to reconnect the cutting tool to the supporting structure.
- 268 With plural cutters:**
This subclass is indented under subclass 243. Apparatus including a first cutting tool adapted to perform a shaping operation and including a second cutting tool adapted to perform a shaping operation, wherein the first and second cutting tools are relatively movable as assembled in the apparatus.
- (1) Note. A first cutting bit and a second cutting bit mounted on the same cutting tool holder are considered to be two edges of the same cutting tool rather than plural cutters.
- 269 With means to advance, infeed, or manipulate work:**
This subclass is indented under subclass 243. Apparatus combined with a base and with means to move the workpiece relative to the base (a) from a remote location to a location closer to the working station, (b) past the cutting tool thereby effecting the cutting stroke, or (c) otherwise from a first to a second position.
- 270 Interrelated with cutter infeed:**
This subclass is indented under subclass 269. Apparatus wherein the cutting tool is moved relative to the base and relative to the workpiece to effect the cutting operation, wherein action of the workpiece moving means is dependent on such cutting tool movement.
- 271 Including means supporting work and additional means opposing infeed force:**
This subclass is indented under subclass 270. Apparatus including means to hold the workpiece against the force of gravity and including other means to act against the workpiece to counteract the force placed thereon by the action of the cutting tool during the cutting stroke.

272 Including work indexing means for sequential cutting of different surfaces of a single workpiece:

This subclass is indented under subclass 270. Apparatus comprising means to move the workpiece from a first definite position to a second definite position between cutting strokes to thereby present a first portion of the workpiece to the cutting tool for a first cutting stroke and then present a second portion of the same workpiece to the cutting tool for a second cutting stroke.

SEE OR SEARCH THIS CLASS, SUBCLASS:

263, for plural broaching tools on an endless carrier.

273 Including work indexing means for sequential cutting of surfaces of different workpieces:

This subclass is indented under subclass 270. Apparatus comprising means to support a first and a second workpiece in a fixed relationship and including means to move the support for a first definite position to a second definite position between cutting strokes to thereby present a portion of the first workpiece to the cutting tool for a first cutting stroke and then to present a portion of the second workpiece to the cutting tool for a second cutting stroke.

274 With means to retract work from path of tool's idle return stroke:

This subclass is indented under subclass 270. Apparatus wherein, prior to a return movement of the cutting tool, the means to convey work also operates to withdraw the work supporting structure from a tool engagement position.

275 To infeed work past cutter:

This subclass is indented under subclass 269. Apparatus comprising means to move the workpiece past the cutting tool thereby effecting the cutting stroke.

276 With means to hold work during cutting:

This subclass is indented under subclass 243. Apparatus including means to support the workpiece against movement and in the position to be operated on by the cutting tool.

(1) Note. A device including an abutment work stop to position the workpiece for the broaching operation is included in this subclass.

(2) Note. The nominal recitation of a "work support", "work holder", or "work table" is insufficient for placement of a device in this subclass unless additional support structure is claimed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

256, for means to hold work including a work immobilizer whose actuator is interrelated with tool or work infeed means.

257, for means to clamp moving work interrelated with tool or work infeed.

269+, for apparatus to hold work including work moving means.

SEE OR SEARCH CLASS:

269, Work Holders, the general locus of work holders regardless of kind of treatment.

277 Including work clamping means:

This subclass is indented under subclass 276. Apparatus including a plurality of opposed elements that are effective by relative movement therebetween, to grip and hold the workpiece with respect to the cutting tool.

SEE OR SEARCH THIS CLASS, SUBCLASS:

250, for a device including structure which serves the dual functions of clamping a workpiece and stripping or otherwise handling the broached material.

278 With means to adjust or facilitate adjustment of work or work holder:

This subclass is indented under subclass 276. Apparatus combined with means which effects or permits variable location of the workpiece or of the workpiece supporting means with respect to the cutting tool.

(1) Note. The means herein permits direct manual adjustment of the workpiece or is manually actuated to translate such actuation directly to the workpiece, said

means and said workpiece partaking of the same movement.

SEE OR SEARCH CLASS:

269, Work Holders, subclasses 55+ for a movable or an adjustable holder, respectively.

279 With means on work or work holder to guide cutter during infeed:

This subclass is indented under subclass 276. Apparatus combined with means adapted to engage the workpiece or the work supporting structure to direct the path of the cutting tool during its cutting stroke.

- (1) Note. Excluded from this subclass is a guide consisting solely of the mating portions of a uniform cross-sectioned tool and a work surface defining an aperture.

280 Cutter infeed means:

This subclass is indented under subclass 243. Apparatus including means to effect movement of a cutting tool to, through, and away from cutting contact with a workpiece to thereby effect the cutting operation.

281 Imparting rectilinear motion to cutter:

This subclass is indented under subclass 280. Apparatus wherein the means to cause the cutting tool to move to effect the cutting operation serves to cause the cutting tool to move in a straight path during the cutting stroke.

282 And rotary motion to cutter:

This subclass is indented under subclass 281. Apparatus wherein means is provided to cause the cutting tool to turn about an axis in addition to the straight-line movement.

- (1) Note. The cutting tool of this subclass is rotated in a support, which support and cutting tool assembly is moved in a straight line.

SEE OR SEARCH THIS CLASS, SUBCLASS:

260, for similar structure used to form a spiral groove in an opening in a workpiece.

SEE OR SEARCH CLASS:

408, Cutting by Use of Rotating Axially Moving Tool, for similar structure adapted to create or enlarge an opening, rather than shape the inner surface of such an opening as is found in this subclass.

283 Fluid powered means:

This subclass is indented under subclass 281. Apparatus wherein the means to cause the cutting tool to move in a straight path to effect the cutting action is adapted to derive moving force from the action of a flowable medium acting against a surface thereof.

284 Rack means:

This subclass is indented under subclass 281. Apparatus including a row of gear teeth arranged in a straight line extending generally along the workpiece and perpendicularly to the cutting edge of the cutting tool, also including a gear to engage the aligned gear teeth, the gear and row of aligned gear teeth intended to cooperate to cause the cutting tool to move toward the workpiece to effect the shaping operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

311, for a planing machine including means for shaving by a wide blade and including a rack to cause infeed.
 323, for a planing machine including a rack to cause work infeed.
 332, for a planing machine including a rack to cause horizontal cutter reciprocation.
 335, for a planing machine including a rack to cause cutter infeed, broadly.

285 Screw means:

This subclass is indented under subclass 281. Apparatus wherein the means to cause the cutting tool to move in a straight path to effect the cutting action includes a member adapted to turn about an axis, which member has a helical thread adapted to engage a relatively movable member and force relative displacement upon rotation of the helically threaded member.

286 Machine frame:

This subclass is indented under subclass 243. Apparatus comprising structure supporting the weight of the cutting tool or the workpiece or for counteracting the thrust of the cutting tool, which structure is generally not in contact with the cutting tool or with the workpiece.

287 Cutter support or guide:

This subclass is indented under subclass 243. Apparatus comprising means to engage and move with the cutting tool during the cutting operation which means is adapted to support the cutting tool against gravity or the reaction from the workpiece, or comprising means to be engaged by the cutting tool and direct the cutting tool to follow the configuration of the means during the cutting operation.

288 PLANING:

This subclass is indented under the class definition. Apparatus or method for shaping by removal of surface material from work by a nonrotary cutting tool having a sharp cutting edge.

- (1) Note. Included herein is (a) shaping by a cutting tool making a single cutting stroke across the workpiece, (b) shaping by a cutting tool making a series of cutting strokes across the workpiece, or (c) shaping by a series of cutting tools making sequential cutting strokes across the workpiece.
- (2) Note. The cutting tool of this subclass may be moved in a straight line or may be moved in an arcuate line relative to the workpiece.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 58+, for formation of a gear by a cutter moving in a line with respect to a workpiece.
- 64+, for shaping of a workpiece by a rotary cutter.
- 243+, for shaping of a workpiece by a cutting tool moving in a line with respect to a workpiece, which cutting tool includes a first and a second cutting edge adapted to be sequentially pre-

sented to the workpiece during a single cutting stroke.

SEE OR SEARCH CLASS:

- 82, Turning, for cutting to shape a workpiece turning more than 360° about an axis with respect to a cutting tool.
- 83, Cutting, subclasses 861+ for the formation of a recess within a planar surface of a workpiece without formation of a particular shape to the surface of the area from which material has been removed.
- 144, Woodworking, subclasses 114 through 130 for planing of wood.
- 483, Tool Changing, subclasses 28+ for a reciprocating tool machine tool combined with a tool transfer means.

289 With regulation of operation by use of template, card, or other replaceable information supply:

This subclass is indented under subclass 288. Apparatus or method for detecting the characteristics (e.g., physical, electrical, etc.) of a member carrying operating instructions for the apparatus, which member is separate from both the workpiece and the organized structure of the apparatus.

- (1) Note. This subclass includes utilizing a prepared information supply that is to be removably placed in the apparatus. This subclass does not include utilizing the characteristics of a permanent part of the apparatus, such as a cam or gear, to influence the operation of other parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 2, for similar control combined with gear cutting apparatus.
- 67, for similar control combined with a milling machine for generating a thread or helix.
- 79, for similar control combined with milling, generally.

SEE OR SEARCH CLASS:

- 408, Cutting by Use of Rotating Axially Moving Tool, subclass 3 for similar control structure for a boring or drilling machine.

290 Including use of tracer adapted to trigger electrical or fluid energy:

This subclass is indented under subclass 289. Apparatus or method including use of means having a follower adapted to ride over the form of the pattern member, which means is adapted to be connected to (a) a supply of electricity to regulate the flow of the electricity or to (b) a supply of gas or liquid so as to regulate the flow of that gas or liquid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 98, for a tracer adapted to trigger electrical energy in a duplicating, milling means adapted to operate without manual intervention.
- 101, for a tracer adapted to trigger fluid energy in a duplicating, milling means adapted to operate without manual intervention.
- 114, for a tracer adapted to trigger electrical or fluid energy in a milling machine adapted to operate without manual intervention.
- 127, for a tracer, per se, for a milling machine, adapted to trigger electrical energy.
- 129, for a tracer, per se, for a milling machine, adapted to trigger fluid energy.

291 Including provision for circumferential relative movement of cutter and work:

This subclass is indented under subclass 290. Apparatus or method particularly adapted to shape a workpiece that is generally circular in cross section about the central axis thereof, wherein the cutting tool is supported for movement about the central axis of the workpiece, or whereon the workpiece is supported for movement about its central axis, which movement of the cutting tool relative to the workpiece is less than 360°.

SEE OR SEARCH CLASS:

- 82, Turning, for similar cutting wherein cutter movement relative to the work is through more than 360° about the work axis.

292 Including provision for circumferential relative movement of cutter and work:

This subclass is indented under subclass 289. Apparatus or method particularly adapted to shape a workpiece that is generally circular in cross section about the central axis thereof, wherein the cutting tool is supported for relative movement about the central axis of the workpiece, or wherein the workpiece is supported for movement about its central axis, which arcuate movement of the cutting tool relative to the workpiece is less than 360°.

SEE OR SEARCH CLASS:

- 82, Turning, for similar cutting wherein cutter movement relative to the work is through more than 360° about the work axis.

293 Process:

This subclass is indented under subclass 288. Method or planing.

294 With means to lubricate:

This subclass is indented under subclass 288. Apparatus combined with structure to apply a friction reducing fluent material to the apparatus or to the workpiece.

295 With product handling means:

This subclass is indented under subclass 288. Apparatus including means to move or affect the movement of material that has been planed or of scrap material of a planing operation.

- (1) Note. A single device to feed work to and remove product from a planing station is considered to be a work handling rather than product handling means. However, similarly claimed means disclosed as a work handling means and a distinct product handling means will be found herein.
- (2) Note. Means for continuous or incremental advance of material from a first planing station to a sequentially acting second station is considered to be product handling for this subclass.

296 Randomly manipulated, work supported, or work following device:

This subclass is indented under subclass 288. Apparatus comprising: (a) a cutting device which is capable of movement in a path instantaneously under the control of the operative during cutting, including a cutting device suspended or supported near the workpiece; (b) a cutting device which as an entirety is disclosed as deriving from the work a substantial amount of its support against gravity during cutting, or (c) a cutting device which is intended to move across the workpiece in a direction dictated by conditions of the workpiece.

- (1) Note. A cutting device mounted at one end of a flexible shaft whose other end is anchored to a table, or a cutting device mounted on a steerable vehicle is included under clause (a) of this definition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
175, for similar structure used in milling.

SEE OR SEARCH CLASS:
30, Cutlery, for a randomly manipulated, work supported, or following cutting device, generally.

297 Means to remove flash or burr:

This subclass is indented under subclass 288. Apparatus particularly adapted to remove the extraneous material formed during a previous shaping, molding, or welding operation.

- (1) Note. Flash is the ridge formed at the abutment line of a pair of mold components or is formed by a weld line and is considered to be that portion of a product of the molding or welding operation that extends beyond the desired surface of the product.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
140, for milling apparatus to remove flash or burr.
258, for broaching apparatus to remove flash or burr.

298 Elongated work:

This subclass is indented under subclass 297. Apparatus particularly adapted to be used on a workpiece having one dimension substantially greater than any other dimension.

299 Flash or burr inside hollow work:

This subclass is indented under subclass 298. Apparatus particularly adapted to be used on a workpiece including an opening extending generally along the greatest dimension, wherein the apparatus is particularly adapted to remove only extraneous material within the opening.

300 Transverse burr:

This subclass is indented under subclass 298. Apparatus particularly adapted to the removal of a previously formed sharp edge extending in a direction generally normal to the greatest dimension.

301 Flat work:

This subclass is indented under subclass 297. Apparatus particularly adapted to be used on a three-dimensional workpiece having a first and a second dimension of substantially greater extent than the third dimension.

302 Of commutator:

This subclass is indented under subclass 288. Apparatus particularly adapted to be used in shaping the surface of a segmented annular member to be utilized in an electromotive device to transfer electrical current from a stationary part to a rotary part.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

176, for a randomly manipulated, work supported, or work following milling device for machining a commutator.

303 Means for trimming edge (e.g., chamfering, scarfing, etc.):

This subclass is indented under subclass 288. Apparatus particularly adapted to remove material from the perimeter bounding a generally planar area of a workpiece.

- (1) Note. Included in this subclass is an apparatus adapted to cut the edge portion of a workpiece into chips.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

138, for a milling machine intended to trim the edge of a workpiece.

SEE OR SEARCH CLASS:

83, Cutting, for subdividing the edge portion from the remainder of a workpiece; particularly subclass 869 for edge trimming, e.g., bevelling, without specific shaping of the formed edge.

304 Means for cutting groove:

This subclass is indented under subclass 288. Apparatus intended to form an elongated recess in generally uniform surface of a workpiece, which elongated recess is of a prescribed cross-sectional shape.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

259, for means for cutting a groove by broaching.

SEE OR SEARCH CLASS:

83, Cutting, subclasses 875+ for cutting of a groove in a workpiece where no particular cross-sectional shape is given to the groove.

305 Arcuate groove:

This subclass is indented under subclass 304. Apparatus particularly adapted to form an elongated recess in a curved surface of a workpiece.

(1) Note. Included herein is means for scoring the surface of a grinding or crushing roll, etc., with longitudinal, helical, sinuous, or other grooves.

306 For rifling:

This subclass is indented under subclass 305. Apparatus consisting of means for cutting a spiral groove in the inner surface of the barrel of a small arms or ordnance device.

(1) Note. The tool of this subclass normally turns gradually about the axis of the work (usually through less than 360°); however, it is considered to be a planing

tool rather than a milling tool because it is driven axially rather than rotatably.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

64+, for milling by a rotating tool wherein the tool is driven to rotate.

261, for rifling a gun barrel by a broaching tool.

307, for apparatus for planing a straight line inside a gun barrel.

SEE OR SEARCH CLASS:

29, Metal Working, subclasses 1.1+ for apparatus especially adapted for making a projectile throwing implement of metal, whether small arms or a large gun.

408, Cutting by Use of Rotating Axially Moving Tool, for cutting by a rotatably driven cutting tool that moves axially through or about a workpiece with no other movement with respect to the workpiece, as in the case of cutting screw threads on a bolt.

307 Inside hollow work:

This subclass is indented under subclass 304. Apparatus particularly adapted to cutting on an inwardly facing surface of a generally enclosed or shell-like workpiece.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

143, for apparatus for milling a groove inside a hollow workpiece.

306, for apparatus for planing an arcuate groove inside a gun barrel.

308 Means for shaving by blade spanning work surface:

This subclass is indented under subclass 288. Apparatus adapted to remove a very thin layer of the surface of the workpiece at a single pass by use of a cutting tool extending substantially across the entire surface of the workpiece, the purpose of the cutting operation being to remove only surface imperfections from a previously shaped surface.

- 309 Concave work surface (e.g., bearing, stereotype printing plate, etc.):**
This subclass is indented under subclass 308. Apparatus particularly adapted to remove a very thin layer of the inside of an inwardly curved surface.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
901, for an art collection of making of a stereotype printing surface by means other than planing.
- 310 Circumferential surface:**
This subclass is indented under subclass 308. Apparatus particularly adapted to remove a very thin layer of material from the outer surface of a rodlike or spherical workpiece.
- 311 Including rack driven infeed means:**
This subclass is indented under subclass 308. Apparatus including a row of gear teeth arranged in a straight line extending generally along the workpiece and perpendicularly to the cutting edge of the cutting tool, also including a gear to engage the aligned gear teeth, the gear and row of aligned gear teeth intended to cooperate and cause relative movement of the cutting tool and the workpiece to effect the shaping operation.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
284, for a broaching machine including a rack means to cause cutter infeed.
323, for a planing machine including a rack to cause work infeed.
332, for a planing machine including a rack to cause horizontal cutter reciprocation.
335, for a planing machine including a rack to cause cutter infeed, broadly.
- 312 Including roller infeed means:**
This subclass is indented under subclass 308. Apparatus including a circular member having a peripheral surface adapted to engage and cause the workpiece to move relative to the cutting tool to effect the shaping operation.
- 313 Means for cutting arcuate surface:**
This subclass is indented under subclass 288. Apparatus particularly adapted to form a surface of the workpiece into a curved shape.
- 314 Cycloidal surface:**
This subclass is indented under subclass 313. Apparatus particularly adapted to form a curved surface on the workpiece wherein a cross section through the surface would show the shape to be that generated by a point on the periphery of a circle, which circle is rolled over a planar surface.
- 315 With work infeed and means to arcuately reposition the cutter:**
This subclass is indented under subclass 313. Apparatus including a base intended to support the apparatus against gravity, including structure to cause the workpiece to move relative to the base and relative to a cutting edge of the cutting tool to effect the shaping operation, and including means to cause the cutting tool to move along a curved path relative to the base and relative to the workpiece to relocate the path of the cutting action with respect to the workpiece, so that a series of cutting passes yields an arcuate surface on the workpiece.
- 316 With work infeed and means to arcuately reposition the work:**
This subclass is indented under subclass 313. Apparatus including a base intended to support the apparatus against gravity, including structure to cause the workpiece to move relative to the base and relative to the cutting edge of the cutting tool to effect the shaping operation, and including means to cause the workpiece to additionally move along a curved path relative to the base and relative to the cutting tool to relocate the path of the cutting action with respect to the workpiece, so that a series of cutting passes yields an arcuate surface on the workpiece.
- 317 With means to relatively infeed cutter and work:**
This subclass is indented under subclass 288. Apparatus including structure to cause the approach of the cutting tool and the workpiece, which approach causes the shaping operation to be effected.

318 And means to rotate work and cutter at same rate about converging axis:

This subclass is indented under subclass 317. Apparatus including means to support the workpiece against gravity and cause that workpiece to turn about a first axis and including means to support the cutting tool against gravity and cause that cutting tool to turn about a second axis inclined relative to the first axis such that as the workpiece is infed relative to the cutting tool there is no relative rotation between the workpiece and the cutting tool.

SEE OR SEARCH CLASS:

82, Turning, subclasses 1.2+ for similar structure wherein there is relative rotary movement between the cutting tool and the workpiece.

319 With plural sequentially acting cutters or with double acting cutter:

This subclass is indented under subclass 317. Apparatus including (a) a first cutting tool adapted to make a first cutting pass through a workpiece and a second cutting tool adapted to follow the first cutting tool generally through the same portion of the workpiece to expand the cut of the first cutting tool, wherein the cutting tools are independent of each other, i.e., they are not on the same tool holder; or including (b) a cutting tool adapted to make a first cutting pass through a workpiece in a first direction and then make a second cutting pass in the opposite direction through the workpiece to expand the cut of the first cutting pass.

(1) Note. Included herein is a chain of tool carriers connected together and pulled sequentially through the workpiece.

320 And means to vary rate of infeed:

This subclass is indented under subclass 317. Apparatus including provision to cause the relative approach of the cutting tool and the workpiece during the shaping operation to be selectively at a first velocity or at a second velocity.

(1) Note. This subclass is not intended to include means to merely start and stop the infeed.

321 Reciprocating work infeed means:

This subclass is indented under subclass 317. Apparatus including a base on which the apparatus is supported and including a carriage adapted to move cyclically to-and-fro to carry the workpiece and present that workpiece to the cutting tool to perform the shaping operation.

322 With fluid-driven bed:

This subclass is indented under subclass 321. Apparatus including means to cause the carriage to move relative to the base to perform the shaping operation, which means is adapted to derive carriage moving force from the action of a flowable medium acting against a surface thereof.

323 With rack-driven bed:

This subclass is indented under subclass 321. Apparatus including a row of gear teeth arranged in a straight line extending generally along the workpiece and perpendicularly to the cutting edge of the cutting tool and also including a gear to engage the aligned gear teeth, the gear and row of aligned gear teeth intended to cooperate to cause the work to move toward the cutting tool to effect the shaping operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

284, for a broaching machine including a rack means to cause cutter infeed.
311, for a planing machine including means for shaving by a wide blade and including a rack to cause infeed.
332, for a planing machine including a rack to cause horizontal cutter reciprocation.
335, for a planing machine including a rack to cause infeed, broadly.

324 With screw-driven bed:

This subclass is indented under subclass 321. Apparatus including means to cause the carriage to move relative to the base to perform the shaping operation, which means includes a member adapted to turn about an axis, the member having a helical thread adapted to engage a relatively movable second member and force relative displacement of the second member upon rotation of the helically-threaded member.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
333, for a planing machine having a screw-driven cutter infeed means.
- 325 And means to permit repositioning of cutter laterally:**
This subclass is indented under subclass 321. Apparatus including a guiding surface to carry the cutting tool transversely to the direction of infeed of the carriage adapted to permit the cutting tool to be selectively moved therealong.
- 326 Reciprocating cutter infeed means:**
This subclass is indented under subclass 317. Apparatus including provision to allow the cutting tool to cyclically move to-and-fro over a surface of the workpiece to perform the shaping operation.
- (1) Note. This subclass includes apparatus known in the art as a "slotter" or a "key seater".
- 327 Reciprocating cutter horizontally:**
This subclass is indented under subclass 326. Apparatus including means to support the workpiece and including means to allow the cutting tool to move to-and-fro over the upper or lower surface of the workpiece to perform the shaping operation.
- (1) Note. Included in this subclass is a device known in the art as a "shaper".
- 328 With work support and lead screw to reposition work support:**
This subclass is indented under subclass 327. Apparatus with means to hold the workpiece against the force of gravity and against the force of the cutting tool and including a helically-spiralled member adapted to interfit with the holding means to cause displacement thereof upon rotation of the helically-spiralled member.
- 329 With fluid-powered means to drive cutter:**
This subclass is indented under subclass 327. Apparatus wherein the means to cause the cutting tool to move to-and-fro is adapted to derive the cutting tool moving force from the action of a flowable medium acting against a surface thereof.
- 330 With pivoting link to drive cutter:**
This subclass is indented under subclass 327. Apparatus wherein the means to cause the cutting tool to move to-and-fro includes a rigid connecting member pivotally secured to the tool and pivotally secured to a second member.
- 331 Link driven by crank:**
This subclass is indented under subclass 330. Apparatus wherein the second member causing the rigid connecting member to move is adapted to turn about an axis and is pivotally connected to the connecting member at a location offset from the axis so that rotation of the second member causes the end of the link connected thereto to orbitally swing and drive the cutting tool.
- 332 With rack to drive cutter:**
This subclass is indented under subclass 327. Apparatus including a row of gear teeth arranged in a straight line extending generally along the workpiece and perpendicularly to the cutting edge of the cutting tool, also including a gear to engage the aligned gear teeth, the gear and row of aligned gear teeth intended to cooperate and cause the cutting tool to move toward the workpiece to effect the shaping operation.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
284, for a broaching machine including a rack means to cause cutter infeed.
311, for a planing machine including means for shaving by a wide blade and including a rack to cause infeed.
323, for planing machine including a rack to cause work infeed.
335, for a planing machine including a rack to cause cutter infeed, broadly.
- 333 With screw to drive cutter:**
This subclass is indented under subclass 327. Apparatus in which the means to cause the cutting tool to move to-and-fro includes a member adapted to turn about an axis, the member having a helical thread adapted to engage a relatively movable second member and force relative displacement of the second member upon rotation of the helically-threaded member.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

324, for a planing machine having a screw-driven work infeed means.

334 With link or cam to drive cutter:

This subclass is indented under subclass 326. Apparatus wherein the means to cause the cutting tool to move to-and-fro includes (a) a rigid connecting member pivotally secured to the tool and pivotally secured to a second member or (b) a rotary member with a spiral or profiled surface adapted to slidingly engage a reaction surface upon rotation thereof.

335 With rack to drive cutter:

This subclass is indented under subclass 326. Apparatus including a row of gear teeth arranged in a straight line extending generally along the workpiece and perpendicularly to the cutting edge of the cutting tool, also including a gear to engage the aligned gear teeth, the gear and row of aligned gear teeth intended to cooperate and cause the cutting tool to move toward the workpiece to effect the shaping operation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

284, for a broaching machine including a rack means to cause cutter infeed.

311, for a planing machine including means for shaving by a wide blade and including a rack to cause infeed.

323, for a planing machine including a rack to cause work infeed.

332, for a planing machine including a rack to cause horizontal cutter reciprocation.

336 Including means causing return stroke:

This subclass is indented under subclass 317. Apparatus including means to cause the direction of approach of the cutting tool and the workpiece to be reversed.

(1) Note. Included in this subclass is a device wherein the direction of infeed is selective, i.e., the device is intended to be operated in one direction or the other. See the search notes below for reciprocatory infeed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

321, for planing apparatus including means to cause the work support to reciprocate to relatively infeed the cutter and the work.

326, for planing apparatus including means to cause the cutter to reciprocate to relatively infeed the cutter and the work.

337 Machine frame:

This subclass is indented under subclass 288. Apparatus comprising structure supporting the weight of the cutting tool or the workpiece or for the weight of the cutting tool or the workpiece or for counteracting the thrust of the cutting tool, which structure is generally not in contact with the cutting tool or with the workpiece.

338 Means to permit repositioning of cutter:

This subclass is indented under subclass 337. Apparatus including a base, including means to support the cutting tool in a first position for presentation to the workpiece, and including provision to allow movement of the cutting tool from the first position to a second position for different presentation to the workpiece.

339 Laterally:

This subclass is indented under subclass 338. Apparatus wherein the allowed movement of the cutting tool relative to both the workpiece and the base is in the direction normal to the direction of movement caused to effect the shaping operation.

340 Plural independently positioned cutters:

This subclass is indented under subclass 339. Apparatus including means to support a first cutting tool in a first position for presentation to a workpiece, and including provision to allow movement of the first cutting tool from a first position to a second position for different presentation to the workpiece, and including means to support a second cutting tool in a first position for presentation to a workpiece and including provision to allow movement of the second cutting tool from the first position to a second position for different presentation to the workpiece, wherein the repositioning movement of the first cutting tool is not necessarily

accompanied by the repositional movement of the second cutting tool.

341 Including clutch:

This subclass is indented under subclass 339. Apparatus including means to cause repositioning of the cutting tool from the first to the second position and including means for coupling power, frictionally or positively, to the repositioning means before the beginning or after the end of infeed (the cutting stroke), and then disengaging during the remainder of the infeed.

- (1) Note. Including herein is a pair of frictionally engaging discs, one attached to a reversible drive shaft and the other attached to a feed rod, the pair adapted to oscillate so that one or the other causes the relative infeed of the cutting tool and the workpiece.

342 Including repositioning means and means to effect stopping thereof:

This subclass is indented under subclass 339. Apparatus including means to cause movement of the cutting tool in the second direction and means to terminate that movement.

- (1) Note. Intermittent starting and stopping is not considered to be termination of positioning for this subclass.

343 Including relatively movable components and means to relatively immobilize these components:

This subclass is indented under subclass 337. Apparatus wherein members thereof can be repositioned with respect to each other, including means to secure the otherwise relatively movable members together.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 241, for similar frame and clamp structure for use as components of a milling machine.

344 Work table:

This subclass is indented under subclass 337. Apparatus including a generally planar upwardly facing surface particularly adapted to support a workpiece against gravity.

SEE OR SEARCH CLASS:

- 269, Work Holders, for structure of general utility to support a workpiece for presentation to a tool.

345 Tool head:

This subclass is indented under subclass 288. Apparatus for supporting the cutting tool of a planer.

346 With selectively usable cutting edges:

This subclass is indented under subclass 345. Apparatus including a first means for supporting a first cutting tool of a planer and including a second means for supporting a second cutting tool of a planer, and including provision to allow use of one or both of the cutting tools during relative approach of the workpiece.

- (1) Note. Included herein is a device including a first cutting tool for engagement with the workpiece moving in a first direction and including a second cutting tool for engagement with the workpiece moving in the opposite or return direction.

347 With means to permit repositioning of cutter for idle return stroke:

This subclass is indented under subclass 345. Apparatus including means to allow movement of the cutting tool out of the cutting position to permit relative movement of the cutting tool and the workpiece for return to the starting position for a subsequent approach and further shaping of the workpiece.

348 Comprising pivotable cutter or cutter support:

This subclass is indented under subclass 347. Apparatus including means to limit the cutting tool to swing about an axis in moving out of cutting position.

CROSS-REFERENCE ART COLLECTIONS

The following subclasses are collections of published disclosures pertaining to various specified aspects of the cutting art which aspects do not form appropriate bases for subclasses in the foregoing classification (i.e., subclasses superior hereto in the schedule), wherein original copies of patents are placed on the basis of proximate function of the apparatus. These subclasses

assist a search based on remote function of the apparatus and may be of further assistance to the searcher, either as a starting point in searching this class or as an indication of further related fields of search inside or outside the class. Thus, there is here provided a second access for retrieval of a limited number of types of disclosures.

- (1) Note. Disclosures are placed in these subclasses for their value as references and as leads to appropriate main or secondary fields of search, without regard to their original classification or their claimed subject matter.
- (2) Note. The disclosures found in the following subclasses are examples, only, of the indicated subject matter, and in no instance do they represent the entire extent of the prior art.

904

WITH HYDROSTATIC BEARING:

This subclass is indented under the class definition. Method or apparatus including use of fluid to support one member relatively to another and thereby reduce the friction between the two members.

END

900.1 Machine button or locator:

Aligning element used for positioning or orienting a machine part or a workplace relative to some reference system, which element is used in an apparatus of this class.

900.2 Machine tool carriage clamp:

A device used for joining, gripping or supporting a moving part of an apparatus of this class, which moving part holds or shifts another part.

901 STEREOTYPE PRINTING PLATE:

Making or modifying a stereotype printing plate by a process or apparatus of this class.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

309, for planing of a stereotype printing plate.

902 TIRE MOLD:

Making a mold to be used in the manufacture or vulcanizing of a rubber vehicle tire by a method or apparatus of this class.

903 WORK HOLDER:

Structure to be used with the apparatus of this class, which structure is intended to support a workpiece against gravity and/or against the force of the cutting tool.