

**CLASS 483, TOOL CHANGING****SECTION I - CLASS DEFINITION**

This is the generic class relating to a process or apparatus comprising use of either (A) means for supporting an implement in position for operative engagement with a workpiece combined with means to transfer the implement to or from that support, or (B) means for storing an implement in a position of repose remote from the operative position, combined with means to transfer the implement to or from the storage means.

**SECTION II - NOTES TO THE CLASS DEFINITION**

- (1) Note. "Transfer" is used to designate a bodily conveying of the implement from one position to another. The transfer means need not be distinct from both the means for supporting the implement in operative engagement and the storage means, i.e., the support or storage means may comprise the transfer means.
- (2) Note. "Workpiece" includes material to be modified by the implement into a product of manufacture and may comprise a portion of stock material to be separated therefrom subsequent to modification, or material to be tested by use of an implement comprising a probe.
- (3) Note. "Operative engagement" refers to the relative implement-workpiece movement during mutual contact which the implement performs its intended function on the workpiece.
- (4) Note. "Implement" consists of a workpiece modifying device, (e.g., a cutting, abrading, or deforming tool intended to remove material from the workpiece or plastically strain the workpiece during contact therewith). Note that an assembling tool (e.g., a wrench or a screwdriver) is not considered to be an implement to be transferred under this class.

**Exceptions**

Because it is handled in the manner of the "implement" of this class, each of the fol-

lowing is treated as an implement in this class: (a) a probe intended to detect or measure a parameter of the workpiece during contact therewith, (b) a tool holder that supports a work engaging tool (e.g., chuck, collet or adapter), (c) a work holder that supports a workpiece for rotation during treatment, (e.g., a chuck, collet or adapter). (d) a nonfiller type electrode used for machining, e.g., for spot welding, electric discharge machining (i.e., by EDM), electro-chemical machining (i.e., by ECM), etc.

- (5) Note. The means for supporting the implement must be distinct from the means for storing, e.g., the mere recitation of a machine tool with a turret or other means to shift or index the implement is considered insufficient subject matter for original classification in this class.
- (6) Note. Transferring an implement of this class combined with transferring another member (e.g., an assembling tool) using the same transfer means is included in this class.
- (7) Note. This class was derived in 1991 from the art then stored in subclass 568 tool changer of Class 29, Metal Working. It was assumed that all references appropriate for original classification in this class (Class 483) were either as original or as cross-reference in that subclass. Inquiries were made of various Post Classifiers and Examiners, but **NO ART WAS SCREENED THAT WAS NOT INCLUDED IN 29/568.**

**SECTION III - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS****A. RELATIONSHIP TO MATERIAL HANDLING CLASSES**

Class 483 includes a process or apparatus comprising use of tool transfer means combined either with a support means where the tool is to engage a workpiece or with a storage means. Also, this class includes "tool changing" combined with other material handling.

Means to transfer a tool, per se, is to be found in the appropriate material handling class.

Means to transfer a member other than a tool is to be found in the appropriate material handling class.

Also see References to Other Classes, below, referencing this section.

#### B. RELATIONSHIP TO CLASSES MAKING USE OF A WORKPIECE MODIFYING "TOOL"

Class 483 includes use of a material treating tool combined with significantly recited tool changing.

Also see References to Other Classes, below, referencing this section.

#### C. RELATIONSHIP TO MATERIAL STORAGE CLASSES

Class 483 includes a tool storage means combined with a tool transfer means.

Also see References to Other Classes, below, referencing this section.

### SECTION IV - REFERENCES TO OTHER CLASSES

#### SEE OR SEARCH CLASS:

- 29, Metal Working, for any of several metal working operations under that class definition which may be combined with, by name only, a tool changing process or apparatus. The combination of Class 29 Metal Working with a significantly recited tool transfer device is to be found in this class (Class 483). (See Relationship to Classes Making Use of a Workpiece Modifying "Tool".)
- 52, Static Structures (e. g., Buildings), subclasses 29+ for a building including means to move an article.
- 65, Glass Manufacturing, for manufacturing of an article from glass. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 72, Metal Deforming, for shaping of preformed metal generally, search especially subclasses 238+ for apparatus for deforming by use of a roller couple combined with means to introduce or remove at least one roller with respect to the couple. This is an exception to the general rule that the combination of a Class 72 process or apparatus with a Tool Changing pro-

cess or apparatus is to be found in Class 483. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)

- 81, Tools, subclass 57.5 for a wrench or screw-driver carrying a turret head.
- 82, Turning, for cutting of rotating work. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 83, Cutting, for subdividing a workpiece by use of a sharp cutting edge. Search particularly subclass 481 for a cutting machine having a rotatable disc tool pair or tool and carrier with means to permit (as distinguished from transfer) replacement of the tool. Search subclasses 549+ for a cutting machine including plural tools selectively engaged by a single drive, especially subclass 552 for a turret from which the tool is not removed during cutting operation. Search subclasses 563+ for a cutting machine including a particular drive means and provision for the tool to be displaced to an inactive position, other than for storage. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 100, Presses, for a process or apparatus for compressing material without a shaping. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 140, Wireworking, generally for a (a) combined process or apparatus for forming or shaping wire to form a wire product, (b) for assembling an article of wire, or (c) for means peculiar to the manufacture of an article from wire. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 142, Wood Turning, for cutting of rotating wood. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 144, Woodworking, generally for a process or apparatus including (a) combined operations in manufacturing an article from wood, or (b) for an operation peculiar to the making of an article from wood. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 173, Tool Driving or Impacting, for a tool support with a driver. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 198, Conveyors: Power-Driven, generally for apparatus for advancing a load over a predetermined path or path section. (see Relationship to Material Handling Classes, above.)

- 204, Chemistry: Electrical and Wave Energy, subclasses 194+ for an electrolytic apparatus and especially subclass 224 for an ECM (i.e., electro-chemical machining) apparatus with localized area applicators. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions, subclasses 640+ for electrolytic erosion to change the shape or surface configuration of a workpiece (e.g., etching, polishing, etc.). (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 206, Special Receptacle or Package, subclasses 372+ for a special receptacle for plural tools. (see Relationship to Material Storage Classes above.)
- 211, Supports: Racks, especially subclasses 1.51+ for a power operated storage supply. (see Relationship to Material Storage Classes above.)
- 212, Traversing Hoists, generally for apparatus or method for lifting and shifting a load from a suspended support. (see Relationship to Material Handling Classes above.)
- 219, Electric Heating, subclasses 50+ for a process or apparatus of treating metal by electric heating. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 221, Article Dispensing, generally for a process or apparatus for dispensing discrete objects from a supply. (see Relationship to Material Handling Classes above.)
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, for a method of molding or shaping an article of flowable material, generally. Note that shaping of metal or glass is generally provided for elsewhere. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 279, Chucks or Sockets, generally for a means of general utility for making a permanent or temporary connection between an article, such as a tool, and a holder.
- 318, Electricity: Motive Power Systems, generally for a system including an electrical motor for actuating a tool changer or a control therefor and wherein the electrical motor, as claimed, is the sole and ultimate electric load device supplied to the system.
- 407, Cutters, for Shaping, generally for a tool adapted for removing material from a workpiece. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 408, Cutting by Use of Rotating, Axially Moving Tool, generally for a process or apparatus wherein a turning cutter removes material from a workpiece during relative axial infeed therewith. Search subclass 35 for apparatus for removing material from a workpiece by an axially advancing, rotating cutter combined with a turret for plural cutters not removable from the turret during cutting. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 409, Gear Cutting, Milling, or Planing, generally for a process or apparatus for removing material from a workpiece with a cutter to shape an article. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 425, Plastic Article or Earthenware Shaping or Treating: Apparatus, for means for molding or shaping an article of flowable material, generally. Note that means for shaping of metal or glass is generally provided for elsewhere. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 451, Abrading, generally for a machine or process for removing material from a workpiece by abrading or polishing. (See Relationship to Classes Making Use of a Workpiece Modifying "Tool" above)
- 414, Material or Article Handling, generally for a process or device for displacing an article with respect to a support or supply, or for a tool transfer device, per se. (See Relationship to Material Handling Classes.)
- 901, Robots, (an art collection class) generally for a reprogrammable manipulator adapted for moving articles through programmed motions repetitively. (See Relationship to Material Handling Classes.)

## SUBCLASSES

- 1 PROCESS:**  
This subclass is indented under the class definition. Method including transferring an implement to or from the support means or the storage means.
- 2 WITH SAFETY MEANS:**  
This subclass is indented under the class definition. Apparatus including means to protect a human operator from accidental injury.

- 3 Guard:**  
This subclass is indented under subclass 2. Apparatus wherein the means to protect comprises a shield or barrier.
- 4 WITH MEANS TO REGULATE OPERATION BY MEANS OF REPLACEABLE INFORMATION SUPPLY (E.G., TEMPLATE, TAPE, CARD, ETC.):**  
This subclass is indented under the class definition. Apparatus comprising means to control the performance of the apparatus from an externally exchangeable algorithm.
- (1) Note. Included in this subclass is an apparatus that is controlled, for example, by a computer wherein the computer may be programmed by inputting a stored set of instructions.
- SEE OR SEARCH CLASS:  
700, Data Processing: Generic Control Systems or Specific Applications, subclasses 159 through 195 for a control system for a machining device, particularly subclass 179 for subject matter related to controlling tool selection and exchange.  
901, Robots, subcollection 6 for apparatus wherein an arm motion controller exchanges information with another machine.
- 5 Replaceable information comprising tool location:**  
This subclass is indented under subclass 4. Apparatus wherein the algorithm comprises address data for the particular position of the implement in the storage means.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
8+, for apparatus including a control means responsive to a detector for identifying tools.
- SEE OR SEARCH CLASS:  
235, Registers, subclasses 435+ for a machine which senses or analyzes coded information on a record.
- 365, Static Information Storage and Retrieval, generally for a process or apparatus for static storage and retrieval of information, particularly subclasses 185.01+ for floating gate memory storage (e.g., flash memory).
- 6 Including determining optimum tool access path:**  
This subclass is indented under subclass 5. Apparatus wherein the algorithm comprises instructions enabling the control means to decide the most desirable route between the transfer means and the address of the particular implement in the storage means.
- (1) Note. Usually the optimum tool access path is the shortest path.
- 7 WITH CONTROL MEANS ENERGIZED IN RESPONSE TO ACTIVATOR STIMULATED BY CONDITION SENSOR:**  
This subclass is indented under the class definition. Apparatus comprising means to regulate the performance of the apparatus or implement and a detector for monitoring the apparatus or implement performance which influences the means to regulate subsequently to detecting a predetermined state or level of the apparatus or implement performance.
- 8 Responsive to tool identifying information:**  
This subclass is indented under subclass 7. Apparatus wherein the detector monitors means which distinguish the implement.
- (1) Note. Contained herein are patents having a detector primarily useful for locating a particular implement in the storage means.  
(2) Note. The means which distinguish may be a portion or adjunct of the implement, or may be distinct from the implement, e.g., indicia at an address location on the storage means which identifies the implement.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
5+, for apparatus including a programmable control means for inputting an address location of an address location of a tool in storage.

## SEE OR SEARCH CLASS:

- 235, Registers, subclasses 435+ for a machine which senses or analyses coded indicia on a record.
- 365, Static Information Storage and Retrieval, generally for a process or apparatus for the static storage and retrieval of information, particularly subclasses 185.01+ for floating gate memory storage (e.g., flash memory).

**9 Identifying information on tool or tool holder:**

This subclass is indented under subclass 8. Apparatus wherein the implement, a portion thereof, or member, e.g., an adapter, permanently attached thereto comprises the means which distinguish.

- (1) Note. For an adapter to be “permanently attached” to the implement the apparatus must have no structure for separating the adapter from the implement.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 10, for apparatus wherein the detector monitors the implement, per se, or a particular feature of the implement, e.g., wear. When a particular feature of the implement such as diameter is monitored to determine the identity of the implement (e.g., to distinguish a one inch diameter from a two inch diameter implement) classification is proper in subclasses 8+. When the particular feature is monitored to determine whether it is within acceptable limits for a known implement classification is proper in subclass 10.

**10 Responsive to tool:**

This subclass is indented under subclass 7. Apparatus wherein the detector monitors the implement or the condition thereof.

- (1) Note. Included herein are patents to apparatus having a detector for monitoring features of the implement not intended for implement identification purposes.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 9, for a detector which monitors the implement to determine its identity.

**11 Including means to monitor and control, i.e., adaptive machining:**

This subclass is indented under subclass 10. Apparatus including means to detect a condition of the implement and to regulate the operation for optimum performance in response thereto, e.g., feedback control.

- (1) Note. Included herein is a detector responsive to chatter in a cutting tool with means to cause the apparatus to select a different cutting tool or reduce the cutting rate, etc., so as to minimize the chatter.

## SEE OR SEARCH CLASS:

- 700, Data Processing: Generic Control Systems or Specific Applications, subclass 173 for a control system for adaptive machining.

**12 WITH SIGNAL OR INDICATOR:**

This subclass is indented under the class definition. Apparatus comprising means for alerting a human operator of an existing or pending condition or state of the apparatus, e.g., an alarm, gage, warning light, etc.

## SEE OR SEARCH CLASS:

- 116, Signals and Indicators, generally for a mechanical signal or indicator, per se.
- 340, Communications: Electrical, subclasses 815.1+ for an electrical annunciator.

**13 WITH MEANS TO CONDITION OR ADJUST TOOL OR TOOL SUPPORT:**

This subclass is indented under the class definition. Apparatus comprising means to treat the implement or the support means, or means for relatively varying the position of the implement on or within the support means.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 11, for apparatus which adjusts the implement in response to a control means responsive to an implement detector.

## SEE OR SEARCH CLASS:

15, Brushing, Scrubbing, and General Cleaning, subclasses 3+ for a machine which conditions by cleaning, particularly subclasses 300.1+ for a machine which cleans by application of an air blast or suction.

**14 WITH MEANS TO TRANSFER WORK:**

This subclass is indented under the class definition. Apparatus combined with means to move the workpiece to or from a workpiece support or storage means.

## SEE OR SEARCH CLASS:

414, Material or Article Handling, subclasses 222.01+ for apparatus to move an article from a supply to a work treatment or inspection station.

**15 Plural machine tools, e.g., flexible manufacturing:**

This subclass is indented under subclass 14. Apparatus comprising more than one implement support means, each mounted in a distinct device which recognizes both the implement and the workpiece and which brings them into operative engagement (i.e., "machine tool").

- (1) Note. Included herein are patents to apparatus having means to transfer the implement or workpiece between machine tools.
- (2) Note. A single device having a common support structure for more than one implement support means (e.g., a ganged or combination machine tool, etc.) is not considered to be a "plural machine tools".

## SEE OR SEARCH THIS CLASS, SUBCLASS:

32, for a rotary spindle machine tool with means to transfer a tool head, which may comprise means for supporting plural implements.

## SEE OR SEARCH CLASS:

29, Metal Working, subclasses 563+ for means to intermittently feed work from one work station to another in

plural, diverse manufacturing apparatus.

700, Data Processing: Generic Control Systems or Specific Applications, subclass 169 for a supervisory control for multiple tools.

**16 INCLUDING MACHINE TOOL OR COMPONENT:**

This subclass is indented under the class definition. Apparatus comprising a device, or a portion thereof, which includes structure for recognizing both the implement and the workpiece and which brings them into operative engagement, i.e., "machine tool".

- (1) Note. Disclosure shall be relied upon for determining original classification of a patent in the subclasses indented hereunder when the claims are silent regarding the type of machine tool disclosed.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

58+, for apparatus comprising an implement transfer means combined with a storage means for use with a machine tool.

## SEE OR SEARCH CLASS:

29, Metal Working, subclasses 592+ for a process of manufacturing including use of a changeable tool, but not reciting tool changing; subclasses 592.1+ for a process of manufacturing an electrical device including use of a changeable tool, but not reciting tool changing; subclasses 428+ for a process of assembling including use of a changeable tool but not reciting tool changing; subclasses 33+ for combined metal working apparatus including a changeable tool but not positively reciting a tool changer; subclasses 700+ for assembling or disassembling apparatus including a changeable tool but not positively reciting a tool changer; and subclasses 728-764 for apparatus for assembling or disassembling an electrical device including a changeable tool but not positively reciting a tool changer.

83, Cutting, for a process or apparatus for dividing a workpiece into a multiplic-

ity of parts, if not in combination with a process or apparatus for tool changing. subclasses 549+ for a cutting machine including plural tools selectively engaged by a single drive, especially subclass 552 for a turret from which the tool is not removed during cutting operation. Subclasses 563+ for a cutting machine including a particular drive means and provision for the tool to be displaced to an inactive position, other than for storage.

- 140, Wireworking, subclass 1 for a combined wireworking apparatus, if not in combination with an apparatus for tool changing.
- 279, Chucks or Sockets, cross-reference art collection 900 for a means for making a connection between an article such as a tool and an article holder adapted for use with (but not in combination with) an automatic tool changer.

**17 Rotating work machine tool (e.g. screw machine, lathe, etc.):**

This subclass is indented under subclass 16. Apparatus wherein the machine tool is intended to turn the workpiece about an axis while in operative engagement with the implement.

**SEE OR SEARCH CLASS:**

- 82, Turning, subclasses 121+ for a lathe, generally, provided with a rotatable cylinder for housing and supporting plural guided cutters, but not combined with a tool changer.
- 142, Wood Turning, for a lathe for cutting wood, but not in combination with a tool changer.

**18 Tool support comprises rotary spindle:**

This subclass is indented under subclass 17. Apparatus comprising a means for support which turns the implement about an axis while in operative engagement with the workpiece.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 30+, for apparatus comprising a rotary spindle machine tool such as a milling machine having no means for rotating the workpiece about an axis.

**SEE OR SEARCH CLASS:**

- 408, Cutting by Use of Rotating Axially Moving Tool, subclass 35 for apparatus for removing material from a workpiece by an axially advancing, rotating cutter combined with a turret for plural cutters.
- 409, Gear Cutting, Milling, or Planing, subclasses 50+ for a process or apparatus for cutting gears by using a rotary cutter.

**19 Tool having specific mounting or work treating feature:**

This subclass is indented under subclass 17. Apparatus comprising an implement or portion thereof having (a) a detailed provision for attachment to a holder or (b) structurally limited to performing a particular function with respect to the workpiece.

- (1) Note. For original classification in this subclass a patent must claim more than a nominal recitation of a "cutting" tool or implement.
- (2) Note. A named "probe" is considered to have a "work treating feature".

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 31+, for apparatus comprising a rotary spindle machine tool combined with means to transfer an implement having a specific mounting or work treating feature.

**SEE OR SEARCH CLASS:**

- 33, Geometrical Instruments, subclasses 501+ for a contact member or probe to touch an object and measure a geometrical characteristic of the object.
- 407, Cutters, for Shaping, generally for a tool adapted to remove material from a workpiece.

**20 Workpiece holder (e.g., chuck or chuck jaw, collet, etc.):**

This subclass is indented under subclass 19. Apparatus wherein the implement consists of a means for attaching a workpiece to the machine tool.

- (1) Note. The “implement” of this subclass is not the type structure normally considered to be a “tool” of the class title; however, the structure for moving a workpiece holder is so similar to that of this class that it is deemed to be best collected with the “tool changing” apparatus of this class.
- SEE OR SEARCH CLASS:  
279, Chucks or Sockets, art collection 901 for a chuck or chuck jaw changer.
- 21 Turning tool insert changer:**  
This subclass is indented under subclass 19. Apparatus wherein the implement consists essentially of a replaceably mounted cutting edge portion intended to be mounted in a non-rotary tool holder and intended to remove material from a turning workpiece during operative engagement therewith.
- SEE OR SEARCH CLASS:  
407, Cutters, for Shaping, subclasses 66+ for a “tool holder” for an inserted cutting tool and subclass 113 for a tool insert having plural, alternatively usable cutting edges. Also, see the class definition for clarification of the terms “cutter” and “tool holder”.
- 22 Tool changer between tool support and matrix:**  
This subclass is indented under subclass 17. Apparatus comprising implement support and storage means, and wherein the transfer means is distinct from the support and storage means and moves the implement to the support means from the storage means or to the storage means from the support means.
- 23 Plural matrices:**  
This subclass is indented under subclass 22. Apparatus comprising more than one storage means.
- 24 Tool support comprises turret:**  
This subclass is indented under subclass 22. Apparatus wherein the means for support comprises a rigid body that simultaneously supports plural implements and is selectively indexable to present one for operative engagement with the workpiece.
- 25 Linearly movable tool changer:**  
This subclass is indented under subclass 24. Apparatus wherein the implement is transferred along a straight line.
- 26 Linearly movable tool changer:**  
This subclass is indented under subclass 22. Apparatus wherein the implement is transferred along a straight line.
- 27 Direct tool exchange between tool support and matrix:**  
This subclass is indented under subclass 17. Apparatus including (a) means to support the implement in operative position combined with a storage means that comprises the transfer means; or (b) storage means for the implement combined with an operative support that comprises the transfer means.
- 28 Reciprocating tool machine tool (e.g., broaching machine, shaping machine, etc.):**  
This subclass is indented under subclass 16. Apparatus wherein the machine tool brings the implement and workpiece together in operative engagement in repetitive linear strokes.
- (1) Note. A ram-carried, tube forming mandrel of an extrusion press is considered to reciprocate, even though it moves in only one direction during the forming operation.
- SEE OR SEARCH CLASS:  
72, Metal Deforming, subclasses 446+ for a deforming apparatus with means to position a deforming tool relative to a workpiece or a complementary tool.  
409, Gear Cutting, Milling, or Planing, subclasses 243+ for a broaching apparatus including means to selectively drive a tool from a group of tools and subclasses 288+ for a process or apparatus for planing.
- 29 Including matrix:**  
This subclass is indented under subclass 28. Apparatus having means for storing an implement.



**30 Rotary spindle machine tool (e.g., milling machine, boring machine, grinding machine, etc.):**

This subclass is indented under subclass 16. Apparatus wherein the means for supporting the implement turns about an axis simultaneously with supporting the implement in operative engagement with the workpiece.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

18, for apparatus comprising a rotary spindle implement support and including means to rotate the workpiece about an axis during operative engagement with the implement.

**SEE OR SEARCH CLASS:**

408, Cutting by Use of Rotating Axially Moving Tool, subclass 35 for apparatus for removing material from a workpiece with an axially advancing rotating cutter combined with a turret for plural cutters.

409, Gear Cutting, Milling, or Planing, subclasses 64+ for a process or apparatus for milling.

**31 Tool having specific mounting or work treating feature:**

This subclass is indented under subclass 30. Apparatus comprising an implement or portion thereof having (a) a detailed provision for attachment to a holder or (b) structurally limited to performing a particular function with respect to the workpiece.

(1) Note. For original classification in this subclass a patent must claim more than a nominal recitation of a "cutting" tool or implement.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

19+, for apparatus comprising a workpiece rotating machine tool combined with a means to transfer an implement having a specific mounting or workpiece treating feature.

**SEE OR SEARCH CLASS:**

33, Geometrical Instruments, subclasses 501+ for a contact member or probe to touch an object and measure a geometrical characteristic of the object.

407, Cutters, for Shaping, subclasses 30+ for a cutting tool adapted for securement to a rotating spindle to turn the tool about an axis.

**32 Tool head:**

This subclass is indented under subclass 31. Apparatus wherein the implement comprises an input shaft attachable to a rotary power source on the machine tool, an output shaft having means for attaching a workpiece modifying implement thereto, a power transmission means interconnecting the input and output shafts, and a housing stationarily attachable to the machine tool for supporting the transmission means and shafts.

**SEE OR SEARCH CLASS:**

409, Gear Cutting, Milling, or Planing, subclass 230 for a milling apparatus including a detachable or repositionable tool head.

**33 Abrading wheel:**

This subclass is indented under subclass 31. Apparatus wherein the implement consists of a circular work modifying tool having naturally formed cutting edges, adapted to turn about a central axis while in operative engagement with the workpiece so as to remove material therefrom, i.e., grinding.

**SEE OR SEARCH CLASS:**

451, Abrading, for an abrading machine without specific tool transfer means

**34 Including means for angularly orienting tool and spindle**

This subclass is indented under subclass 31. Apparatus wherein the implement and means for support comprise mutually complimentary coupling structure for positive torsional engagement therebetween, and the transfer means or machine tool comprises means for relative rotational positioning of the implement and support means so as to position the mutually complementary coupling structure for engagement.

- the transfer means during the transfer operation.
- 35 Spindle angularly oriented to align with tool:**  
This subclass is indented under subclass 34. Apparatus wherein the machine tool comprises means for turning the support means about its axis to effect the relative rotational positioning.
- 36 Tool changer between spindle and matrix:**  
This subclass is indented under subclass 30. Apparatus comprising means for storing and supporting the implement, and wherein the transfer means moves the implement from the storage means to the support means or from the support means to the storage means.
- 37 Plural matrices:**  
This subclass is indented under subclass 36. Apparatus comprising more than one physically distinct storage means.
- 38 Including tool holder pivotable about axis:**  
This subclass is indented under subclass 36. Apparatus wherein the transfer means comprises means for gripping the implement rotatably mounted for advancing the implement during transfer along a circular arc centered about a spaced line, i.e., the pivot axis.
- SEE OR SEARCH CLASS:  
414, Material or Article Handling, subclasses 680+ and 741+ for a general article handler having a swinging load support.
- 39 Plural tool holders pivotable about a common axis:**  
This subclass is indented under subclass 38. Apparatus wherein the transfer means comprises more than one implement gripping means rotatably mounted for simultaneously advancing more than one implement during transfer along circular arcs centered about the pivot axis.
- 40 Including intermediate tool changer:**  
This subclass is indented under subclass 39. Apparatus comprising a second transfer means arranged to transfer the implement to or from the transfer means or storage means.
- (1) Note. Included herein are devices having plural transfer means and wherein the implement is serially handed off between
- 41 Intermediate tool changer includes tool holder pivotable about axis:**  
This subclass is indented under subclass 40. Apparatus wherein the intermediate transfer means comprises means for gripping the implement rotatably mounted for advancing the implement during transfer along a circular arc centered about a spaced line.
- 42 Tool holders pivotable with respect to each other:**  
This subclass is indented under subclass 39. Apparatus wherein each gripping means is mounted for relative rotation therebetween.
- 43 Tool holders pivotable about plural nonparallel axes:**  
This subclass is indented under subclass 39. Apparatus wherein the gripping means are rotatably mounted for advancing the implement during transfer along circular arcs centered about more than one angularly offset pivot axis.
- 44 Linearly moveable tool holders:**  
This subclass is indented under subclass 39. Apparatus wherein the transfer means comprises means for advancing the gripping means along a straight line.
- 45 Extensible tool holders:**  
This subclass is indented under subclass 44. Apparatus wherein the means for advancing the gripping means along a straight line comprises means for radially translating the gripping means with respect to the pivot axis.
- 46 Translatable axis:**  
This subclass is indented under subclass 44. Apparatus wherein the means for advancing the gripping means along a straight line comprises means for laterally translating the pivot axis.
- 47 Distinct tool changer for each tool:**  
This subclass is indented under subclass 38. Apparatus comprising a separate transfer means for every implement in the storage means.

- 48 Including intermediate tool changer:**  
This subclass is indented under subclass 38. Apparatus comprising a second transfer means to transfer the implement to or from the transfer means or storage means.
- (1) Note. Included herein are devices having plural transfer means and wherein the implement is serially handed off between the transfer means during the transfer operation.
- 49 Linearly movable tool holder:**  
This subclass is indented under subclass 38. Apparatus wherein the transfer means comprises means for advancing the gripping means along a straight line.
- 50 Tool holder pivotable about plural nonparallel axes:**  
This subclass is indented under subclass 38. Apparatus wherein the gripping means is rotatably mounted for advancing the implement during transfer along circular arcs centered about more than one angularly offset pivot axis.
- 51 Including linearly translatable tool holder (e.g., shuttle, ram, etc.):**  
This subclass is indented under subclass 36. Apparatus wherein the transfer means comprises means for gripping the implement mounted for advancing the implement during transfer along a straight line.
- SEE OR SEARCH CLASS:  
414, Material or Article Handling, subclass 749.1 for an article handler having linear movement.
- 52 Plural tool holders:**  
This subclass is indented under subclass 51. Apparatus wherein the transfer means comprises more than one gripping means for simultaneously advancing more than one implement during transfer.
- 53 Orthogonally translatable:**  
This subclass is indented under subclass 51. Apparatus wherein the gripping means is mounted for advancing the implement during transfer along perpendicular straight lines.
- 54 Direct tool exchange between spindle and matrix:**  
This subclass is indented under subclass 30. Apparatus comprising a support means and a storage means and wherein the support means or the storage means comprises the transfer means.
- 55 Spindle comprises tool changer:**  
This subclass is indented under subclass 54. Apparatus wherein the support means comprises the transfer means.
- 56 Matrix indexes selected tool to transfer position:**  
This subclass is indented under subclass 55. Apparatus comprising means to orient the storage means so as to present an implement selected for transfer to a location accessible to the transfer means.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
66+, for apparatus comprising an indexing matrix combined with an implement transfer means for use with a machine tool.
- 57 Including means to project tool from matrix:**  
This subclass is indented under subclass 54. Apparatus wherein the storage means comprises means for extending an implement selected for transfer away from the storage means.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
60+, for apparatus comprising a matrix having an implement projecting means combined with an implement transfer means for use with a machine tool.
- 58 TOOL TRANSFER TO OR FROM MATRIX:**  
This subclass is indented under the class definition. Apparatus comprising a storage means, and wherein the transfer means advances the implement thereto or removes it therefrom.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

16+, for apparatus comprising a machine tool having a support means combined with an implement transfer means.

SEE OR SEARCH CLASS:

211, Supports: Racks, subclasses 1.51+ for an article support comprising means to reposition an article with respect to a load bearing stand.

221, Article Dispensing, generally for a process or apparatus for dispensing discrete objects from a supply means.

414, Material or Article Handling, generally for a means to displace an article with respect to a support or supply.

**59 Matrix including means to latch tool:**  
This subclass is indented under subclass 58. Apparatus wherein the storage means comprises means to secure the implement thereto.

**60 Matrix including means to project tool for transfer:**  
This subclass is indented under subclass 58. Apparatus wherein the storage means comprises means for extending the implement to be removed therefrom away from the storage means.

(1) Note. The implement remains bodily attached to the storage means after it has been extended therefrom.

**61 Rectilinear:**  
This subclass is indented under subclass 60. Apparatus wherein the extending means translates the implement away from the storage means along a straight line.

**62 Pivoting:**  
This subclass is indented under subclass 60. Apparatus wherein the extending means rotates the implement away from the storage means along a circular arc.

**63 Plural matrices:**  
This subclass is indented under subclass 58. Apparatus comprising more than one storage means.

SEE OR SEARCH CLASS:

211, Supports: Racks, subclass 1.55 for plural article supports rotatable about a spindle.

**64 Including tool replenishing:**  
This subclass is indented under subclass 63. Apparatus wherein transfer means transfers the implement directly from one storage means to another.

**65 Including tool pot or adapter:**  
This subclass is indented under subclass 58. Apparatus wherein the storage means comprises an individual detachable receptacle for an implement stored therein, or means for fitting thereto an implement of different type, shape, or size than originally intended.

**66 Indexing matrix:**  
This subclass is indented under subclass 58. Apparatus comprising means to orient the storage means so as to present the implement for transfer to a location accessible to the transfer means.

SEE OR SEARCH CLASS:

82, Turning, subclass 159 for a lathe attachment using a rotatable cylinder for housing plural guided cutters.

**67 Rotary disc:**  
This subclass is indented under subclass 66. Apparatus wherein the storage means comprises a cylindrical implement carrier of generally short axial extent mounted for turning about a central axis.

SEE OR SEARCH CLASS:

211, Supports: Racks, subclass 1.53 for an article support rotatable about a spindle.

**68 Chain or belt:**  
This subclass is indented under subclass 66. Apparatus wherein the storage means comprises an endless linked or flexible implement carrier.

SEE OR SEARCH CLASS:

211, Supports: Racks, subclass 1.56 for an endless article carrier comprising a chain or belt.

**69 MISCELLANEOUS:**

This subclass is indented under the class definition. Apparatus not elsewhere provided for above.

## CROSS-REFERENCE ART COLLECTIONS

**900 GRIPPING PORTION ENGAGES TOOL SIMULTANEOUS WITH TOOL ROTATING IN SPINDLE:**

A collection of art wherein the transfer means is adapted for engaging the implement while the implements is mounted to a spinning tool support.

**901 ROBOT END EFFECTORS:**

A collection of art disclosing an implement or support means specially adapted for use by a robot.

## SEE OR SEARCH CLASS:

901, Robots, subcollections 30+ for robot end effector.

**902 TOOL GRIPPERS:**

A collection of art wherein a means for temporarily securing the implement to the transfer means during transfer has particular significance.

## SEE OR SEARCH CLASS:

294, Handling: Hand and Hoist-Line Implements, subclasses 86.4+ for a handling device comprising means for grasping a load.

414, Material or Article Handling, subclasses 745.1+ for a cylindrical bar handling device.

END