CLASS 363, ELECTRIC POWER CONVERSION SYSTEMS

SECTION I - CLASS DEFINITION

This is a restricted class for conversion systems wherein a single electrical source circuit is coupled to a single electrical load circuit.

A. LOAD IN OUTPUT CIRCUIT

1. Load Defined By Its Characteristics:

This class provides for conversion systems as defined the Glossary, below, even though the electrical load in the output circuit is recited by its characteristics, e.g., an inductive load, a load having negative current resistance characteristic, etc.

2. Particular Load Device:

Systems wherein a particular load device is recited in the output circuit are classified with the particular art even though the load device is recited by name only, e.g., a motor, an electrical furnace, etc. A partial list of such art systems is set forth under References to Other Classes, below.

3. What This Class Does Not Provide For:

This class does not provide for systems having a plurality of load devices whether the load devices are in different output circuits or in the same output circuit, except where the plural load device in a single output circuit are similar type loads. Therefore, if there are a plurality of diverse load devices in a single output circuit, even though recited only by their characteristics, e.g., a high inductive load and a low inductive load, then the system is excluded from this class.

B. CONVERSION SYSTEMS INCLUDING VOLTAGE MAGNITUDE AND/OR PHASE CONTROL

Conversion systems of the type classified herein are included in this class, even though they include voltage magnitude and/or phase control means.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

B. CONVERSION SYSTEMS HAVING PLURAL INPUT AND/OR PLURAL OUTPUT CIRCUITS

1. What This Class Excludes:

This class excludes systems having a plurality of either electrical source (input) circuits (see below with reference to polyphase systems) or output circuits. Where the system including the plurality of input and/or output comprises or is part of an art device, classification is with the art device. For other such systems, see References to Other Classes, below.

2. Alternate Input or Load Systems

If the system can operate with only one input and one output circuit at a time, even though there might be an alternate input or output circuit, classification is in this class (363). If the system contemplates that more than one input or output circuit will be used concurrently at any time, the system is excluded from this class and pointed out in 1 above. Also, see 3 below, with reference to polyphase systems.

3. Polyphase Systems

Although this class excludes systems having a plurality of input or output circuits, systems wherein the input circuit or the output circuit is a single polyphase circuit are considered to be systems having a single input or output circuit and are included in this class.

a. A single polyphase circuit is defined as a polyphase circuit which either does not have significantly different sources or significantly different load devices or load circuits for its several phases.

b. Plural Single Phase Sources To Make Polyphase:

Systems wherein a plurality of single phase sources are combined to produce a single polyphase output are excluded from this class. See References to Other Classes, below.

c. Polyphase From Single Phase:

This class includes systems having a single phase source circuit where phase converter means are used to produce a polyphase output. Where impedances are used for this purpose, see Subclass References to the Current Class, below.

C. CONVERSION SYSTEMS NOT INCLUDED IN THIS CLASS

1. The conversion systems not included in this class for

the most part relate to the communications arts. They include such converters as oscillators, modulators, demodulators, detectors, amplifiers, repeaters, filters, pulsing systems, wave transmission systems, etc. Many of these excluded systems, such as modulators, amplifiers, detectors, include means to control an electric current or potential of one character, such as direct or alternating current, by means of a control signal so as to produce a current or potential of another character. For example, in an amplifier system using an electronic tube with a source of direct current connected to the anode, the alternating current in the grid circuit controls the electronic tube so that the flow of direct current is varied to produce a pulsating current in the output. Also in some of these systems, such as some types of detectors, alternating current modulated by a signal is passed through a rectifying system so as to produce in the output circuit a pulsating direct current representative of the signal. For the lines between some of the excluded systems and this class, see the following sections. Also, for a partial list of such converters and their classification, see "Related Art" below.

It is common practice in the communications arts to refer to a signal or control circuit as an "input" circuit and the claims might recite "-- --conversion of one frequency to another" where the first frequency is in fact only a signal or control for controlling another electrical source circuit which is the source of energy for producing the second frequency. In this class, the input circuit is the circuit to which the energy is applied which is to appear in the output circuit.

Systems which include Electricity-Heat-Electricity Conversion are classified elsewhere. Lines and Networks which include frequency conversion are classified elsewhere. See References to Other Classes below.

2. Pulse Forming Circuits:

Systems designed to produce a plurality of discrete pulses similar to the pulses used in radar systems by conversion of electrical energy will be found in a number of other classes. Some of these classes are found in References to Other Classes, below.

3. Amplifiers in Class 330, and the Conversion Systems of This Class (363):

Systems which are designed to control a local source of energy by means of a control wave so as to produce an output which is either an enlarged, diminished or identical copy of the control wave of the type used in communication systems are classified as amplifiers in Class 330. In such systems, the control wave is not the source of power for the system.

4. Oscillators In Class 331 and Conversion Systems Of This Class (363):

a. Converting Direct to Alternating Current:

Converters for converting direct to alternating current wherein the system is self-controlled are classified in Class 331, except in those cases wherein the control involves circuit making and breaking, or wherein a resistor is mechanically varied. Where the system is such that conversion may be either way, i.e., A.C. to D.C. or D.C. to A.C. classification is in this class (363). In those cases wherein the conversion is A.C. to D.C. classification is in this class (363). The usual art in Class 331, will have a tuned circuit for determining the frequency of the resulting alternating current. However, the art in Class 331 also includes oscillators using resistance-inductance and resistance-capacity circuits (e.g., relaxation oscillators) which are self-controlled. Some of the oscillation generators in Class 331 are designed to produce pulse waves. Also, see the reference to Class 315 in References to Other Classes, below, for a reference to the systems closely analogous to oscillation generators in Class 315.

b. Oscillators with Alternating Power Supply:

Self-controlled oscillatory circuits which have an alternating current source of supply are classified as oscillation generators elsewhere. See References to Other Classes, below.

c. Oscillators with Rectifier in Output Circuit:

Where the output of an oscillator is rectified, the overall system is a conversion system for this class (363). See Subclass References to the Current Class, below.

5. Harmonic Generators, Frequency Multipliers in Class 327 and Class 331:

Systems designed to produce an output alternating current of a frequency (f_1), from an alternating current having a frequency (f_2) may be used as frequency multipliers or frequency dividers. In event the output frequency had definite harmonic relation to the frequency (f_1), (f_1 is a multiple of f_2) the system is a harmonic generator. Where the output frequency is a submultiple of the frequency (f_1) the system is a frequency divider. Included as multiples are fractions such

as three-halves and as submultiples are fractions such as two-thirds.

If the system includes an electronic tube of type having a control means (e.g., grid) as the converting means and the source of power (e.g., anode supply) is A.C. or D.C. and the frequency of the output circuit is a multiple of the frequency applied to the control circuit, classification is elsewhere; for cascaded oscillator systems of the frequency multiplying type, and for oscillators combined with output coupling networks of the harmonic, producing or selecting type classification is also elsewhere. If the frequency of the output circuit in such electronic tube systems is a submultiple of the frequency applied to the control circuit, classification is elsewhere. Miscellaneous nonlinear active device frequency control circuits (including mixers and multipliers) having a configuration other than a single source coupled to a single electrical load are classified elsewhere.

If there is no definite relation as above set forth, then the system is excluded from Class 331, and will be found in this class. To be classified in Class 331 as a frequency multiplier or divider the system must contain a local source of energy or signal for controlling the output frequency. Where the system is not self-controlled and the source circuit is supplied with energy having a frequency (f_2) other than the output energy and is the same energy as the input energy, and has a frequency relation to the source energy, which is determined by the frequency of the source circuit, classification is in class (363), regardless of the magnitudes of the frequencies or the proposed use of the system. Also, included in Class 363 are frequency multipliers and dividers which are not otherwise classified, such as motor-generator systems where the motor is supplied by a frequency(f_2) and the output circuit of the generator has a frequency (f_2).

6. Demodulators in Class 329, Demodulators and The Conversion Systems of This Class (363):

Class 329 provides for both the structure of devices used by demodulating and for the demodulating systems. Included in these subclasses are systems using a rectifying means designed to rectify a signal modulated wave so as to produce in the output circuit a pulsating direct current representative of the signal, and electronic tube systems where a modulated wave is impressed upon the control means (e.g., grid) of the tube so as to control the output to produce a wave representative of the signal.

7. The Gas Or Vapor Tube Systems In Class 315, Electric Lamp and Discharge Devices, Systems and the Conversion Systems in This Class (363):

Class 315 contains many systems which are closely analogous to the systems in this class. Class 315 provides for electrical systems for supplying electric current and/or potential to one or more electronic tubes of the gas or vapor type. Many of these systems inherently convert A.C. to D.C. or D.C. to A.C. Some are inherently oscillation generators. Where the system is limited by claimed subject matter to supplying a load circuit, it is excluded from Class 315. Merely claiming the circuit necessary to connect the anode to the cathode as a load circuit is not sufficient to exclude the system from Class 315. Claiming a load device, either specifically or broadly in the output circuit will exclude the system from Class 315. Claiming subject matter which would not be provided unless the system were to be used for supplying a load device is sufficient to exclude the system from Class 315. For example, reciting means in the output circuit responsive to overload conditions in output circuit to control the system will exclude the system from Class 315.

Particular attention is called to the following subclasses which are fields of search for gas or vapor-type systems which inherently convert A.C. to D.C. or D.C. to A.C: Subclasses where the system includes means to substitute one electronic tube for another when the electronic tube becomes inoperative by reason of some defect or failure to operate properly; subclasses where the system includes a signal indicator or alarm for indicating some condition of the system; and subclasses where the phase shifting means to control the current or potential applied to the control (grid circuit). See the Class 315 reference Search Class note below, referencing this section.

a. A.C. to D.C. In many of the systems in Class 315, the electronic tube is an asymmetrical device, and operates to pass electric current in one direction only between the electrodes. Merely naming the device as a rectifier or derectifier is not sufficient to exclude the system from Class 315, unless some subject matter is claimed which limits the system to the rectifying or derectifying art. Accordingly, a search for such systems where control of the rectifying or derectifying tube is the significant factor should include Class 315.

See the Class 315 Search Class reference below for the art subclasses referred to in the sections above, and also note there the references to subclasses where polyphase current is supplied to the tube or tubes (note where single phase is changed to polyphase which is applied to

the tube to tubes); and subclasses where alternating current is supplied to one or more tubes.

b. D.C. to A.C. Many systems using electric lamps of the gaseous or vapor discharge type inherently generate oscillations during operation. Class 315 therefore, provides for all systems for merely supplying electric current and/or potential to gaseous or vapor discharge devices whether the system is claimed as an oscillation generator or merely as a lamp circuit, provided that the system is not limited by claimed subject matter to use as an oscillation generator, such as, for example, means to transfer the oscillating electric energy to another circuit or means to use the oscillating energy.

Also, Class 315 includes systems which do not inherently generate oscillations but which do inherently convert D.C. to A.C. The subclass areas referred to in the general Section of 7. above, and also note Class 315 subclasses for systems having a condenser in the supply circuit. Many of the systems include relaxation circuits (L-C R-C). Note especially subclasses where the condenser is connected in shunt to the tube so as to supply pulses of energy to the tube. In subclass 229 will be found plural tube systems having a commutating condenser where the system inherently converts D.C. to A.C. Similar systems using tubes with a plurality of anodes or cathodes with a commutating condenser are in Class 315.

Class 315 provides for miscellaneous systems for sequentially starting a plurality of gas or vapor tubes. So-called ring circuits are an example of such systems. The search should extend for any particular type of system to the appropriate subclass.

8. Motor Generator Systems in Class 322, Electricity, Single Generator Systems:

Class 322 provides for motor-generator set systems wherein there is no significant relationship between the characteristics of the electrical energy supplied to the motor and the characteristics of the electrical energy supplied to the output circuit by the generator.

Class 363 provides for those motor-generator set systems wherein there is a significant relationship between the characteristics of the electrical energy supplied to the motor and the characteristics of the electrical energy supplied to the output circuit by the generator (e.g., f_1 to f_2 or $phase_1$ to $phase_2$).

9. Modulators in Class 332, Modulators and the Conversion Systems in This Class (363):

Class 332 includes conversion systems, such as pulse forming systems, D.C. to A.C. systems, frequency conversion systems where the purpose of the system is to produce a repetitious wave which has one of its characteristics (frequency, shape, phase) varied in accordance with an intelligence which continuously varies in an arbitrary manner. An example of an arbitrary continuously varying intelligence is speech. Examples of the waves produced by these systems are modulated pulse waves, frequency modulated carrier waves. Oscillation generators which are modulated by an intelligence are included in Class 332.

D. LINE BETWEEN CLASS 363 AND CLASS 323, ELECTRICITY, POWER SUPPLY OR REGULATION SYSTEMS

Class 323 is restricted to those systems wherein only the magnitude of the current or voltage and/or the magnitude of the phase angle relationship are controlled, varied, or regulated. Class 323 excludes all systems wherein a conversion step is performed on the energy going through the system.

Class 363 provides for systems for converting input electrical energy into output electrical energy whose characteristics are different from those of the input electrical energy. A Class 363 conversion system may include as a subcombination thereof a voltage magnitude and/or phase control system such as might be classified, per se, in Class 323.

E. SYSTEMS NOT INCLUDED IN THIS CLASS

a. Wave Shaping:

Mere wave shaping systems where the electrical energy is not converted into a different character (e.g., from A.C. to D.C. or vice versa), or where there is no phase or frequency conversion are not included in this class. For example, networks consisting of passive elements, such as resistors, capacitors, and inductances, which function to alter the shape of the wave (e.g., to convert a sine wave to a square wave) and which do not involve current, phase or frequency conversion means are excluded from Class 363. Also excluded are systems such as electronic tube systems and saturable reactor systems where a source of energy (e.g., the anode supply in the case of an electronic tube system) is controlled by a control sig-

nal so as to produce a wave having a particular shape, the shape having a definite relation to the control wave.

See the Search Class notes below for classifications for appropriate waveform or wave shape determinative or pulse producing systems and for miscellaneous nonlinear active device converting, shaping or generating circuits wherein a single electrical source is not coupled to a single electrical load.

Also see the Search Class notes below for differentiating and integrating networks of the passive type, and for wave shaping networks of the passive type in general.

b. Filters:

Filter network which are designed to transmit freely, electrical energy of a particular frequency or range of frequencies while to attenuate substantially electrical energy of another frequency or range of frequencies are found elsewhere. See References to OTher Classes, below, for Lines and Networks which include frequency conversion.

c. Wave Transmission Systems:

Wave transmission systems wherein wave shaping occurs for facilitating transmission or correcting for distortion of electrical waves are provided for elsewhere. See References to Other Classes below referencing this section.

F. CONVERTER STRUCTURE

This class provides for the electrical system as distinguished from the structure of the device which may be used in or as part of the system. For the structure of such converting devices, see References to Other Classes, below.

The following SEARCH CLASS references contain art related to main subject matter of this class (363). The parenthetical references at the end of SEARCH CLASS note indicate the topical subject area.

RELATED ART

See References To Other Classes below for the following related art areas.

Amplifiers

Battery Charging Systems

Car Systems

Condenser Charging Systems

Consumable Electrode Systems

Current Magnitude Control Systems

Demodulators

Dynamoelectric Machine

Dynamotor Structure

Electric Communication Systems

Electric Measuring Systems

Electric Space Discharge Devices

Electrochemistry

Electrocuting Vermin

Electronic Tube Structure

Electronic Tube Systems

Filters

Furnaces: Electric

Generator Structure

Generator Systems

Harmonic Generator Systems

Heating Systems, Electric

Lamp Systems

Modulators

Motor Systems

Music

Oscillators

Phase Control Systems

Plural Input and/or Output Systems

Pulsing Systems

Railroad Locomotives, Electric

Rectifier Element Structure

Rotary Converter Structure

Signaling Systems

Surgery: Electrical applications

Switching Systems

Telegraph SYstems

Telephone Systems

Testing Systems

Thermocouples or Thermal Batteries

Voltage Magnitude Control Systems

Wave MOde Converters

Wave Transmission Systems

X-Ray Systems Supplied By Rectifiers

SECTION III - SUBCLASS REFERENCES TO THE CURRENT CLASS

SEE OR SEARCH THIS CLASS, SUBCLASS:

1+, where the output of an oscillator is rectified, the overall system is a conversion system for this class (363).

156, for systems having a single phase source circuit where impedances are used to produce a polyphase output.

SECTION IV - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

43, Fishing, Trapping, and Vermin Destroying, subclasses 98+ and 112 for arrangements wherein such electrocuting devices are supplied by conversion systems. (Electrocuting Vermin)

84, Music, subclasses 672 through 677 for electrical tone generators which include conversion systems as a part thereof. (Music)

105, Railway Rolling Stock, subclasses 49+ for electric motor driven locomotives which may include a conversion system for converting the electrical energy supplied by the trolley to a form having characteristics suitable for the motor. (Railroad Locomotives, Electric)

136, Batteries: Thermoelectric and Photoelectric, subclasses 200+. (Thermocouples Or Thermal Batteries)

178, Telegraphy, appropriate subclasses for telegraph systems which may include conversion systems as subcombinations thereof. (Electric Communication Systems)

178, Telegraphy, has a number of subclasses with pulse producing systems. In Class 178, the pulses are usually representative of a telegraph code. Some of the systems relate to the 5 unit code where marking (a pulse) and spacing (no pulse) are used to code information. This class provides for such pulse forming systems and devices where a perforated tape or other automatic means controls the production of the pulses. This class also provides for such code pulses where a keyboard is used to produce the pulses. See this class for miscellaneous telegraph systems using pulsating currents. (see Lines With Other Classes, Conversion Systems Not in This Class, “Pulse Forming Circuits” above)

200, Electricity: Circuit Makers and Breakers, appropriate subclasses for switches used as rectifier elements; particularly note subclasses 19.01+ for periodic switches. (Rectifier Element Structure)

204, Chemistry: Electrical and Wave Energy, appropriate subclasses for arrangements wherein chemical processes are supplied with electrical energy by a conversion system. (Electrochemistry)

219, Electric Heating, appropriate subclasses for electric heating systems supplied by conversion systems. (Heating Systems, Electric)

246, Railway Switches and Signals, appropriate subclasses for railway signaling systems which may include conversion systems as subcombinations thereof.

250, Radiant Energy, subclasses 458+ for signaling communication systems utilizing fluorescent or phosphorescent detectors.

250, Radiant Energy, subclass 250 for radio and microwave absorption wavemeters. (Electric Measuring Systems)

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), appropriate subclasses for devices which may be used as rectifiers, including subclasses 107 through 181 for regenerative type devices (e.g., thyristors).

307, Electrical Transmission or Interconnection Systems, subclasses 9.1+ for systems wherein the electrical equipment of a railroad car such as lights, air conditioning apparatus, etc., are supplied with electrical energy through a converter. (Car Systems)

307, Electrical Transmission or Interconnection Systems, contains patents for such pulse producing systems. (see Lines With Other Classes, Conversion Systems Not in This Class, "Pulse Forming Circuits" above)

307, Electrical Transmission or Interconnection Systems, subclass 110 for systems wherein a plurality of condensers are charged in parallel and discharged in series to produce a high voltage, and wherein there is no conversion. (Condenser Charging Systems)

307, Electrical Transmission or Interconnection Systems, subclasses 106+ accepts class appropriate waveform or wave shape determinative or pulse producing systems. (see Lines With Other Classes, "Systems Not Included In This Class-Wave-shaping Systems" above)

307, Electrical Transmission or Interconnection Systems, subclasses 43+ for systems where a circuit is energized by a plurality of sources of supply. (Generator Systems)

307, Electrical Transmission or Interconnection Systems, subclasses 112+ for class appropriate transmission or interconnection switching systems, and subclass 132 for repetitive make and break systems. (Switching Systems)

307, Electrical Transmission or Interconnection Systems, subclasses 11+ for systems having a plurality of load devices in either single or plural output circuits. (See Lines With Other Classes, Load in Output Circuit, Particular Load Device.)

307, Electrical Transmission or Interconnection Systems, subclasses 11+ and subclasses 43+ are the generic subclasses for plural output and plural input circuits, respectively. (See Lines With Other Classes, "Conversion Systems Having Plural Input and/or Plural Output Circuits," above.)

310, Electrical Generator or Motor Structure, subclass 138 for dynamotor structure. (Dynamotor Structure)

310, Electrical Generator or Motor Structure, appropriate subclasses for the structure of electrical generators and motors and subcombinations thereof, not elsewhere classified. (Generator Structure)

310, Electrical Generator or Motor Structure, subclasses 129+ for rotary converter structure. (Rotary Converter Structure)

313, Electric Lamp and Discharge Devices, appropriate subclasses for the structure of electronic tubes. (Electronic Tube Structure)

314, Electric Lamp and Discharge Devices: Consumable Electrodes, appropriate subclasses for converter system supplied arc lamps, arc welders, etc. (Consumable Electrode Systems)

314, Electric Lamp and Discharge Devices: Consumable Electrodes, appropriate subclasses for conversion system supplied consumable electrode lamp systems. (Lamp Systems)

315, Electric Lamp and Discharge Devices: Systems, provides in many of the subclasses for systems using gas or vapor tubes which operate so that the energy passes through the gas tube in pulses of energy. These systems are closely analogous to the oscillation generators in Class 331, appropriate subclasses. See the reference to the Gas Or Vapor Tube Systems in Class 315 and the Conversion Systems in This Class (363). (see Lines With Other Classes, Conversion Systems Not in This Class, "Pulse Forming Circuits" above)

315, Electric Lamp and Discharge Devices: Systems, subclasses 88+ where the system includes means to substitute one electronic tube for another when the electronic tube becomes inoperative by reason of some defect or failure to operate properly; subclasses 129+ where the system includes a signal indicator or alarm for indicating some condition of the system; and subclasses 194+ where the phase shifting means to control the current or potential applied to the control (grid circuit); subclasses 137+ where polyphase current is supplied to the tube or tubes (note subclass 138 where single phase is changed to polyphase which is applied to the tube to tubes); subclasses 246+ where alternating current is supplied to one or more tubes; subclasses 227+ for systems having a condenser in the supply circuit. Many of the systems in subclasses 227+ include relaxation circuits (L-C R-C).

Note especially subclasses 241+ where the condenser is connected in shunt to the tube so as to supply pulses of energy to the tube. In subclass 229 will be found plural tube systems having a commutating condenser where the system inherently converts D.C. to A.C. Similar systems using tubes with a plurality of anodes or cathodes with a commutating condenser are in subclass 235. Subclass 323 provides for miscellaneous systems for sequentially starting a plurality of gas or vapor tubes. So-called ring circuits are an example of such systems. The search should extend for any particular type of system to the appropriate subclass noted in the search notes to subclass 323. (see Lines With Other Classes, "The Gas Or Vapor Tube Systems In Class 315, Electric Lamp and Discharge Devices, etc." above)

315, Electric Lamp and Discharge Devices: Systems, for gas or vapor tube systems. See Lines WIth Other Classes, above. (Electronic Tube Systems)

315, Electric Lamp and Discharge Devices: Systems, gas or vapor tube systems analogous to oscillators. See Lines With Other Classes, above. (Oscillators)

318, Electricity: Motive Power Systems, appropriate subclasses for electric motor systems, which include conversion means. (Motor Systems)

320, Electricity: Battery or Capacitor Charging or Discharging, appropriate subclass for the use of electric power conversion in a battery or capacitor charging or discharging system. (Battery Charging Systems)

320, Electricity: Battery or Capacitor Charging or Discharging, subclasses 166+ for miscellaneous capacitor charging or discharging systems. (Condenser Charging Systems)

322, Electricity: Single Generator Systems, subclass 1.5 for systems which include electricity-heat-electricity conversion. (Lines With Other Classes. "Conversion Systems not Included in This Class." above)

323, Electricity: Power Supply or Regulation Systems, subclasses 220 through 354 for current and/or voltage magnitude control systems. See Lines With Other Classes, above. (Current Magnitude Control Systems)

323, Electricity: Power Supply or Regulation Systems, subclasses 212 through 219 , subclasses indented under "Phase Control", for phase control systems of general application. (Phase Control Systems)

324, Electricity: Measuring and Testing, is the miscellaneous class of electrical measuring and testing. Note subclasses 76.41+ for frequency measurement using frequency conversion; subclass 85 for phase comparison using frequency conversion; and subclasses 118, 119, and 120 for electric metering using current conversion.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous electron tube circuits and see the class definition search notes also.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 365+ for miscellaneous gating circuits analogous to mechanical switching.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 291+ for miscellaneous pulse or clock generating circuits. (See Lines With Other Classes, Pulse Forming Circuits.)

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 100+ accepts miscellaneous nonlinear active device converting, shaping or generating circuits wherein a single electrical source is not coupled to a single electrical load. (see Lines With Other Classes, "Systems Not Included In This Class-Wave-shaping Systems" above)

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, if the frequency of the output circuit in such electronic tube systems is a submultiple of the frequency applied to the control circuit, classification is in Class 327. Also included in Class 327 are miscellaneous nonlinear active device frequency control circuits (including mixers and multipliers) having a configuration other than a single source coupled to a single electrical load. (Lines With Other Classes, C, "Conversion Systems not Included in This Class.")

329, Demodulators, appropriate subclasses for appropriate subclasses for rectifiers used in demodulators (Demodulators)

330, Amplifiers, for amplifiers. (Amplifiers)

331, Oscillators, for self-controlled oscillatory circuits which have an alternating current source of supply classified as oscillation generators where there is no definite relation between the frequency of the source circuit and the frequency of the output circuit; subclasses 111+, 129+, and 143+ also includes oscillators using resistance-inductance and resistance-capacity circuits (e.g., relaxation oscillators) which are

self-controlled. (Lines With Other Classes "Conversion Systems not Included in This Class, Converting Direct to Alternating Current")

331, Oscillators, subclass 53 for cascaded oscillator systems of the frequency multiplying type, and subclasses 76 and 77 for oscillators combined with output coupling networks of the harmonic, producing or selecting type; subclass 71 for a Self-controlled oscillatory circuits which have an alternating current source of supply where there is no definite relation between the frequency of the source circuit and the frequency of the output circuit. (Lines With Other Classes, Conversion Systems not Included in This Class., "Harmonic Generators, Frequency Multipliers" and "Oscillators with Alternating Power Supply")

332, Modulators, for systems including a pulse generator and means to modulate the pulse with intelligence. (See Lines With Other Classes, "Pulse Forming Circuits".)

333, Wave Transmission Lines and Networks, subclass 21 for wave mode converters. (Wave Mode Converters)

333, Wave Transmission Lines and Networks, includes wave transmission systems wherein wave shaping occurs for facilitating transmission or correcting for distortion of electrical waves; see subclass 14 for amplitude compression and expansion systems; subclasses 15 and 16, respectively, for pilot line and current control systems wherein compensation occurs for changes in a transmission line's impedance characteristics; subclass 28 for equalizers of the passive type which modify the attenuation or attenuation and phase characteristics over a frequency range of the energy passing therethrough, and subclasses 138+ for passive networks for retarding wave energy a predetermined period of time over a range of frequencies; subclasses 25+ for passive networks for balanced to unbalanced circuit conversion; subclasses 236+ for long transmission lines which may be balanced; subclasses 4+ for plural channel systems which include balanced circuits. (see Lines With Other Classes, "Systems Not Included In This Class--Wave Transmission Systems)

333, Wave Transmission Lines and Networks, subclass 19 provides for differentiating and integrating networks of the passive type, and subclass 20 provides for wave shaping networks of the passive type in general. (see Lines With Other Classes, "Systems Not Included In This Class--Wave-shaping Systems" above)

333, Wave Transmission Lines and Networks, subclasses 167+ for filter network which are designed to transmit freely, electrical energy of a particular frequency or range of frequencies while to attenuate substantially electrical energy of another frequency or range of frequencies; subclasses 24, 245+ and 248+ for Lines and Networks which include frequency conversion. (see Lines With Other Classes, "Systems Not Included In This Class--Filters" above)

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 87+ for vibrator type electromagnetic switches.

340, Communications: Electrical, appropriate subclass for signaling systems which may include conversion systems as subcombinations thereof.

340, Communications: Electrical, subclasses 287+ for signal box electric signaling systems having means for transmitting a train of pulse signals. The pulses are usually formed by making and breaking a circuit. (See Lines With Other Classes, "Pulse Forming Circuits".)

341, Coded Data Generation or Conversion, subclasses 20+ and 173+ for a pulse code transmitter. (See Lines With Other Classes, Pulse Forming Circuits.)

342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation) appropriate subclasses for radar and directive radio systems which may include conversion systems as subcombinations thereof.

361, Electricity: Electrical Systems and Devices, subclass 436 for the structure of rectifier elements of the electrolytic type.

361, Electricity: Electrical Systems and Devices, subclasses 93.1+ for safety systems involving circuit interruption, subclasses 160+ for relay and electromagnetic switching systems, and subclasses 245+ for polarity reversing systems.

373, Industrial Electric Heating Furnaces, appropriate subclasses for electric furnaces which may be supplied by conversion systems. (Furnaces, Electric)

378, X-Ray or Gamma Ray Systems or Devices, subclasses 101+. (X-Ray Systems Supplied By Rectifiers)

379, Telephonic Communications, appropriate subclasses for telegraphy systems which may

include conversion systems as subcombinations thereof.

379, Telephonic Communications, subclasses 362+ for pulse producing systems with converting means for use in telephone cell transmitter systems. (See Lines With Other Classes, Pulse Forming Circuits.)

398, Optical Communications, various subclasses for light wave communications.

607, Surgery: Light, Thermal, and Electrical Application, subclass 1 for arrangements for supplying electricity to the body. These arrangements require electric currents having particular characteristics and it is usual for them to include conversion systems as subcombinations. (Surgery, Electrical Applications)

SECTION V - GLOSSARY

ALTERNATING CURRENT

Alternating current includes pulsating current which is of such a character as to have the characteristics of alternating current (e.g., such as to be applied to the primary of a transformer to produce alternating current in the secondary).

AUTOMATIC CONTROL

Includes means for sensing the existence of, the magnitude of, or a deviation of a predetermined condition, e.g., the existence, magnitude or change of temperature voltage, etc., combined with means for initiating the operation of a controlled means to perform a controlling operation.

CHOPPER

A device for interrupting current at regular intervals.

CONTROL

Includes either the maintenance of a condition at a predetermined value or the variation of a condition from one value to another.

CONVERSION

This class (363), includes only the following: (1) Changing alternating current to direct current (rectification); (2) Changing direct current to alternating current (inverting); (3) Systems having means for performing a combination of the conversions of (1) and (2) above so that the input and output current are of the same character, but the system includes intermediate means to convert the current to a different character (e.g., A.C. to D.C. to A.C.); (4) Changing the frequency of alternating current from one frequency to a different frequency; (5) Changing electrical energy having one number phases to a different number of phases; (6) Combination of any of the above.

CURRENT CONVERSION

The transformation of electrical energy from alternating current to direct current or the transformation of direct current to alternating current.

CURRENT OR VOLTAGE MAGNITUDE CONTROL

Includes controlling either the amplitude of the current or voltage, or controlling the average or effective value of the current or voltage, even though the amplitude is not controlled.

DIRECT CURRENT

Direct current includes pulsating current which is of such character as to have the characteristics of direct current (e.g., such as the output of half-wave rectifier which may be smoothed by filters to produce a substantially nonpulsating current).

DYNAMOELECTRIC MACHINE

A device for converting electrical energy into mechanical energy or mechanical energy into electrical energy or combinations thereof which involve electromagnetic induction. (Also see particular type).

DYNAMOTOR

Also called a rotary converter or synchronous inverter. A rotating device for changing a D.C. voltage to another value. It is a combination electric motor and D.C. generator with two or more armature windings and a common set of field poles. One armature winding receives the direct current and rotates (thus operating as a motor), while the others generate the required voltage (and thus operate as dynamos or generators).

ELECTRICAL SPACE DISCHARGE DEVICE

An apparatus which is intended to have an electrical current flow between two spaced electrodes, at least part of the current path being constituted by a gas vapor or vacuum. “Electronic tube” is used as the name for an

electric space discharge device in this class. Included are discharge devices which operate in the open, i.e., not in an enclosed envelope.

ELECTRONIC TUBE

An electrical space discharge device.

ELECTRIC SOURCE CIRCUIT

The circuit designed to be connected to a source of electric energy.

FREQUENCY CONVERSION

The transformation of electrical energy having a first frequency to electrical energy having a second frequency.

IMPEDANCE

Includes an inductance, or a capitance, or a resistance, or any combination thereof, and excludes any source of electrical energy.

LINE CIRCUIT

The main power path between the source and the load.

PHASE CONVERSION

The transformation of electrical energy having one number of phases to electrical energy having another number of phases.

PULSATING CURRENT

A nonuniform electron flow which varies periodically but does not reverse its direction.

SEMICONDUCTOR

A solid or liquid electronic conductor, with resistivity between that of metals and that of insulators in which the electrical charge carrier concentration increases with increasing temperature over some temperature range. Over most of the practical temperature range, the resistance has a negative temperature coefficient. Certain semiconductors possess two types of carriers, negative electrons and positive holes. The charge carriers are usually electrons, but there may be also some ionic conductivity.

THYRISTOR

A bistable device comprising three or more junctions. At least one of the junctions can switch between reverse and forward-voltage polarity within a single quadrant of the anode-to-cathode voltage-current characteristics. Used in a generic sense to include silicon controlled rectifiers and gate-control switches as well as multilayer two- terminal devices.

TRANSFORMER:

An electrical device which transfers electrical energy from one circuit to another circuit at the same frequency solely by electrical induction.

TRANSISTORS:

An active semiconductor device usually made of silicon or germanium, having three or more electrodes. The three main electrodes used are the emitter, base, and collector. Conduction is by means of electrons (elementary particles having the smallest negative electrical charge that can exist) and holes (mobile electron vacancies equivalent to a positive charge).

VIBRATOR

A circuit interrupter that has a movable conducting member which moves between contacts for converting D.C. to A.C. or A.C. to D.C.

SUBCLASSES

1 CASCADED OR COMBINED, DIVERSE CONVERSIONS IN WHICH THE FREQUENCY OR PHASE OR COMBINED CONVERSION IS WITHOUT INTERMEDIATE CONVERSION TO D.C.:
This subclass is indented under the class definition. Subject matter wherein different types of conversions are cascaded or combined without intermediate conversion to D.C.

(1) Note. The conversions must be of the type classifiable in this class. That is, the system must be within the class definition and include means to effect a differing sequence or combination of at least two of the following operations: 1. Current conversion; 2. Phase conversion; 3. Frequency conversion

SEE OR SEARCH THIS CLASS, SUBCLASS:
15+, 34+, for diverse conversion with intermediate conversion to D.C.

2 Current and phase (e.g., D.C. -Ph_1 -Ph_2):
This subclass is indented under subclass 1. Subject matter wherein the system includes current conversion and phase conversion.

SEE OR SEARCH THIS CLASS, SUBCLASS:
13+, for current conversion systems.
148+, for phase conversion systems.

3 Phase 1 to phase 2 to D.C.:
This subclass is indented under subclass 2. Subject matter wherein A. C. of one phase is converted to A.C. of another phase which is then converted to D.C.

4 Single phase to polyphase to D.C.:
This subclass is indented under subclass 3. Subject matter wherein single phase A.C. is converted to polyphase A.C. which is then converted to D.C.

5 With interphase transformer:
This subclass is indented under subclass 3. Subject matter wherein an interphase transformer is provided in the polyphase circuit.

(1) Note. See subclass 64 for definition of an interphase transformer.

SEE OR SEARCH THIS CLASS, SUBCLASS:
64, for current conversion systems operating without phase conversion which include an interphase transformer.

6 Including plural anode/single cathode device:
This subclass is indented under subclass 5. Subject matter wherein the system includes a device having multiple anodes, but only a single cathode.

SEE OR SEARCH THIS CLASS, SUBCLASS:
66, for current conversion systems including plural anode/single cathode devices; and subclass 168 for frequency conversion systems including plural anode/single cathode devices.

7 With dynamic rectifier in phase 2 to D.C. stage (e.g., commutator type):
This subclass is indented under subclass 3. Subject matter wherein a dynamic rectifier is provided for converting the phase 2 A.C. to D.C.

(1) Note. A dynamic converter is a converter having mechanical moving parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:
102+, for dynamoelectric machine current conversion.
108, for current conversion by circuit interrupter, rotating rectifier type conversion systems.

8 Current and frequency (e.g., f_1-f_2-D.C.):
This subclass is indented under subclass 1. Subject matter wherein the system includes current and frequency conversion and frequency conversion.

(1) Note. See the class definition, Glossary, for definitions of current conversion and frequency conversion.

SEE OR SEARCH THIS CLASS, SUBCLASS:
13+, for current conversion systems.
157+, for frequency conversion systems.

9 Combined phase and frequency conversion (i.e., Ph_1f_1-Ph_2f_2):
This subclass is indented under subclass 1. Subject matter wherein the system includes phase and frequency conversion.

(1) Note. See the class definition Glossary, for definitions of phase conversion and frequency conversion.

SEE OR SEARCH THIS CLASS, SUBCLASS:
148+, for phase conversion systems.
157+, for frequency conversion systems.

10 By semiconductor device converter:
This subclass is indented under subclass 9. Subject matter wherein the converter means includes a semiconductor device.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159+, for frequency conversion by semiconductor converter.

11 By electron tube converter:
This subclass is indented under subclass 9. Subject matter wherein the converter means includes an electron tube device.

SEE OR SEARCH THIS CLASS, SUBCLASS:
151, for phase conversion by electron tube converter.
166, for frequency conversion by electron tube converter.

12 By saturable reactor converter:
This subclass is indented under subclass 9. Subject matter wherein the converter means includes a saturable reactor device.

SEE OR SEARCH THIS CLASS, SUBCLASS:
91+, for current conversion with saturable reactor control means in the line current.

13 CURRENT CONVERSION:
This subclass is indented under the class definition. Subject matter wherein the conversion system includes means to convert alternating current to direct current or direct current to alternating current.

(1) Note. The conversion systems included in this and the indented subclasses are the current conversion systems as defined in the class definition.

(2) Note. In the communication arts, there are many different conversion systems which are, in fact, converters of D.C. to A.C. or vice versa. A partial list of such converters includes oscillators, detectors, amplifiers, demodulators, etc. See the class definition, Lines With Other Classes, for more detailed discussion of the conversion systems not included in this class. See the class definition, References to Other Classes, for a listing of the related art.

SEE OR SEARCH THIS CLASS, SUBCLASS:
1+, for current conversion systems cascaded or combined with frequency or phase converters without intermediate conversion to D.C.

SEE OR SEARCH CLASS:
331, Oscillators, appropriate subclasses for self-sustaining electric wave generating systems for converting direct current to alternating current.
378, X-Ray or Gamma Ray Systems or Devices, subclasses 101+ for X-ray tube energizing circuits which may include circuit interrupter type converters.

14 Cryogenic:
This subclass is indented under subclass 13. Subject matter wherein the conversion system is operated at temperatures near absolute zero.

SEE OR SEARCH THIS CLASS, SUBCLASS:
141, for current conversion systems with noncryogenic cooling means.

15 Including D.C.-A.C.-D.C. converter:
This subclass is indented under subclass 13. Subject matter including a means for changing a source of direct current to an intermediate alternating current (i.e., inverter), and an additional means for changing said intermediate alternating current to a direct-current output (i.e., rectifier).

(1) Note. Chopper-type converters are classified in this or indented subclasses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
52+, 67+, 76+, 81+, 84+, 108+, 114+, and 125+, for single stage A.C.-D.C. systems.
55+, 71+, 95+, 109, 120+, 131+, and 135+, for single stage D.C.-A.C. systems.

SEE OR SEARCH CLASS:

324, Electricity: Measuring and Testing, subclass 118 for amplifiers of the type described below under Class 330, when claimed in combination with a meter.

330, Amplifiers, subclass 10 for amplifier systems for D.C. amplification which have a modulator means to convert D.C. to A.C., and A.C. amplifier and demodulator means to detect the D.C. signal for feeding to the load. See the search notes thereunder.

16 Having transistorized inverter:

This subclass is indented under subclass 15. Subject matter wherein the inverter includes a switch means for interrupting, at regular intervals, current supplied from said source of direct current, and further wherein said switch means comprises an active, three-electrode semiconductor (i.e., transistor).

SEE OR SEARCH THIS CLASS, SUBCLASS:

27, for a D.C.-A.C.-D.C. converter wherein the switch means is a thyristor (e.g., SCR, etc.).

29, for a D.C.-A.C.-D.C. converter wherein the switch means is an electron tube.

32, for a D.C.-A.C.-D.C. converter wherein switch means is a rotary commutator.

33, for a D.C.-A.C.-D.C. converter wherein the switch means is a vibrator-type inverter.

80, 97-98 and 131, for single stage D.C.-A.C. conversion by transistorized inverter means.

17 Bridge type:

This subclass is indented under subclass 16. Subject matter in which the inverter consists of either two transistors and two capacitors or four transistors in a bridge configuration.

SEE OR SEARCH THIS CLASS, SUBCLASS:

98, for transistorized bridge-type conversion means with transistor control means in the line circuit.

132, for single stage D.C.-A.C. conversion by transistorized bridge-type conversion means.

18 Single ended self-oscillating type:

This subclass is indented under subclass 16. Subject matter in which one transistor switch means automatically operates to consecutively and periodically couple the source to an inductive device.

(1) Note. The inductive device may be a swinging choke or the primary winding of a power transformer.

SEE OR SEARCH THIS CLASS, SUBCLASS:

20, for single ended separately driven type.

30, for single ended electron tube type.

19 With automatic control of the magnitude of the voltage or current:

This subclass is indented under subclass 18. Subject matter which includes circuitry for the regulation of the output voltage or current.

SEE OR SEARCH THIS CLASS, SUBCLASS:

21, 23, 25+, 28, and 78+, for other automatic voltage and current regulation circuits.

20 Single ended separately driven type:

This subclass is indented under subclass 16. Subject matter wherein the inverter further includes an inductive device (e.g., transformer winding, etc.) connected to receive source current conducted by said transistor switch means, and switch control means for controlling conduction and non-conduction of said transistor switch means (i.e., at said regular intervals) in a manner that passes conducted current through said inductive device in only one direction.

(1) Note. The inductive device may be a swinging choke or the primary winding of a power transformer.

SEE OR SEARCH THIS CLASS, SUBCLASS:

18, for single ended self-oscillating type transistorized inverters.

30, for single ended tube type transistorized inverters.

21.01 With automatic control of the magnitude of output voltage or current:
This subclass is indented under subclass 20.
Subject matter further including means responsive to a circuit condition (e.g., via feedback, etc.) for regulating the amplitude of rectifier output voltage or current.

21.02 For resonant-type converter:
This subclass is indented under subclass 21.01.
Subject matter wherein the inverter includes an LC tank circuit coupled to receive D.C. source current conducted through said transistor switching means.

(1) Note. The inductive device (e.g., transformer winding, etc.) of the inverter is commonly coupled with a capacitor to form the LC tank circuit, whereby action of the transistor switching means is utilized to pump energy into the tank circuit.

SEE OR SEARCH THIS CLASS, SUBCLASS:
18, for a converter that includes a single-ended transistor inverter of the self-oscillating type.
21.04, for a forward-type converter that includes a single-ended, separately-driven transistor inverter.
21.12, for a flyback-type converter that includes a single-ended, separately-driven transistor inverter.

21.03 Having particular zero-switching control circuit (e.g., for quasi-resonant converter, etc.):
This subclass is indented under subclass 21.02.
Subject matter wherein the switching control means includes detailed means for causing the transistor switch means to change its state of conduction at, or substantially close to, the lowest magnitude of voltage across, or current through, the transistor switch means.

21.04 For forward-type converter:
This subclass is indented under subclass 21.01.
Subject matter wherein the means for changing intermediate alternating current to a direct-current output is constructed and arranged, with respect to the inductive device of the inverter, to output direct-current when the transistor switch means is conductive.

(1) Note. The means for changing intermediate alternating current to a direct-current output is commonly a rectifier coupled to a secondary winding of a transformer (where the primary winding constitutes the inductive device of the inverter), and the rectifier is oriented with respect to the "dot" convention of the transformer to allow current to flow through the secondary (and rectifier) via induction, due to primary current, when the transistor switch means is turned on (in contrast to a flyback-type converter, wherein energy stored in the during primary conduction of the transistor switching means is inductively coupled to the secondary during primary-field decay when the transistor switch means is turned off).

SEE OR SEARCH THIS CLASS, SUBCLASS:
21.02, for a resonant-type converter that includes a single-ended, separately-driven transistor inverter.
21.12, for a flyback-type converter that includes a single-ended, separately-driven transistor inverter.

21.05 Having digital logic:
This subclass is indented under subclass 21.04.
Subject matter wherein the switch control means includes means to process coded data that is in a discrete, discontinuous (i.e., digital) form.

(1) Note: Implicit in the above definition is the requirement that the data be processed via an instruction set in some manner -- e.g., manipulated, converted, etc. -- while in the digital domain, either by hardware or software or both, as opposed to mere threshold detection of amplitude level (e.g., a mere latch, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:
1.13, for utilization of digital logic in the swich control means of a flyback-type converter.

21.06 Having synchronous rectifier:
This subclass is indented under subclass 21.04. Subject matter wherein the means for changing the intermediate alternating current to a direct-current output (i.e., rectifier) includes a switchable element (e.g., MOSFET, etc.), and means for controlling conduction of said switchable element in functional relation to the switching of the inverter's transistor switch means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
21.14, for synchronous rectification in a flyback-type converter.

21.07 Having feedback isolation (e.g., opto-isolator, transformer coupled, etc.):
This subclass is indented under subclass 21.04. Subject matter further including means for obtaining a signal indicative of a condition under the control of the means for regulating (i.e., feedback signal), and means for communicating said signal to the means for regulating, wherein said means for communicating includes means for preventing direct electrical (i.e., ohmic) conduction between said means for obtaining and said means for regulating.

SEE OR SEARCH THIS CLASS, SUBCLASS:
21.15, for use of feedback isolation in a flyback-type converter.

21.08 Having feedback winding inductively coupled to inverter inductive device (e.g., tertiary winding, etc.):
This subclass is indented under subclass 21.04. Subject matter further including an electrical coil means (i.e., feedback winding) wound around a magnetic circuit portion of the inductive device of the inverter for outputting a signal to the means for regulating, and further wherein said feedback winding is separate and distinct from any winding that carries load current.

(1) Note. The feedback winding is commonly wound on a portion of a magnetic core shared by the inductor of the inverter, where the inductor is commonly the primary winding of a transformer.

(2) Note. The signal from the feedback winding is commonly utilized to indicate load current. [However, see (3)Note.]

(3) Note. When a feedback signal is obtained from a winding that supplies load current, the winding is not considered to be a feedback winding for this subclass.

(4) Note. The use of a winding to obtain a feedback signal is to be distinguished from a winding (e.g., transformer, etc) utilized to conductively isolate an "obtained" feedback signal from, for example, the means for regulating.

SEE OR SEARCH THIS CLASS, SUBCLASS:
21.07, for a transformer utilized for feedback isolation in a forward-type converter.
21.09, for a feedback winding coupled to a circuit portion other than the inductor for detecting output current in a forward-type converter.
21.15, for a transformer utilized for feedback isolation in a flyback-type converter.
21.17, for a feedback winding, coupled to a circuit portion other than the inductor, for detecting output current in a flyback-type converter.

21.09 Having output current feedback:
This subclass is indented under subclass 21.04. Subject matter further including means for obtaining a signal indicative of rectifier output current, and means for presenting said signal to the means for regulating.

(1) Note. A voltage obtained from a current-sensing resistor is a signal indicative of current proper for this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:
21.17, for use of output current feedback in a flyback-type converter.

21.1 Utilizing pulse-width modulation:
This subclass is indented under subclass 21.04. Subject matter wherein the switch control means includes means to vary the conduction/non-conduction duty cycle of the transistor

switch means to control the rectifier output current or voltage.

SEE OR SEARCH THIS CLASS, SUBCLASS:
21.18, for use of pulse-width modulation to regulate the output current or voltage of a flyback-type converter.

21.11 Having particular pulse-width modulation circuit:
This subclass is indented under subclass 21.1. Subject matter including detailed means for performing the pulse-width modulation.

21.12 For flyback-type converter:
This subclass is indented under subclass 21.01. Subject matter wherein energy from the source of direct current is stored in the inductive device of the inverter when the transistor switch means is conductive, and further wherein the said means for changing intermediate alternating current to a direct-current output (i.e., rectifier) includes means for converting the stored energy to a direct-current output when the transistor switch means is nonconductive.

(1) Note. The means for changing intermediate alternating current to a direct-current output is commonly a rectifier coupled to a secondary winding of a transformer (where the primary winding constitutes the inductive device of the inverter), and the rectifier is oriented with respect to the "dot" convention of the transformer to allow current to flow through the secondary winding (and rectifier) via induction, due to primary-field decay, when the transistor switch means is turned off (in contrast to a forward-type converter, where primary current is inductively coupled to the secondary when the transistor switching means is turned on).

SEE OR SEARCH THIS CLASS, SUBCLASS:
21.02, for a resonant-type converter that includes a single-ended, separately-driven transistor inverter.
21.04, for a forward-type converter that includes a single-ended, separately-driven transistor inverter.

21.13 Having digital logic:
This subclass is indented under subclass 21.12. Subject matter wherein the switch control means includes means to process coded data that is in a discrete, discontinuous (i.e., digital) form.

(1) Note: Implicit in the above definition is the requirement that the data be processed via an instruction set in some manner -- e.g., manipulated, converted, etc. -- while in the digital domain, either by hardware or software or both, as opposed to mere threshold detection of amplitude level (e.g., a mere latch, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:
21.05, for utilization of digital logic in the swich control means of a forward-type converter.

21.14 Having synchronous rectifier:
This subclass is indented under subclass 21.12. Subject matter wherein the means for changing the intermediate alternating current to a direct-current output (i.e., rectifier) includes a switchable element (e.g., MOSFET, etc.), and means for controlling conduction of said switchable element in functional relation to the switching of the inverter's transistor switch means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
21.06, for synchronous rectification in a forward-type converter.

21.15 Having feedback isolation (e.g., opto-isolator, transformer coupled, etc.):
This subclass is indented under subclass 21.12. Subject matter further including means for obtaining a signal indicative of a condition under the control of the means for regulating, and means for communicating said signal to the means for regulating, wherein said means for communicating includes means for preventing direct electrical (i.e., ohmic) conduction between said means for obtaining and said means for regulating.

SEE OR SEARCH THIS CLASS, SUBCLASS:

21.07, for use of feedback isolation in a forward-type converter.

21.16 Having feedback winding inductively coupled to inverter inductive device (e.g., tertiary winding, etc.):

This subclass is indented under subclass 21.12. Subject matter further including an electrical coil means (i.e., feedback winding) wound around a magnetic circuit portion of the inductive device of the inverter for outputting a signal to the means for regulating, and further wherein said feedback winding is separate and distinct from any winding that carries load current.

(1) Note. The feedback winding is commonly wound on a portion of a magnetic core shared by the inductor of the inverter, where the inductor is commonly the primary winding of a transformer.

(2) Note. The signal from the feedback winding is commonly utilized to indicate load current. [However, see (3)Note.]

(3) Note. When a feedback signal is obtained from a winding that supplies load current, the winding is not considered to be a feedback winding for this subclass.

(4) Note. The use of a winding to obtain a feedback signal is to be distinguished from a winding (e.g., transformer, etc) utilized to conductively isolate an "obtained" feedback signal from, for example, the means for regulating.

SEE OR SEARCH THIS CLASS, SUBCLASS:

21.07, for a transformer utilized for feedback isolation in a forward-type converter.
21.09, for a feedback winding, coupled to a circuit portion other than the inductor, for detecting output current in a forward-type converter.
21.15, for a transformer utilized for feedback isolation in a flyback-type converter.
21.17, for a feedback winding coupled to a circuit portion other than the inductor for detecting output current in a flyback-type converter.

21.17 Having output current feedback:

This subclass is indented under subclass 21.12. Subject matter further including means for obtaining a signal indicative of rectifier output current, and means for presenting said signal to the means for regulating.

(1) Note. A voltage obtained from a current-sensing resistor is a signal indicative of current proper for this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

21.09, for use of output current feedback in a forward-type converter.

21.18 Utilizing pulse-width modulation:

This subclass is indented under subclass 21.12. Subject matter wherein the switching control means includes means to vary the conduction/non-conduction duty cycle of the transistor switching means to control the output current or voltage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

21.1, for use of pulse-width modulation to regulate the output current or voltage of a forward-type converter.

22 Double ended (i.e., push-pull) self-oscillating type:

This subclass is indented under subclass 16. Subject matter in which the inverter comprises a push-pull oscillator.

SEE OR SEARCH THIS CLASS, SUBCLASS:

24+, and 134, for other double ended separately driven type.
31, for double ended tube type inverter.

23 With automatic control of the magnitude of the output voltage or current:

This subclass is indented under subclass 22. Subject matter which includes circuitry for the regulation of the output voltage or current.

SEE OR SEARCH THIS CLASS, SUBCLASS:

19, 21.01, 25-41, and 78-102, for other automatic voltage and current regulation circuits.

24 Double ended (i.e., push-pull) separately driven type:

This subclass is indented under subclass 16. Subject matter in which an independent drive circuit controls both the on and the off state of the transistors.

SEE OR SEARCH THIS CLASS, SUBCLASS:

22+, and 133, for other transistorized double ended inverters.

31, for tube type double ended inverters. 134, for single stage transistorized double ended separately driven type inverters.

25 With automatic control of the magnitude of the output voltage or current:

This subclass is indented under subclass 24. Subject matter which includes circuitry for the regulation of the output voltage or current.

SEE OR SEARCH THIS CLASS, SUBCLASS:

19, 21.01, 23, 28, and 78-102, for other automatic voltage and current regulation circuits.

26 Using pulse width modulation:

This subclass is indented under subclass 25. Subject matter wherein circuit means are included to control the duration of the pulses that drive the transistors, which regulate the magnitude of the output voltage or current.

SEE OR SEARCH THIS CLASS, SUBCLASS:

41+, for pulse modulating techniques in introducing or eliminating frequency components to or from inverter systems.

27 Having thyristor inverter, (e.g., SCR):

This subclass is indented under subclass 15. Subject matter wherein the inverter includes a switch means for interrupting, at regular intervals, current supplied from said source of direct current, wherein said switching means comprises a bistable semiconductor means having three or more junctions (e.g., thyristor, etc.).

(1) Note. Examples of these devices are the silicon controlled rectifier (SCR), the gate controlled switch (SCS), or the four layer diode.

SEE OR SEARCH THIS CLASS, SUBCLASS:

96, for inverter systems with automatic control having thyristor control means in the line circuit.

135+, for single stage thyristor inverter systems.

28 With automatic control of the magnitude of the output voltage or current:

This subclass is indented under subclass 27. Subject matter which includes circuitry for the regulation of the output voltage or current.

SEE OR SEARCH THIS CLASS, SUBCLASS:

19, 21.01, 23, 28, and 78-102, for other automatic voltage and current regulation circuits.

29 Having electron tube inverter:

This subclass is indented under subclass 15. Subject matter in which the D.C.-A.C. conversion is performed by circuitry utilizing electron tubes.

SEE OR SEARCH THIS CLASS, SUBCLASS:

38, and 120+, for other inverters utilizing electron tubes.

30 Single ended type:

This subclass is indented under subclass 29. Subject matter in which one electronic tube is repeatedly and periodically coupled to an inductive device.

(1) Note. The inductive device may be a swinging choke or the primary winding of a power transformer.

SEE OR SEARCH THIS CLASS, SUBCLASS:
18+, for single ended transistorized self-oscillating type inverters.
20+, for single ended transistorized separately driven type inverters.

31 Double ended type (i.e., push-pull):
This subclass is indented under subclass 29. Subject matter in which two electronic tubes are alternately and periodically coupled to opposite terminals of a center-tapped primary winding of a power transformer.

SEE OR SEARCH THIS CLASS, SUBCLASS:
22+, for double ended transistorized self-oscillating type inverters.
24+, for double ended transistorized separately driven type inverters.

32 Rotary-commutator-type inverter:
This subclass is indented under subclass 15. Subject matter in which the conversion is performed mechanically utilizing rotating, arcuate segments.

SEE OR SEARCH THIS CLASS, SUBCLASS:
109, for other rotary-type inverters.

33 Vibrator-type inverter:
This subclass is indented under subclass 15. Subject matter in which the conversion is performed by a vibrator.

(1) Note. See the class definition, Glossary, for definition of vibrator.

SEE OR SEARCH THIS CLASS, SUBCLASS:
110, for other vibrator-type inverters.

34 Including an A.C.-D.C.-A.C. converter:
This subclass is indented under subclass 13. Subject matter including a first stage with means to change alternating current to intermediate direct current, and a further second stage with means to change the intermediate direct current to alternating current.

SEE OR SEARCH THIS CLASS, SUBCLASS:
52+, 61, 67+, 84+, 108, 114+, and 125, for A.C. to D.C. single current conversion systems.

35 For transfer of power via a high voltage D.C. link (i.e., HVDC transmission system):
This subclass is indented under subclass 34. Subject matter wherein the conversion of A.C. to D.C. facilitates the transmission of power as D.C. between A.C. systems.

SEE OR SEARCH THIS CLASS, SUBCLASS:
51, for HVDC transmission systems with automatic or integral protection means.

36 For change of phase (e.g., number of phases):
This subclass is indented under subclass 34. Subject matter wherein there is a phase conversion with an intermediate conversion to D.C.

SEE OR SEARCH THIS CLASS, SUBCLASS:
2+, 9+ and 148+, for phase conversion without intermediate conversion to D.C.

37 By semiconductor rectifier and inverter:
This subclass is indented under subclass 34. Subject matter which includes semiconductor converting elements in both this rectifier and the inverter.

SEE OR SEARCH THIS CLASS, SUBCLASS:
10, 16+ and 27+, for converters which both rectify and invert, and utilize semiconductor elements to perform the inverting conversion.
53+, 61, 67+, 77, and 125+, for semiconductor rectifier systems.
56.01, 131-134, and 135, for semiconductor inverter systems.

38 By electron tube rectifier and inverter:
This subclass is indented under subclass 34. Subject matter which includes electron tubes as the converting elements in both the rectifier and the inverter.

SEE OR SEARCH THIS CLASS, SUBCLASS:

27+, for current converters which both invert and rectify having electron tube inverter.

114, for electron tube rectifier systems.

120+, for electron tube inverter systems.

39 With means to introduce or eliminate frequency components:

This subclass is indented under subclass 13. Subject matter wherein the system includes means for introducing a desired harmonic frequency into the system or filtering an undesired frequency component from the system.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 3 for systems in which currents of different frequency or phase are superimposed thereon; and subclass 73 for systems having plural supply circuits of different frequency; also, subclass 105 for systems with harmonic filters or neutralizers.

329, Demodulators, subclasses 318+ for undesired signal removal from a frequency demodulator and subclasses 349+ for undesired signal removal from an amplitude demodulator.

332, Modulators, appropriate subclasses for systems wherein a single wave controls a base fundamental or carrier wave to produce a resultant modulated wave.

333, Wave Transmission Lines and Networks, subclasses 167+ for wave filter networks.

40 In inverter systems:

This subclass is indented under subclass 39. Subject matter where the system is a D.C. to A.C. converter.

41 By pulse modulation technique (e.g. PWM, PPM, etc.):

This subclass is indented under subclass 40. Subject matter wherein each half cycle of the basic inverter frequency is divided into two or more pulses in accordance with a modulating waveform.

(1) Note. The most common technique in this subclass is pulse width modulation.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclasses 265+ for systems having signal shaping, converting or generating means with pulse width control.

42 Including notching:

This subclass is indented under subclass 41. Subject matter wherein "Notches" are produced in the inverted waveform by temporarily applying opposite discrete voltages from that which dominates during the waveform cycle.

43 By step-wave, amplitude summation technique:

This subclass is indented under subclass 40. Subject matter in which a plurality of square waves are selectively combined to provide stepped waveform approaching a sine wave.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 107 for inverters with waveform or wave shape determining systems.

44 In rectifier systems:

This subclass is indented under subclass 39. Subject matter wherein the systems is an A.C.-D.C. converter.

45 Including means for reducing ripples from the output:

This subclass is indented under subclass 44. Subject matter wherein the means reduce the ripple from the output D.C. line.

(1) Note. The most usual means in this subclass is a low pass filter used to eliminate ripple from the D.C. line.

SEE OR SEARCH CLASS:

333, Wave Transmission Lines and Networks, subclass 181 for filters of the smoothing type, e.g., direct current power supply filters.

46 With ripple responsive, automatic control:
This subclass is indented under subclass 45. Subject matter wherein the means provided are responsive to the D.C. ripple on the output line, and the means include circuitry for reducing the magnitude of the sensed ripple.

47 With low-pass L or LC filter:
This subclass is indented under subclass 45. Subject matter wherein a low pass inductor or inductor-capacitor filter is used to reduce the ripple.

(1) Note. The filter may be integral with or on the output side of the rectifier.

48 For semiconductor rectifier:
This subclass is indented under subclass 47. Subject matter wherein the rectification is performed by a semiconductor system or device.

49 With starting arrangement:
This subclass is indented under subclass 13. Subject matter having means to initiate operation of the conversion system.

50 Including automatic or integral protection means:
This subclass is indented under subclass 13. Subject matter including means which are automatically responsive to an abnormal or unsafe condition and either disables the system or corrects the abnormal or unsafe condition.

(1) Note. Examples of the conditions to which the systems of this subclass are responsive are: arc back, flash over, excess heating, short circuit, open ground, input voltage failure, failure of an element of the system, excess overload and underload.

(2) Note. The abnormal or unsafe condition may be in the converter device or in any other part of the system.

(3) Note. An example of the integral protection means is a zener diode which responds to an overload condition.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclasses 635+ for electrical apparatus condition responsive means.
361, Electricity: Electrical Systems and Devices, subclasses 1+ for safety and protection of general systems and devices, subclasses 91.1+ for overvoltage protection, and 93.1+ for abnormal current protection.

51 For high voltage D.C. transmission systems:
This subclass is indented under subclass 50. Subject matter wherein the system for which protection is provided is a high voltage D.C. transmission system.

SEE OR SEARCH THIS CLASS, SUBCLASS:
35, for other HVDC transmission systems.

52 For rectifiers:
This subclass is indented under subclass 50. Subject matter wherein the systems for which protection is provided is an A.C. to D.C. converter.

53 Semiconductor type:
This subclass is indented under subclass 52. Subject matter which includes a semiconductor device as the converting element.

54 Thyristor:
This subclass is indented under subclass 53. Subject matter wherein the semiconductor device is a “Thyristor”.

SEE OR SEARCH CLASS:
257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 107 through 181 for regenerative type devices, including thyristors.

55 For inverters:
This subclass is indented under subclass 50. Subject matter wherein the system for which protection is provided is a D.C. to A.C. converter.

56.01 Transistor inverter:
This subclass is indented under subclass 55. Subject matter wherein said D.C. to A.C. con-

verter includes switch means for interrupting, at regular intervals, current from the supply of said D.C., wherein said switch means comprises an active, three-electrode, semiconductor (i.e., transistor).

56.02 Bridge type:
This subclass is indented under subclass 56.01. Subject matter wherein said switch means includes a series-connected pair of transistors connected across said supply of D.C., and further wherein the series-connection point of the series-connected pair is the A.C. output of said converter.

(1) Note. The bridge can be a half-wave or full-wave type (one or two pairs of transistors, respectively), and commonly includes multiple pairs for multiple phases of A.C., wherein each phase is derived from the series-connection point of a separate and distinct pair of series-connected transistors.

SEE OR SEARCH THIS CLASS, SUBCLASS:
56.06, for protection means in a double-ended transistor inverter.
56.09, for protection means in a single-ended transistor inverter.
56.12, for transient protection means (e.g., snubber, etc.) in an unspecified transistor inverter.

56.03 Having current protection (e.g., over current, short, etc.):
This subclass is indented under subclass 56.02. Subject matter including protection from an abnormal or unsafe current condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
56.07, for current protection means in a double-ended transistor inverter.
56.1, for current protection means in a single-ended transistor inverter.
56.12, for transient protection means (e.g., snubber, etc.) in an unspecified transistor inverter.

56.04 Including short protection across a series-connected pair of transistors (e.g., shoot-through protection, etc.):
This subclass is indented under subclass 56.03. Subject matter including means for preventing simultaneous conduction of both transistors of a series-connected pair of transistors.

56.05 Having voltage protection:
This subclass is indented under subclass 56.02. Subject matter including protection from an abnormal or unsafe voltage condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
56.08, for voltage protection means in a double-ended transistor inverter.
56.11, for voltage protection means in a single-ended transistor inverter.
56.12, for transient protection means (e.g., snubber, etc.) in an unspecified transistor inverter.

56.06 Double-ended type:
This subclass is indented under subclass 56.01. Subject matter wherein the inverter further includes an inductive device (e.g., transformer winding, etc.) having first and second opposite ends and a tap between said ends, and said transistor switch means includes means for conducting and interrupting, at regular intervals, direct current from each opposite end to said tap -- or from said tap to each end -- and further wherein said transistor switch means interrupts current through one of said opposite ends while conducting current through the opposite end, in an alternating sequence.

(1) Note. The inductor device is commonly a center-tapped winding of a transformer, which provides for balanced operation in the winding.

(2) Note. The switch means may supply either:

(a) opposite polarities of D.C. to opposite ends of the inductive device, respectively, where there is a common tap (e.g., grounded center tap, etc.); or,

(a) alternately connect one pole of D.C. to opposite ends of the inductive device,

where the opposite pole of D.C. is connected to a tap.

SEE OR SEARCH THIS CLASS, SUBCLASS:
56.02, for protection means in a bridge-type transistor inverter.
56.09, for protection means in a single-ended transistor inverter.
56.12, for transient protection means (e.g., snubber, etc.) in an unspecified transistor inverter.

56.07 Having current protection:
This subclass is indented under subclass 56.06. Subject matter including protection from an abnormal or unsafe current condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
56.03, for current protection means in a bridge-type transistor inverter.
56.1, for current protection means in a single-ended transistor inverter.
56.12, for transient protection means (e.g., snubber, etc.) in an unspecified transistor inverter.

56.08 Having voltage protection:
This subclass is indented under subclass 56.06. Subject matter including protection from an abnormal or unsafe voltage condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
56.05, for voltage protection means in a bridge-type transistorized inverter.
56.11, for voltage protection means in a single-ended transistor inverter.
56.12, for transient protection means (e.g., snubber, etc.) in an unspecified transistor inverter.

56.09 Single-ended type:
This subclass is indented under subclass 56.01. Subject matter wherein the inverter further includes an inductive device (e.g., transformer winding, etc.) having first and second opposite ends, and said transistor switching means includes means for conducting said direct current from one end of said inductor to the opposite end.

SEE OR SEARCH THIS CLASS, SUBCLASS:
56.02, for protection means in a bridge-type transistor inverter.
56.06, for protection means in a double-ended transistor inverter.
56.12, for transient protection means (e.g., snubber, etc.) in an unspecified transistor inverter.

56.1 Having current protection:
This subclass is indented under subclass 56.09. Subject matter including protection from an abnormal or unsafe current condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
56.03, for current protection means in a bridge-type transistor inverter.
56.07, for current protection means in a double-ended transistor inverter.
56.12, for transient protection means (e.g., snubber, etc.) in an unspecified transistor inverter.

56.11 Having voltage protection:
This subclass is indented under subclass 56.09. Subject matter including protection from an abnormal or unsafe voltage condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
56.05, for voltage protection means in a bridge-type transistor inverter.
56.08, for voltage protection means in a double-ended transistor inverter.
56.12, for transient protection means (e.g., snubber, etc.) in an unspecified transistor inverter.

56.12 Transient protection (e.g., snubber, etc.):
This subclass is indented under subclass 56.01. Subject matter including means to prevent, dissipate, or redirect excess energy from a voltage or current spike or overshoot (i.e., transient).

SEE OR SEARCH THIS CLASS, SUBCLASS:
56.02, for transient protection means in a transistor inverter having a specified topology.

57 Thyristor:
This subclass is indented under subclass 55. Subject matter wherein said D.C. to A.C. converter includes a switch means for interrupting current, at regular intervals, from the supply of said D.C., wherein said switch means comprises a bistable semiconductor means having three or more junctions (e.g., thyristor, etc.).

SEE OR SEARCH CLASS:
257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 107 through 181 for regenerative type devices, including thyristors.

58 Bridge:
This subclass is indented under subclass 57. Subject matter wherein the inverter circuit is in a bridge-type configuration and includes at least one thyristor.

59 With voltage multiplication means (i.e., V out > V in):
This subclass is indented under subclass 13. Subject matter wherein storage type device means are provided for multiplying the voltage, so that the output voltage is a multiple of the input voltage.

(1) Note. An example of a voltage multiplier is an arrangement wherein a plurality of condensers are charged in parallel and discharged in series.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclass 110 for voltage multipliers of the type which charges two or more capacitors in parallel and discharges them in series.
320, Electricity: Battery or Capacitor Charging or Discharging, appropriate subclass for series connection of voltaic cells or capacitors in a battery or capacitor charging or discharging system.

60 Including semiconductor means:
This subclass is indented under subclass 59. Subject matter wherein the converting means includes a nonlinear solid-state device.

61 For Rectifying:
This subclass is indented under subclass 60. Subject matter wherein the conversion is from A.C. to D.C.

62 With voltage division by storage type impedance (i.e., V out >V in):
This subclass is indented under subclass 13. Subject matter wherein storage type device means are provided for dividing the voltage, so that the output voltage is a subdivision of the input voltage.

(1) Note. An example of a voltage divider is an arrangement wherein a plurality of capacitors are charged in series and discharged in parallel.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclass 109 for voltage dividers of the type which charges two or more capacitors in series and discharges them in parallel.
320, Electricity: Battery or Capacitor Charging or Discharging, appropriate subclass for series connection of voltaic cells or capacitors in a battery or capacitor charging or discharging system.

63 With means to selectively provide D.C. of either polarity:
This subclass is indented under subclass 13. Subject matter having means to optionally supply a D.C. output of either a negative or positive polarity.

64 With interphase transformer:
This subclass is indented under subclass 13. Subject matter wherein the conversion system is of a type wherein polyphase alternating current is converted to direct current or vice versa and an interphase transformer is provided in the polyphase circuit.

(1) Note. An interphase transformer is an auto transformer or a set of mutually coupled reactors used in combination with the converter transformers, where a plurality of transformers are used in the line circuits to balance the distribution of current among the converters connected

to the transformer. Also, an interphase transformer may be connected to the line circuit so as to multiply the number of paths of the current through the converter without multiplying the number of phases in the line circuit containing the interphase transformers. Many of the systems having interphase transformers use electronic tubes as the converting means.

SEE OR SEARCH CLASS:
315, Electric Lamp and Discharge Devices: Systems, subclass 142 for electronic tube systems of the gas or vapor type having a polyphase source of supply for the electronic tubes, the supply circuit including an interphase transformer. The systems in subclass 142 of Class 315 are closely analogous to the systems in this subclass as many of the systems in Class 315 are disclosed as being rectifying systems.

65 Having plural converters for single conversion:
This subclass is indented under subclass 13. Subject matter wherein a single current conversion is effected simultaneously by a plurality of converters.

(1) Note. The converters may be connected in series, in parallel, or combinations thereof.

(2) Note. In the systems in this subclass the conversion must be only from A.C. to D.C. or from D.C. to A.C. The ordinary full wave rectifying systems are excluded because each half of the wave is rectified by a separate converter, and rectifiers are alternately effective, i.e., one half of the wave being rectified and then the other half of the wave. Full wave systems having a plurality of converters for each half of the alternating current wave are included. Likewise, polyphase systems are excluded unless one or more of the phases is provided with a plurality of converters so that a single current conversion in a phase is effected by a plurality of converters. Full wave and polyphase converter systems will be found in the other subclasses of this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:
15, and 34+, for current conversion systems where the system includes means to effect a plurality of current conversion. Examples of the systems in subclasses 34+ are systems which convert A.C. to D.C. to A.C. or which convert A.C. to D.C. to A.C. to D.C.
64, for current conversion systems which include an interphase transformer for multiplying the number of paths through the converter without multiplying the number of phases.

66 Including plural anode and single cathode (e.g., vapor arc device):
This subclass is indented under subclass 65. Subject matter wherein each converter means is an electron tube device having more than one anode and only one cathode.

SEE OR SEARCH THIS CLASS, SUBCLASS:
6, for cascaded conversion of current and phase including at least one plural anode-single cathode device.
168, for plural anode-single cathode devices used in frequency conversion.

67 Plural rectifiers:
This subclass is indented under subclass 65. Subject matter having more than one rectifier as the conversion means.

SEE OR SEARCH CLASS:
257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 75+ for plural discrete rectifying active solid-state devices combined with a housing.

68 In series (e.g., series SCR's, bridge circuits, etc.):
This subclass is indented under subclass 67. Subject matter wherein the rectifiers are connected in series.

69 In parallel:
This subclass is indented under subclass 67. Subject matter wherein the rectifiers are connected in parallel.

70 Including semiconductor device:
This subclass is indented under subclass 69. Subject matter wherein the converting means includes a semiconductor device.

71 Plural inverters:
This subclass is indented under subclass 65. Subject matter having more than one inverter as the conversion means.

72 Master-slave:
This subclass is indented under subclass 71. Subject matter wherein one inverter is operated in a phase shifted relationship with respect to a second inverter.

73 Constant current to constant voltage or vice versa:
This subclass is indented under subclass 13. Subject matter wherein the system includes means for changing constant current to constant voltage or vice versa.

(1) Note. Some exemplary arrangements for changing constant current to constant voltage or vice versa include monocyclic networks and networks and constant current transformers.

SEE OR SEARCH CLASS:
323, Electricity: Power Supply or Regulation Systems, subclasses 220 through 354 for miscellaneous current regulating systems of the constant current type.

74 With condition responsive means to control the output voltage current:
This subclass is indented under subclass 13. Subject matter wherein the system is provided with means responsive to a predetermined condition which controls the voltage and/or current magnitude of the system in response to that condition.

(1) Note. The control may be accomplished by controlling any of the following: (1) The converter supply circuit; (2.) The converter load circuit; (3) The converter itself.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclasses 635+ for electrical apparatus condition responsive means.

75 Including inductive integral sensing and control means (e.g., ferroresonant circuit):
This subclass is indented under subclass 74. Subject matter wherein the system includes inductive integral means for performing the dual functions of sensing a condition and regulating the output voltage or current.

SEE OR SEARCH THIS CLASS, SUBCLASS:
82, for plural cooperating sensing and control means for rectifier with inductive means in the line circuit.
90, for cooperating sensing and control means for rectifier with inductive means in the line circuit.

76 Including integral sensing and control means for rectifier:
This subclass is indented under subclass 74. Subject matter wherein the system is a rectifier which includes integral means for performing the dual functions of sensing a condition and regulating the output voltage or current.

SEE OR SEARCH THIS CLASS, SUBCLASS:
52+, for integral protection means for rectifiers.

77 With semiconductor conversion means:
This subclass is indented under subclass 76. Subject matter wherein the rectifier is a semiconductor circuit or device.

78 Cooperating separate sensing and control means:
This subclass is indented under subclass 74. Subject matter wherein the system includes means to sense a condition and to operate in conjunction with a separate means to regulate the output voltage or current.

(1) Note. This subclass includes those systems wherein a line condition is compared with a standard (e.g., line voltage

compared with a standard voltage cell). Such systems are considered to be responsive to a single condition.

79 Including plural sensing or control means:
This subclass is indented under subclass 78. Subject matter which includes more than one sensing or control means to regulate the output voltage or current.

(1) Note. The above plural conditions may include conditions of the same kind, such as the voltage of the supply circuit and the voltage of the load circuit.

SEE OR SEARCH CLASS:
322, Electricity: Single Generator Systems, subclass 19, 20, 21, and 24+ for single generator systems, including motor-generator systems having automatic control of the generator in response to plural circuit conditions of the generator.
323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for automatic voltage and/or current control systems which are responsive to plural line circuit conditions.

80 With transistor as control means in line circuit:
This subclass is indented under subclass 79. Subject matter having transistor control means in the line circuit, the operation of which is controlled by condition responsive means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
89, for similar subject matter in a rectifier system.
97, for similar subject matter in an inverter system.

81 For rectifier:
This subclass is indented under subclass 79. Subject matter wherein the condition responsive system is included in an A.C.-D.C. converter.

SEE OR SEARCH THIS CLASS, SUBCLASS:
84, for single sensing and control means for a rectifier system.

82 With inductive control means in the line circuit:
This subclass is indented under subclass 81. Subject matter having inductive control means in the line circuit, the operation of which is controlled by the condition responsive means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
75, for inductive integral sensing and control means.
90, for inductive control means in the line circuit of a rectifier system.

83 With electron tube or valve as control means in line circuit:
This subclass is indented under subclass 81. Subject matter wherein the line circuit control means includes an electronic tube.

(1) Note. See the class definition, Glossary, for definition of electronic tube.

SEE OR SEARCH THIS CLASS, SUBCLASS:
94, for similar subject matter in a rectifier system.
99, for similar subject matter in an inverter system.

SEE OR SEARCH CLASS:
315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for miscellaneous systems for supplying current to electronic tubes of the vapor or gas type.
323, Electricity: Power Supply or Regulation Systems, subclass 227 and 291 for current or voltage magnitude control systems where the current or voltage magnitude control means includes an electronic tube.
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous electron tube systems not otherwise classified.

84 For rectifier system:
This subclass is indented under subclass 78. Subject matter wherein the system is an A.C. to D.C. converter.

85 With thyristor control means in the line circuit:

This subclass is indented under subclass 84. Subject matter having a thyristor in the line circuit, the operation of which is controlled by condition responsive means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

96, for this subject matter in an inverter system.

86 External to rectifier (e.g., pre or post regulation):

This subclass is indented under subclass 85. Subject matter wherein the thyristor controls the flow of current to or from the rectifier.

87 For plural phase to D.C. rectifier:

This subclass is indented under subclass 85. Subject matter wherein the A.C. input to the rectifier is of more than one phase.

SEE OR SEARCH THIS CLASS, SUBCLASS:

129, for plural phase A.C. to D.C. thyristor rectifier systems.

88 For full wave rectifier with at least 1 three electrode device:

This subclass is indented under subclass 85. Subject matter wherein each half wave is rectified by a separate rectifier and the rectifiers are alternately operated to perform full wave rectification.

SEE OR SEARCH THIS CLASS, SUBCLASS:

67+, for plural rectifiers for single conversion.

89 With transistor control means in the line circuit:

This subclass is indented under subclass 84. Subject matter having transistor control means in the line circuit, the operation of which is controlled by condition responsive means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

80, for this subject matter with plural sensing and control means.

97, for this subject matter in an inverter system.

90 With inductive control means in the line circuit:

This subclass is indented under subclass 84. Subject matter having inductive control means in the line circuit, the operation of which is controlled by condition responsive means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

75, for inductive integral means for performing the dual functions of sensing a condition and regulating the output voltage or current.

82, for plural sensing with inductive control means in the line circuit.

91 Saturable reactor (e.g., magnetic amplifier):

This subclass is indented under subclass 90. Subject matter wherein the inductive control means is a saturable reactor type device.

(1) Note. A saturable reactor is a reactor provided with a control winding which is supplied with a direct current to saturate the magnetic circuit of the reactor and thereby vary its impedance.

(2) Note. The saturable reactor may be, for example, a magnetic amplifier.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclass 249, 302, 310, and 329 for current and/or voltage magnitude control systems where the control means is a saturable transformer.

92 In plural phase to D.C. system:

This subclass is indented under subclass 91. Subject matter wherein the A.C. input to the system is of more than one phase and the output from the system is D.C.

93 With plural control windings:

This subclass is indented under subclass 91. Subject matter where the saturable reactor has more than one control winding.

94 With electron tube or valve control means in the line circuit:

This subclass is indented under subclass 84. Subject matter wherein the line circuit control means includes an electronic tube.

(1) Note. See the class definition, Glossary, for definition of Electronic Tube.

SEE OR SEARCH THIS CLASS, SUBCLASS:

83, for this subject matter in a rectifier system having plural sensing or control means.

99, for this subject matter in an inverter system.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for miscellaneous systems for supplying current to electronic tubes of the vapor or gas type.

323, Electricity: Power Supply or Regulation Systems, subclass 227 and 291 for current or voltage magnitude control systems where the current or voltage magnitude control means includes an electronic tube.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous electron tube systems not otherwise classified.

95 For inverter:

This subclass is indented under subclass 78. Subject matter wherein the system is a D.C. to A.C. converter.

96 With thyristor control means in the line circuit:

This subclass is indented under subclass 95. Subject matter having a thyristor in the line circuit, the operation of which is controlled by condition responsive means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

85, for this subject matter in a rectifier system.

97 With transistor control means in the line circuit:

This subclass is indented under subclass 95. Subject matter having transistor control means in the line circuit, the operation of which is controlled by condition responsive means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

80, for this subject matter with plural sensing or control means.

89, for this subject matter in a rectifier system.

98 For bridge type inverter:

This subclass is indented under subclass 97. Subject matter wherein the conversion system includes a bridge configuration type inverter.

SEE OR SEARCH THIS CLASS, SUBCLASS:

58, for bridge configuration type inverters with automatic or integral protection means.

99 With electron tube or valve control means in the line circuit:

This subclass is indented under subclass 95. Subject matter wherein the line circuit control means includes an electron tube.

SEE OR SEARCH THIS CLASS, SUBCLASS:

83, for this subject matter in a rectifier system having plural sensing or control means.

94, for this subject matter in a rectifier system.

100 With manual control of the output voltage or current:

This subclass is indented under subclass 13. Subject matter wherein control of the output voltage or current is effected by hand operated means.

101 With auxiliary bucking or boosting EMF:

This subclass is indented under subclass 13. Subject matter wherein the system is provided with means to supply additional voltage into the system which may either aid or oppose the voltage of the system.

(1) Note. The additional voltage may be introduced into either the converter supply line or the converter load line.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclasses 77+ for systems in which a plurality of sources of electric current are connected in series.
322, Electricity: Single Generator Systems, subclasses 86+ for generator systems including motor generator systems, wherein the field winding is supplied by plural sources of excitation voltage.
323, Electricity: Power Supply or Regulation Systems, subclass 259 and 344 for bucking and/or boosting transformer systems.

102 By dynamoelectric machine converter:
This subclass is indented under subclass 13. Subject matter wherein the converter includes a dynamoelectric machine.

(1) Note. See the Glossary for a definition of Dynamoelectric Machine.

(2) Note. The dynamoelectric machine types commonly used as current converters include motor-generator sets and rotary converters.

(3) Note. Although systems involving motor-generator sets are generally classified in Class 322, Electricity: Single Generator Systems, in systems wherein there is significant conversion from D.C. to A.C. or vice versa, classification is in this class (363). However, the generic place for systems involving motor-generator sets is in Class 322. See the class definition, Lines With Other Classes, Motor Generator Systems in Class 322, Electricity, Single Generator Systems.

(4) Note. Since many of the problems of operation and control of dynamoelectric machine converters are analogous to the problems of operation, and control of motors and generators (e.g., starting speed control, excitation control, etc.), it is noted that analogous pertinent art is classified in the motor and generator classes. See search classes below.

SEE OR SEARCH THIS CLASS, SUBCLASS:
150, for phase conversion systems of the dynamoelectric type.
174, for frequency conversion systems of the dynamoelectric type.

SEE OR SEARCH CLASS:
310, Electrical Generator or Motor Structure, subclass 113 for the structure of a motor-generator set; subclasses 129+ for rotary converter structure; and subclass 160 for frequency converters of the dynamoelectric type.
318, Electricity: Motive Power Systems, appropriate subclasses for electric motor system.
322, Electricity: Single Generator Systems, appropriate subclasses for electric motor-driven generator systems; see subclasses 14+ where the system includes means for controlling both the motor and the generator; note particularly subclass 16 for such systems having simultaneous control of both motor and generator; see subclass 39 for electric motor-driven generator systems having motor control; and see subclasses 44+ for generator control; see (3) Note, above, for the line between Classes 322 and 363.
323, Electricity: Power Supply or Regulation Systems, subclasses 201 through 204 for control systems having a dynamoelectric machine as the control means.

103 Plural collector type:
This subclass is indented under subclass 102. Subject matter wherein the dynamoelectric machine is of the type which has plural sets of current collectors.

(1) Note. The usual machine of this type is a rotary converter which has a single field structure, a single armature winding and the armature winding is provided both with a commutator and slip rings, the direct current brushes cooperate with the

commutator and alternating current brushes cooperating with the slip rings.

(2) Note. Closely analogous subject matter is found in Class 323, Electricity: Power Supply or Regulation Systems wherein a dynamoelectric machine having plural sets of brushes is used to control voltage magnitude. However, such dynamoelectric machine (e.g., dynamotor) is not a converter since the input and output electrical energy are the same in kind (e.g., both D.C. or both A.C.).

SEE OR SEARCH THIS CLASS, SUBCLASS:

150, for phase conversion systems having a plural current collector type dynamoelectric machine as the converter.

174+, for frequency conversion systems having a plural current collector type dynamoelectric machine as the converter.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclasses 201 through 204 for current and voltage magnitude control systems including a dynamoelectric machine having plural sets of current collectors. See (2) Note above.

104 Having plural field windings:

This subclass is indented under subclass 103. Subject matter wherein the dynamoelectric machine is provided with plural field windings.

SEE OR SEARCH CLASS:

310, Electrical Generator or Motor Structure, subclasses 112+ for plural, structurally united dynamoelectric machines, subclass 114 for plural rotary element dynamoelectric machines operating in different fields, subclasses 134, 141, 142, and 149 for plural collector type dynamoelectric machines having plural field windings, and subclasses 184+ for plural field winding structure.

318, Electricity: Motive Power Systems, appropriate subclasses for motor systems wherein the motor is provided with plural field windings; particularly note, subclasses 523+ for miscellaneous motor systems wherein the motor is provided with plural field windings.

322, Electricity: Single Generator Systems, subclasses 63+ for plural field winding generator systems.

105 Having auxiliary motor drive:

This subclass is indented under subclass 103. Subject matter wherein the dynamoelectric machine is provided with an additional driving means.

(1) Note. The subject matter of this subclass is analogous in many ways to that of motor-generator set converters. A plural set of current collectors converter is analogous to a motor-generator set in that it may be considered to have a motor part and a generator part. The addition of another motor means results in an arrangement analogous to a motor-generator set having two motors.

SEE OR SEARCH CLASS:

322, Electricity: Single Generator Systems, subclass 9 for systems wherein a generator is provided with plural driving means. See (1) Note, above.

106 By circuit interrupter type:

This subclass is indented under subclass 13. Subject matter wherein the converter is a circuit interrupter which is operated synchronously with the A.C. current.

(1) Note. The circuit interrupter is a periodic switch. The usual types of switches used in the systems of this subclass are vibrating and rotary switches.

SEE OR SEARCH THIS CLASS, SUBCLASS:

177, for frequency conversion systems having a current interrupter type converter.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, subclasses 19.01+ for the structure of periodic switches.

307, Electrical Transmission or Interconnection Systems, subclasses 96+ for systems having an intermittent regulatory interrupter, and subclasses 112+ for miscellaneous switching systems.
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 87+ for the structure electromagnetically operated periodic switches.
361, Electricity: Electrical Systems and Devices, subclasses 139+ for relay and electromagnet systems.
378, X-Ray or Gamma Ray Systems or Devices, subclasses 101+ for X-Ray tube energizing circuits which may include circuit interrupter type converters.

107 Rotating:
This subclass is indented under subclass 106. Subject matter wherein the circuit interrupter is a rotary switch.

(1) Note. A rotary switch is a device wherein a rotary contact member coacts with stationary contacts so that as the rotary member rotates the circuit between each of the stationary contacts and the rotary contact is made and broken in a predetermined sequence.

(2) Note. A usual example of a rotary switch is a commutator.

SEE OR SEARCH CLASS:
200, Electricity: Circuit Makers and Breakers, subclasses 19.03+, 19.07+, 19.18+, and 36+ for the structure of rotary switch structures.
250, Radiant Energy, subclass 401 for such conversion systems wherein the load device is an X-ray apparatus.
310, Electrical Generator or Motor Structure, subclasses 233+ for the structure of commutators for dynamoelectric machines.

108 Rectifier (i.e., A.C.-D.C.):
This subclass is indented under subclass 107. Subject matter wherein the converter is of the type which converts alternating current into direct current.

SEE OR SEARCH THIS CLASS, SUBCLASS:
114+, for rectifying systems having an electron tube type converter.
125+, for rectifying systems having a semiconductor type converter.

109 Inverter (i.e., D.C.-A.C.):
This subclass is indented under subclass 107. Subject matter wherein the converter is of the type which converts direct current into alternating current.

SEE OR SEARCH THIS CLASS, SUBCLASS:
120+, for inverting systems having an electronic tube type converter.
123+, for inverting systems having a semiconductor type converter.

110 Vibrating:
This subclass is indented under subclass 106. Subject matter wherein the circuit interrupter is a device which has a movable conducting member which moves between contacts for converting either D.C. to A.C. or A.C. to D.C.

111 Using electronic tube converter:
This subclass is indented under subclass 13. Subject matter wherein the converter includes an electronic tube.

(1) Note. See the class definition, under Glossary, for the definition of an electronic tube.

(2) Note. See Lines With Other Classes, Conversion Systems Not Included in This Class, in the class definition of this class for other conversion systems using electronic tubes which are not included in this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:
94, for current conversion systems wherein an electronic tube is used for line circuit control.
151, for phase conversion systems including an electronic tube converter.
166+, for frequency conversion systems including an electronic tube converter.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for miscellaneous systems for supplying current to electronic tubes of the gas or vapor tube type. In these systems, the output circuit may be claimed if it is claimed so broadly as to be in effect the mere completion of the circuit so that a discharge may take place. In many of the systems in Class 315, the electronic tube is an asymmetrical discharge device and operates to pass electric current in one direction only between the discharge electrodes. Merely naming the device as a rectifier will not exclude the patent from Class 315, unless some subject matter is claimed which limits the system to the conversion art. The subject matter of Class 315 is closely analogous to the subject matter of this and the indented subclasses. See the class definition, Lines With Other Classes, for a statement of the line between Classes 315 and 363.

323, Electricity: Power Supply or Regulation Systems, subclass 227 and 291 for control systems involving an electronic tube.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous electron tube systems not otherwise classified.

112 With gap in open atmosphere:

This subclass is indented under subclass 111. Subject matter wherein the electronic tube is of the type wherein the electric space discharge takes place between electrodes which are exposed to the atmosphere.

(1) Note. This type of electronic tube is usually called a spark gap or an arc device.

SEE OR SEARCH CLASS:

313, Electric Lamp and Discharge Devices, appropriate subclasses for the structure of spark gaps and open air arc devices.

315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for miscellaneous systems for supplying current to electronic tubes of the type which have the gap in the open atmosphere.

331, Oscillators, subclass 127 for oscillators using a gaseous space discharge device of the spark or open arc type, and which convert direct current to oscillatory current.

113 With cathode element control:

This subclass is indented under subclass 111. Subject matter wherein the control of the electronic tube involves control of the cathode element.

(1) Note. Control of the cathode-anode circuit is not control of the cathode element.

(2) Note. A usual cathode element control is the control of cathode temperature.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, subclasses 94+ for miscellaneous systems for supplying heating current to the cathode or cathode heater of an electronic tube. The systems in Class 315, subclasses 94+ may include the circuit necessary to also supply the anode potential if the anode supply is included in combination with the supply of the cathode current. In such systems, the electronic tube may be either a vacuum tube or a gas or vapor tube. However, if the system includes the supply of control current or potential to the discharge control means, then only the systems limited to having an electronic tube of the gas or vapor type are included, and such other systems will be found in Class 250, Radiant Energy, or in one of the classes or subclasses specified in the notes to the definition of that subclass.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous electron tube systems which include means for controlling the

cathode element. See the reference to Class 315, above.

114 In rectifier systems:
This subclass is indented under subclass 111. Subject matter wherein the conversion is from A.C. to D.C.

SEE OR SEARCH THIS CLASS, SUBCLASS:
38, for electron tube rectifier used in A.C.-D.C.-A.C. conversion systems.
67+, for plural electron tube rectifiers for single current conversion.
81+, and 84+, for electron tube rectifying systems with condition responsive means to control the output voltage or current.
108, for circuit interrupter type rectifying systems.
113, for electronic tube rectifiers with cathode element control.
125+, for rectifying systems having semiconductor type converter.

115 With retarding or delaying control means:
This subclass is indented under subclass 114. Subject matter wherein means are provided for delaying the operation of the electronic tube converter until conditions are such that its operation is safe, feasible, or desirable.

(1) Note. An example of such delay control is where the application of cathode, anode voltage is delayed until the cathode temperature has reached its operating value.

SEE OR SEARCH CLASS:
315, Electric Lamp and Discharge Devices: Systems, subclasses 102+ for miscellaneous systems for supplying electric current and/or potential to electronic tubes where the system includes means to supply heating current to the cathode or cathode heating circuit, and means for delaying the application of anode potential until the cathode has reached its operating potential. This subclass in Class 315 provides for vacuum tube systems as well as gas or vapor tube systems, provided that in the case of the vacuum tubes there is no control of the discharge control (e.g., grid) circuit. Systems which are not limited to having a gas or vapor type electronic tube and which include the discharge control circuit will be found in Class 327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses.
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous electron tube systems having delayed or retarded operation of the tube. See the reference to Class 315, above.

116 With discharge control means (e.g., grid):
This subclass is indented under subclass 114. Subject matter wherein the electronic tube converter is provided with a discharge control means.

(1) Note. Examples of such discharge control means include a grid, igniter, magnetic control device, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
94, for current conversion systems wherein an electronic tube having discharge control means is used for line circuit control.
121+, for inverter systems including an electronic tube converter which has a discharge control means.
151, for phase conversion systems including an electronic tube converter which has a discharge control means.
166+, for frequency conversion systems including an electronic tube converter which has a discharge control means.

SEE OR SEARCH CLASS:
315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for miscellaneous systems for supplying current to an electronic tube of the gas or vapor type which has a discharge control means (e.g., grid, igniter, magnetic field). Many of the systems inherently operate to convert A.C. to D.C. and many of the tubes are referred to as rectifiers, and are therefore closely analogous to the sys-

tems in this and the indented subclass. Note, especially subclasses 137+ where the supply circuit is a polyphase alternating current supply circuit; subclasses 194+ where the system includes means to shift the phase of the current or potential applied to the discharge control means with respect to the anode-cathode current to control the tube; subclasses 248+ where the source of supply is alternating current; indented subclass 252 providing for those systems which include a plurality of discharge control type electronic tubes; indented subclasses 261+ providing for those systems where the discharge control means is an auxiliary starting electrode (e.g., igniter); indented subclass 267 providing for those systems where the discharge control means is an electromagnetic means; and indented subclasses 268+ providing for the miscellaneous alternating current supplied discharge control tube systems. For the line between Classes 315 and 363, see the class definition, Lines With Other Classes.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous electron tube systems not otherwise classified.

117 D.C. bias control:

This subclass is indented under subclass 116. Subject matter wherein the control of the electronic tube includes varying the magnitude of a direct current or potential applied to the discharge control means.

(1) Note. This subclass includes those systems wherein both an A.C. component and a D.C. component are applied to the control means and those systems wherein only a D.C. is applied to the control means, provided that in each case the actual control of the conductivity of the discharge device is accomplished by varying the magnitude of the D.C. voltage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

116, for the miscellaneous systems having an electronic tube converter with a discharge control means, where the conductivity of the electronic tube is controlled by controlling the time of application of a voltage but not the magnitude of either the D.C. or A.C. applied to the discharge control means. See the reference to subclass 118, below.

118, for the systems under subclass 116 where the phase of the alternating current or potential applied to the discharge control means is shifted with respect to the cathode-anode current to control the electronic tube.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for miscellaneous systems for supplying current to an electronic tube of the gas or vapor type which has a discharge control means, (e.g., grid, igniter, magnetic field). Many of the systems inherently operate to convert A.C. to D.C. and many of the tubes are referred to as rectifiers, and are therefore closely analogous to the systems in this subclass. subclasses 261 through 264 , and 267 to 275 provide for the systems where the tube is supplied with alternating current and where the tube has a discharge control means which is controlled by controlling the magnitude of the direct current and/or potential is the control circuit. Subclasses 261+ provide for those systems where the discharge control means is an auxiliary starting electrode (e.g., igniter); subclass 267 provides for those systems where the discharge control means is an electromagnetic means; and subclasses 268+ provide for the miscellaneous alternating current supplied discharge control tube systems. Note, indented subclass 270 where both alternating and direct current and/or potential are supplied to the control means. See indented subclass 272 where a recti-

fier and/or discharge device is connected in the circuit of discharge control means. For the line between Classes 315 and 321, see the class definition, Lines With Other Classes.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, particularly subclasses 530+ for miscellaneous electron tube systems which include DC bias control.

118 Phase angle control:

This subclass is indented under subclass 116. Subject matter wherein the control of the electronic tube is accomplished by controlling the phase of an A.C. current or voltage applied to the discharge control means with respect to the cathode-anode voltage.

(1) Note. This subclass includes (1) systems wherein both an A.C. current or voltage and a D.C. current or voltage are applied to the discharge control means and (2) systems wherein one or more A.C. currents or voltages are applied to the discharge control means, provided that conductivity of the electronic tube is controlled by varying the phase of the A.C. voltage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

117, for those systems wherein the conductivity of the electronic tube is controlled by both varying the magnitude of a D.C. or voltage applied to the discharge control means and by controlling the phase of an A.C. or voltage applied to the discharge control means.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for miscellaneous systems for supplying current to an electronic tube of the gas or vapor type which has a discharge control means, (e.g., grid, igniter, magnetic field). Many of the systems inherently operate to convert A.C. to D.C. and many of the tubes are referred to as rectifiers, and are therefore closely analogous to the systems in this and the indented subclass. Note, especially subclasses 194+ where the supply circuit is an alternating current supply circuit and the system includes means to shift the phase of the current or potential applied to the discharge control means with respect to the anode-cathode current to control the tube, for the line between Classes 315 and 363, see the class definition, Lines With Other Classes.

323, Electricity: Power Supply or Regulation Systems, subclass 237, 300, and 320 for electronic tube voltage magnitude control systems having phase control of the A.C. or voltage applied to the discharge control device of the tube.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 231+ for miscellaneous tube phase shift or control circuits.

119 Particular waveform grid excitation:

This subclass is indented under subclass 116. Subject matter wherein the control of the discharge control means involves the application thereto of a voltage having a particular waveform.

(1) Note. Particular waveform is defined as a waveform significantly different from that of a sine wave.

(2) Note. Particular waveforms include square top waves, saw tooth waves, peaked waves, etc.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclasses 106+ for miscellaneous wave shaping systems.

315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for miscellaneous systems for supplying current to an electronic tube of the gas or vapor type which has a discharge control means (e.g., grid, igniter, magnetic field). Many of the systems inherently operate to convert A.C. to D.C. and many of the tubes are referred to as rectifiers, and are

therefore closely analogous to the systems in this and the indented subclass. subclasses 261 through 264 and 267 to 275 provide for the systems where the tube is supplied with alternating current, and where the tube has a discharge control means which is controlled by applying current or voltage of a particular waveform to the discharge control means. See subclasses 261+ for those systems where the discharge control means is an auxiliary starting electrode (e.g., igniter). Note, especially indented subclass 262 where a peaking transformer is in the auxiliary starting electrode circuit; and subclass 263 where an inductance or surge generator is included in the auxiliary electrode circuit. See subclass 267 for those systems where the discharge control means is an electromagnetic means. See subclasses 268+ for the miscellaneous alternating current supplied discharge control tube systems. Note especially indented subclass 274 where a transformer such as a peaking transformer, is included in the control circuit, and indented subclass 275 where a condenser is included in the control circuit. For the line between Classes 315 and 363, see the class definition, Lines With Other Classes.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 100+ for miscellaneous tube networks producing a waveform of particular shape.

333, Wave Transmission Lines and Networks, subclass 19 for differentiating and integrating networks of the passive type, and subclass 20 for wave shaping networks in general of the passive type.

120 In inverter systems:

This subclass is indented under subclass 111. Subject matter wherein the conversion is from D.C. to A.C.

(1) Note. There are many conversion systems for converting D.C. to A.C. in the communications arts, (e.g., oscillators, harmonic generators, amplifiers, etc.). See the class definition, Lines With Other Classes, for a list of conversion systems excluded from this class, their classification and the lines between them and the subject matter of this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

9, for circuit interrupter type inverter systems.

29+, for electron tube inverter in D.C.-A.C.-D.C. systems.

38, for electron tube inverter in A.C.-D.C.-A.C. systems.

95+, for electron tube inverting systems with means to control the output voltage or current.

131+, and 135+, for transistor and thyristor type inverter systems.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for systems for supplying electric current to electronic tubes of the gas or vapor type. Many of these systems inherently operative to convert D.C. to A.C. and are closely analogous to the systems in this and the indented subclass. Note especially subclasses 227+ where a condenser is used to control the supply of current to the electronic tube. In many of these systems the condenser causes the current through the tube to flow periodically, similar to the current flow in a relaxation oscillator circuit. Note especially indented subclass 229 where the system includes a plurality of tubes and a commutating condenser is connected between the anodes or cathodes to cause the tubes to become conductive alternately (converts D.C. to A.C.). See subclass 235 where the electronic tube has a plurality of cathodes or anodes with a commutating condenser connected between the anodes or cathodes to cause the discharge to alternate between the plural cathodes or anodes (converts D.C. to A.C.). See the class definition, Lines With Other Classes, for the line between Classes 315 and 363.

331, Oscillators, appropriate subclasses for self-sustaining electric wave generating systems utilizing electronic tubes which convert direct current to alternating current.

121 With discharge control means (e.g., grid):
This subclass is indented under subclass 120. Subject matter wherein the electronic tube converter has a discharge control means.

(1) Note. Such control means may include a grid, igniter, or magnetic control means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
116, for electronic tube rectifier systems wherein the electronic tube has a discharge control means.

SEE OR SEARCH CLASS:
315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for miscellaneous systems for supplying current to electronic tubes of the gas or vapor type where the electronic tube has a discharge control means. Many of these systems inherently operate to convert D.C. to A.C. and are closely analogous to the systems in this and the indented subclass. Note especially subclass 229 where the system includes a plurality of tubes with discharge control means a commutating condenser is connected between the anodes or cathodes to cause the tubes to become conductive alternately (converts D.C. to A.C.). See subclasses 233+, 236+, and 237+ where a condenser is connected in the supply circuit of a gas or vapor tube having a discharge control means, the condenser causing the current through the tube to flow periodically similar to the current flow in a relaxation oscillator circuit. See subclasses 233+ where the tube has an auxiliary starting electrode (e.g., igniter) as the control means; subclass 236 where the control means is a magnetic means; and subclasses 237+ where the control means is an electrostatic (e.g., grid) electrode. See subclass 235 where the electronic tube has a plurality of cathodes or anodes and a discharge control means with a commutating condenser connected between the anodes or cathodes to cause the discharge to alternate between the plural cathodes or anodes (converts D.C. to A.C.). See Lines With Other Classes, in the class definition for the line between Classes 315 and 363.
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclass 597 for miscellaneous tube circuits with grid control means.

122 Grid-like electrode:
This subclass is indented under subclass 121. Subject matter wherein the discharge control means is of the type which controls the flow of space current by controlling the space charge between the cathode and the anode.

(1) Note. A common designation for this type of control means is a grid. The grid is usually interposed in the discharge path between the cathode and anode.

SEE OR SEARCH THIS CLASS, SUBCLASS:
119, for electronic tube rectifier systems wherein the electronic tube is provided with grid control means.

SEE OR SEARCH CLASS:
315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for miscellaneous systems for supplying current to electronic tubes of the gas or vapor type which have a control grid. Many of these systems inherently operate to convert D.C. to A.C. and are closely analogous to the systems in this subclass. Note especially subclass 229 where the system includes a plurality of tubes with control grids and a commutating condenser connected between the anodes or cathodes to cause the tubes to become conductive alternately. See subclass 235 where the electronic tube has a plurality of cathodes or anodes and a control grid with a commutating condenser connected between the anodes or cathodes to cause the discharge to alternate between the plural

cathodes or anodes (converts D.C. to A.C.). See subclasses 237+ where a condenser is connected in the supply circuit of a gas or vapor tube having a grid, the condenser causing the current through the tube to flow periodically similar to the current flow in a relaxation oscillator circuit. See the class definition, See Lines With Other Classes, for the line between Class 315 and Class 363.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 597+ for miscellaneous tube circuits with grid control means.

123 Using semiconductor-type converter:

This subclass is indented under subclass 13. Subject matter wherein the converter includes a semiconductor device.

(1) Note. See the class definition, Glossary, for the definition of semiconductor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

10, for combined phase and frequency conversion by semiconductor device converter.

15+, and 37, and appropriate subclasses for semiconductor type converters for either D.C.-A.C.-D.C. or A.C.-D.C.-A.C. conversion.

53+, for semiconductor type rectifier systems including automatic or integral protection means.

56.01, for semiconductor type inverter systems including automatic or integral protection means.

159+, for frequency conversion by semiconductor converter.

124 In chopper converter systems:

This subclass is indented under subclass 123. Subject matter which includes a device used to interrupt a D.C. or low frequency A.C. source at regular intervals.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 9.1 and 10.1 for chopper type amplifiers.

330, Amplifiers, subclass 240 for chopper type circuits utilizing semiconductors.

125 In rectifier systems:

This subclass is indented under subclass 123. Subject matter wherein the current conversion is from A.C. to D.C.

SEE OR SEARCH THIS CLASS, SUBCLASS:

37, for semiconductor rectifiers in A.C.-D.C.-A.C. conversion systems.

48, for semiconductor rectifiers with low pass L or LC filter means for reducing ripples from the output.

53+, for semiconductor rectifiers including automatic or integral protection means.

61, for semiconductor rectifiers with voltage multiplication means.

67+, for plural semiconductor rectifiers for single current conversion.

77, for semiconductor rectifiers including integral sensing and control means.

108, for circuit interrupter rectifier systems.

114+, for electron tube rectifier systems.

126 Diode:

This subclass is indented under subclass 125. Subject matter wherein the semiconductor device is a two-terminal device which will conduct electricity more easily in one direction than in the other.

SEE OR SEARCH THIS CLASS, SUBCLASS:

67+, for systems which rectify by diode strings in series or in parallel.

127 Transistor:

This subclass is indented under subclass 125. Subject matter wherein the semiconductor device includes a transistor type element.

SEE OR SEARCH THIS CLASS, SUBCLASS:

131+, for transistor inverter systems.

128 Thyristor:

This subclass is indented under subclass 125. Subject matter wherein the semiconductor device is of the thyristor type.

SEE OR SEARCH THIS CLASS, SUBCLASS:

54, for thyristor rectifier systems including automatic or integral protection means.

67+, for systems which rectify by thyristor strings in series or in parallel.

88, for full wave rectifier with at least 1 three electrode device having thyristor control means in the line circuit.

135+, for thyristor inverter systems.

160+, for thyristor frequency conversion systems.

129 Plural phase to D.C.:

This subclass is indented under subclass 128. Subject matter wherein the A.C. input to the rectifier is of more than one phase.

SEE OR SEARCH THIS CLASS, SUBCLASS:

4, for thyristor plural phase to D.C. converters in single phase to plural phase to D.C. systems.

87, for plural phase to D.C. conversion with thyristor control means in the line circuit.

92, for plural phase to D.C. conversion with saturable reactor control means in the line circuit.

130 With magnetic control means:

This subclass is indented under subclass 128. Subject matter wherein the thyristor type device is regulated by magnetic means.

131 In transistor inverter systems:

This subclass is indented under subclass 123. Subject matter wherein the semiconductor device includes a transistor type element.

SEE OR SEARCH THIS CLASS, SUBCLASS:

16+, for transistorized inverters in D.C.-A.C.-D.C. conversion systems.

80, and 97+, for inverters with transistor control means in the line circuit.

127, for transistor rectifier systems.

132 Bridge type:

This subclass is indented under subclass 131. Subject matter wherein the inverter includes one or more transistors in a bridge configuration.

(1) Note. A bridge configuration in this art is a four terminal network with the supply being connected to two terminals opposite each other, and the load connected to the remaining terminals. One of the load terminals may be a center tap of the supply.

SEE OR SEARCH THIS CLASS, SUBCLASS:

17, for transistorized bridge type inverters in D.C.-A.C.-D.C. conversion systems.

98, for bridge type inverter with transistor control means in the line circuit.

133 Double-ended (i.e., push-pull) type:

This subclass is indented under subclass 131. Subject matter wherein the inverter includes two transistors which alternately and periodically couple the source to opposite terminals of a center-tapped primary winding of a power transformer.

SEE OR SEARCH THIS CLASS, SUBCLASS:

22+, and 24+, for transistorized double-ended inverters in D.C.-A.C.-D.C. conversion systems.

134 Separately driven:

This subclass is indented under subclass 133. Subject matter in which an independent drive circuit controls both the on and the off state of the transistors.

SEE OR SEARCH THIS CLASS, SUBCLASS:

24+, for transistorized double-ended separately driven inverters in D.C.-A.C.-D.C. conversion systems.

135 In thyristor inverter systems:

This subclass is indented under subclass 123. Subject matter wherein the semiconductor device includes a thyristor type element.

SEE OR SEARCH THIS CLASS, SUBCLASS:
27+, for thyristor inverters in D.C.-A.C.-D.C. conversion systems.
57+, for thyristor inverters with automatic or integral protection means.
96, for inverters with thyristor control means in the line circuit.
128+, for thyristor rectifier systems.

136 Bridge type:
This subclass is indented under subclass 135. Subject matter combined with a small box for containing Toilet Articles.

(1) Note. This subclass includes portable collapsible or hand-carried cases as distinguished form the dressing table furniture type of subclass 128 above. This subclass also includes mirrored purses or bags.

SEE OR SEARCH THIS CLASS, SUBCLASS:
128+, for dressing table-type mirrored vanities without a carrying handle.
154+, for illuminated containers without a mirror.

SEE OR SEARCH CLASS:
132, Toilet, subclass 83 for a powder box and applicator with a mirror.

137 D.C. to plural phase A.C.:
This subclass is indented under subclass 136. Subject matter wherein the conversion is from D.C. to plural phase A.C.

138 With commutation means:
This subclass is indented under subclass 137. Subject matter having means to alternately and repeatedly turn on or off current flowing in one or more arms of the bridge inverter circuit.

139 Double-ended (i.e., push-pull) type:
This subclass is indented under subclass 135. Subject matter wherein the inverter includes two thyristors which alternately and periodically couple the source to opposite terminals of a center-tapped primary winding of a power transformer.

140 Using impedance-type converter:
This subclass is indented under subclass 13. Subject matter wherein the converter includes an impedance.

(1) Note. See the class definition, under Glossary, for a definition of impedance.

SEE OR SEARCH THIS CLASS, SUBCLASS:
62, for voltage division by storage-type impedance.
156, for phase conversion by passive phase shift elements.
158, for frequency conversion by varactor-type devices.

141 With cooling means:
This subclass is indented under subclass 13. Subject matter wherein means are provided for removing heat from the conversion system.

SEE OR SEARCH THIS CLASS, SUBCLASS:
14, for current conversion systems operating at temperatures near absolute zero.

142 With means to connect the input to diverse power sources:
This subclass is indented under subclass 13. Subject matter having means to optionally connect power sources of differing electrical characteristics to the input of the converter system.

143 110/220 Volts A.C. in constant 110 Volts D.C. out:
This subclass is indented under subclass 142. Subject matter wherein the power sources are 110V A.C. and 220V A.C. and the converter system output is 110V D.C.

144 With conductive support mounting:
This subclass is indented under subclass 13. Subject matter having a structure which holds the converter means and which is capable of transmitting electricity.

145 Adapted for use with alternators:
This subclass is indented under subclass 144. Subject matter wherein the conductive support is designed to be utilized with an alternator.

146 Encased in plug housing:
This subclass is indented under subclass 13. Subject matter wherein the converter system in enclosed within a structure which has socket prongs or receptacles.

147 Integrated circuit:
This subclass is indented under subclass 13. Subject matter wherein the conversion means is composed of a combination of interconnected circuit elements inseparably associated on or within a continuous substrate.

148 PHASE CONVERSION (0_1 - 0_2) WITHOUT INTERMEDIATE CONVERSION TO D.C.:
This subclass is indented under the class definition. Subject matter wherein a system is provided which converts A.C. having one number of phases into A.C. having a different number of phases without intermediate conversion to D.C.

(1) Note. The output number of phases may be either greater or less than the input number of phases.

(2) Note. This class does not take those systems wherein a plurality of different single phase sources are combined to produce a polyphase output or wherein one or more single phase loads are connected to a polyphase source line.

SEE OR SEARCH THIS CLASS, SUBCLASS:
2+, where the system includes means for effecting phase conversion, and also a single current conversion.
9+, where the system includes means for effecting both phase and frequency conversions.
36, where the system includes means for effecting phase conversion, and also plural current conversion.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclasses 13+ for plural load circuits connected to a polyphase system; subclasses 43+ for systems interconnecting a plurality of supply circuits; but particularly subclasses 72+ for supplies having unlike electrical characteristics; and subclass 79 for current sources interconnected in series but out of phase with each other.
310, Electrical Generator or Motor Structure, subclass 160 for dynamoelectric frequency converter structure.
315, Electric Lamp and Discharge Devices: Systems, subclasses 138+ for electric systems for supplying alternating current to an electric lamp or gas or vapor type electronic tube where the system includes a phase converting means in the supply circuit. Subclass 138 provides for those systems where single phase current is converted to polyphase current.
329, Demodulators, subclasses 315+ for frequency demodulators and subclasses 345+ for phase demodulators.
331, Oscillators, subclass 45 for self-sustaining oscillator systems provided with plural output circuits, each output producing a wave of the same frequency, the waves being displaced in phase by a fixed angle (other than phase coincidence or phase opposition) so as to produce a polyphase set of currents or voltages.

149 With automatic voltage magnitude or phase angle control:
This subclass is indented under subclass 148. Subject matter wherein the system is provided with automatic current or voltage magnitude or automatic phase angle controls.

(1) Note. Phase angle control includes power factor control.

SEE OR SEARCH THIS CLASS, SUBCLASS:
74+, for automatic current or voltage magnitude control means.

SEE OR SEARCH CLASS:
323, Electricity: Power Supply or Regulation Systems, subclasses 212 through 303 for automatic phase and voltage regulators.

150 By dynamoelectric machine converter:
This subclass is indented under subclass 148. Subject matter wherein the converter includes a dynamoelectric machine.

(1) Note. See the class definition, Glossary, for a definition of dynamoelectric machine.

(2) Note. The dynamoelectric machine types commonly used as phase converters include motor-generator sets and practically every kind of A.C. motor and generator.

(3) Note. Although systems involving motor-generator sets are generally classified in Class 322, Electricity: Single Generator Systems, systems involving significant phase conversion are classified in this class (363). However, the generic place for motor-generator set systems are in Class 323. See the class definition, See Lines With Other Classes, Motor Generator Systems in Class 322, Electricity, Single Generator Systems:.

(4) Note. Since many of the problems of operation and control of dynamoelectric machine converters are analogous to the problems of operation and control of motors and generators (e.g., starting, speed control, excitation control, etc.) it is noted that analogous pertinent art is classified in the motor and generator classes.

SEE OR SEARCH THIS CLASS, SUBCLASS:
102+, for current conversion system having a dynamoelectric machine converter.
174+, for frequency conversion systems having a dynamoelectric machine converter.

SEE OR SEARCH CLASS:
310, Electrical Generator or Motor Structure, subclasses 10+ for miscellaneous dynamoelectric machine structures, and subclass 161 for phase shifter dynamoelectric machines.
318, Electricity: Motive Power Systems, appropriate subclasses for electric motor systems.
322, Electricity: Single Generator Systems, appropriate subclasses for electric generator systems; particularly subclass 16 for motor-generator set systems having simultaneous control of both motor and generator; subclass 39 for motor- generator set systems having motor control. See (3) Note above.
323, Electricity: Power Supply or Regulation Systems, subclasses 201 through 204 for control systems involving dynamoelectric machines.

151 By electron tube converter:
This subclass is indented under subclass 148. Subject matter wherein the converter includes an electronic tube.

(1) Note. See the class definition, Glossary for a definition of an electronic tube.

SEE OR SEARCH THIS CLASS, SUBCLASS:
111+, for current conversion systems having an electronic tube converter.
166+, for frequency conversion systems having an electronic tube-type converter.

SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous electron tube systems not otherwise classified.

152 By induction-type converter:
This subclass is indented under subclass 148. Subject matter wherein the conversion system includes an induction type converter.

(1) Note. The usual induction type converter is a transformer.

SEE OR SEARCH THIS CLASS, SUBCLASS:
170+, for frequency conversion systems having an induction type converter.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclass 215, 247, 301, 305, and 328 for control systems involving a transformer.

336, Inductor Devices, appropriate subclasses for the structure of electric transformers, per se.

153 Transformer type:

This subclass is indented under subclass 152. Subject matter wherein the induction type converter is a transformer.

154 Stationary:

This subclass is indented under subclass 153. Subject matter wherein the transformer has no moving parts.

155 With passive phase shift element:

This subclass is indented under subclass 154. Subject matter wherein the transformer converter system includes resistive, capacitive, or inductive elements for phase shifting.

SEE OR SEARCH THIS CLASS, SUBCLASS:

156, for phase conversion by passive phase shift elements.

156 By passive phase shift elements:

This subclass is indented under subclass 148. Subject matter wherein the phase conversion means includes resistive, capacitive, or inductive elements for phase shifting.

SEE OR SEARCH THIS CLASS, SUBCLASS:

155, for stationary transformer phase conversion with passive phase shift elements.

157 FREQUENCY CONVERSION (f_1-f_2) WITHOUT INTERMEDIATE CONVERSION TO D.C.:

This subclass is indented under the class definition. Subject matter wherein an input alternating current having a first value of frequency is converted directly into an output alternating current having a second value of frequency.

(1) Note. The output frequency may be either greater or less than the input frequency.

(2) Note. See the classes referred to in the class definition, under References To Other Classes, for analogous conversion systems in the communication arts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

8, for the systems wherein an alternating current of a first frequency is converted to an alternating current of a second frequency and then converted to direct current or vice versa (e.g., f_1-f_2-D.C. or D.C.-f_1-f_2).

9, for those systems wherein an input alternating current having a first frequency and a first number of phases is converted into an output alternating current having a second frequency and a second number of phases.

37, and 38, for the systems wherein an alternating current of a first frequency is rectified and the resulting direct current is derectified and converted into an alternating current of a second frequency (e.g., f_1-D.C.-f_2).

SEE OR SEARCH CLASS:

322, Electricity: Single Generator Systems, subclasses 14+ for generator systems wherein the output frequency may be controlled by combined control of generator and driving means; subclasses 29+ for automatic control of generator or driving means responsive to generator frequency; and subclasses 38+ for systems wherein the output frequency may be controlled by controlling the generator driving means.

329, Demodulators, subclasses 315+ for frequency demodulators and subclasses 345+ for phase demodulators.

331, Oscillators, appropriate subclasses for oscillator systems having an output frequency which is a beat frequency or a function of a control frequency; see particularly subclasses 37+ for beat frequency systems wherein two

sources of different frequencies are combined in a nonlinear device to produce a difference (sometimes sum) frequency; subclass 47 for plural oscillator systems wherein one oscillator varies the frequency of another; subclass 51 for cascaded oscillators of the frequency dividing type; subclass 53 for cascaded oscillators of the frequency multiplying type; subclasses 76 and 77 for oscillators combined with a particular harmonic producing or selecting network; subclasses 128 and 165+ for shock-excited resonant systems; and subclasses 145, 149, 153, and 172+ for oscillator systems of the electrically pulsed type.

158 By varactor:
This subclass is indented under subclass 157. Subject matter wherein a two-terminal solid-state device which utilizes the voltage variable capacitance of a PN junction is included in the conversion systems.

(1) Note. A varactor is also called a varactor diode, silicon capacitor, voltage-controlled capacitor, or voltage-variable capacitor.

159 By semiconductor converter:
This subclass is indented under subclass 157. Subject matter wherein the converter includes a semiconductor device.

(1) Note. See the class definition, Glossary, for the definition of semiconductor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
10, for combined phase and frequency conversion by semiconductor device converter.
37, for systems wherein an A.C. of a first frequency is rectified and the resulting D.C. is inverted into an A.C. of a second frequency by semiconductor rectifying and inverting means.
123+, for current conversion by semiconductor type conversion means.

160 Thyristor type:
This subclass is indented under subclass 159. Subject matter wherein the semiconductor device is of the thyristor type.

SEE OR SEARCH CLASS:
257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 107 through 181 for regenerative type devices, including thyristors.

161 Positive and negative groups:
This subclass is indented under subclass 160. Subject matter wherein thyristor type elements are combined in a circuit to form at least two groups, one of which operates during the positive half cycle of an A.C. input and the other during the negative half cycle.

(1) Note. A group may consist of a number of thyristor type elements connected in some well-known rectifier configuration, the output current from a group being able to flow in only one direction.

162 Including blanking or inhibiting means:
This subclass is indented under subclass 161. Subject matter including means for rendering noneffective a channel or controlling device for a desired interval.

163 Transistor type:
This subclass is indented under subclass 159. Subject matter where the semiconductor device is of the transistor type.

164 With automatic voltage magnitude control:
This subclass is indented under subclass 157. Subject matter wherein the frequency conversion system includes cooperating separate sensing and control means for regulating the magnitude of the output voltage.

SEE OR SEARCH THIS CLASS, SUBCLASS:
165, for frequency conversion with automatic frequency control.

165 With automatic frequency control:
This subclass is indented under subclass 157. Subject matter wherein means responsive to a predetermined condition acts upon the system to provide a control to maintain or vary the out-

put frequency of the system in response to that condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
164, for frequency conversion with automatic voltage magnitude control.

SEE OR SEARCH CLASS:
322, Electricity: Single Generator Systems, subclasses 17+ for miscellaneous generator systems having automatic control of generator or driving means, which control may be control of the output frequency.
331, Oscillators, subclasses 1+ for oscillation generation systems with automatic frequency stabilization.

166 By electron tube converter:
This subclass is indented under subclass 157. Subject matter wherein the converter includes an electronic tube.

(1) Note. See the class definition, Glossary, for a definition of an electronic tube.

SEE OR SEARCH THIS CLASS, SUBCLASS:
11, for combined phase and frequency conversion by electron tube converter.
38, for systems wherein an A.C. of a first frequency is rectified and the resulting D.C. is inverted into an A.C. of a second frequency by electron tube rectifying and inverting means.
111+, for current conversion systems having an electronic tube type converter.
151, for phase conversion systems where the converter includes an electronic tube.

SEE OR SEARCH CLASS:
84, Music, subclasses 674+ for electronic tube musical tone generators which may include frequency converters as subcombinations thereof.
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 113+ for miscellaneous repetition rate or frequency control or conversion.
329, Demodulators, particularly subclass 368 and 370 for an electron discharge demodulator device in an amplitude demodulator.
331, Oscillators, subclass 53 for cascaded oscillator systems of the frequency multiplying type, and subclasses 76 and 77 for oscillators combined with output coupling networks of the harmonic producing or selecting type. See the class definition of this class, Lines With Other Classes and Within This Class, for the line between Class 363 and Class 331, subclasses 53, 76, 77, and Class 328.

167 With discharge control means:
This subclass is indented under subclass 166. Subject matter wherein the electronic tube is provided with discharge control means.

(1) Note. The discharge control means may include a grid, igniter, magnetic element, etc.

SEE OR SEARCH CLASS:
323, Electricity: Power Supply or Regulation Systems, subclass 227 and 291 for current or voltage magnitude control systems having an electronic tube as the control means, wherein the electronic tube is provided with discharge control means.

168 Including plural anodes and single cathode device (e.g. vapor arc device):
This subclass is indented under subclass 167. Subject matter wherein the electronic tube is a device having more than one anode and only one cathode.

169 Thyratron type:
This subclass is indented under subclass 167. Subject matter wherein the electronic tube is of the thyratron type.

170 By induction-type converter:
This subclass is indented under subclass 157. Subject matter wherein the conversion system includes an induction-type converter.

(1) Note. The usual induction-type converter is a transformer.

SEE OR SEARCH THIS CLASS, SUBCLASS:

152+, for phase conversion systems having an induction converter.

SEE OR SEARCH CLASS:

336, Inductor Devices, appropriate subclasses for the structure of electric transformers, per se.

171 Transformer:

This subclass is indented under subclass 170. Subject matter wherein the induction-type device is a transformer.

172 Saturable core:

This subclass is indented under subclass 171. Subject matter wherein the saturation state of the core of the induction device is controlled to regulate its operation.

173 LC circuit:

This subclass is indented under subclass 170. Subject matter wherein the induction-type converter includes an LC circuit for regulating the frequency conversion.

174 Dynamoelectric machine:

This subclass is indented under subclass 170. Subject matter wherein the converter includes a dynamoelectric machine.

(1) Note. See the class definition, Glossary, for a definition of dynamoelectric machine.

(2) Note. Since many of the problems of operation and control of dynamoelectric machine converters are analogous to the problems of operation and control of motors and generators (e.g., starting, speed control, excitation control, etc.), it is noted that analogous pertinent art is classified in the motor and generator classes.

SEE OR SEARCH THIS CLASS, SUBCLASS:

102+, for current conversion systems having a dynamoelectric converter.

150, for phase conversion systems having a dynamoelectric converter.

SEE OR SEARCH CLASS:

310, Electrical Generator or Motor Structure, subclasses 10+ for miscellaneous dynamoelectric machine structure, particularly, subclass 160 for frequency converter structure.

318, Electricity: Motive Power Systems, appropriate subclasses for electric motor systems.

322, Electricity: Single Generator Systems, appropriate subclasses for electric generator systems.

323, Electricity: Power Supply or Regulation Systems, subclasses 201 through 204 for control systems involving dynamoelectric machines.

175 Motor generator type:

This subclass is indented under subclass 174. Subject matter wherein the dynamoelectric machine is of the motor generator type.

(1) Note. In this arrangement the input frequency is supplied to the motor and the output frequency is taken from the generator.

(2) Note. Although systems involving motor-generator sets are generally classified in Class 322, Electricity: Single Generator Systems, systems involving significant frequency conversion are classified in this class (363). However, the generic place for systems involving motor-generator sets is in Class 322. See the class definition, Lines With Other Classes.

SEE OR SEARCH THIS CLASS, SUBCLASS:

102, for current conversion systems which have a motor-generator converter.

150, for phase conversion systems which have a motor-generator converter.

SEE OR SEARCH CLASS:

322, Electricity: Single Generator Systems, subclass 16 for miscellaneous motor-generator set systems having simultaneous control of both motor and generator; subclasses 17+ for motor- generator set systems having automatic control of either the motor

or generator; subclass 39 for motor-generator systems having motor control.

323, Electricity: Power Supply or Regulation Systems, subclass 202 for current or voltage magnitude control systems involving balances sets (which are motor-generator sets).

176 Including induction motor:

This subclass is indented under subclass 174. Subject matter wherein the dynamoelectric machine is in the form of an induction motor.

(1) Note. The dynamoelectric machine does not drive any other device.

SEE OR SEARCH THIS CLASS, SUBCLASS:

150, for phase conversion systems wherein the converter is in the form of an induction motor.

SEE OR SEARCH CLASS:

310, Electrical Generator or Motor Structure, subclasses 166+ for induction motor structure.

318, Electricity: Motive Power Systems, subclasses 727+ for induction motor systems.

177 By circuit interrupter converter:

This subclass is indented under subclass 157. Subject matter wherein the converter is a circuit interrupter.

(1) Note. The circuit interrupter is a periodic switch. The usual types of switches used in the systems in this subclass are vibratory and rotary switches.

SEE OR SEARCH THIS CLASS, SUBCLASS:

106+, for current conversion systems having a circuit interrupter converter.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, subclasses 19.01+ for the structure of periodic switches.

307, Electrical Transmission or Interconnection Systems, subclasses 96+ for systems having intermittent regulatory interruption thereof, and subclasses 112+ for miscellaneous switching systems.

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 87+ for electromagnetically operated periodic switches.

361, Electricity: Electrical Systems and Devices, subclasses 139+ for relay switching systems.

178 MISCELLANEOUS:

This subclass is indented under the class definition. Subject matter not provided for in any of the subclasses above.

FOREIGN ART COLLECTIONS

Any foreign patents or non-patent literature from subclassesthat have been classified have been transferred directly to FOR listed below. These collections contain ONLY foreign patents or non-patent literature. The parenthetical references in the collection titles refer to the abolished subclasses from which these collections were derived.

FOR 100 With automatic control of the magnitude of the output voltage or current:

Subject matter which includes circuitry for the regulation of the output voltage or current.

FOR 101 Semiconductor type:

Subject matter which includes a semiconductor device as the converting element.

END