

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

CLASSIFICATION ORDER 1873

NOVEMBER 6, 2007

PROJECT E-6547

The following classification changes will be effected by this order:

	<u>Class</u>	<u>Subclass</u>	<u>Art Unit</u>	<u>Ex'r Search Room</u>
Abolished:	318	138, 254, 439	2837	OS0001
Established:	318	254.1, 254.2, 400.01-400.09, 400.1, 400.11-400.19, 400.2, 400.21-400.29, 400.3, 400.31- 400.39, 400.4, 400.41, 400.42	2837	OS0001

The following classes are also impacted by this order:

310, 327, 334, 388

This order includes the following:

- A. CLASSIFICATION MANUAL CHANGES
- B. LISTING OF PRINCIPAL SOURCE OF ESTABLISHED AND DISPOSITION OF ABOLISHED SUBCLASSES
- C. CHANGES TO THE USPC-TO-IPC CONCORDANCE
- D. DEFINITION CHANGES AND NEW OR ADDITIONAL DEFINITIONS

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1	ELECTRIC MOTOR WITH NONMOTOR DRIVING MEANS (E.G., AXLE DRIVE, MANUAL DRIVE)	568.24	...With reliability enhancement means (e.g., monitoring, redundant circuits, etc.)
2	.Manual driving means	568.25	....Including display device
3	WITH PARTICULAR MOTOR-DRIVEN LOAD DEVICE	569	..Digital or numerical systems
4	.Plural, diverse or diversely controlled load device	570	...Contouring systems
		571	...With "feed-rate" control
5	..Plural motor drive	572	...With "zero-offset" or tool radius correction
6	.Tension-maintaining type of motor-control system	573	...With interpolating means
7	..Plural, diverse or diversely controlled motors	574	...Multiple axes point to point systems
		575	..Multiple axes analog systems
8	.Plural, diverse or diversely controlled driving motors (e.g., driving differential gearing)	576	..Nonmechanical line, seam or edge followers
		577	....Optical or photoelectric line followers
9	.Power- or motion-transmitting mechanism		
10	..Reversible drive mechanism	578	...Cam or template followers
11	..Variable speed mechanism	579	...Multiple pass systems
12	...Gearing	580	.Vehicular guidance systems with single axis control
13	....Differential type		
14	..Motion-converting mechanism	581	..Radio-controlled
15	..Mechanical gearing	582	..Celestial navigation
16	SUPPLIED OR CONTROLLED BY SPACE-TRANSMITTED ELECTROMAGNETIC OR ELECTROSTATIC ENERGY (E.G., BY RADIO)	583	..Landing systems
		584	..Altitude or pitch control
17	PORTABLE-MOUNTED MOTOR AND/OR PORTABLE-MOUNTED ELECTRICAL SYSTEMS THEREFOR	585	..Roll control
		586	..Yaw control
		587	..Land vehicles
560	POSITIONAL SERVO SYSTEMS (E.G., SERVOMECHANISMS)	588	..Marine vehicles
		589	...Submarine and torpedo systems
561	.Adaptive or optimizing systems including "bang-bang" servos	590	.Multiple mode systems
		591	..With mode-engagement features (e.g., manual to automatic)
562	.Time-sharing or multiplexing systems	592	..Fine and coarse systems
563	.With protective or reliability increasing features (e.g., "fail-safe" systems)	593	...Separate fine and coarse motors
		594	...Digital systems
564	..Redundant" operating channels	595	...Multiple speed synchro systems
565	..Monitoring systems	596	..Combined "on-off" and proportional control
566	..Maneuver, force, or load-limiting		
567	.Program- or pattern-controlled systems	597	..Slewing systems
568.1	..With program recording or composing means	598	...With a separate slewing motor
		599	.Pulse-width modulated power input to motor (e.g., "duty cycle" systems)
568.11	...Multifunction manipulator (i.e., Robot)	600	.Digital or numerical systems
568.12	....Mobile robot	601	..Digital comparison
568.13	....With particular program teaching method	602	...Commutating switch-type encoder
		603	..Pulse-counting systems
568.14	....Manual lead through	604	..Analogue comparison
568.15	....With particular interpolation means	605	...Synchro or resolver (e.g., transmitter simulators)
568.16	....With particular sensing device		
568.17	....With multimode control (e.g., course-fine, position-force, etc.)	606	.Frequency- or phase-modulated systems
		607	..Frequency comparison
		608	..Phase comparison
568.18	.....Including velocity control	609	..Reset" systems (P.I.)
568.19	....With particular coordinate transformation means	610	..With rate (P. I. D.) (e.g., reset windup prevention)
568.2	....With plural control systems (e.g., the interaction of plural processors to control the plural joints of a single robot):	611	.With stabilizing features (e.g., anti-hunting, damping)
		612	..Electric braking near balance (e.g., dynamic)
568.21	.....Including end effector (e.g., gripping jaw, micromanipulator, etc.)	613	...D.C. in A.C. windings
		614	..Friction-braking near balance including magnetic or eddy current brakes
568.22	....With particular compensation (e.g., gain, offset, etc.)		
568.23	.....Including program modification		

Title Change
* Newly Established Subclass

@ Indent Change
& Position Change

POSITIONAL SERVO SYSTEMS (E.G., SERVOMECHANISMS)	655	....With synchro differential
.With stabilizing features (e.g., anti-hunting, damping)	656	...Differential transformer systems
615 ..By auxiliary feedback loop	657	...Linear differential transformer
616 ...Rate feedback	658	...."E" type transformer
617 ...Variable rate feedback	659	...."Microsyn" type
618 ....Tachometer feedback	660	...."Inductosyn" systems
619 ..Variable gain bandwidth	661	...Resolver systems
620 ..Nonlinear circuits	662	..Variable capacitor systems
621 ..Lead or lag networks	663	...Potentiometer systems including autotransformers and Wheatstone bridges
622 ...A.C. networks	664	....Minor arc seeking
623 ..Load stabilization (e.g., viscous, magnetic or friction dampers)	665	...Continuous rotation, unlimited range
624 ..By deadband at null (e.g., threshold circuits)	666	...Controlled tap and slidewire
625 ..Plural servomotors	667	...With a bridge in the feedback circuit
626 ..Limit or end-stop control	668	....Recalibrating systems
627 ..Secto-scanning systems	669	...Standing wave
628 .."Feelback" systems	670	...Contact resistance
629 ..Unwanted harmonic or voltage component elimination quadrature rejection systems	671	..With particular motor control system responsive to the "actuating signal"
630 ..Antibacklash systems (e.g., with unidirectional approach to balance)	672	..Discontinuous or "on-off" control
631 ..Antistatic friction features (e.g., "dither" voltage)	673	...Seeking switch type
632 ..With compensating features	674	...Wheatstone bridge type
633 .."Two-cycle error" compensation	675	..One transmitter or controller element follows another
634 ..Temperature compensation	676	..Transmitter or controller element returned (e.g., force balance systems)
635 ..With signal-, voltage-, or current-limiting	677	..With particular servoamplifier
636 .."Sampling" systems including miscellaneous "sampled data" control systems	678	...Differential amplifier
637 ..Analog computation	679	...Diverse types of amplifiers in different stage
638 ..With particular "error-detecting" means	680	...Magnetic servoamplifiers
639 ..Plural, diverse conditions	681	...Solid-state servoamplifiers
640 ..Photoelectric or optical-type measuring instruments	682	...Rotating amplifier (e.g., "Ward Leonard" control)
641 ..With particular temperature measuring instrument	683	..With particular phase discriminator
642 ..With liquid level measuring instruments	684	..With particular modulator or detector (e.g., choppers)
643 ..With moisture content or wetness measuring instruments	685	.. "Step-by-step" motors in closed-loop servos
644 ..With flow measuring instruments	686	..Reciprocating or oscillating motors
645 ..With fluid pressure measuring instruments	687	..Linear movement motors
646 ..With force or weight measuring instruments	688	..Shaded pole motors
647 ..With magnetic field measuring instruments	689	Torquing motors
648 ..With inertial, direction or inclination measuring instrument	690	SELF-SYNCHRONOUS TYPE OF MOTOR
649 ...Stable platforms	691	..With means to amplify transmitter signals
650 ..With current, voltage or electrical power measuring instruments	692	..Having induction or "selsyn" type transmitter
651 ..With acceleration measuring instruments	693	..Having impedance-type transmitter
652 ..With particular position measuring instruments	694	..Having commutated dynamoelectric machine transmitter
653 ...Magnetic transducers	695	..Having commutating switch-type transmitter
654 ...Synchro control transmitter-transformer systems	696	OPEN-LOOP STEPPING MOTOR CONTROL SYSTEMS
	34	PLURAL, DIVERSE OR DIVERSELY CONTROLLED ELECTRIC MOTORS
	35	..Motors with diverse motions (e.g., reciprocating and rotary motors)

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	PLURAL, DIVERSE OR DIVERSELY CONTROLLED	80	...Armature or primary circuit control
	ELECTRIC MOTORS	81	...Field secondary circuit control
37	.Plural reciprocating or oscillating motors	82	..Armature or primary circuit control
		83	...Series-parallel armature circuit connections
38	.Plural linear-movement motors		
39	.Work and feed motors (e.g., indexing)	84	..Field or secondary circuit control
40	.Motor biased against rotation	85	.Synchronizing or phasing control
41	.Having electrical synchronizing interconnections	86	.Braking
		87	..Motor used as braking generator (dynamic braking)
42	..Between windings on auxiliary dynamo-electric machines	88	...Load or current division during braking
43	..D.C. or A.C. commutator motors with slip rings	89	...Motor as exciter for another motor
44	..Between induction motor secondaries	90	.Acceleration control
45	.Mechanically coupled in fixed ratio of movement	91	..Accelerating motors in succession or selectively
46	..Motors having unlike operating characteristics	92	..Control of both armature (or primary) and field (or secondary) circuits
47	...Synchronous and nonsynchronous motors	93	...Series-parallel connected armature or primary circuits
48	..Mechanically coupled in torque opposition	94	..Armature or primary circuit control
49	.Motors electrically connected in cascade or tandem	95	...Series-parallel connections
		96	...With armature circuit impedance
50	..With means for effecting other motor interconnections	97	..Field or secondary circuit control
51	.Plural, diverse motor controls for different motors	98	.Load control
		99	..Fixed ratio of load or current division
52	.Slipping and/or racing control for electric motors	100	...By field or secondary circuit control
53	.Plural, diverse motor controls	101	.Starting and/or stopping
54	..Motor-reversing	102	..Sequential or successive starting and/or stopping
55	...With running-speed control		
56	...And braking	103	..Selective starting and/or stopping
57	...And braking	104	..Armature (or primary) circuit control
58	...And acceleration control	105	.Plural, diverse or diversely controlled sources of armature (or primary) supply
59	..Running-speed control		
60	...And braking	106	..Diverse sources
61	...And acceleration control	107	...A.C. and D.C.
62	...And automatic starting and/or stopping and/or with time delay	108	...Different voltages
		109	...Different voltages
63	..Braking	110	...Different frequencies
64	..Acceleration control	111	.Series-parallel connected motors
65	.Motor-reversing	112	.Parallel connected motors
66	.Running-speed control	113	.Series connected motors
67	..Diverse speeds for different motors	114	IMPACT, MECHANICAL SHOCK, OR VIBRATION-PRODUCING MOTORS
68	..Relative motor speed control		
69	...With speed-difference detector	115	MOTOR WITH DIVERSE MOTIONS (E.G., ROTARY AND RECIPROCATING)
70	....Electrical-type detectors		
71	.....Voltage and/or current difference detector	116	NONMAGNETIC MOTOR
		117	.Thermoelectric motor
72	.....Dynamoelectric machine detector	118	MAGNETOSTRICTIVE MOTOR
73	.....Synchronously operated impedance detectors	119	RECIPROCATING OR OSCILLATING MOTOR
		120	.Stopping after predetermined number of reciprocations or cycles (including single cycle)
74	.....Synchronously actuated switch detectors		
75	.....Plural switches connected in series	121	.Having means to produce a progressing or traveling motor field flux
76	....Differential-gearing detector	122	.Plural, diverse or diversely controlled motor windings
77	...Controlling motor speed in response to speed of another motor		
78	....Controlling A.C. frequency or rate of electrical impulses to other motor		
79	...Control of both armature (or primary) and field (or secondary) circuits		

Title Change
* Newly Established Subclass

@ Indent Change
& Position Change

	RECIPROCATING OR OSCILLATING MOTOR	162		CONTROL BY PATTERNS OR OTHER PREDETERMINED SCHEDULE MEANS
	..Plural, diverse or diversely controlled motor windings	163		..Motor running-speed control
123	..Polyphase or diverse or diversely controlled sources of motor supply	164		..Cyclically varying or repeated speed schedules
124	...A.C. and D.C. sources	700		SYNCHRONOUS MOTOR SYSTEMS
125	..Unidirectionally conductive devices in energizing circuit	* 400.01		..Brushless motor closed-loop control
126	..Energizing winding circuit control	* 400.02		..Vector control (e.g., dq-axis control, 3-2 phase conversion, etc.)
127	..Automatic in response to predetermined position, movement or condition in or of the motor or driven device	* 400.03		..Plural reference comparison (e.g., reference changes during startup, upper/lower reference, etc.)
128	...Noise, sound, vibration, movement or position of motor	* 400.04		..Specific processing of feedback signal or circuit therefore (i.e., A-D conversion, compression, or modification)
129	..By means for producing periodic electrical pulses in the energizing circuit	* 400.05		...With reference signal generation (e.g., from external system, mechanical oscillator, etc.)
130	...Electrical oscillation or condenser charging and/or discharging circuits	* 400.06		...Comparator circuit or method
131	...Motor or escapement-controlled means	* 400.07		...Plural diverse feedback (e.g., torque and speed, load and speed, etc.)
132	..By space-discharge or unidirectionally conductive devices in energizing circuit	* 400.08		..With nonmotor parameter or remote condition detected (e.g., temperature, light, airflow, position of diverse object, etc.)
133	..By impedance devices in energizing circuit			..Plural mode control (e.g., open and closed loop, starting and braking, plural-phase and single-phase operation, open and closed loop, etc.)
134	..By circuit making and/or braking devices	* 400.09		...With timing or delay
135	LINEAR-MOVEMENT MOTORS			...With separate starting mode or "ramp-up" mode (e.g., open-loop control for startup, startup initialization, etc.)
136	AUXILIARY MEANS FOR PRODUCING MECHANICAL STARTING OR ACCELERATING TORQUE	* 400.1		...With table lookup, stored map, or memory table (e.g., speed table, stored current profile, etc.)
137	..By auxiliary motor	* 400.11		..With timing, delay, or clock pulse counting circuit or generation
139	BATTERY-FED MOTOR SYSTEMS			...Phase shifted as function of speed or position
140	GENERATOR-FED MOTOR SYSTEMS HAVING GENERATOR CONTROL			..With torque or load determination (e.g., by calculation, detection, or estimation, etc.)
141	..Automatic generator control and/or with time-delay means	* 400.12		..Control or position information digitally stored on disk (e.g., computer hard drive position detection, etc.)
142	..Responsive to diverse conditions or with time-delay means	* 400.13		..Modification or waveshaping of switching control signal (e.g., switching control input to inverter, etc.)
143	...Plural electrical conditions	* 400.14		..With manual control (e.g., foot switch, surgical tool, etc.)
144	..Armature or primary current of motor	* 400.15		..Slew rate control (e.g., slew limiting, etc.)
145	..Terminal voltage or counter e.m.f. of motor	* 400.16		
146	..Speed of motor or driven device			
147	..Speed or frequency of generator or its drive means	* 400.17		
148	..Alternating-current-motor system			
149	..With plural, diverse or diversely controlled generators	* 400.18		
150	..With flywheel on generator or on motor	* 400.19		
151	..Control of both the generator and the circuit to the motor			
152	..With motor control			
153	..Control of both the generator and the motor			
154	..Control of excitation (field) circuit of both			
155	..Plural, diverse or diversely actuated, generator control means			
157	..Generator speed control			
158	..Generator field circuit control			
159	HAVING ROTOR ELEMENT BIASED AGAINST ROTATION			
160	..By resilient biasing means (e.g., spring)			
161	WITH FLYWHEEL OR MASSIVE ROTARY MEMBER			

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	SYNCHRONOUS MOTOR SYSTEMS	704	.Pole changing motor winding circuits
	.Brushless motor closed-loop control	705	.Synchronization systems
* 400.2	..Phase voltage wave-shaping circuit or method (e.g., output from inverter, phase energizing signal, trapezoidal wave, etc.)	706	..With armature power removal upon failure to synchronize or loss of synchronism
* 400.21	..Having protection means (e.g., switching circuit protection, stall protection, failure to start, "wrong" direction, etc.)	707	...Upon failure to resynchronize
		708	...Responsive to thermal electrical element in system
		709	..Having different armature voltage prior to synchronism
* 400.22	...Current or voltage limiting (e.g., over-voltage or over-current protection, etc.)	710	..With d.c. field removal
		711	...With electronic control element in system
* 400.23	..Torque ripple stabilization or acoustic noise attenuation (e.g., cogging prevention, etc.)	712	..With field excitation application
		713	...Responsive to slip voltage frequency in d.c. field winding
* 400.24	..Electrical noise attenuation (e.g., EMI, EMR, RFI, etc.)	714	...Responsive to armature current
* 400.25	...Switching noise transient attenuation (e.g., switching error prevention, masking, blanking, etc.)	715	...Responsive to rotor speed or rotor driven member
* 400.26	..switching circuit structure or component (e.g., inverter, bridge circuit, etc.)	716	.Field winding circuits
		717	..Responsive to a motor condition
		718	...Induced voltage in field winding
		719	...Speed responsive field power sources
* 400.27	...Having both high-side and low-side switching elements for plural-phase motor	720	.Armature winding circuits
		721	..Responsive to rotor shaft position or speed
* 400.28	...Diverse high side or low side switching	722	..Having electronic power conversion circuit
* 400.29	...H-bridge	723	..Having variable frequency supply
* 400.3	..Power supply voltage feature (e.g., power supply voltage, V_{cc} compensation, rectifier circuit, power regulator, auxiliary or secondary power supply, etc.)	724	..Having a plurality of windings or winding portions
		725	REPULSION MOTOR SYSTEMS
		726	.With added motor winding or convertible to series motor
* 400.31	..Utilization or dissipation of stored or collapsing field energy (e.g., freewheeling, discharging one winding through another, etc.)	727	INDUCTION MOTOR SYSTEMS
		728	.Repulsion start
		729	.Power-factor control
* 400.32	..Sensorless feedback circuit	730	.With plural separately movable rotors
* 400.33	...Voltage injection detection (e.g., voltage injected at startup to determine position, etc.)	731	.With voltage source connected to motor secondary
		732	..Electronic device controls current in secondary circuit
* 400.34	...Electromotive force sensor (e.g., back or counter EMF sensor, etc.)	733	..Commutator connected to secondary winding
* 400.35	...With zero-crossing detection (e.g., polarity reversal, etc.)	734	..Slip rings connected to secondary winding
* 400.36	...With center-tap feedback circuit	735	..Rotor shaft coupled to dynamoelectric machine
* 400.37	..With sensor structure (e.g., tachometer, reed switch, cam-controlled switching, etc.)	736	....Slip rings connected to dynamoelectric machine winding
* 400.38	...Magnetic field sensor or responsive device (e.g., Hall element, magneto-resistance, etc.)	737	.Self-cascaded motor windings
		738	.With commutated winding
* 400.39	...Rotating sensor component separate from motor structure (e.g., resolver, magnetically sensed rotating disk, etc.)	739	.Reversing
		740	..With diverse motor operation
		741	...With braking
		742	....Electromagnetic brakes
* 400.4	...Optical sensor (e.g., encoder, photodetector, etc.)		
* 400.41	..Having specific motor structure (e.g., bifilar windings, airgap dimension, auxiliary winding, phase winding with midtap, etc.)		
* 400.42	.Brushless motor open-loop control		
	701 .Hysteresis or reluctance motor systems		
	702 .Antihunting or damping		
	703 .Braking		

Title Change
* Newly Established Subclass

@ Indent Change
& Position Change

INDUCTION MOTOR SYSTEMS	782	....With protective features
.Reversing	783	.....Thermal starting and thermal overload protection
..With diverse motor operation		
...With braking	784	....Impedance for reducing current during starting operation
....Electromagnetic brakes		
743	785	....Start winding removed during running operation
744		
745	786	....By electronic switch
..With controlled saturable reactor in primary circuit	787	.....With transformer for sensing the run winding current
746		
747	788	.....With variable temperature coefficient resistor in switch control circuit
748		
...With plural primary windings or winding portions having common connection	789	....By electromagnetic switch
749	790	.....With relay coil in series with main winding
750		
751	791	....By thermal switch
...Split phase motor with capacitor interchangeably connected in series with either primary winding	792	.....With variable temperature coefficient impedance element
752	793	....By centrifugal switch
....With controlled electronic device to provide the series connection	794	....Capacitor run motor with different capacitance at starting
753		
754	795	....With plural capacitors
....With separate winding or winding portion energized for each direction of rotation	796	....Saturable winding in capacitor run motor circuit
755	797	....Phase splitting using stator winding mutual inductance or saturable winding
756		
..With controlled electronic switch for phase reversal	798	..Responsive to motor condition
757	799	...Responsive to speed or rotation phase angle
758		
759	800	....With controlled power conversion
760	801	.....Including inverter
...Direct current primary winding braking circuit	802	.....Responsive to an additional condition
761	803	.....With controlled a.c. to d.c. circuit in inverter supply
....Rotating rotor controls braking current in primary winding		
762	804	....With controlled magnetic reactance
....With a.c. to d.c. conversion circuit	805	...Responsive to motor voltage
763	806	..Condition responsive
764	807	..Frequency control
...Three phase power reversal	808	...With voltage magnitude control
765	809	...With voltage phase angle control
..Eddy current braking circuits	810	...With voltage pulse time control
766	811	....Pulse width modulation or chopping
..Primary and secondary circuits	812	..Voltage control
767	813	...With transformer
..Primary circuit control	814	...With impedance control
768	815	....Saturable reactor
..Three phase motor operated from single phase source	816	...Single phase, split phase motors
769	817	...With capacitor
..With dynamoelectric converter	818	..Secondary circuit control
770	819	..Open secondary member or portion thereof with means to open or close the circuit thereto
771		
..Delta-wye, plural wye, or plural delta connected primary windings	820	..Closed secondary member or member portion with means to change electrical characteristics thereof
772		
..Plural speed	821	..Impedance control of secondary circuit
773		
...Pole changing		
774		
....Single phase motor		
775		
.....Separate primary running winding for each pole number, alternately energized		
776		
.....Entire primary running winding energized for each running speed		
777		
....Separate primary running winding for each pole number, alternately energized		
778		
..Starting control		
779		
...With speed control		
780		
...Three phase motor with variable transformer to initially adjust voltage to motor windings		
781		
...Operating from a single phase source		

Title Change
* Newly Established Subclass

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	INDUCTION MOTOR SYSTEMS	276	.Acceleration control
	.Secondary circuit control	277	..With automatic starting and/or stopping
822	..Impedance control of secondary circuit		...In response to an electrical condition
823	...Responsive to motor condition	278	....Automatic stopping means less responsive during acceleration
824	....Rotor speed or position responsive		
	.....Centrifugal force of rotor controls secondary circuit impedance	279	
825	....Induction motor current	280	MOTOR-REVERSING
826	....Primary motor current	281	.Periodic- or intermittent-reversing
827	....Frequency of secondary current	282	..In response to movement or position (e.g., limit of travel) of motor or driven device
828	....Secondary voltage		
829	..By manual operation	283	.Automatic and/or with time-delay means
830	.With relatively movable cooperating motor parts to control energized motor	284	..With means to delay reversing until motor substantially stops
831	..Axially movable cooperating parts	285	..Instant of, or passage or predetermined time or having time-delay means
832	..Dual stators, one or both angularly movable		
244	ALTERNATING CURRENT COMMUTATING MOTORS	286	..Movement or position of motor or driven device
245	.Universal or A.C.-D.C. motors	287	.Armature or primary circuit control
246	SERIES MOTORS	288	..Plural, diverse or diversely controlled armature windings
247	.Convertible for nonseries motor operation	289	...Phase-reversal
248	.With plural, diverse or diversely connected or controlled sources of e.m.f.	290	...Selectively energized windings
249	.Control by motor circuit impedance	291	..Armature or primary current reversal
250	..Impedance in series with field windings and in parallel to armature winding	292	...By shifting motor brushes or selecting appropriate set of brushes
251	.Field circuit control	293	...Reversing polarity of current supplied to armature circuit
252	..Plural, diverse or diversely connected or controlled field coils	294	...Wheatstone bridge type
253	HOMOPOLAR OR UNIFORM FIELD MOTORS	295	...Potentiometer-controlled
* 254.1	SWITCHED RELUCTANCE MOTOR COMMUTATION CONTROL	296	.Field circuit control
* 254.2	.Having asymmetric half-bridge	297	..Plural, diverse or diversely controlled field windings
255	PLURAL DIVERSE MOTOR CONTROLS	298	...Simultaneous energization
256	.Motor-reversing	299	...With means for short-circuiting a winding
257	..With running-speed control	300	..Field-circuit current reversed
258	...And braking		
259	...And acceleration control		
260	...And acceleration control		
261	..With braking		
262	...And acceleration control		
263	..With acceleration control		
264	..With automatic starting and/or stopping	362	BRAKING
265	...Stopping upon predetermined movement of or position of motor or driven device	363	."Spotting" or adjustment of braking controller during coasting
266	....At limit-of-travel of motor or driven device	364	.Automatic and/or with time-delay means
267	....Dual control circuits alternately energized	365	..Plural diverse conditions or with time delay
268	.Running-speed control	366	..Condition of motor or driven device
269	..With braking	367	...Armature or primary current
270	...And acceleration control	368	...Armature or primary circuit voltage or terminal or counter e.m.f. voltage
271	..With acceleration control	369	...Speed, acceleration, movement or position of motor or driven device
272	..With automatic starting and/or stopping	370	.Plural, diverse or diversely controlled braking means
273	.Motor braking		
274	..With acceleration control		
275	..With automatic starting and/or stopping		

Class 388 subclasses 800-841 are an integral part of this Class (Class 318), as shown by the position of this box, and follows the schedule hierarchy of this Class, retaining all pertinent definitions and Class lines of this class.

	BRAKING	450	..Electrical detector
	.Plural, diverse or diversely controlled braking means	451	..Mechanically vibrating device as reference device (e.g., tuning fork)
371	..Including both friction braking "plugging" and/or dynamic braking	452	.Plural, diverse conditions or with time-delay means
372	.Friction braking	453	..Electrical condition
373	."Plugging" or application of reverse power to motor	454	...Plural, diverse electrical conditions
374	..Energy flow interrupted when motor stops	455	...Voltage and current (e.g., watts)
375	.Dynamic braking	456	.Rate-of-change of a condition
376	..Regenerative	457	..Interia-type detector
377	..With additional source of e.m.f.	458	..Electrical condition
378	....In series with armature or primary circuit	459	.Terminal voltage or counter-electromotive force of controlled motor
379	..Locally closed armature circuit	460	.Sound, supersonic vibration or mechanical vibration
380	...Closed through impedance or the like	461	.Speed or rate-of-movement
381	...With field or secondary circuit control	462	..Centrifugal-type detector
382	.By auxiliary electric generator or by magnetic attraction or repulsion devices	463	..Tachometer-type detector
		464	...Electric generator tachometer
		465	..In excess of a predetermined valve
383	"ANTI-BRAKING" OR BRAKING-PREVENTION MEANS	466	.Movement, position, or limit-of-travel
		467	..Plural sensing means for determining plural positions or plural limits-of travel
		468	..Limit-of-travel control means
		469	...Overloading limit-of-travel-type control means
		470	..Magnitude of movement or revolutions
		471	..Responsive to thermal conditions
430	MOTOR LOAD, ARMATURE CURRENT OR FORCE CONTROL DURING STARTING AND/OR STOPPING	472	..Of motor control means
		473	..In or about the motor being controlled
431	.Initial, "cracking" or "starting from rest" torque control	474	.Motor load, armature or primary or secondary circuit current
432	CONSTANT MOTOR CURRENT, LOAD AND/OR TORQUE CONTROL	475	..Mechanical-type detector (e.g., by yielding spring devices)
433	.Control of motor load or device driven	476	..In excess of a predetermined magnitude
434	LIMITATION OF MOTOR LOAD, CURRENT, TORQUE OR FORCE (E.G., PREVENTING OVERLOAD)	477	...Intentionally increased load
		478	.Electrical conditions in circuit other than controlled motor circuit
436	NONRUNNING, ENERGIZED MOTOR	479	..Voltage
437	PHASING OR ANGULAR OR LINEAR POSITIONAL CONTROL OF MOVABLE ELEMENT OF THE MOTOR	480	.Radiant energy
		481	.Pressure in a fluid or granular material
438	POWER FACTOR CONTROL OF ARMATURE OR LINE CIRCUIT	482	.Level of fluid or granular material
		483	.Moisture content or wetness
440	HAVING PLURAL, DIVERSE OR DIVERSELY CONTROLLED SOURCES	484	.Time or with time-delay means
441	.A.C. and D.C.	485	..Dash-pot or other mechanical delay means
442	.Different voltages	486	..Pilot- or servo-motors
443	PERIODIC, REPETITIOUS OR SUCCESSIVE OPERATIONS CONTROL OF MOTOR, INCLUDING "JOG" AND "INCH" CONTROL	487	..Electromagnetic or inductive time-delay means
444	.Variable periods or intervals between controlling operations	488	.Responsive to stress in body or material
445	AUTOMATIC AND/OR WITH TIME-DELAY MEANS (E.G., AUTOMATIC STARTING AND/OR STOPPING)	489	.Responsive to direction, inclination or angular position of bodies
		490	WITH SIGNALS, METERS, RECORDERS OR TESTING DEVICES
446	.With nonautomatic control means (e.g., manual)		
447	.Nonresponsive or less responsive for limited periods		
448	.Anti-hunting		
449	.With respect to a fixed standard, master or reference device		

Class 388 subclasses 842-860 are an integral part of this Class (Class 318), as shown by the position of this box, and follows the schedule hierarchy of this Class, retaining all pertinent definitions and Class lines of this class.

491 CONTROL OF BOTH MOTOR CIRCUIT AND MOTOR STRUCTURE
 492 MOTOR MAGNETIC ENERGY DISSIPATION
 493 CONTROL OF BOTH ARMATURE (OR PRIMARY) CIRCUIT AND FIELD (OR SECONDARY) CIRCUIT
 494 ARMATURE (OR PRIMARY) CIRCUIT CONTROL
 495 .Plural, diverse or diversely controlled, armature or primary windings
 496 ..Polyphase windings
 497 ..Series-parallel
 498 ..Energized or controlled in predetermined sequence
 499 ..Wound or energized in magnetic opposition
 500 .Plural sources of voltage (including counter e.m.f. cells)
 501 .By shunting armature or primary winding
 502 .Variable length or tapped armature winding
 503 .Frequency or pulsation control
 504 .Voltage control
 505 .By means to space-discharge devices
 506 ..Plural, diverse or diversely connected or controlled space-discharge devices
 507 ..Having discharge-control means (e.g., grids)
 508 .Impedance-controlled
 509 ..Plural, diverse or diversely controlled impedances
 510 ...Including both reactor and condenser
 511 ..Inherently or self-variable impedance
 512 ..Inductive reactor controlled
 513 ...Having auxiliary means for saturating reactor core
 514 ..Resistor-controlled
 515 ...Having short-circuiting means
 516 ...Short-circuited step-by-step
 519 .By armature or primary circuit-making and/or breaking
 520 ..Electromagnetically actuated
 521 FIELD OR SECONDARY CIRCUIT CONTROL
 523 .Plural, diverse or diversely connected or controlled field windings
 524 ..Convertible number-of-poles type (e.g., 4-pole or 6-pole)
 525 ..Differentially wound or energized windings
 526 ..Series-parallel
 527 ..Series field winding
 528 ..With means to short circuit a field winding
 529 ..Selectively energized
 530 .Plural, diverse or diversely connected or controlled sources of field circuit voltage
 531 .Variable length or tapped field winding
 532 .By means of space-discharge device in field circuit
 533 .Impedance-controlled
 534 ..Plural, diverse or diversely connected or controlled field circuit impedances

535 ...Wheatstone bridge
 536 .By field circuit making and/or breaking
 537 ..Intermittently operated
 538 MOTOR STRUCTURE ADJUSTMENT OR CONTROL
 539 .Both armature and field structures rotatable or adjustable
 540 .Rotor element movable axially
 541 .Brush or other current-collector control
 542 ..Having movement toward or from cooperating part (e.g., brush lifted from commutator)
 543 THREE-OR-MORE-POSITIONS MOTOR CONTROLLER SYSTEMS
 544 .With other motor control device
 545 ..Main line switch
 546 .Plural, diverse or diversely controlled controllers
 547 ..Plural control stations
 548 .Plural control stations
 549 .Return to "off", "starting" or "neutral" positions
 550 ..Power-operated controllers
 551 .Knee- or foot-operated controllers
 552 .Power-actuated controllers
 553 ..Separately actuated controller contacts
 554 ...Electromagnetic actuated
 555 ..Electromagnetic actuated
 556 ...Reciprocating or oscillating electromagnetic means
 557 ...Intermittent or step-by-step operation
 558 MISCELLANEOUS

 FOREIGN ART COLLECTIONS

FOR 000 CLASS-RELATED FOREIGN DOCUMENTS

Any foreign patents or nonpatent literature from subclasses that have been reclassified have been transferred directly to the FOR Collections listed below. These Collections contain ONLY foreign patents or nonpatent literature. The parenthetical references in the Collection titles refer to the abolished subclasses from which these Collections were derived.

* FOR 100 SPACE-DISCHARGE-DEVICE COMMUTATED MOTOR (318/138)
 * FOR 101 SELF-COMMUTATED IMPULSE OR RELUCTANCE MOTORS (318/254)
 * FOR 102 MOTOR COMMUTATION CONTROL SYSTEMS (318/439)

 DIGEST

 DIG 2 Windshield wiper controls

Title Change
 * Newly Established Subclass

@ Indent Change
 & Position Change

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C. CHANGES TO THE USPC-TO-IPC CONCORDANCE

<u>Class</u>	<u>UPSC</u> Subclass	<u>IPC</u> Subclass	<u>Notation</u>
318	254.1	H02P	25/08
	254.2		25/08
	400.01		6/00
			6/14
	400.02		21/00
	400.03		6/06
	400.04		6/16
	400.05		6/06
	400.06		6/06
	400.07		6/16
	400.08		6/00
	400.09		1/04
	400.1		6/04
	400.11		6/04
	400.12		6/16
	400.13	H03K	5/00
	400.14	H02P	23/12
	400.15		6/12
	400.16		6/00
	400.17		1/04
	400.18		1/00
	400.19		1/04
	400.2	H03K	5/00
	400.21	H02H	7/08
	400.22		7/09
	400.23	H02P	6/10
		H02K	29/06
	400.24	H02P	6/00
	400.25		6/00
	400.26		6/14
	400.27		6/14
	400.28		6/14
	400.29		6/00
	400.3		27/00
	400.31		27/00
	400.32		6/00
		H02K	29/06
	400.33	H02P	1/04
	400.34		6/18
	400.35		6/00
			6/16
	400.36		6/00
		6/16	
400.37	H03K	29/12	
400.38		29/08	
400.39		29/08	
400.4		29/10	

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C. CHANGES TO THE USPC-TO-IPC CONCORDANCE

<u>Class</u>	<u>UPSC</u> <u>Subclass</u>	<u>Subclass</u>	<u>IPC</u> <u>Notation</u>
318	400.41	H03K	3/00
		H02P	25/00
	400.42		6/00
			6/14

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D. CHANGES TO THE DEFINITIONS

CLASS 310 - ELECTRICAL GENERATOR OR MOTOR STRUCTURE

Definitions Modified

Subclass 220: Under SEE OR SEARCH CLASS

Delete:

The reference to Class 318

Insert:

318, Electricity: Motive Power Systems, subclasses 400.1-400.42 for electric motor systems having means to control the commutation.

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D. CHANGES TO THE DEFINITIONS

CLASS 318 - ELECTRICITY: MOTIVE POWER SYSTEMS

Definitions Abolished

Subclasses

138, 254, 439

Definitions Modified

Subclass 244: Under SEE OR SEARCH THIS CLASS, SUBCLASS

Delete:

The reference to subclass 138

Insert:

400.1, through 400.42, for synchronous motor commutation control systems.

Subclass 494: Under SEE OR SEARCH THIS CLASS, SUBCLASS

Delete:

The references to subclasses 138, 254, and 439

Insert:

254.1, and 254.2, for this subject matter where the motor is a self-commutated impulse or reluctance motor.

400.1, through 400.42, for motor commutation control systems.

Subclass 505: Under SEE OR SEARCH THIS CLASS, SUBCLASS

Delete:

The reference to subclass 138

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D. CHANGES TO THE DEFINITIONS

Insert:

400.1, through 400.42, for synchronous motor commutation control systems.

Subclass 696: Under SEE OR SEARCH THIS CLASS, SUBCLASS

Delete:

The reference to subclass 138

Insert:

400.42, for open-loop commutated motors.

Subclass 700: In the (2) Note, after “appropriate subclass.”

Delete:

See subclass 254.

Subclass 700: Under SEE OR SEARCH THIS CLASS, SUBCLASS

Delete:

The reference to subclass 254

Insert:

254.1, and 254.2, see (2) Note above.

Subclass 701: Under SEE OR SEARCH THIS CLASS, SUBCLASS

Delete:

The reference to subclass 254

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D. CHANGES TO THE DEFINITIONSInsert:

254.1, and 254.2, for motor systems having a self-commutated motor in which the rotor tends to assume positions of minimum magnetic reluctance when energized.

Subclass 722: Under SEE OR SEARCH THIS CLASS, SUBCLASS

Delete:

The reference to subclass 138

Insert:

400.1, through 400.42, for synchronous motor commutation control systems.

Subclass 738: Under SEE OR SEARCH THIS CLASS, SUBCLASS

Delete:

The references to subclasses 138 and 439

Insert:

400.1, through 400.42, for synchronous motor commutation control systems.

Definitions Established**254.1 SWITCHED RELUCTANCE MOTOR COMMUTATION CONTROL:**

Subject matter under the class definition in which the rotor element tends to assume a predetermined angular position when the motor is continuously energized and is provided with a commutator or circuit making and breaking device which is actuated by the motor to determine the instants of time at which the field producing windings thereof are energized and de-energized relative to the angular position of the rotary element.

- (1) Note. In a switched reluctance motor, there are no permanent magnets and no windings on the rotor and the rotor assumes a position to minimize reluctance. Therefore, these motors are capable of high speeds, but produce little torque.
- (2) Note. Typically, three-phase switched reluctance motors are in a 6/4 form, that is six stator and four rotor poles.

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D. CHANGES TO THE DEFINITIONS

SEE OR SEARCH THIS CLASS, SUBCLASS:

701, for reluctance synchronous motors.

254.2 Having asymmetric half-bridge:

Subject matter under subclass 254.1 wherein the circuit making or breaking means includes a bridge circuit wherein each side of the bridge contains both a transistor (or switch) and a diode and the motor is connected between the transistor and the diode.

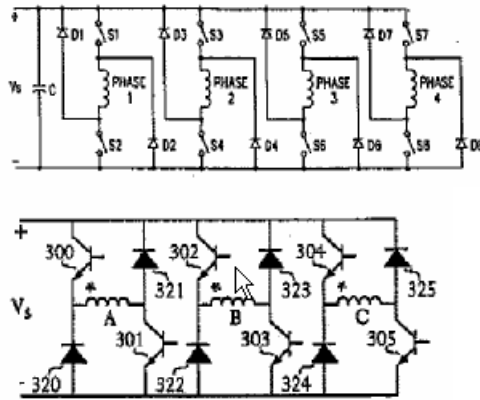


Figure 1. Typical circuit configurations.

SEE OR SEARCH THIS CLASS, SUBCLASS:

701, for reluctance synchronous motors.

400.01 Brushless motor closed-loop control:

Subject matter under subclass 700 for controlling the currents or voltages in (or supplied to) the motor phases (or windings) to control motor performance (or produce torque) without motor-controlled mechanical switches (i.e., commutators, brushes, slip rings, etc.) by generating a feedback signal in response to any motor parameter (e.g., speed, position, load, torque, current, voltage, acceleration, etc.) and controlling the motor in response to the feedback signal.

(1) Note. Brushless motors are often called “self-commutating” motors.

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D. CHANGES TO THE DEFINITIONS

- (2) Note. This subclass may also include subject matter wherein the motor is controlled by an additional or remote parameter signal (e.g., light, temperature, fluid flow, position of a work piece, etc.). However, in this case, the motor is also controlled by a feedback signal in response to any motor parameter (e.g., speed, position, torque, load, current, voltage, acceleration, etc.).

SEE OR SEARCH CLASS:

- 388, Electricity: Motor Control Systems, subclasses 800-824 for closed-loop speed control of motors having commutators and subclasses 842-847 for closed-loop acceleration control of motors having commutators.

400.02 Vector control (e.g., dq-axis control, 3-2 phase conversion, etc.):

Subject matter under subclass 400.01 in which the feedback loop includes a means to convert multiphase currents or voltages supplied to the motor phases (or windings) to a two-phase representation of a related motor parameter (e.g., flux, rotor angle current vector, etc.) which is used to control the motor.

SEE OR SEARCH CLASS:

- 307, Electrical Transmission or Interconnection Systems, subclass 151 for miscellaneous electrical conversion systems.
- 341, Coded Data Generation or Conversion, appropriate subclasses for conversion of data, per se.
- 363, Electric Power Conversion Systems, subclasses 1-12 for frequency and phase converters and subclass 150 for phase conversion using dynamoelectric machines.

400.03 Plural reference comparison (e.g., reference changes during startup, upper/lower reference, etc.):

Subject matter under subclass 400.01 in which the feedback signal is compared against more than one reference value.

400.04 Specific processing of feedback signal or circuit therefore (i.e., A-D conversion, compression, or modification):

Subject matter under subclass 400.01 in which the feedback signal is altered, modified, or converted.

- (1) Note. This subclass does not include nominally recited feedback circuits or processes.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 615, for auxiliary feedback loops in a servomotor control circuit.

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D. CHANGES TO THE DEFINITIONS

667, for a bridge feedback circuit.

SEE OR SEARCH CLASS:

73, Measuring and Testing, for measuring (or sensing) nonelectrical parameters.

324, Electricity: Measuring and Testing, subclasses 160-180 for electrical speed measuring.

361, Electricity: Electrical Systems and Devices, subclasses 236-244 for speed measurements and signal processing thereof.

388, Electricity: Motor Control Systems, subclasses 923-934 for specific feedback circuits for motors having commutators.

400.05 With reference signal generation (e.g., from external system, mechanical oscillator, etc.):

Subject matter under subclass 400.04 comprising a circuit or method for obtaining or generating a parameter or value (i.e., the reference signal) by which a feedback signal can be compared.

SEE OR SEARCH THIS CLASS, SUBCLASS:

449, for automatic motor control with respect to a fixed standard.

451, for motor control via a mechanical reference, such as a tuning fork.

400.06 Comparator circuit or method:

Subject matter under subclass 400.04 comprising a circuit or technique by which to compare the motor feedback signal with a reference or value.

SEE OR SEARCH THIS CLASS, SUBCLASS:

601, for digital comparison techniques in servo systems.

607, and 608, for frequency and phase comparison techniques in servo systems.

400.07 Plural diverse feedback (e.g., torque and speed, load and speed, etc.):

Subject matter under subclass 400.04 wherein two or more motor conditions or parameters are detected and used as feedback signals.

(1) Note. The use of plural feedback circuits measuring the same parameter does not qualify to be included in this subclass (e.g., speed measurement for each phase of a three-phase motor).

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D. CHANGES TO THE DEFINITIONS

SEE OR SEARCH THIS CLASS, SUBCLASS:

601, for digital comparison techniques in servo systems.

607, and 608, for frequency and phase comparison techniques in servo systems.

400.08 With nonmotor parameter or remote condition detected (e.g., temperature, light, airflow, position of diverse object, etc.):

Subject matter under subclass 400.04 in which the control signal is a function of a condition spatially separate from the motor structure.

(1) Note. In the case of light sensing, this subclass does not include subject matter where optical means are used to sense rotor position for feedback to the commutation control circuit.

(2) Note. The motor shaft is a part of the motor structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

400.4, for light sensing of rotor position.

471, for automatic motor control via thermal conditions.

638, through 670, for "error" detecting means, especially subclass 641 for temperature, subclass 643 for moisture, and subclass 644 for flow.

SEE OR SEARCH CLASS:

73, Measuring and Testing, for measuring (or sensing) nonelectrical parameters.

324, Electricity: Measuring and Testing, for measuring (or sensing) electrical parameters.

400.09 Plural mode control (e.g., open and closed loop, starting and braking, plural-phase and single-phase operation, open and closed loop, etc.):

Subject matter under subclass 400.01 in which the motor is controlled in more than one distinct set or range of operational characteristics (e.g., high/low speed, forward/reverse, running/braking, high/low torque, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:

255, through 279, for plural motor control systems.

362, through 382, for motor braking systems.

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D. CHANGES TO THE DEFINITIONS

590, through 598, for multiple mode servo systems.

400.1 With timing or delay:

Subject matter under subclass 400.09 in which a second mode of operation is initiated after a specified period of time.

SEE OR SEARCH THIS CLASS, SUBCLASS:

445, through 489, for automatic motor control with a time-delay means (e.g., automatic starting or stopping).

400.11 With separate starting mode or “ramp-up” mode (e.g., open-loop control for startup, startup initialization, etc.):

Subject matter subclass 400.09 wherein the motor is controlled with one distinct set or range of operational characteristics prior to reaching running speed and a second set or range of operational characteristics at running speed.

- (1) Note. Running speed is any speed for which the motor was designed to operate. A separate starting mode may, for example, be used to quickly establish a speed (by supplying more torque), prevent over-current situations (when starting from standstill), or to establish a set of starting parameters (e.g., position, etc.).

400.12 With table lookup, stored map, or memory table (e.g., speed table, stored current profile, etc.):

Subject matter under subclass 400.09 wherein the control information for each of the plural modes is predetermined and stored in a table, map, or memory.

SEE OR SEARCH THIS CLASS, SUBCLASS:

567, for program- or pattern-controlled servo systems.

400.13 With timing, delay, or clock pulse counting circuit or generation:

Subject matter under subclass 400.01 wherein a means by which a temporal assessment is used within the feedback system to provide control.

SEE OR SEARCH THIS CLASS, SUBCLASS:

445, through 489, for automatic motor control with a time-delay means (e.g., automatic starting or stopping).

484, for time-delay means in automatic motor control systems.

400.14 Phase shifted as function of speed or position:

Subject matter under subclass 400.13 wherein the currents or voltages to the motor phases or windings are advanced and/or made to lag in accordance with detected speed and/or position.

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D. CHANGES TO THE DEFINITIONS

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for the miscellaneous systems for controlling phase angle or voltage and/or current magnitude, and for the miscellaneous transformer and impedance systems.

400.15 With torque or load determination (e.g., by calculation, detection, or estimation, etc.):

Subject matter under subclass 400.01 wherein the rotational force of the motor or resistance to rotation is determined by calculation, estimation, or detection.

400.16 Control or position information digitally stored on disk (e.g., computer hard drive position detection, etc.):

Subject matter under subclass 400.01 wherein information concerning the position or control of the motor is digitally stored on a computer disk (e.g., a hard drive).

(1) Note. This subclass does not include disk control systems, per se.

SEE OR SEARCH CLASS:

720, Dynamic Optical Information Storage or Retrieval, for optical disks, per se.

400.17 Modification or waveshaping of switching control signal (e.g., switching control input to inverter, etc.):

Subject matter under subclass 400.01 in which switching control signals used to control motor performance (or produce torque) are processed, modified, manipulated, or generated.

(1) Note. Typically, these "switching control signals" are used to control the inverter switches. This subclass does not pertain to the currents or voltages sent to the motor windings, but instead pertains to the signals that control or cause the currents or voltages to be sent to the motor windings.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 106 for waveform determinative or pulse-producing systems.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 100-333 for signal or waveform converting, shaping, or generating.

388, Electricity: Motor Control Systems, subclass 915 for waveform generators used to control motors with commutators.

400.18 With manual control (e.g., foot switch, surgical tool, etc.):

Subject matter under subclass 400.01 wherein a human operator provides motor control via an interface.

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D. CHANGES TO THE DEFINITIONS

SEE OR SEARCH THIS CLASS, SUBCLASS:

551, for foot- or knee-controlled motor systems.

400.19 Slew rate control (e.g., slew limiting, etc.):

Subject matter under subclass 400.01 wherein the time rate of change (or gradient) of voltage or current in either the phase windings or in a circuit for controlling the voltages or currents is varied or regulated.

(1) Note. Slew rate control is often employed to prevent switching transients, electromagnetic interference, and noise.

400.2 Phase voltage wave-shaping circuit or method (e.g., output from inverter, phase energizing signal, trapezoidal wave, etc.):

Subject matter under subclass 400.01 in which the energy supplied to the motor field windings is modified and/or altered to achieve a desired result (e.g., wave shaping the drive pulses).

SEE OR SEARCH THIS CLASS, SUBCLASS:

43, for inverter input waveshaping (i.e., waveshaping circuits for driving the inverter).

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 106 for waveform determinative or pulse-producing systems.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 100-333 for signal or waveform converting, shaping, or generating.

388, Electricity: Motor Control Systems, subclass 915 for waveform generators used to control motors with commutators.

400.21 Having protection means (e.g., switching circuit protection, stall protection, failure to start, "wrong" direction, etc.):

Subject matter under subclass 400.01 in which any part of the motor, switches, feedback system, and/or commutation control hardware is protected against adverse effects.

SEE OR SEARCH THIS CLASS, SUBCLASS:

563, through 566, for servo systems having protective features.

706, and 707, for motor synchronization systems wherein failure to synchronize is determined.

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D. CHANGES TO THE DEFINITIONS

SEE OR SEARCH CLASS:

361, Electricity: Electrical Systems and Devices, subclasses 1-138 for safety and protection of systems and devices.

400.22 Current or voltage limiting (e.g., over-voltage or over-current protection, etc.):

Subject matter under subclass 400.21 in which current and/or voltage is limited, reduced, or compensated to prevent failure or malfunction.

SEE OR SEARCH THIS CLASS, SUBCLASS:

635, for current or voltage limiting in servomotors.

SEE OR SEARCH CLASS:

361, Electricity: Electrical Systems and Devices, subclasses 1-138 for safety and protection of systems and devices, especially subclass 93.9 for current limiting.

400.23 Torque ripple stabilization or acoustic noise attenuation (e.g., cogging prevention, etc.):

Subject matter under subclass 400.01 in which the sound or mechanical vibration of the motor is attenuated or eliminated (or otherwise modified) and/or the motor torque is stabilized and variations are reduced.

SEE OR SEARCH THIS CLASS, SUBCLASS:

128, for controlling motor in response to noise, sound, vibration, or position of a motor.

400.24 Electrical noise attenuation (e.g., EMI, EMR, RFI, etc.):

Subject matter under subclass 400.01 for reducing or eliminating electromagnetic radiation or electrical disturbances (e.g., transients or perturbations) which interfere with desired operation (e.g., feedback signal) of the motor.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, subclass 19.4 for noise-preventing switching.

361, Electricity: Electrical Systems and Devices, subclass 800 for shielding structures.

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D. CHANGES TO THE DEFINITIONS**400.25 Switching noise transient attenuation (e.g., switching error prevention, masking, blanking, etc.):**

Subject matter under subclass 400.24 in which the electrical disturbances or transients that result from transistor (i.e., in the inverter) switching during motor control are reduced or eliminated.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, subclass 19.4 for noise-preventing switching.

361, Electricity: Electrical Systems and Devices, subclass 800 for shielding structures.

400.26 Switching circuit structure or component (e.g., inverter, bridge circuit, etc.):

Subject matter under subclass 400.01 directed to circuits to make or break (i.e., switches) the electrical power to the windings.

(1) Note. This subclass includes single-phase inverters.

(2) Note. This subclass also includes the rectifier circuit commonly associated with inverter circuits to rectify an ac source to dc for use by the inverter switches.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, for switches, per se.

363, Electric Power Conversion Systems, subclasses 135-139 for inverter systems (e.g., having thyristor).

400.27 Having both high-side and low-side switching elements for plural-phase motor:

Subject matter under subclass 400.26 having a means to connect and disconnect a motor winding to a power supply (i.e., the high-side switching elements) and to connect and disconnect a motor winding to ground (i.e., the low-side switching elements).

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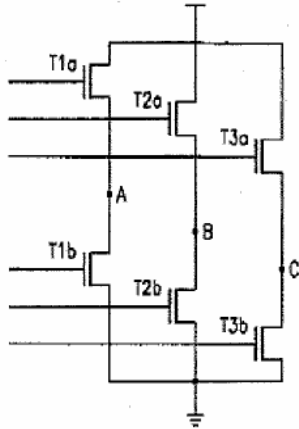
D. CHANGES TO THE DEFINITIONS

Figure 1. T1a, T2a, and T3a are high-side switching elements; T1b, T2b, and T3b are low-side switching elements; and A, B, and C indicate connections to the motor windings.

SEE OR SEARCH CLASS:

363, Electric Power Conversion Systems, subclasses 135-139 for inverter systems (e.g., having thyristor).

400.28 Diverse high side or low side switching:

Subject matter under subclass 400.27 wherein the means to connect and disconnect a motor winding to a power supply (i.e., the high-side switching elements) and the means to connect and disconnect a motor winding to ground (i.e., the low-side switching elements) are controlled in a different manner or by a different method.

SEE OR SEARCH CLASS:

363, Electric Power Conversion Systems, subclasses 135-139 for inverter systems (e.g., having thyristor).

400.29 H-bridge type:

Subject matter under subclass 400.26 in which the motor is connected between two switches for connecting the motor to a voltage supply (high-side switching elements) and two switches for connecting the motor to ground (low-side switching elements).

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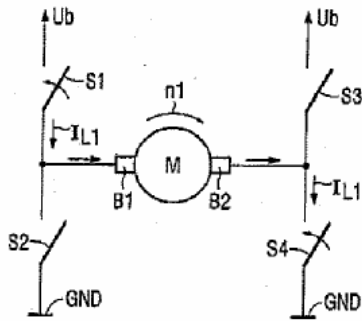
D. CHANGES TO THE DEFINITIONS

Figure 1. S1 and S3 are high-side switching elements; and S2 and S4 are low-side switching elements.

400.3 Power supply voltage feature (e.g., power supply voltage, V_{cc} compensation, rectifier circuit, power regulator, auxiliary or secondary power supply, etc.):

Subject matter under subclass 400.01 pertaining to the supply of voltage or current to a circuit for controlling the motor.

SEE OR SEARCH CLASS:

- 307, Electrical Transmission or Interconnection Systems, subclasses 149-157 for miscellaneous "power pack" systems.
- 315, Electric Lamp and Discharge Devices: Systems, subclasses 91-93 for cathode or cathode heater including anode supply circuit but not including any grid-biasing circuit.
- 323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for the miscellaneous systems for controlling phase angle or voltage and/or current magnitude, and for the miscellaneous transformer and impedance systems.
- 327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 530-550 for miscellaneous circuits combined with power supply or bias means.
- 363, Electric Power Conversion Systems, appropriate subclasses for inverter and/or converter systems.

400.31 Utilization or dissipation of stored or collapsing field energy (e.g., freewheeling, discharging one winding through another, etc.):

Subject matter under subclass 400.01 wherein energy stored in a motor winding is controlled, modified, dissipated, or used.

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Subject matter under subclass 400.01 in which motor parameters (e.g., rotor position, speed, etc.) are determined by measuring phase current or voltage.

- (1) Note. While phase currents and voltages are “sensed,” per se, sensors typically refer to physical units attached to the motor (or rotor) (e.g., Hall effect sensors, tachometers, etc.). Therefore, sensorless motors are those without the physical unit attached to the motor (or rotor).

SEE OR SEARCH THIS CLASS, SUBCLASS:

615, for auxiliary feedback loops in a servomotor control circuit.

667, for a bridge feedback circuit.

SEE OR SEARCH CLASS:

73, Measuring and Testing, for measuring (or sensing) nonelectrical parameters.

324, Electricity: Measuring and Testing, subclasses 160-180 for electrical speed measuring.

361, Electricity: Electrical Systems and Devices, subclasses 236-244 for speed measurements and signal processing thereof.

388, Electricity: Motor Control Systems, subclasses 923-934 for specific feedback circuits for motors having commutators.

400.33 Voltage injection detection (e.g., voltage injected at startup to determine position, etc.):

Subject matter under subclass 400.32 wherein a usually small or test voltage (typically not large enough to generate torque) is applied to (i.e., “injected”) the motor winding to determine position.

- (1) Note. This is typically done to determine motor position prior at startup.

400.34 Electromotive force sensor (e.g., back or counter EMF sensor, etc.):

Subject matter under subclass 400.32 in which phase EMF is detected to determine a motor attribute (e.g., rotor position and/or speed) which is fed back to provide commutation control data.

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- (1) Note. Back-EMF (or BEMF or counter-EMF or CEMF), is the voltage produced across motor windings, due to the winding turns (of the rotor/armature) passing through a magnetic field (of the stator/field), during rotation of the motor. The back-EMF is directly proportional to rotor velocity and opposite in polarity to the applied voltage. This static voltage arises from the generator action in a motor, even if the motor windings are not energized.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 459, for automatic motor control with time-delay using counter-electromotive force of controlled motor.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, for measuring (or sensing) nonelectrical parameters.
- 324, Electricity: Measuring and Testing, subclasses 160-180 for electrical speed measuring.
- 361, Electricity: Electrical Systems and Devices, subclasses 236-244 for speed measurements and signal processing thereof.
- 388, Electricity: Motor Control Systems, subclasses 923-934 for specific feedback circuits for motors having commutators.

400.35 With zero-crossing detection (e.g., polarity reversal, etc.):

Subject matter under subclass 400.34 in which a polarity reversal (i.e., a change in sign) in an induced voltage or current in an undriven winding/coil is determined or sensed.

400.36 With center-tap feedback circuit:

Subject matter under subclass 400.32 in which motor field windings are electrically connected to a common point and electrical parameters (i.e., current and/or voltage) are determined from the common point.

400.37 With sensor structure (e.g., tachometer, reed switch, cam-controlled switching, etc.):

Subject matter under subclass 400.01 in which any motor parameter (e.g., speed, position, etc.) is generated into a feedback signal.

- (1) Note. Here, the sensor is more than a sensing circuit and typically includes a physical unit attached to the motor, motor shaft, or any other structure and capable of determining a motor parameter.
- (2) Note. In "sensorless" motors, motor parameters are determined by the use of a measuring circuit and not some physical unit attached to the motor.

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SEE OR SEARCH THIS CLASS, SUBCLASS:

463, for automatic motor control using a tachometer.

SEE OR SEARCH CLASS:

322, Electricity: Single Generator Systems, subclass 31 for tachometer devices.

400.38 Magnetic field sensor or responsive device (e.g., Hall element, magneto-resistance, etc.):

Subject matter under subclass 400.37 in which a magnetic field is used to determine a motor parameter (e.g., position, speed, etc.).

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 514.31 for inductive or magnetic sensing.

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, appropriate subclasses for a magnet or an electromagnet, per se.

336, Inductor Devices, subclass 30 for an inductor device having an acceleration responsive inductance adjusting means.

400.39 Rotating sensor component separate from motor structure (e.g., resolver, magnetically sensed rotating disk, etc.):

Subject matter under subclass 400.38 wherein the magnetic field is generated remotely (i.e., separately) from the motor structure (e.g., detected from a rotating disk attached to a shaft turned by the motor rotor).

SEE OR SEARCH THIS CLASS, SUBCLASS:

605, for the use of resolvers in servo systems.

400.4 Optical sensor (e.g., encoder, photodetector, etc.):

Subject matter under subclass 400.37 wherein light or radiant energy is used to determine the motor parameter (e.g., position or speed, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:

577, for optical line followers for servo systems.

640, for photoelectric "error" detecting systems.

400.41 Having specific motor structure (e.g., bifilar windings, airgap dimension, auxiliary winding, phase winding with midtap, etc.):

Subject matter under subclass 400.01 wherein the motor being controlled has a structural characteristic or feature (e.g., an element or dimension, etc.) that enhances, modifies, or otherwise affects motor performance.

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- (1) Note. The intent of this subclass is to include subject matter other than the controlling circuitry.

SEE OR SEARCH THIS CLASS, SUBCLASS:

491, for motor control of both circuit and motor structure.

538, through 542, for motor structure adjustment control.

400.42 Brushless motor open-loop control:

Subject matter under subclass 700 for controlling the currents or voltages in (or to) the motor phases (or windings) to control motor performance (or produce torque) without motor-controlled mechanical switches (i.e., commutators, brushes, slip rings, etc.) and without feedback of any motor parameter.

- (1) Note. This subclass contains documents that control a motor without the use of specific feedback parameters, such as position, speed, torque, load, voltage, current, etc.

- (2) Note. Brushless motors are often called "self-commutating" motors.

SEE OR SEARCH THIS CLASS, SUBCLASS:

34, through 113, for plural, diverse, or diversely controlled motors.

362, through 382, for motor braking.

560, through 688, for servo system motors (e.g., stepper motors, etc.).

700, through 724, for synchronous motors.

727, through 832, for induction motors.

SEE OR SEARCH CLASS:

- 388, Electricity: Motor Control Systems, subclasses 825-841 for open-loop speed control of motors having commutators and subclasses 848-860 for open-loop acceleration control of motors having commutators.

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D. CHANGES TO THE DEFINITIONS**FOREIGN ART COLLECTIONS**

The definitions below correspond to abolished subclasses from which these collections were formed. See the Foreign Art Collection schedule of this class for specific correspondences. [Note: The titles and definitions for *indented* art collections include all the details of the one(s) that are hierarchically superior.]

FOR 100 SPACE-DISCHARGE-DEVICE COMMUTATED MOTOR:

Foreign art collection in which space discharge devices are connected in the armature or primary circuit of the motor and are connected so as to effect the commutation of the motor.

- (1) Note. The interposition of an induction transformer or other electric converter between the space discharge devices and the armature of the motor does not prevent classification herein.

FOR 101 SELF-COMMUTATED IMPULSE OR RELUCTANCE MOTORS:

Foreign art collection in which a rotary electric motor, of the type in which the rotary element tends to assume a predetermined angular position when the motor is continuously energized, is provided with a commutator or circuit making and breaking means which is actuated by the motor to determine the instants of time at which the field producing winding or windings thereof are energized and de-energized relative to the angular position of the rotary element of the motor.

FOR 102 MOTOR COMMUTATION CONTROL SYSTEMS:

Foreign art collection in which means are provided for facilitating or otherwise controlling commutation in commutator motors.

- (1) Note. For example, means for preventing or reducing deleterious effects incident to, or accompanying, commutation in electric motors are included herein; such effects including large intercommutator bar currents, heating of commutator bars and brushes, flashover between bars, arcing and pitting of commutator bars and brushes, etc. Periodically or repeatedly reversing polarity of direct current supplied to commutator motors to reduce pitting, corrosion metal transfer between brush and commutator is included herein. Shifting of brushes to reduce sparking is included.

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D. CHANGES TO THE DEFINITIONS

CLASS 327 - MISCELLANEOUS ACTIVE ELECTRICAL NONLINEAR DEVICES,
CIRCUITS, AND SYSTEMS

Definitions Modified

Class Definition: In SECTION IV- REFERENCES TO OTHER CLASSES, SEE OR SEARCH
CLASS

Delete:

The reference to Class 318

Insert:

318, Electricity: Motive Power Systems, subclasses 400.1-400.42 for synchronous
motor commutation control systems.

Subclass 129: Under SEE OR SEARCH CLASS

Delete:

The reference to Class 318

Insert:

318, Electricity: Motive Power Systems, subclasses 400.1-400.42 for synchronous
motor commutation control systems.

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CLASS 334 - TUNERS

Definitions Modified

Subclass 10: Under SEE OR SEARCH CLASS

Delete:

The reference to Class 318

Insert:

318, Electricity: Motive Power Systems, subclasses 400.1-400.42 for synchronous motor commutation control systems.

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D. CHANGES TO THE DEFINITIONS

CLASS 388 - ELECTRICITY: MOTOR CONTROL SYSTEMS

Definitions Modified

Subclass 800: Under SEE OR SEARCH CLASS

Delete:

The reference to Class 318

Insert:

318, Electricity: Motive Power Systems, subclasses 400.01-400.41 for closed-loop speed control system in synchronous brushless (i.e., electronic commutating) motors.

Subclass 825: Under SEE OR SEARCH CLASS

Delete:

The reference to Class 318

Insert:

318, Electricity: Motive Power Systems, subclasses 400.01-400.41 for closed-loop speed control system in synchronous brushless (i.e., electronic commutating) motors.

Subclass 842: Under SEE OR SEARCH CLASS

Delete:

The reference to Class 318

Insert:

318, Electricity: Motive Power Systems, subclasses 400.01-400.41 for closed-loop acceleration control system in synchronous brushless (i.e., electronic commutating) motors.

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Subclass 848: Under SEE OR SEARCH CLASS

Delete:

The reference to Class 318

Insert:

318, Electricity: Motive Power Systems, subclass 400.42 for closed-loop acceleration control system in synchronous brushless (i.e., electronic commutating) motors.