

SECTION G — PHYSICS

G05 CONTROLLING; REGULATING

G05D SYSTEMS FOR CONTROLLING OR REGULATING NON-ELECTRIC VARIABLES (for continuous casting of metals B22D 11/16; valves per se F16K; sensing non-electric variables, see the relevant subclasses of G01; for regulating electric or magnetic variables G05F)

Note(s)

1. This subclass does not cover features of general applicability to regulating systems, e.g. anti-hunting arrangements, which are covered by subclass G05B.
2. In this subclass, the following term is used with the meaning indicated:
 - "systems" includes self-contained devices such as speed governors, pressure regulators.
3. Control systems specially adapted for particular apparatus, machines or processes are classified in the subclasses for the apparatus, machines or processes, provided that there is specific provision for control or regulation relevant to the special adaptation, either at a detailed level (e.g. A21B 1/40: "for regulating temperature in bakers' ovens") or at a general level (e.g. B23K 9/095: "for automatic control of welding parameters in arc welding"). Otherwise, classification is made in the most appropriate place in this subclass. The following are lists of places where there is specific provision of the kind referred to above. Where such provision is at a detailed level, the places have been grouped according to the main groups of this subclass. Where the provision is at a general level (e.g. of a kind appropriate to more than one of the main groups specified in the lists, or to main groups G05D 27/00 or G05D 29/00), the places are listed under the title "General References".

Places related to

A01B 69/00.....Agricultural machines or implements
 A63H 17/36.....Toy vehicles
 B60V 1/11.....Air-cushion vehicles
 B60W 30/10.....Road vehicle path control
 B62D 1/00.....Steering controls of motor vehicles or trailers, i.e. means for initiating a change of direction
 B62D 6/00.....Arrangements for automatically controlling the steering depending on driving conditions
 B62D 55/116.....Chassis of endless-tracked vehicles
 B63H 25/00.....Marine steering; control of waterborne vessels
 B64C 13/00-B64C 15/00.....Controlling aircraft
 B64D 25/11.....Controlling attitude or direction of aircraft ejector seats
 B64G 1/24.....Cosmonautic vehicles
 F41G 7/00.....Self-propelled missiles
 F42B 15/01.....Guided missiles
 F42B 19/01.....Marine torpedoes

Places related to

A43D 119/00.....Footwear manufacture
 B21K 31/00.....Tool carriers in forging or pressing
 B23B 39/26.....Pattern-controlled boring or drilling tools
 B23D 1/30, B23D 3/06, B23D 5/04 Planing or slotting machines controlled by copying device
 B23H 7/18.....Electrode to workpiece spacing in electric discharge and electrochemical machining
 B23K 26/02.....Workpiece in laser welding or cutting
 B23K 37/04.....Workpiece in welding
 B23K 37/06.....Molten metal in welding
 B23Q 5/20.....Spindles in machine tools
 B23Q 15/00, B23Q 16/00.....Tool or work position in machine tools
 B23Q 35/00.....Tools controlled by pattern or master model
 B24B 17/00.....Grinding controlled by patterns, drawings, magnetic tape or the like
 B24B 47/22.....Starting position in grinding
 B30B 15/24.....Actuating members in presses
 B62D 55/116.....Chassis of tracked vehicles
 B65H 23/18.....Web-advancing mechanisms
 E02F 3/43.....Dippers or buckets in dredgers
 F15B 9/00.....Fluid-pressure servomotors with follow-up action
 F24J 2/38.....Tracking of solar heat collectors
 G03F 9/00.....Photomechanical production of patterned or textured surfaces
 G11B 5/588.....Rotating heads in information storage systems
 G21C 7/12.....Movement of control elements in nuclear reactors

Places related to

A24B 7/14.....Tobacco cutting

B05C 11/02.....	Thickness of coating of fluent material on surface
B21B 37/16.....	Thickness, width, diameter or other transverse dimensions of the products of metal-rolling mills
C03B 18/04.....	Dimension of glass ribbon
D21F 7/06.....	Thickness of layer in paper making

Places related to

A45D 20/26.....	Air in hair drying helmets
A61M 5/168.....	Flow of media to the human body
B03C 3/36.....	Gases or vapour in electrostatic separators
B05C 11/10.....	Fluent material in coating devices
B67D 1/12.....	Dispensing beverages on draught
B67D 7/28.....	Transferring liquids
C10K 1/28.....	Gas purifiers
E21B 21/08.....	Flushing boreholes
E21B 43/12.....	Obtaining liquids from wells
F01D 17/00.....	Flow in non-positive-displacement machines or systems
F01M 1/16.....	Lubrication arrangements
F01P 7/00.....	Coolant flow in cooling devices
F02C 9/16, F02C 9/50.....	Gas-turbine working fluid
F16L 55/027.....	Throttle passages in pipes
F24F 11/00.....	Air-flow or supply of heating or cooling fluids in air treatment arrangements
F26B 21/12.....	Air or gas flow in dryers
G01G 11/08.....	Continuous flow weighing apparatus
G21D 3/14.....	Coolant in nuclear power plant

Places related to

B01D 21/34.....	Liquid level in sedimentation arrangements
B41L 27/04.....	Ink level in printing, manifolding or duplicating arrangements
F22D 5/00.....	Feed water for boilers
H01J 1/10, H01J 13/14.....	Liquid pool electrodes in electric discharge tubes or lamps

Places related to

B01D 21/32.....	Density in sedimentation arrangements
B01F 15/04.....	Mixers
B24C 7/00.....	Abrasive blasts
B28C 7/00.....	Mixtures of clays or cements
B65G 53/66.....	Bulk material conveyers
F02K 3/075.....	Flow ratio in jet-propulsion plants

Places related to

B21C 1/12.....	Drum speed in metal drawing
B23Q 15/00.....	Cutting velocity of tool or work
B30B 15/20.....	Ram speed in presses
B60K 31/00.....	Setting or limiting speed of vehicles
B60L 15/00.....	Electrically-propelled vehicles
B60W 30/14.....	Road vehicle cruise control
B64D 31/08.....	Cruising speed of aircraft
D01D 1/09.....	Feed rate in manufacture of artificial filaments, threads, fibres, bristles or ribbons
D01G 15/36.....	Carding machines
D02H 13/14.....	Warping, beaming or leasing machines
D03D 51/16.....	Cyclically varying speed of looms
G01N 30/32.....	Speed of fluid carrier in chemical analysis
G11B 15/46.....	Filamentary or web record carriers or heads for such carriers in information storage systems
G11B 19/28.....	Non-filamentary, non-web record carriers, or heads for such carriers in information storage systems

Places related to

B25D 9/26.....	Portable percussive tools
B30B 15/22.....	Ram pressure in presses
B65H 59/00.....	Tension in filamentary material
B65H 77/00.....	Tension in webs, tapes, filamentary material
B66D 1/50.....	Rope, cable or chain tension
D03D 49/04.....	Tension in looms
D05B 47/04.....	Tension in sewing machines
D21F 3/06.....	Pressure in paper-making machines
F26B 13/12.....	Drying fabrics
F26B 21/10.....	Pressure in dryers
G11B 15/43.....	Record carrier tension in information storage arrangements

Places related to

B60C 23/00.....	Tyre pressure
B63C 11/08.....	Air within diving suit
B64D 13/00.....	Aircraft air-pressure
B65G 53/66.....	Bulk material conveyers
D01D 1/09.....	Manufacture of artificial filaments, threads, fibres, bristles or ribbons
E21B 21/08.....	Flushing boreholes
F01M 1/16.....	Lubrication arrangements
G01N 30/32.....	Pressure of fluid carrier in chemical analysis

H01J 7/14.....	Pressure in electric discharge tubes or lamps
H01K 1/52.....	Pressure in electric incandescent lamps
<u>Places related to</u>	
B25D 9/26.....	Portable percussion tools
B65G 27/32.....	Jigging conveyers
<u>Places related to</u>	
B01D 21/32.....	Density in sedimentation arrangements
B01D 53/30.....	Treating gases or vapours
G01N 30/34.....	Composition of fluid carrier in chemical analysis
<u>Places related to</u>	
A01G 25/16.....	Watering gardens, fields, sports grounds or the like
A01K 41/04.....	Poultry incubators
A24B 9/00.....	Tobacco products
F24F 11/00.....	Air conditioning
F26B 21/08.....	Dryers
<u>Places related to</u>	
A21B 1/40.....	Bakers' ovens
A45D 6/20.....	Hair curlers
B21C 31/00.....	Metal extruding
B60C 23/00.....	Tyre temperature
B64G 1/50.....	Cosmonautic vehicles
C03B 18/18, C03B 18/22.....	Float baths in glass making
D01D 1/09.....	Manufacture of artificial filaments, threads, fibres, bristles or ribbons
D04B 35/30.....	Knitting machines
D06F 75/26.....	Hand irons
D21F 5/06.....	Paper-making machines
F01M 5/00.....	Lubricant in lubrication arrangements
F16N 7/08.....	Arrangements for supplying oil or unspecified lubricant from a reservoir
F22G 5/00.....	Steam superheat
F26B 21/10.....	Dryers
G01N 30/30.....	Temperature of fluid carrier in chemical analysis
H01M 10/50.....	Electric storage cells
H05B 6/06, H05B 6/50, H05B 6/68	Dielectric, induction or microwave heating
H05G 1/36.....	Anode of X-ray tube
<u>Places related to</u>	
B41B 21/08.....	Photographic composing machines
H01S 3/10, H05B 33/08, H05B 35/00-H05B 43/00	Lasers and other light sources
<u>General references</u>	
A01D 41/127.....	Combines
A01J 5/007.....	Milking machines
B23K 9/095.....	Welding parameters
B23Q 35/00.....	Copying
B24B 17/00, B24B 49/00.....	Grinding or polishing
B24C 7/00.....	Abrasive blasts
B67D 1/12.....	Dispensing beverages on draught
F23C 10/28.....	Combustion apparatus in which combustion takes place in a fluidised bed of fuel or other particles
G03G 21/20.....	Electrographic, electrophotographic or magnetographic processes
H02P 5/00-H02P 9/00.....	Dynamo-electric motors or generators

Subclass index

CONTROL OF: SPEED OR ACCELERATION; FORCE; PRESSURE; POWER; MECHANICAL OSCILLATIONS.....	13/00, 15/00, 16/00, 17/00, 19/00
CONTROL OF: FLOW; LEVEL; RATIO.....	7/00, 9/00, 11/00
CONTROL OF: TEMPERATURE; HUMIDITY; VISCOSITY; CHEMICAL OR PHYSICO-CHEMICAL VARIABLES; LIGHT INTENSITY.....	23/00, 22/00, 24/00, 21/00, 25/00
CONTROL OF: POSITION, DIRECTION, DIMENSIONS.....	1/00-5/00
SIMULTANEOUS CONTROL OF TWO OR MORE VARIABLES.....	27/00, 29/00
SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS.....	99/00

1/00 Control of position, course, altitude, or attitude of land, water, air, or space vehicles, e.g. automatic pilot
(radio navigation systems or analogous systems using other waves G01S)

- 1/02 • Control of position or course in two dimensions [2]
- 1/03 • • using near-field transmission systems, e.g. inductive-loop type
- 1/04 • Control of altitude or depth
- 1/06 • • Rate of change of altitude or depth

- 1/08 • Control of attitude, i.e. control of roll, pitch, or yaw
- 1/10 • Simultaneous control of position or course in three dimensions (G05D 1/12 takes precedence)
- 1/12 • Target-seeking control

- 3/00 Control of position or direction** (G05D 1/00 takes precedence; for numerical control G05B 19/18)
- 3/10 • without using feedback [3]
- 3/12 • using feedback [3]

- 3/14 • • using an analogue comparing device [3]
- 3/16 • • • whose output amplitude can only take a number of discrete values (G05D 3/18 takes precedence) [3]
- 3/18 • • • delivering a series of pulses [3]
- 3/20 • • using a digital comparing device [3]
- 5/00 Control of dimensions of material**
- 5/02 • of thickness, e.g. of rolled material
- 5/03 • • characterised by the use of electric means
- 5/04 • of the size of items, e.g. of particles
- 5/06 • • characterised by the use of electric means
- 7/00 Control of flow** (level control G05D 9/00; ratio control G05D 11/00; weighing apparatus G01G)
- 7/01 • without auxiliary power
- 7/03 • with auxiliary non-electric power [2]
- 7/06 • characterised by the use of electric means
- 9/00 Level control, e.g. controlling quantity of material stored in vessel**
- 9/02 • without auxiliary power
- 9/04 • with auxiliary non-electric power [2]
- 9/12 • characterised by the use of electric means
- 11/00 Ratio control** (control of chemical or physico-chemical variables, e.g. pH-value, G05D 21/00; humidity control G05D 22/00; control of viscosity G05D 24/00) [3]
- 11/02 • Controlling ratio of two or more flows of fluid or fluent material
- 11/03 • • without auxiliary power
- 11/035 • • with auxiliary non-electric power [2]
- 11/04 • • • by sensing weight of individual components, e.g. gravimetric procedure
- 11/06 • • • by sensing density of mixture, e.g. using aerometer
- 11/08 • • • by sensing concentration of mixture, e.g. by measuring pH-value [3]
- 11/10 • • • • by sensing moisture of non-aqueous liquids
- 11/12 • • • by sensing viscosity of mixture
- 11/13 • • characterised by the use of electric means
- 11/16 • Controlling mixing ratio of fluids having different temperatures, e.g. by sensing the temperature of a mixture of fluids having different viscosities
- 13/00 Control of linear speed; Control of angular speed; Control of acceleration or deceleration, e.g. of a prime mover** (synchronising telegraph receiver and transmitter H04L 7/00)
- 13/02 • Details
- 13/04 • • providing for emergency tripping of an engine in case of exceeding maximum speed
- 13/06 • • providing for damping of erratic vibrations in governors
- 13/08 • without auxiliary power
- 13/10 • • Centrifugal governors with fly-weights
- 13/12 • • • Details
- 13/14 • • • • Fly-weights; Mountings thereof; Adjusting equipment for limits, e.g. temporarily
- 13/16 • • • • Risers; Transmission gear therefor; Restoring mechanisms therefor
- 13/18 • • • counterbalanced by spider springs acting immediately upon the fly-weights
- 13/20 • • • counterbalanced by spider springs acting upon the articulated riser
- 13/22 • • • counterbalanced by fluid pressure acting upon the articulated riser
- 13/24 • • • counterbalanced by two or more different appliances acting simultaneously upon the riser, e.g. with both spring force and fluid pressure, with both spring force and electromagnetic force
- 13/26 • • • with provision for modulating the degree of non-uniformity of speed
- 13/28 • • • with provision for performing braking effects in case of increased speed
- 13/30 • • Governors characterised by fluid features in which the speed of a shaft is converted into fluid pressure (transducers converting variations of physical quantities into fluid-pressure variations F15B 5/00)
- 13/32 • • • using a pump
- 13/34 • with auxiliary non-electric power (fluid-pressure converters F15B 3/00) [2]
- 13/36 • • using regulating devices with proportional band, i.e. P. regulating devices
- 13/38 • • • involving centrifugal governors of fly-weight type
- 13/40 • • • involving centrifugal governors of pump type
- 13/42 • • • involving fluid governors of flow-controller type, i.e. the width of liquid flow being controlled by fly-weights
- 13/44 • • • involving fluid governors of jet type
- 13/46 • • using regulating devices with proportional band and integral action, i.e. P.I. regulating devices
- 13/48 • • • involving resilient restoring mechanisms
- 13/50 • • • involving connecting means for superimposing a proportional regulating device and an integral regulating device
- 13/52 • • using regulating devices with proportional band and derivative action, i.e. P.D. regulating devices
- 13/54 • • • involving centrifugal governors of fly-weight type exerting an acceleratory effect
- 13/56 • • • involving restoring mechanisms exerting a delay effect
- 13/58 • • • involving means for connecting a speed-regulating device and an acceleration-regulating device
- 13/60 • • using regulating devices with proportional band, derivative, and integral action, i.e. P.I.D. regulating devices
- 13/62 • characterised by the use of electric means, e.g. use of a tachometric dynamo, use of a transducer converting an electric value into a displacement
- 13/64 • Compensating the speed difference between engines meshing by a differential gearing or the speed difference between a controlling shaft and a controlled shaft
- 13/66 • Governor units providing for co-operation with control dependent upon a variable other than speed
- 15/00 Control of mechanical force or stress; Control of mechanical pressure**
- 15/01 • characterised by the use of electric means
- 16/00 Control of fluid pressure**
- 16/02 • Modifications to reduce the effects of instability, e.g. due to vibrations, friction, abnormal temperature, overloading, unbalance (vibration-dampers F16F 7/00)
- 16/04 • without auxiliary power
- 16/06 • • the sensing element being a flexible member yielding to pressure, e.g. diaphragm, bellows, capsule
- 16/08 • • • Control of liquid pressure

16/10	• • the sensing element being a piston or plunger	23/22	• • • the sensing element being a thermocouple
16/12	• • the sensing element being a float	23/24	• • • the sensing element having a resistance varying with temperature, e.g. thermistor
16/14	• with auxiliary non-electric power [2]	23/26	• • • the sensing element having a permeability varying with temperature
16/16	• • derived from the controlled fluid	23/27	• • with sensing element responsive to radiation
16/18	• • derived from an external source	23/275	• • with sensing element expanding, contracting, or fusing in response to changes of temperature
16/20	• characterised by the use of electric means	23/30	• • Automatic controllers with an auxiliary heating device affecting the sensing element, e.g. for anticipating change of temperature (automatic controllers in general and not restricted to control of temperature G05B)
17/00	Control of torque; Control of mechanical power	23/32	• • • with provision for adjustment of the effect of the auxiliary heating device, e.g. as a function of time
17/02	• characterised by the use of electric means	24/00	Control of viscosity
19/00	Control of mechanical oscillations, e.g. of amplitude, of frequency, of phase	24/02	• characterised by the use of electric means
19/02	• characterised by the use of electric means	25/00	Control of light, e.g. intensity, colour, phase (mechanically operable parts of lighting devices for the control of light F21V; optical devices or arrangements using movable or deformable elements for controlling light independent of the light source G02B 26/00; devices or arrangements, the optical operation of which is modified by changing the optical properties of the medium of the devices or arrangements for the control of light, circuit arrangements specially adapted therefor, control of light by electro-magnetic waves, electrons or other elementary particles G02F 1/00) [4]
21/00	Control of chemical or physico-chemical variables, e.g. pH-value [3]	25/02	• characterised by the use of electric means
21/02	• characterised by the use of electric means	27/00	Simultaneous control of variables covered by two or more of main groups G05D 1/00-G05D 25/00
22/00	Control of humidity [2]	27/02	• characterised by the use of electric means
22/02	• characterised by the use of electric means	29/00	Simultaneous control of electric and non-electric variables
23/00	Control of temperature (automatic switching arrangements for electric heating apparatus H05B 1/02)	99/00	Subject matter not provided for in other groups of this subclass [2006.01]
23/01	• without auxiliary power		
23/02	• • with sensing element expanding and contracting in response to changes of temperature (G05D 23/13 takes precedence)		
23/08	• • • with bimetallic element (arrangement of valves and flow lines specially adapted for mixing fluid F16K 11/00)		
23/10	• • • • with snap-action elements (for valves F16K 31/56)		
23/12	• • with sensing element responsive to pressure or volume changes in a confined fluid		
23/13	• • by varying the mixing ratio of two fluids having different temperatures		
23/185	• with auxiliary non-electric power [2]		
23/19	• characterised by the use of electric means		
23/20	• • with sensing elements having variation of electric or magnetic properties with change of temperature (G05D 23/13 takes precedence)		