

CPC**COOPERATIVE PATENT CLASSIFICATION****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

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 G05D 1/00](#)

A01B 69/00	Agricultural machines or implements
A63H 17/36	Toy vehicles
B60V 1/11	Air-cushion vehicles
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	aircraft
	to B64C 15/00 Controlling
B64D 25/10	aircraft
	ejector seats
B64G 1/24	Cosmonautic vehicles
F41G 7/00	Self-propelled missiles
F42B 15/01	Guided missiles

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(continued)

F42B 19/01 related to	Marine torpedoes	Places G05D 3/00
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 dischargte 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 haet 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	G05D 5/00	
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	

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(continued)

D21F 7/06	Thickness of layer in paper making
Places related to	G05D 7/00
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	G05D 9/00
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	G05D 11/00
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	G05D 13/00
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

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(continued)

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
	<u>Places related to</u> G05D 15/00
B25D 9/26	Portable percussive tools
B30B 15/22	Ram pressure in presses
B65H 59/00	Tension in filamentary material
{B65H 23/00	B65H 59/00} 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
	<u>Places related to</u> G05D 16/00
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> G05D 19/00
B25D 9/26	Portable percussion tools

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(continued)

B65G 27/32	Jigging conveyers	Places
related to	G05D 21/00	
B01D 21/32	Density in sedimentation arrangements	
B01D 53/30	Treating gases or vapours	
G01N 30/34	Composition of fluid carrier in chemical analysis	
Places related to	G05D 22/00	
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	Places related to
G05D 23/00		
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 10/60	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	Places
related to	G05D 25/00	
B41B 21/08	Photographic composing machines	
H01S 3/10	,	
H05B 33/08	,	
H05B 35/00	to	

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(continued)

H05B 43/00	Lasers and other light sources
General references	
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
G03G 21/20	Electrographic, electrophotographic or magnetographic processes
H02P 5/00	to
H02P 9/00	Dynamo-electric motors or generators

G05D 1/00

Control of position, course or altitude of land, water, air, or space vehicles, e.g. automatic pilot (steering applicable only to other than landborne vehicles, e.g. three-dimensional steering applicable to both aircraft and submarines [B60K](#) ; construction or disposition of steering means on land vehicles [B62](#) , on waterborne vessels [B63](#) ; manual or automatic control of aircraft, e.g. using automatic pilot or radiated signal [B64C](#) ; radio navigation systems or analogous systems using other waves [G01S](#))

- G05D 1/0005 . {with arrangements to save energy}
- G05D 1/0011 . {associated with a remote control arrangement}
- G05D 1/0016 .. {characterised by the operator's input device (input arrangements for computing systems in general [G06F 3/00](#))}
- G05D 1/0022 .. {characterised by the communication link (data switching networks in general [H04L 12/00](#))}
- G05D 1/0027 .. {involving a plurality of vehicles, e.g. fleet or convoy travelling (traffic control systems for road vehicles [G08G 1/00](#) ; for marine craft [G08G 3/00](#) ; for aircraft [G08G 5/00](#) ; fleet control of land vehicles from a control room [G05D 1/0297](#))}
- G05D 1/0033 .. {by having the operator tracking the vehicle either by direct line of sight or via one or more cameras located remotely from the vehicle}
- G05D 1/0038 .. {by providing the operator with simple or augmented images from one or more cameras located onboard the vehicle, e.g. tele-operation (images analyzed by a computer and used for automatic navigation [G05D 1/0246](#))}
- G05D 1/0044 .. {by providing the operator with a computer generated representation of the environment of the vehicle, e.g. virtual reality, maps (maps used for automatic navigation [G05D 1/0274](#) ; flight directors [G01C 23/005](#))}
- G05D 1/005 .. {by providing the operator with signals other than visual, e.g. acoustic, haptic}
- G05D 1/0055 . {with safety arrangements}
- G05D 1/0061 .. {for transition from automatic pilot to manual pilot and vice versa}
- G05D 1/0066 .. {for limitation of acceleration or stress}
- G05D 1/0072 .. {to counteract a motor failure}
- G05D 1/0077 .. {using redundant signals or controls}
- G05D 1/0083 . {to help an aircraft pilot in the rolling phase}

- G05D 1/0088 . {characterized by the autonomous decision making process, e.g. artificial intelligence, predefined behaviours (using knowledge based models [G06N 5/00](#))}
- G05D 1/0094 . {involving pointing a payload, e.g. camera, weapon, sensor, towards a fixed or moving target}
- G05D 1/02 . Control of position or course in two dimensions
 - G05D 1/0202 .. {specially adapted to aircraft}
 - G05D 1/0204 ... {to counteract a sudden perturbation, e.g. cross-wind, gust}
 - G05D 1/0206 .. {specially adapted to water vehicles}
 - G05D 1/0208 ... {dynamic anchoring}
 - G05D 1/021 .. {specially adapted to land vehicles}

NOTE

1. This group covers control of position or course in two dimensions specially adapted for land vehicles, i.e. control systems to define a trajectory for a land vehicle, and to take suitable actions to make the vehicle follow said trajectory.
2. Relationships with other classification places.

Subclass [G01C](#) covers navigation in general, i.e. determining the position and course of land vehicles, ships, aircraft, and space vehicles.

Subclass [G01S](#) covers radio, sonar or lidar navigation systems, i.e. navigation by use of radio, acoustic or optical waves, or analogue arrangements using other electromagnetic waves.

Subclass [G08G](#) covers navigation systems for traffic control purposes, i.e. systems in which the navigation is not performed autonomously by or in the vehicle, but where the vehicles are guided by instructions transmitted to them.

Aspects of navigation systems that are important per se should also be classified in the relevant groups of [G01C](#) (see for example list under "Informative References" below).

Aspects of radio, sonar or lidar navigation systems that are important per se should also be classified in the relevant groups of [G01S](#) (see for example list under "Informative References" below).

Aspects of navigation systems for traffic purposes that are important per se should also be classified in the relevant groups of [G08G](#) (see for example list under "Informative References" below).
3. Informative References.

Attention is drawn to the following places, which could be of interest for search:

 - navigation, i.e. determining the position and course of land vehicles, ships, aircraft, and space vehicles [G01C 21/00](#)
 - measuring distance traversed on the ground by vehicles, e.g. using odometers [G01C 22/00](#)
 - position-fixing by co-ordinating a plurality of determinations of direction or position lines [G01S 5/00](#)
 - determining distance or velocity using waves and not using reflection or reradiation of waves [G01S 11/00](#)
 - radar systems specially designed for traffic control [G01S 13/91](#)
 - radar systems specially designed for anti-collision purposes [G01S 13/93](#)

G05D 1/021

(continued)

- sonar systems specially designed for for anti-collision purposes [G01S 15/93](#)
- lidar systems specially designed for for anti-collision purposes [G01S 17/93](#)
- traffic control systems for road vehicles [G08G 1/00](#)
- monitoring the location of fleet of vehicles in traffic control systems [G08G 1/127](#)
- anti-collision traffic control systems [G08G 1/16](#)

G05D 1/0212	...	{with means for defining a desired trajectory (involving a plurality of land vehicles G05D 1/0287)}
G05D 1/0214	....	{in accordance with safety or protection criteria, e.g. avoiding hazardous areas (monitoring the location of vehicles within a certain area, e.g. forbidden or allowed areas, in traffic control systems for road vehicles G08G 1/13)}
G05D 1/0217	....	{in accordance with energy consumption, time reduction or distance reduction criteria}
G05D 1/0219	....	{ensuring the processing of the whole working surface}
G05D 1/0221	....	{involving a learning process}
G05D 1/0223	....	{involving speed control of the vehicle (vehicle fittings for automatically controlling, i.e. preventing speed from exceeding an arbitrarily established velocity or maintaining speed at a particular velocity, as selected by the vehicle operator B60K 31/00)}
G05D 1/0225	....	{involving docking at a fixed facility, e.g. base station or loading bay (parking aids B62D 15/027)}
G05D 1/0227	...	{using mechanical sensing means, e.g. for sensing treated area}
G05D 1/0229	....	{in combination with fixed guiding means}
G05D 1/0231	...	{using optical position detecting means (position-fixing by using electromagnetic waves other than radio waves, e.g. optical position detecting means G01S 5/16)}
G05D 1/0234	....	{using optical markers or beacons (optical beacons per se G01S 1/70)}
G05D 1/0236	.....	{in combination with a laser (lasers per se H01S)}
G05D 1/0238	....	{using obstacle or wall sensors (G05D 1/0246 and G05D 1/0289 take precedence; lidar systems designed for anti-collision purposes G01S 17/93)}
G05D 1/024	.....	{in combination with a laser (lasers per se H01S)}
G05D 1/0242	....	{using non-visible light signals, e.g. IR or UV signals}
G05D 1/0244	....	{using reflecting strips}
G05D 1/0246	....	{using a video camera in combination with image processing means (image data processing in general G06T ; video signal coding and transmission H04N)}
G05D 1/0248	.....	{in combination with a laser (lasers per se H01S)}
G05D 1/0251	.....	{extracting 3D information from a plurality of images taken from different locations, e.g. stereo vision (stereoscopic image analysis H04N 13/00 ; depth recovery from images G06T 7/0075)}
G05D 1/0253	.....	{extracting relative motion information from a plurality of images taken successively, e.g. visual odometry, optical flow (determining position or orientation from images G06T 7/004)}

G05D 1/0255	...	{using acoustic signals, e.g. ultra-sonic signals (sonar systems designed for anti-collision purposes G01S 15/93)}
G05D 1/0257	...	{using a radar (radar systems designed for anti-collision purposes between land vehicles or between land vehicle and fixed obstacles G01S 13/931)}
G05D 1/0259	...	{using magnetic or electromagnetic means}
G05D 1/0261	....	{using magnetic plots}
G05D 1/0263	....	{using magnetic strips}
G05D 1/0265	....	{using buried wires}
G05D 1/0268	...	{using internal positioning means}
G05D 1/027	....	{comprising inertial navigation means, e.g. azimuth detector (inertial navigation G01C 21/16 ; inertial navigation combined with non-inertial navigation instruments G01C 21/165)}
G05D 1/0272	....	{comprising means for registering the travel distance, e.g. revolutions of wheels (measuring distance traversed on the ground by vehicles, e.g. using odometers G01C 22/00)}
G05D 1/0274	....	{using mapping information stored in a memory device (navigation using map-matching G01C 21/30)}
G05D 1/0276	...	{using signals provided by a source external to the vehicle (involving a plurality of vehicles G05D 1/0287 ; automatically controlling vehicle speed responsive to externally generated signals B60K 31/0058)}
G05D 1/0278	....	{using satellite positioning signals, e.g. GPS}
G05D 1/028	....	{using a RF signal}
G05D 1/0282	.....	{generated in a local control room}
G05D 1/0285	....	{using signals transmitted via a public communication network, e.g. GSM network}
G05D 1/0287	...	{involving a plurality of land vehicles, e.g. fleet or convoy travelling (traffic control systems for road vehicles G08G 1/00 , particularly anticollision systems G08G 1/16)}

NOTE

In this group, the following terms or expressions are used with the meaning indicated:

- fleet means a plurality of vehicles controlled in a coordinated manner or under unified control;
- convoy (or platooning) means a plurality of vehicles following an identical trajectory, said vehicles being separated by a predetermined distance maintained by a control system

G05D 1/0289	....	{with means for avoiding collisions between vehicles (vehicle fittings for automatically controlling speed including means for detecting potential obstacles B60K 31/0008 ; avoiding obstacles by action on the steering system B62D ; radar, sonar, lidar systems designed for anti-collision purposes G01S 13/93 , G01S 15/93 , G01S 17/93)}
G05D 1/0291	....	{Fleet control (monitoring fleets in traffic control systems for road vehicles G08G 1/127 , G08G 1/127)}
G05D 1/0293	.....	{Convoy travelling}
G05D 1/0295	.....	{by at least one leading vehicle of the fleet}

- G05D 1/0297 {by controlling means in a control room}
- G05D 1/03 . . . using near-field transmission systems, e.g. inductive-loop type {(G05D 1/021 and subgroups take precedence)}
- G05D 1/04 . . . Control of altitude or depth
- G05D 1/042 . . . {specially adapted for aircraft}
- G05D 1/044 . . . {during banks}
- G05D 1/046 . . . {to counteract a perturbation, e.g. gust of wind}
- G05D 1/048 . . . {specially adapted for water vehicles}
- G05D 1/06 . . . Rate of change of altitude or depth
- G05D 1/0607 . . . {specially adapted for aircraft}
- G05D 1/0615 {to counteract a perturbation, e.g. gust of wind}
- G05D 1/0623 {by acting on the pitch}
- G05D 1/063 {by acting on the motors}
- G05D 1/0638 {by combined action on the pitch and on the motors}
- G05D 1/0646 {to follow the profile of undulating ground}
- G05D 1/0653 {during a phase of take-off or landing}
- G05D 1/0661 {specially adapted for take-off}
- G05D 1/0669 {specially adapted for vertical take-off}
- G05D 1/0676 {specially adapted for landing}
- G05D 1/0684 {on a moving platform, e.g. aircraft carrier}
- G05D 1/0692 {specially adapted for under-water vehicles}
- G05D 1/08 . . . Control of attitude, i.e. control of roll, pitch, or yaw
- G05D 1/0808 . . . {specially adapted for aircraft}
- G05D 1/0816 . . . {to ensure stability}
- G05D 1/0825 {using mathematical models}
- G05D 1/0833 {using limited authority control}
- G05D 1/0841 {to prevent a coupling between different modes}
- G05D 1/085 {to ensure coordination between different movements}
- G05D 1/0858 {specially adapted for vertical take-off of aircraft}
- G05D 1/0866 {specially adapted to captive aircraft}
- G05D 1/0875 . . . {specially adapted to water vehicles}
- G05D 1/0883 . . . {specially adapted for space vehicles}
- G05D 1/0891 . . . {specially adapted for land vehicles}
- G05D 1/10 . . . Simultaneous control of position or course in three dimensions (G05D 1/12 takes precedence)
- G05D 1/101 . . . {specially adapted for aircraft}
- G05D 1/102 . . . {specially adapted for vertical take-off of aircraft}
- G05D 1/104 . . . {involving a plurality of aircrafts, e.g. formation flying (traffic control systems for aircraft G08G 5/00)}
- G05D 1/105 . . . {specially adapted for unpowered flight, e.g. glider, parachuting, forced landing (parachutes per se B64D 17/00)}

- G05D 1/107 . . {specially adapted for missiles}
- G05D 1/108 . . . {animated with a rolling movement}
- G05D 1/12 . Target-seeking control

NOTE

Within groups [G05D 3/00](#) to [G05D 3/20](#) , in the absence of an indication of the contrary, an invention is classified in the last appropriate place

G05D 3/00

Control of position or direction ([G05D 1/00](#) takes precedence)

- G05D 3/10 . without using feedback
- G05D 3/105 . . {Solar tracker}
- G05D 3/12 . using feedback
- G05D 3/121 . . {using synchromachines (selsyns)}
- G05D 3/122 . . . {without modulation}
- G05D 3/124 . . . {with modulation}
- G05D 3/125 . . {using discrete position sensor}
- G05D 3/127 . . . {with electrical contact}
- G05D 3/128 . . {using clutch or brake}
- G05D 3/14 . . using an analogue comparing device
- G05D 3/1409 . . . {with dc amplifier chain}
- G05D 3/1418 . . . {with ac amplifier chain}
- G05D 3/1427 . . . {with non-linear amplifier chain}
- G05D 3/1436 . . . {with fine or coarse devices}
- G05D 3/1445 . . . {with a plurality of loops}
- G05D 3/1454 {using models or predicting devices}
- G05D 3/1463 {using PID devices}
- G05D 3/1472 . . . {with potentiometer}
- G05D 3/1481 . . . {with discrete position sensor}
- G05D 3/149 . . . {with clutch or brake}
- G05D 3/16 . . . whose output amplitude can only take a number of discrete values ([G05D 3/18](#) takes precedence)
- G05D 3/165 {using clutch or brake}
- G05D 3/18 . . . delivering a series of pulses
- G05D 3/183 {using stepping motor}
- G05D 3/186 {using clutch or brake}
- G05D 3/20 . . using a digital comparing device
- G05D 3/203 . . . {using fine or coarse devices}
- G05D 3/206 . . . {using clutch or brakes}

G05D 5/00

Control of dimensions of material

- G05D 5/02 . of thickness, e.g. of rolled material (of specific materials [B21B](#) , [B29C](#) , [B32B](#) , [C03B](#) , [D21F](#))
- G05D 5/03 . . characterised by the use of electric means
- G05D 5/04 . of the size of items, e.g. of particles
- G05D 5/06 . . characterised by the use of electric means
- G05D 7/00** **Control of flow** (level control [G05D 9/00](#) ; ratio control [G05D 11/00](#) ; of media to the human body [A61M 5/168](#) ; weighing apparatus [G01G](#))
- G05D 7/005 . {characterised by the use of auxiliary non-electric power combined with the use of electric means}
- G05D 7/01 . without auxiliary power
- G05D 7/0106 . . {the sensing element being a flexible member, e.g. bellows, diaphragm, capsule}
- G05D 7/0113 . . . {the sensing element acting as a valve}
- G05D 7/012 . . . {the sensing element being deformable and acting as a valve}
- G05D 7/0126 . . {the sensing element being a piston or plunger associated with one or more springs}
- G05D 7/0133 . . . {within the flow-path}
- G05D 7/014 {using sliding elements}
- G05D 7/0146 . . {the in-line sensing element being a piston or float without flexible member or spring}
- G05D 7/0153 . . . {using slidable elements}
- G05D 7/016 . . . {the sensing element being a ball}
- G05D 7/0166 . . {the sensing element being a float or a ball placed outside the flow path to be controlled}
- G05D 7/0173 . . {using pivoting sensing element acting as a valve mounted within the flow-path}
- G05D 7/018 . . {using rotary sensing element}
- G05D 7/0186 . . {without moving parts}
- G05D 7/0193 . . {using hydraulic or pneumatic amplifiers, relays or transmitters}
- G05D 7/03 . with auxiliary non-electric power {([G05D 7/005](#) takes precedence)}
- G05D 7/06 . characterised by the use of electric means {([G05D 7/005](#) takes precedence)}
- G05D 7/0605 . . {specially adapted for solid materials}
- G05D 7/0611 . . . {characterised by the set value given to the control element}
- G05D 7/0617 . . {specially adapted for fluid materials}
- G05D 7/0623 . . . {characterised by the set value given to the control element}
- G05D 7/0629 . . . {characterised by the type of regulator means}
- G05D 7/0635 {by action on throttling means ([G05D 7/0688](#) , [G05D 7/0694](#) take precedence)}
- G05D 7/0641 {using a plurality of throttling means ([G05D 7/067](#) takes precedence)}
- G05D 7/0647 {the plurality of throttling means being arranged in series}
- G05D 7/0652 {the plurality of throttling means being arranged in parallel}
- G05D 7/0658 {the plurality of throttling means being arranged for the control of a single flow from a plurality of converging flows ([G05D 7/0652](#) takes precedence; ratio control [G05D 11/13](#))}

G05D 7/0664	.....	{the plurality of throttling means being arranged for the control of a plurality of diverging flows from a single flow (G05D 7/0652 takes precedence; ratio control G05D 11/13)}
G05D 7/067	.....	{characterised by free surface flow (open channel water distribution systems E02B 13/00)}
G05D 7/0676	....	{by action on flow sources (G05D 7/0688 , G05D 7/0694 take precedence)}
G05D 7/0682	.....	{using a plurality of flow sources}
G05D 7/0688	....	{by combined action on throttling means and flow sources (G05D 7/0694 takes precedence)}
G05D 7/0694	....	{by action on throttling means or flow sources of very small size, e.g. microfluidics (microvalves F16K 99/0001 ; micro-structural devices per se B81B)}
G05D 9/00		Level control, e.g. controlling quantity of material stored in vessel (controlling level of liquid-pool electrode in electric discharge tubes and lamps H01J 1/10 , H01J 13/14)
G05D 9/02	.	without auxiliary power
G05D 9/04	.	with auxiliary non-electric power
G05D 9/12	.	characterised by the use of electric means
G05D 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 ; proportioning the ingredients for mixing clay or cement with other substances B28C 7/00)
G05D 11/001	.	{with discontinuous action}
G05D 11/003	.	{using interconnected flow control elements}
G05D 11/005	.	{using synchronised pumps}
G05D 11/006	.	{involving a first fluid acting on the feeding of a second fluid}
G05D 11/008	.	{involving a fluid operating a pump motor}
G05D 11/02	..	Controlling ratio of two or more flows of fluid or fluent material
G05D 11/03	..	without auxiliary power
G05D 11/035	..	with auxiliary non-electric power
G05D 11/04	...	by sensing weight of individual components, e.g. gravimetric procedure
G05D 11/06	...	by sensing density of mixture, e.g. using aerometer
G05D 11/08	...	by sensing concentration of mixture, e.g. measuring pH value
G05D 11/10	....	by sensing moisture of non-aqueous liquids
G05D 11/12	...	by sensing viscosity of mixture
G05D 11/13	..	characterised by the use of electric means
G05D 11/131	...	{by measuring the values related to the quantity of the individual components (G05D 11/139 takes precedence)}
G05D 11/132	....	{by controlling the flow of the individual components (G05D 11/133 takes precedence)}
G05D 11/133	....	{with discontinuous action}
G05D 11/134	.....	{by sensing the weight of the individual components}

- G05D 11/135 . . . {by sensing at least one property of the mixture ([G05D 11/139](#) takes precedence)}
- G05D 11/136 {by sensing the viscosity}
- G05D 11/137 {by sensing the density of the mixture}
- G05D 11/138 {by sensing the concentration of the mixture, e.g. measuring pH value}
- G05D 11/139 . . . {by measuring a value related to the quantity of the individual components and sensing at least one property of the mixture}
- G05D 11/16 . Controlling mixing ratio of fluids having different temperatures, e.g. by sensing the temperature of a mixture of fluids having different viscosities
- G05D 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](#))
- G05D 13/02 . Details
- G05D 13/04 . . providing for emergency tripping of an engine in case of exceeding maximum speed
- G05D 13/06 . . providing for damping of erratic vibrations in governors
- G05D 13/08 . without auxiliary power
- G05D 13/10 . . Centrifugal governors with fly-weights
- G05D 13/12 . . . Details
- G05D 13/14 Fly weights; Mountings thereof; Adjusting equipment for limits, e.g. temporarily
- G05D 13/16 Risers; Transmission gear therefor; Restoring mechanisms therefor
- G05D 13/18 . . . Counterbalanced by spider springs acting immediately upon the fly-weights
- G05D 13/20 . . . counterbalanced by spider springs acting upon the articulated riser
- G05D 13/22 . . . counterbalanced by fluid pressure acting upon the articulated riser
- G05D 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
- G05D 13/26 . . . with provision for modulating the degree of non-uniformity of speed
- G05D 13/28 . . . with provision for performing braking effects in case of increased speed
- G05D 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](#))
- G05D 13/32 . . . using a pump
- G05D 13/34 . with auxiliary non-electric power ([fluid-pressure converters F15B 3/00](#))
- G05D 13/36 . . using regulating devices with proportional band, i.e. P regulating devices
- G05D 13/38 . . . involving centrifugal governors of fly-weight type
- G05D 13/40 . . . involving fluid governors of pump type
- G05D 13/42 . . . involving fluid governors of flow-controller type, i.e. the width of liquid flow being controlled by fly-weights
- G05D 13/44 . . . involving fluid governors of jet type
- G05D 13/46 . . using regulating devices with proportional band and integral action, i.e. PI regulating devices

- G05D 13/48 . . . involving resilient restoring mechanisms
- G05D 13/50 . . . involving connecting means or superimposing a proportional regulating device and an integral regulating device
- G05D 13/52 . . using regulating devices with proportional band and derivative action, i.e. PD regulating devices
- G05D 13/54 . . . involving centrifugal governors of fly-weight type exerting an acceleratory effect
- G05D 13/56 . . . involving restoring mechanisms exerting a delay effect
- G05D 13/58 . . . involving means for connecting a speed regulating device and an acceleration regulating device
- G05D 13/60 . . using regulating devices with proportional band, derivative and integral action, i.e. PID regulating devices
- G05D 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 [{\(electric motor control H02P\)}](#)
- G05D 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 [{\(G05D 13/62 takes precedence\)}](#)
- G05D 13/66 . Governor units providing for co-operation with control dependent upon a variable other than speed

- G05D 15/00 Control of mechanical force or stress; Control of mechanical pressure**
- G05D 15/01 . characterised by the use of electric means

- G05D 16/00 Control of fluid pressure [\(control of pressure in electric discharge tubes or lamps H01J e.g. H01J 7/14 ; control of pressure in electric incandescent lamps H01K 1/52\)](#)**
- G05D 16/02 . Modifications to reduce the effects of instability, e.g. due to vibrations, friction, abnormal temperature, overloading, unbalance [\(vibration dampers F16F 7/00\)](#)
- G05D 16/04 . without auxiliary power
- G05D 16/06 . . the sensing element being a flexible membrane, yielding to pressure, e.g. diaphragm, bellows, capsule
- G05D 16/0602 . . . [{two controllers being mounted in series}](#)
- G05D 16/0605 . . . [{two controllers being mounted in parallel}](#)
- G05D 16/0608 . . . [{the controller being mounted within the flow path and having slidable elements}](#)
- G05D 16/0611 . . . [{the sensing element being deformable, e.g. Bourdon tube}](#)
- G05D 16/0613 [{the deformable sensing element acting as a throttling member}](#)
- G05D 16/0616 . . . [{the sensing element being a bellow}](#)
- G05D 16/0619 [{acting directly on the obturator}](#)
- G05D 16/0622 [{characterised by the form of the obturator}](#)
- G05D 16/0625 [{acting indirectly on the obturator, e.g. by a lever}](#)
- G05D 16/0627 [{characterised by the form of the obturator}](#)
- G05D 16/063 . . . [{the sensing element being a membrane}](#)
- G05D 16/0633 [{characterised by the properties of the membrane}](#)
- G05D 16/0636 [{characterised by the loading device of the membrane e.g. spring}](#)

G05D 16/0638	....	{characterised by the form of the obturator}
G05D 16/0641	.....	{the obturator is a membrane}
G05D 16/0644	....	{the membrane acting directly on the obturator}
G05D 16/0647	.....	{using one membrane without spring}
G05D 16/065	.....	{characterised by the form of the obturator}
G05D 16/0652	.....	{using several membranes without spring}
G05D 16/0655	.....	{using one spring-loaded membrane}
G05D 16/0658	.....	{characterised by the form of the obturator}
G05D 16/0661	.....	{characterised by the loading mechanisms of the membrane}
G05D 16/0663	.....	{using a spring-loaded membrane with a spring-loaded slideable obturator}
G05D 16/0666	.....	{characterised by the form of the obturator}
G05D 16/0669	.....	{characterised by the loading mechanisms of the membrane}
G05D 16/0672	.....	{using several spring-loaded membranes}
G05D 16/0675	....	{the membrane acting on the obturator through a lever}
G05D 16/0677	.....	{using one membrane without spring}
G05D 16/068	.....	{characterised by the form of the obturator}
G05D 16/0683	.....	{using a spring-loaded membrane}
G05D 16/0686	.....	{characterised by the form of the lever}
G05D 16/0688	.....	{characterised by the form of the obturator}
G05D 16/0691	.....	{characterised by the loading mechanisms of the membrane}
G05D 16/0694	.....	{using a spring-loaded membrane with a spring-loaded slideable obturator}
G05D 16/0697	.....	{using several membranes}
G05D 16/08	...	Control of liquid pressure
G05D 16/10	..	the sensing element being a piston or plunger
G05D 16/103	...	{with sensing element placed within the flow-path}
G05D 16/106	....	{using sliding elements}
G05D 16/12	..	the sensing element being a float
G05D 16/14	.	with auxiliary non-electric power
G05D 16/16	..	derived from the controlled fluid
G05D 16/163	...	{using one or several membranes}
G05D 16/166	...	{using one or several pistons}
G05D 16/18	..	derived from an external source
G05D 16/185	...	{using one or several membranes}
G05D 16/20	.	characterised by the use of electric means
G05D 16/2006	..	{with direct action of electric energy on controlling means (G05D 16/2093 takes precedence)}
G05D 16/2013	...	{using throttling means}
G05D 16/202	....	{actuated by an electric motor}
G05D 16/2026	....	{with a plurality of throttling means}

G05D 16/2033	.....	{the plurality of throttling means being arranged in series}
G05D 16/204	.....	{the plurality of throttling means being arranged in parallel}
G05D 16/2046	.....	{the plurality of throttling means being arranged for the control of a single pressure from a plurality of converging pressures (G05D 16/204 takes precedence)}
G05D 16/2053	.....	{the plurality of throttling means comprising only a first throttling means acting on a higher pressure and a second throttling means acting on a lower pressure, e.g. the atmosphere}
G05D 16/206	.....	{the plurality of throttling means being arranged for the control of a plurality of diverging pressures from a single pressure (G05D 16/204 takes precedence)}
G05D 16/2066	...	{using control means acting on the pressure source}
G05D 16/2073	....	{with a plurality of pressure sources}
G05D 16/208	...	{using a combination of controlling means as defined in G05D 16/2013 and G05D 16/2066 (G05D 16/2073 takes precedence)}
G05D 16/2086	..	{without direct action of electric energy on the controlling means (G05D 16/2093 takes precedence)}
G05D 16/2093	..	{with combination of electric and non-electric auxiliary power}

G05D 17/00**Control of torque; Control of mechanical power**

G05D 17/02

- . characterised by the use of electric means

G05D 19/00**Control of mechanical oscillations, e.g. of amplitude, of frequency, of phase (generating or transmitting mechanical vibrations [B06B](#) ; control of electric motors [H02P](#))**

G05D 19/02

- . characterised by the use of electric means

G05D 21/00**Control of chemical or physico-chemical variables, e.g. pH value**

G05D 21/02

- . characterised by the use of electric means

G05D 22/00**Control of humidity (of tobacco products [A24B 9/00](#) ; air conditioning [F24F](#))**

G05D 22/02

- . characterised by the use of electric means

G05D 23/00**Control of temperature (automatic switching arrangements for electric heating apparatus [H05B 1/02](#) ; controlling induction heating [H05B 6/06](#) ; regulating temperature of anode of X-ray tube [H05G 1/36](#))****NOTE**

Within groups [G05D 23/01](#) to [G05D 23/32](#) , an invention is classified in the last appropriate place in the absence of an indication of the contrary

G05D 23/01

- . without auxiliary power

G05D 23/015

- .. {with mechanical sensing element not covered by groups [G05D 23/02](#) and [G05D 23/12](#)}

G05D 23/02

- .. with sensing element expanding and contracting in response to changes of temperature ([G05D 23/13](#) takes precedence)

G05D 23/021

- ... {the sensing element being a non-metallic solid, e.g. elastomer, paste}

G05D 23/022	....	{the sensing element being placed within a regulating fluid flow}
G05D 23/023	....	{the sensing element being placed outside a regulating fluid flow}
G05D 23/024	...	{the sensing element being of the rod type, tube type, or of a similar type}
G05D 23/025	....	{the sensing element being placed within a regulating fluid flow}
G05D 23/026	....	{the sensing element being placed outside a regulating fluid flow}
G05D 23/027	.....	{for combustible fluid}
G05D 23/028	...	{with fusing sensing element}
G05D 23/08	...	with bimetallic element (valve arrangements adapted for mixing F16K 11/00)
G05D 23/10	....	with snap-action elements (for valves F16K 31/56)
G05D 23/12	..	with sensing element responsive to pressure or volume changes in a confined fluid
G05D 23/121	...	{characterised by the sensing element}
G05D 23/122	....	{using a plurality of sensing elements}
G05D 23/123	...	{the sensing element being placed within a regulating fluid flow}
G05D 23/125	...	{the sensing element being placed outside a regulating fluid flow}
G05D 23/126	....	{using a capillary tube}
G05D 23/127	.....	{to control a gaseous fluid circulation}
G05D 23/128	.....	{the fluid being combustible}
G05D 23/13	..	by varying the mixing ratio of two fluids having different temperatures
G05D 23/1306	...	{for liquids (G05D 23/1393 takes precedence)}
G05D 23/1313	....	{without temperature sensing element}
G05D 23/132	....	{with temperature sensing element}
G05D 23/1326	.....	{details of the sensor}
G05D 23/1333	.....	{measuring the temperature of incoming fluid}
G05D 23/134	.....	{measuring the temperature of mixed fluid}
G05D 23/1346	.....	{with manual temperature setting means}
G05D 23/1353	.....	{combined with flow controlling means}
G05D 23/136	.....	{with pressure equalizing means}
G05D 23/1366	.....	{using a plurality of sensing elements}
G05D 23/1373	.....	{measuring the temperature of mixed fluid}
G05D 23/138	...	{for gases (G05D 23/1393 takes precedence)}
G05D 23/1386	...	{for steam and liquid (G05D 23/1393 takes precedence)}
G05D 23/1393	...	{characterised by the use of electric means}
G05D 23/185	.	with auxiliary non-electric power
G05D 23/1852	..	{with sensing element expanding and contracting in response to change of temperature}
G05D 23/1854	..	{with bimetallic element}
G05D 23/1856	..	{with sensing element responsive to pressure or volume change in a confined fluid}
G05D 23/1858	..	{by varying the mixing ratio of fluids having different temperatures}

G05D 23/19 . characterised by the use of electric means {(G05D 23/1393 takes precedence)}

NOTE

In this group, multi-aspect classification is applied, so that subject matter characterised by aspects covered by more than one of its subgroups, which is considered to represent information of interest for search, should be classified in each of those subgroups. Temperature control arrangements are classified in subgroups [G05D 23/20](#) to [G05D 23/275](#) on the base of the type of temperature sensor and in the subgroups directly under [G05D 23/19](#) for each aspect related to temperature control in general.

G05D 23/1902	..	{characterised by the use of a variable reference value}
G05D 23/1904	...	{variable in time}
G05D 23/1905	...	{associated with tele control}
G05D 23/1906	..	{using an analogue comparing device}
G05D 23/1909	...	{whose output amplitude can only take two discrete values}
G05D 23/1912	...	{whose output amplitude can take more than two discrete values}
G05D 23/1913	...	{delivering a series of pulses}
G05D 23/1917	..	{using digital means}
G05D 23/1919	..	{characterised by the type of controller}
G05D 23/192	...	{using a modification of the thermal impedance between a source and the load}
G05D 23/1921	...	{using a thermal motor}
G05D 23/1923	...	{using thermal energy, the cost of which varies in function of time}
G05D 23/1924	...	{using thermal energy, the availability of which is aleatory}
G05D 23/1925	..	{using a combination of auxiliary electric and non-electric power}
G05D 23/1927	..	{using a plurality of sensors (G05D 23/1902 , G05D 23/1917 , and G05D 23/1919 take precedence)}
G05D 23/1928	...	{sensing the temperature of one space}
G05D 23/193	...	{sensing the temperature in different places in thermal relationship with one or more spaces}
G05D 23/1931	....	{to control the temperature of one space}
G05D 23/1932	....	{to control the temperature of a plurality of spaces}
G05D 23/1934	.....	{each space being provided with one sensor acting on one or more control means}
G05D 23/1935	....	{using sequential control}
G05D 23/1951	..	{with control of the working time of a temperature controlling device}
G05D 23/20	..	with sensing elements having variation of electric or magnetic properties with change of temperature (G05D 23/13 takes precedence)
G05D 23/2033	...	{details of the sensing element}
G05D 23/2034	....	{the sensing element being a semiconductor}
G05D 23/2035	....	{the sensing element being a ionized gas}
G05D 23/2036	....	{the sensing element being a dielectric of a capacitor}
G05D 23/2037	...	{details of the regulator}

- G05D 23/2039 {using mechanical means}
- G05D 23/22 . . . the sensing element being a thermocouple
- G05D 23/2236 {details of the regulator}
- G05D 23/2237 {using discharge tubes}
- G05D 23/2239 {using photoelectric elements}
- G05D 23/224 {using selfs or transformers}
- G05D 23/24 . . . the sensing element having a resistance varying with temperature, e.g. a thermistor
- G05D 23/2401 {using a heating element as a sensing element}
- G05D 23/2451 {Details of the regulator}
- G05D 23/2453 {using discharge tubes}
- G05D 23/2454 {using photoelectric elements}
- G05D 23/2456 {using selfs or transformers}
- G05D 23/26 . . . the sensing element having a permeability varying with temperature
- G05D 23/27 . . with sensing element responsive to radiation
- G05D 23/275 . . with sensing element expanding, contracting, or fusing in response to changes of temperature
- G05D 23/27535 . . . {Details of the sensing element}
- G05D 23/27536 {using fusible material}
- G05D 23/27537 {using expansible fluid}
- G05D 23/27539 {using conductible expansible fluid}
- G05D 23/2754 {using bimetallic element}
- G05D 23/27541 {using expansible solid}
- G05D 23/27543 {using the controlled element as sensing element}
- G05D 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](#))
- G05D 23/303 . . . {using a sensing element having a resistance varying with temperature, e.g. thermistor}
- G05D 23/306 {using semiconductor devices}
- G05D 23/32 . . . with provision for adjustment of the effect of the auxiliary heating device, e.g. a function of time

G05D 24/00 Control of viscosity

- G05D 24/02 . characterised by the use of electric means

G05D 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](#) ; circuit arrangements for controlling light sources [H01S 3/10](#) , [H05B 33/08](#) , [H05B 35/00](#) to [H05B 43/00](#))

G05D 25/02	. characterised by the use of electric means
G05D 27/00	Simultaneous control of variables covered by two or more of the preceding main groups
G05D 27/02	. characterised by the use of electric means
G05D 29/00	Simultaneous control of electric and non-electric variables
G05D 99/00	Subject matter not provided for in other groups of this subclass
G05D 2201/00	Application
G05D 2201/02	. Control of position of land vehicles
G05D 2201/0201	.. Agriculture or harvesting machine
G05D 2201/0202	.. Building or civil engineering machine
G05D 2201/0203	.. Cleaning or polishing vehicle
G05D 2201/0204	.. Golf cart
G05D 2201/0205	.. Harbour vehicle, e.g. crane
G05D 2201/0206	.. Vehicle in a health care environment, e.g. for distribution of food or medicines in a hospital or for helping handicapped persons
G05D 2201/0207	.. Unmanned vehicle for inspecting or visiting an area
G05D 2201/0208	.. Lawn mower
G05D 2201/0209	.. Combat or reconnaissance vehicle for military, police or security applications
G05D 2201/021	.. Mining vehicle
G05D 2201/0211	.. Vehicle in an office environment, e.g. for delivering mail or for videoconferencing
G05D 2201/0212	.. Driverless passenger transport vehicle
G05D 2201/0213	.. Road vehicle, e.g. car or truck
G05D 2201/0214	.. Position controlled toy
G05D 2201/0215	.. Vacuum cleaner
G05D 2201/0216	.. Vehicle for transporting goods in a warehouse, factory or similar
G05D 2201/0217	.. Anthropomorphic or bipedal robot
G05D 2201/0218	.. Planetary exploration vehicle