SECTION F — MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

F15 FLUID-PRESSURE ACTUATORS; HYDRAULICS OR PNEUMATICS IN GENERAL

F15B SYSTEMS ACTING BY MEANS OF FLUIDS IN GENERAL; FLUID-PRESSURE ACTUATORS, e.g. SERVOMOTORS; DETAILS OF FLUID-PRESSURE SYSTEMS, NOT OTHERWISE PROVIDED FOR (motors, turbines, compressors, blowers, pumps F01-F04; fluid dynamics F15D; fluid clutches or brakes F16D; fluid springs F16F; fluid gearing F16H; pistons, cylinders, packing F16J; valves, taps, cocks, actuating-floats F16K; safety valves with auxiliary fluid operation of the main valve F16K 17/10; fluid-operating means for valves F16K 31/12; pipes, pipe joints F16L; lubricating F16N)

Note(s)

In this subclass, the following terms are used with the meanings indicated:

- "telemotor" means a system or device in which a substantially constant amount of fluid is trapped between an input member and an output member to act as a fluid link;
- "servomotor" means a fluid-pressure actuator, e.g. a piston and cylinder, directly controlled by a valve or other device which is responsive to operation of an initial controlling member; "Servomotor" does not cover a telemotor. The initial controlling member may be adjacent to the servomotor or at a distance, and may be, for example, a hand lever.

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1/00 Installations or systems with accumulators; Supply reservoir or sump assemblies [1, 2006.01]

1/02 • Installations or systems with accumulators (devices damping pulsations or vibrations in fluids for use in, or in connection with, pipes or pipe systems F16L 55/04) **[1, 2006.01]**

1/027 • • having accumulator charging devices (control of fluid pressure in general G05D 16/00) **[6, 2006.01]**

1/033 • • • with electrical control means **[6, 2006.01]**

1/04 • • Accumulators (connection of valves to inflatable elastic bodies B60C 29/00) **[1, 2006.01]**

1/08 • • • using a gas cushion; Gas charging devices; Indicators or floats therefor **[6, 2006.01]**

1/10 • • • • with flexible separating means **[6, 2006.01]**

1/12 • • • • • attached at their periphery (F15B 1/16 takes precedence) **[6, 2006.01]**

1/14 • • • • • • by means of a rigid annular supporting member **[6, 2006.01]**

1/16 • • • • • in the form of a tube **[6, 2006.01]**

1/18 • • • • • Anti-extrusion means **[6, 2006.01]**

1/20 • • • • • • fixed to the separating means **[6, 2006.01]**

1/22 • • • • Liquid port constructions **[6, 2006.01]**

1/24 • • • • with rigid separating means, e.g. pistons **[6, 2006.01]**

1/26 • Supply reservoir or sump assemblies **[6, 2006.01]**

3/00 Intensifiers or fluid-pressure converters, e.g. pressure exchangers; Conveying pressure from one fluid system to another, without contact between the fluids [1, 2006.01]

5/00 Transducers converting variations of physical quantities, e.g. expressed by variations in positions of members, into fluid-pressure variations or vice versa; Varying fluid pressure as a function of variations of a plurality of fluid pressures or variations of other quantities (F15B 9/00 takes precedence; for measuring or controlling G01, G05) **[1, 2006.01]**

Fluid-pressure actuator systems

Note(s)

1. Groups F15B 7/00-F15B 21/00 cover systems in which members are moved into one or more definite positions by means of fluid pressure.
2. Pump, motor, and control features so far as not peculiar to this purpose are classified in the relevant classes.

7/00 Fluid-pressure actuator systems in which the movement produced is definitely related to the output of a volumetric pump; Telemotors [1, 2006.01]

7/02 • Systems with continuously-operating input and output apparatus **[1, 2006.01]**
7/04 • in which the ratio between pump stroke and motor stroke varies with the resistance against the motor (in brake-actuating systems for motor vehicles B60T) **[1, 2006.01]**
7/06 • Details (F15B 15/00 takes precedence) **[1, 2006.01]**
7/08 • • Input units; Master units **[1, 2006.01]**
7/10 • • Compensation of the liquid content in a system (F15B 7/08 takes precedence; pressure-maintaining arrangements for brake master cylinders B60T 11/228) **[1, 5, 2006.01]**

9/00 Servomotors with follow-up action, i.e. in which the position of the actuated member conforms with that of the controlling member [1, 2006.01]
9/02 • with servomotors of the reciprocatable or oscillatable type **[1, 2006.01]**
9/03 • • with electrical control means **[1, 2006.01]**
9/04 • • controlled by varying the output of a pump with variable capacity **[1, 2006.01]**
9/06 • • controlled by means using a fluid jet **[1, 2006.01]**
9/07 • • • with electrical control means **[1, 2006.01]**
9/08 • • controlled by valves affecting the fluid feed or the fluid outlet of the servomotor (F15B 9/06 takes precedence) **[1, 2006.01]**
9/09 • • • with electrical control means **[1, 2006.01]**
9/10 • • • in which the controlling element and the servomotor each controls a separate member, these members influencing different fluid passages or the same passage **[1, 2006.01]**
9/12 • • • in which both the controlling element and the servomotor control the same member influencing a fluid passage and are connected to that member by means of a differential gearing **[1, 2006.01]**
9/14 • with rotary servomotors **[1, 2006.01]**
9/16 • Systems essentially having two or more interacting servomotors **[1, 2006.01]**
9/17 • • with electrical control means **[1, 2006.01]**

11/00 Servomotor systems without provision for follow-up action (F15B 3/00 takes precedence) **[1, 2006.01]**
11/02 • Systems essentially incorporating special features for controlling the speed or the actuating force or speed of an output member **[1, 2006.01]**
11/024 • • by means of differential connection of the servomotor lines, e.g. regenerative circuits **[6, 2006.01]**
11/028 • • for controlling the actuating force (F15B 11/024 takes precedence) **[6, 2006.01]**
11/032 • • • by means of fluid-pressure converters (fluid-pressure converters per se F15B 3/00) **[6, 2006.01]**
11/036 • • • by means of servomotors having a plurality of working chambers (servomotors per se F15B 15/00) **[6, 2006.01]**
11/04 • • for controlling the speed (F15B 11/024 takes precedence) **[1, 6, 2006.01]**
11/042 • • • by regulating means in feed line (F15B 11/046, F15B 11/05 take precedence) **[6, 2006.01]**
11/044 • • • by regulating means in return line (F15B 11/046, F15B 11/05 take precedence) **[6, 2006.01]**
11/046 • • • depending on the position of the working member **[6, 2006.01]**
11/048 • • • • with deceleration control **[6, 2006.01]**
11/05 • • • specially adapted to maintain constant speed, e.g. pressure-compensated, load-responsive **[1, 2006.01]**
11/06 • involving features specific to the use of a compressible medium, e.g. air, steam **[1, 2006.01]**
11/064 • • with devices for saving the compressible medium **[6, 2006.01]**
11/068 • • with valves for gradually putting pneumatic systems under pressure **[6, 2006.01]**
11/072 • • Combined pneumatic-hydraulic systems **[6, 2006.01]**
11/076 • • • with pneumatic drive or displacement and speed control or stopping by hydraulic braking **[6, 2006.01]**
11/08 • with only one servomotor **[1, 2006.01]**
11/10 • • in which the servomotor position is a function of the pressure **[1, 2006.01]**
11/12 • • providing distinct intermediate positions; with step-by-step action **[1, 2006.01]**
11/13 • • • using chambers of predetermined volume **[6, 2006.01]**
11/15 • • with special provision for automatic return **[1, 2006.01]**
11/16 • with two or more servomotors **[1, 2006.01]**
11/17 • • using two or more pumps **[6, 2006.01]**
11/18 • • used in combination for obtaining stepwise operation of a single controlled member **[1, 2006.01]**
11/20 • • controlling several interacting or sequentially-operating members (fluid distribution or supply devices for the control of two or more servomotors F15B 13/06) **[1, 2006.01]**
11/22 • • Synchronisation of the movement of two or more servomotors **[1, 2006.01]**

13/00 Details of servomotor systems (F15B 15/00 takes precedence) **[1, 2006.01]**
13/01 • Locking-valves or other detent devices (associated with the actuator F15B 15/26) **[1, 2006.01]**
13/02 • Fluid distribution or supply devices characterised by their adaptation to the control of servomotors (multiple-way valves F16K 11/00) **[1, 2006.01]**
13/04 • • for use with a single servomotor **[1, 2006.01]**
13/042 • • • operated by fluid pressure **[1, 2006.01]**
13/043 • • • • with electrically-controlled pilot valves **[1, 2006.01]**
13/044 • • • operated by electrically-controlled means, e.g. solenoids, torque-motors **[1, 2006.01]**
13/06 • • for use with two or more servomotors **[1, 2006.01]**
13/07 • • • in distinct sequence **[1, 2006.01]**
13/08 • • • Assemblies of units, each for the control of a single servomotor only **[1, 2006.01]**
13/10 • Special arrangements for operating the actuated device without using fluid pressure, e.g. for emergency use **[1, 2006.01]**
13/12 • Special measures for increasing the sensitivity of the system **[1, 2006.01]**
13/14 • Special measures for giving the operator by sense of touch the immediate response of the actuated device **[1, 2006.01]**
13/16 • Special measures for feedback **[1, 2006.01]**

15/00 Fluid-actuated devices for displacing a member from one position to another (motors for continuous movement F01-F03)**; Gearing associated therewith [1, 2006.01]**

15/02 • Mechanical layout characterised by the means for converting the movement of the fluid-actuated element into movement of the finally-operated member **[1, 2006.01]**
15/04 • • with oscillating cylinder **[1, 2006.01]**
15/06 • • for mechanically converting rectilinear movement into non-rectilinear movement **[1, 2006.01]**
15/08 • characterised by the construction of the motor unit (pistons, cylinders, packing F16J) **[1, 2006.01]**
15/10 • • the motor being of diaphragm type (connection of valves to inflatable elastic bodies B60C 29/00; diaphragms, bellows F16J 3/00) **[1, 2006.01]**
15/12 • • of the oscillating-vane or curved-cylinder type **[1, 2006.01]**
15/14 • • of the straight-cylinder type **[1, 2006.01]**
15/16 • • • of the telescopic type **[1, 2006.01]**
15/17 • • • of differential-piston type **[1, 2006.01]**
15/18 • Combined units comprising both motor and pump **[1, 2006.01]**
15/19 • Pyrotechnical actuators **[3, 2006.01]**
15/20 • Other details **[1, 2006.01]**
15/22 • • for accelerating or decelerating the stroke **[1, 2006.01]**
15/24 • • for restricting the stroke **[1, 2006.01]**
15/26 • • Locking mechanisms **[1, 2006.01]**
15/28 • • Means for indicating the position, e.g. end of stroke **[4, 2006.01]**

17/00 Combinations of telemotor and servomotor systems [1, 2006.01]
17/02 • in which a telemotor operates the control member of a servomotor **[1, 2006.01]**

18/00 Parallel arrangements of independent servomotor systems [1, 2006.01]

19/00 Testing fluid-pressure actuator systems or apparatus, so far as not provided for elsewhere [1, 2006.01]

20/00 Safety arrangements for fluid actuator systems; Applications of safety devices in fluid actuator systems; Emergency measures for fluid actuator systems [1, 2006.01]

21/00 Common features of fluid actuator systems; Fluid-pressure actuator systems or details thereof, not covered by any other group of this subclass [1, 2006.01]
21/02 • Servomotor systems with programme control derived from a store or timing device; Control devices therefor **[1, 2006.01]**
21/04 • Special measures taken in connection with the properties of the fluid, e.g. for venting, compensating for changes of viscosity, cooling, filtering, preventing churning **[1, 2006.01]**
21/06 • Use of special fluids, e.g. liquid metal; Special adaptations of fluid-pressure systems, or control of elements therefor, to the use of such fluids **[1, 2006.01]**
21/08 • Servomotor systems incorporating electrically-operated control means (F15B 21/02 takes precedence) **[1, 2006.01]**
21/10 • Delay devices or arrangements (associated with fluid motors or actuators F15B 15/22) **[1, 2006.01]**
21/12 • Fluid oscillators or pulse generators (fluid oscillators predominantly used for computing or control purposes F15C 1/22, F15C 3/16) **[1, 2006.01]**
21/14 • Energy-recuperation means (for vehicles B60T 1/10) **[6, 2006.01]**

F15C FLUID-CIRCUIT ELEMENTS PREDOMINANTLY USED FOR COMPUTING OR CONTROL PURPOSES (transducers F15B 5/00; fluid dynamics in general F15D; computers comprising fluid elements G06D, G06G)

Note(s) [7]

Attention is drawn to the Notes following the titles of class B81 and subclass B81B relating to "micro-structural devices" and "micro-structural systems".

1/00 Circuit elements having no moving parts [1, 2006.01]
1/02 • Details **[1, 2006.01]**
1/04 • • Means for controlling fluid streams to fluid devices, e.g. by electric signals **[1, 2006.01]**
1/06 • • Constructional details; Selection of specified materials **[1, 2006.01]**

Note(s) [2]

Group F15C 1/22 takes precedence over groups F15C 1/08-F15C 1/20.

1/08 • Boundary-layer devices, e.g. wall-attachment amplifiers **[1, 2, 2006.01]**
1/10 • • for digital operation, e.g. to form a logical flip-flop, OR-gate, NOR-gate **[1, 2006.01]**
1/12 • • • Multiple arrangements thereof for performing operations of the same kind, e.g. majority gates, identity gates **[1, 2006.01]**
1/14 • Stream-interaction devices; Momentum-exchange devices, e.g. operating by exchange between two orthogonal fluid jets **[1, 2006.01]**
1/16 • Vortex devices, i.e. devices in which use is made of the pressure drop associated with vortex motion in a fluid **[1, 2006.01]**
1/18 • Turbulence devices, i.e. devices in which a controlling stream will cause a laminar flow to become turbulent **[1, 2006.01]**
1/20 • Direct-impact devices, i.e. devices in which two collinear opposing power streams are impacted **[1, 2006.01]**
1/22 • Oscillators **[2, 2006.01]**

3/00 Circuit elements having moving parts (valves, construction of valves F16K) **[1, 2006.01]**

Note(s) [2]

Group F15C 3/16 takes precedence over groups F15C 3/02-F15C 3/10.

3/02 • using spool valves **[1, 2006.01]**
3/04 • using diaphragms (connection of valves to inflatable elastic bodies B60C 29/00) **[1, 2006.01]**
3/06 • using balls **[1, 2006.01]**
3/08 • using reeds **[1, 2006.01]**

3/10 • using nozzles or jet pipes **[1, 2006.01]**
3/12 • • the nozzle or jet pipe being movable **[1, 2006.01]**
3/14 • • the jet from the nozzle being intercepted by a flap **[1, 2006.01]**
3/16 • Oscillators **[2, 2006.01]**

4/00 Circuit elements characterised by their special functions [1, 2006.01]

5/00 Manufacture of fluid-circuit elements; Manufacture of assemblages of such elements [1, 2006.01]

7/00 Hybrid elements, i.e. circuit elements having features according to groups F15C 1/00 and F15C 3/00 [2, 2006.01]

F15D FLUID DYNAMICS, i.e. METHODS OR MEANS FOR INFLUENCING THE FLOW OF GASES OR LIQUIDS (fluid-circuit elements F15C)

Note(s)

This subclass covers boundary-layer control and other arrangements and methods, not provided for in other classes, for influencing the flow of fluids relative to constraining surfaces and after leaving these surfaces, e.g. producing or removing turbulence, deflecting jets, guiding flow through bends in conduits, affecting distribution of fluid in a conduit, reducing fluid friction.

1/00 Influencing the flow of fluids [1, 2006.01]
1/02 • in pipes or conduits **[1, 2006.01]**
1/04 • • Arrangements of guide vanes in pipe elbows or duct bends; Construction of pipe conduit elements or elbows with respect to flow, specially for reducing losses of flow **[1, 2006.01]**
1/06 • • by influencing the boundary layer **[1, 2006.01]**
1/08 • of jets leaving an orifice (nozzles or outlets with means for mechanically breaking-up or deflecting the jet B05B, e.g. B05B 1/26) **[1, 2006.01]**
1/10 • around bodies of solid material **[1, 2006.01]**
1/12 • • by influencing the boundary layer **[1, 2006.01]**
1/14 • Diverting flow into alternative channels (in hydraulic engineering E02B) **[1, 2006.01]**