Nov. 4, 1941. A. SÄLZER 2,261,925

PRESSURE FLUID SERVOMOTOR FOR HIGH POTENTIAL SWITCHES

Filed Feb. 24, 1939 2 Sheets-Sheet 1

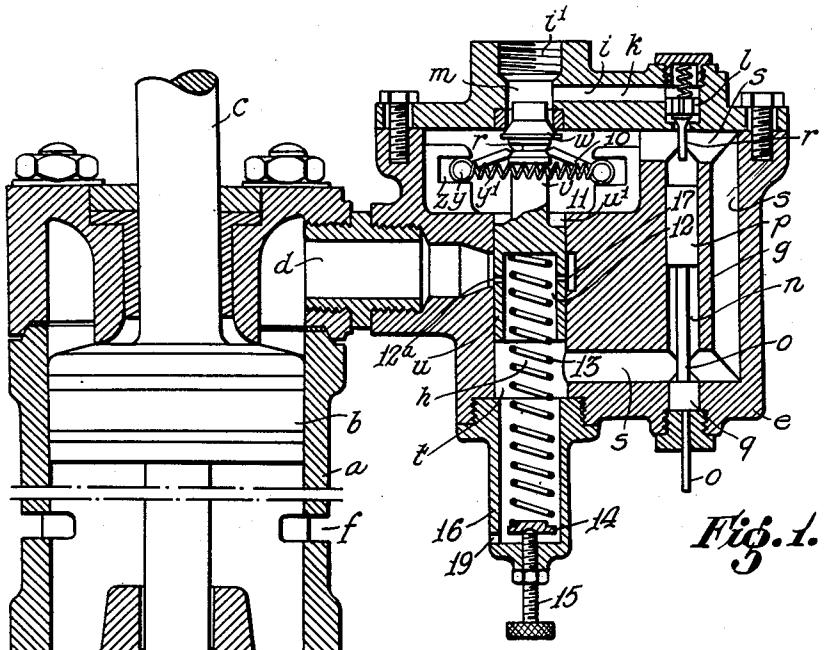

Fig. 1.

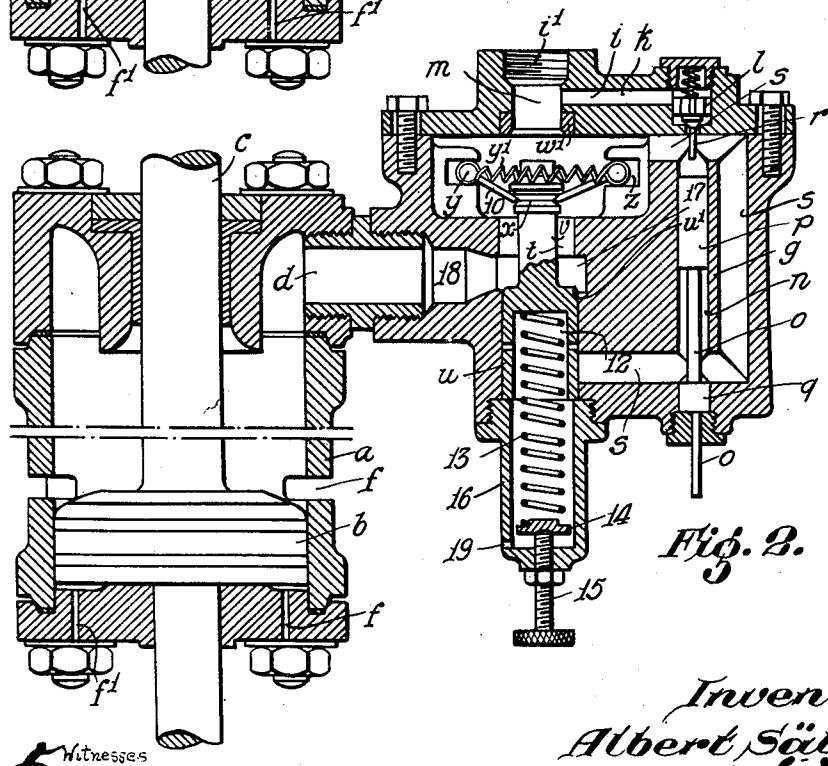

Fig. 2.

Witnesses

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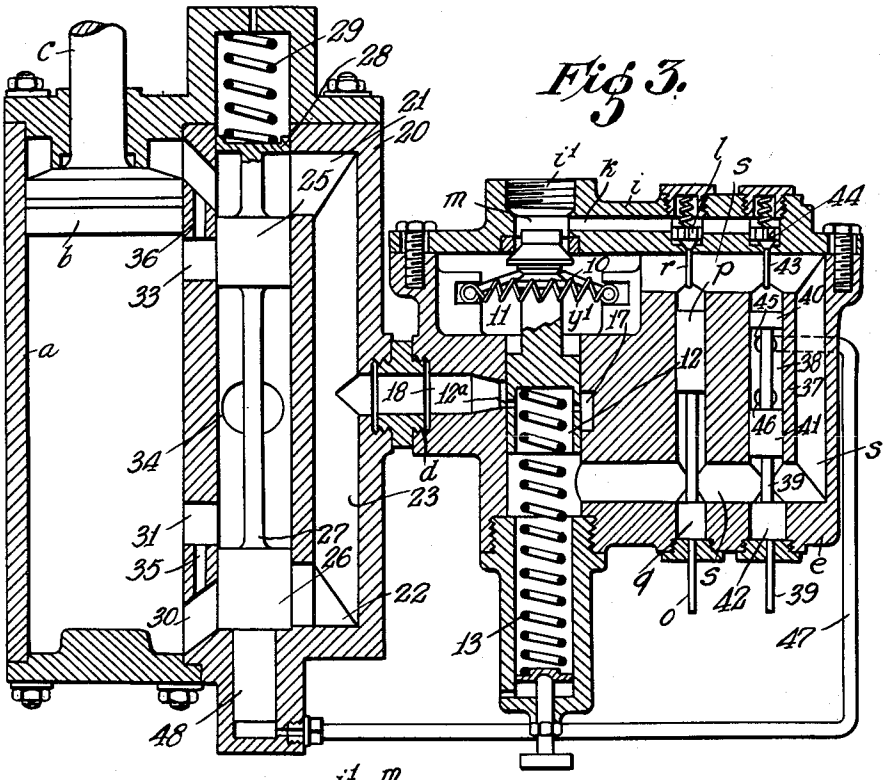
Fig 3.



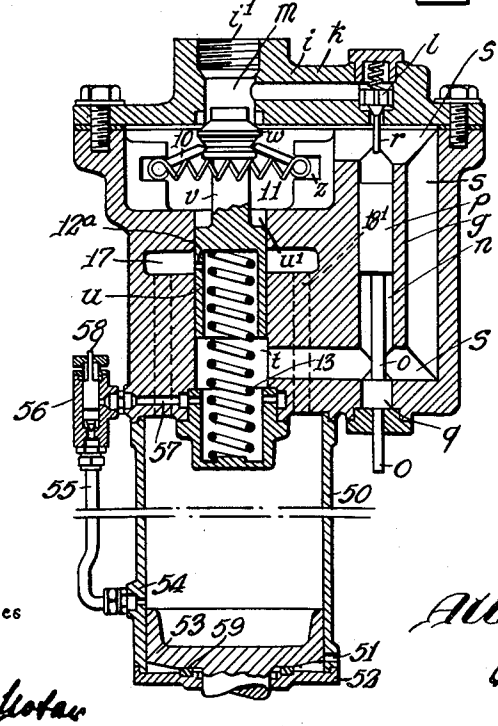


Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE

2,261,925

PRESSURE FLUID SERVOMOTOR FOR HIGH POTENTIAL SWITCHES

Albert Sälzer, Geisweid, Germany

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In Germany February 28, 1938

8 Claims. (Cl. 121—38)

In the compressed air actuation of switches in electric power plants, it is of great importance that, on the one hand, every switching operation once commenced should be carried out with complete security to the end of the operation, even when the impulse given for example by a push knob or other device is only very short and ceases before the switching operation is terminated. On the other hand, it is of prime importance to exclude the possibility of the switching operation becoming suspended during its movement, for example by the dropping of the driving pressure, since thereby permanent arcs could occur, leading to the destruction of the switches, machines and the like.

Safety devices preventing non-completion of a switching operation when only very short operating impulses are adopted are already known. One such device adopts the insertion of an intermediate valve between the compressed air cylinder which carries out the switching process and a preliminary control valve excited only temporarily, the intermediate valve being controlled by the preliminary control valve and shifted in both directions by the pressure medium, and also in its position of rest connecting the working space of the switch cylinder with atmosphere, whilst in the opposite terminal position it connects it with the pressure medium pipe. This device has the disadvantage that the intermediate valve is continuously under the full pressure of the working agent and consequently it is difficult to keep continuously tight. Leakages which could cause a sluggish switching action and all the dangers attaching thereto are consequently not impossible.

Another device has already been proposed for the same purpose in which the cylinder of the control piston connected with the inlet valve for the compressed air supply to the working cylinder after ceasing its charging with compressed air effected by the key switch, is regularly emptied and the compressed air acting on the inlet valve only brings this inlet valve into the closed position (and thus cuts off the delivery of compressed air to the working cylinder) when the compressed air which is above the control piston in the control cylinder has all escaped to atmosphere.

Further, in order to prevent a switching operation once commenced not being carried to its termination owing to insufficient pressure, and thus causing a permanent arc, it has already been proposed to provide a spring-loaded subsidiary piston which opens a subsidiary path for the working compressed air to atmosphere when the pressure is not sufficient to carry the switching process to its termination. This device, however, has the disadvantage that the spring system of the subsidiary piston only comes into operation when the switching stroke has commenced. It is, however, difficult to provide so wide an outlet conduit that the air escaping immediately after the beginning of the switching stroke, escapes sufficiently rapidly for the working piston to be stopped before reaching the arcing limit.

The present invention avoids these drawbacks by means which ensure that the pressure medium is only supplied to the working cylinder carrying out the switching stroke when the tension of this is so high that the terminal position of the switch will be attained under any circumstances. This result is attained by an intermediate valve device, specially constructed for this purpose, between the key valve and the working cylinder. A piston of this intermediate valve device is subject, on the one side, to the working pressure and is supported on the other side by an adjustable spring. It is, furthermore, influenced by a pair of auxiliary springs located transversely to the piston axis and arranged on the pressure medium side, which auxiliary springs act, by means of two oscillatable toggles affording a "snap-over" action.

In order that this invention may be clearly understood and readily carried into effect two sheets of drawings are appended hereto illustrating embodiments thereof, and wherein:

Fig. 1 shows in sectional elevation a device for switching in power switches, the "switched-out" or preparatory switching position being shown.

Fig. 2 is a sectional elevation but showing the relative positions of the parts at the instant of attaining the terminal switched-in position.

Fig. 3 is a sectional elevation of a modification which embodies means for switching in either direction, e. g. for circuit breakers, and,

Fig. 4 is a detailed sectional elevation view of a further modification.

Referring to the drawings the working cylinder *a* contains the working piston *b* with a switching rod *c* which is connected in any suitable manner with the switch contacts or contact levers not shown. In the cover of the working cylinder *a* through which the rod *c* passes is a compressed air inlet opening *d* through which the compressed air enters on the operation of an intermediate valve device *e* above the piston *b*. Open-

ings *f* are arranged in the lower part of the working cylinder *a*, through which openings the working air escapes to atmosphere when the piston *b* passes into the terminal switching position shown in Fig. 2.

The intermediate valve device *e* consists of the key valve device *g* and the safety snap valve device *h* controlled by the key valve *g*, both being adapted for operation by compressed air. This air enters through a connection i^1 in the cover *i* in a conduit *k* and the preliminary chamber *l*, of the key valve *g* and *m* of the safety valve *h*.

The key valve *g* consists of the cylinder *n*, the key spindle *o* with main piston *p* and subsidiary piston *q*, and the valve cone *r*, which under the pressure in the preliminary space *l* blocks the connection thereof with the valve cylinder *n* and the by-pass conduit *s*.

The safety valve *h* consists of the cylinder *t* in which is carried the step piston *u*, the upper reduced diameter portion *v* of which carries a valve plate cone *w* engaging a seating w^1 so that in the position of rest this valve *w* closes the pressure preliminary space *m*. The valve *w* is furthermore provided with a circumferential recess *x* in which engage two toggles 10 movable perpendicularly to the axis of the piston about the axes of hinges supported by slides *y* located in guides *z*. The hinge slides *y* are connected by tension springs y^1. This valve carrying part *v* of the piston *u* is in a preliminary space 11 of the cylinder *t*, and such space communicates with the by-pass conduit *s*. The piston *u* has a concentric cylindrical hollow space 12 open downward and receiving one end of a compression spring 13 interposed between the piston *u* and a disc 14 adjustable by a regulating screw 15 in a cap 16 closing the cylinder *t*.

Near the upper part of the cylinder *t* there is an annular surrounding space communicating with a conduit 18 extending into the working cylinder *a*. This in the position of rest is closed by the piston part *v*.

The method of operation of the device is as follows:—

In the position of rest, the valves *r* and *w* of the intermediate valve device *e* are closed. There is pressure only in the connecting conduit *k* and the preliminary spaces *l* and *m*. The cylinder spaces *n* and *t* are relieved through the conduit *s* by the air pressure release opening 19 in the closing cap 16 of the cylinder *t*. The piston *b* of the working cylinder *a* is, as shown in Fig. 1, in its upper prepared position for the switching in.

For the switching in the free end of the key valve spindle *o* is forced upward by any electrical mechanical or manual actuation, and the upper piston *p* thereof lifts the valve cone *r* from its seat against the influence of a spring r^1, and at the same time the lower piston *q* interrupts the connecting conduit *s* between cylinder preliminary space 11 and cylinder *t*. The compressed air passes through the seating of the valve *r* into the cylinder preliminary space 11 and impinges on the upper annular surface u^1 of the piston *u* which overcomes the influence of the main spring 13 and the supporting force of the toggles 10 arising from the tension of the pair of springs y^1, and with the compression of the main spring *h* forces the spring pivot slides *y* apart against the influence of the springs y^1, until the toggles 10 are perpendicular to the axis of the piston. At this instant, the action of the pair of springs y^1 reverses and supports the pressure of the air on the piston surface u^1 against the main spring 13. The piston *u* now jumps suddenly into its lowest position and leaves the passage 17—18 to the inlet opening *d* of the working cylinder *a* free. The piston *b* is brought suddenly into its lowest position (switched in position) as shown in Fig. 2. During this operation the air between the openings *f* and the bottom of the cylinder acts as a cushion, such air escaping slowly through the narrow conduits f^1 in the bottom of the cylinder. Shortly before reaching this position, the piston *b* has left the openings *f* of the wall of the working cylinder *a* free, whereby the air pressure in the cylinder *a* and the cylinder preliminary space 11 is suddenly relieved. By that means the springs 13 move the piston *u* back, supported by the springs after passing of their toggles 10 through their dead center, whereby the valve *w* is again closed against its seating w^1 and the inner space 12 of the piston is brought by narrow bores 12*a* into communication with the conduit 17—18, which now acts as an exhaust conduit. The valve *r* has previously been closed by its resetting spring r^1 which thrusts back the key spindle *o* after the means that opened it had left holding. The part of the conduit *s*, which was enclosed between the pistons *q* and *v* is freed from air through the cylinder *t* by the air discharge opening 19. In this way, the device is ready for a fresh switching-in operation.

Returning of the main piston *b* from the position of Fig. 2 to that of Fig. 1 is initiated by an element that has been excited by its going from the position of Fig. 1 to that of Fig. 2, e. g. by the resetting springs for maximum load of an electric switch.

Referring to the arrangement shown in Fig. 3, a device is shown for duplicate switching direction, as for circuit breakers and the like purposes. Inserted between the control valve *e* and the working cylinder *a* is a reversing device 20. This comprises a cylinder 24 connected through an upper admission conduit 21 and a lower one 22 and a connecting conduit 23 with the outlet conduit 18, formed in a connector *d* of the control valve device *e*. In the cylinder 24 moves an upper piston 25 and a lower one 26 which are connected together by a common rod 27. The upper end of this rod carries a disc 28 on which presses a spring 29 adapted to move the pistons 25 and 26 into their lower positions. In this lower position the bottom piston 26 closes a compressed air inlet 30 to the lower end of the working cylinder *a* but leaves free an exhaust opening 31 slightly spaced above the inlet 30, whilst the upper piston 25 leaves free the passage from the compressed air inlet 21 to the upper compressed air conduit 32 of the working cylinder *a* and blocks the upper air release opening 33. The air passing through the air release holes 31 or 33 escapes to atmosphere through the opening 34.

The openings 30 and 31, and also 32 and 33 are connected together each said pair by narrow conduits 35 or 36, which in the positions of rest permit of a slow equalisation of pressure even out of the blocked parts.

The intermediate valve device *e* in this embodiment for circuit breakers has a second key valve device 37. This consists of the cylinder 38, the key rod 39 with the pistons 40, 41 and 42 and the key valve cone 43 which valve cone, under the pressure in the preliminary space 44,

is closed to cut off connection between the conduit *k* and the switch cylinder **38** and by-pass conduit *s*. The cylinder **38** has two openings **45** and **46**, the opening **45** being connected by the pipe **47** with the lower end of the cylinder **24** of the reversing device **20**. The opening **46** leads to atmosphere and serves to relieve the pipe **47** and the cylinder space **38** from air.

The method of operation of the device shown in Fig. 3 is as follows:

To close the circuit breaker, the free end of the key valve spindle *o* is pressed upward by any suitable actuating device, so that its upper piston *p* raises the valve cone *r* from its seating, whilst the lower piston *q* interrupts the connecting conduit *s* between cylinder preliminary space **11** and the cylinder *t*. The compressed air then enters the cylinder preliminary space **11** and, overcoming the spring **13** and the auxiliary springs y^1, slowly presses down the piston *u* as already described, until the piston *u* suddenly jumps into its lowest position and opens the passage **17—18**. The air now passes through the conduit **23** and enters the zone above the piston **25** of the cylinder space **24** and also the connecting conduit **32** above the piston *b* of the working cylinder *a*, and moves the piston *b* into the lower position. In this position the piston *b* leaves the air outlet opening **31** free and the working air escapes by the cylinder **24** through the opening **34** to atmosphere. In this way, the conduits **23** and **32**, as also the cylinders *a* and **24** are freed from air. The circuit breaker is now closed.

If it is now to be opened again, the key spindle **39** of the second key valve **37** is pressed upward by any suitable actuating device. The subsidiary piston **42** here interrupts the connecting conduit *s* between the cylinder preliminary space **11** and the cylinder *t* of the intermediate valve device *e*. At the same time, the upper piston **40** raises the valve cone **43** from its seating. The compressed air enters through the seating of this valve **43** and the connecting conduit *s* into the upper part of the cylinder space **38** freed by the raised piston **40**. The lower piston **41**, has, on rising, closed the air release opening **46** leading to atmosphere. The compressed air now enters through the opening **45** and the pipe **47** underneath the reduced diameter lower extension **48** of the piston **26** of the reversing device **20**, and forces the control rod **27** with the pistons **25** and **26** upward against the pressure of the spring **29**. The upper piston **25** now closes the conduits **21** and **32** and opens the air release opening **33**. The lower piston **26**, on the contrary, frees the conduit **23** and the connecting opening **30** between the working cylinder *a* and the control cylinder **24** and closes the air release opening **31**. At the same time, the compressed air has passed from the valve **43** of the key valve **37** also into the preliminary space **11** of the intermediate valve *e*. It there suddenly presses the piston *u* downward in the manner already described, so that the compressed air passes over the cylinder *t* and the outlet opening **17—18** through the connecting conduit **23** and the opening **30** underneath the working piston *b* which is in its lower terminal position and urges this upward. In its upper terminal position it leaves free the air release opening **33** and the working air passes through the cylinder space **24** and the opening **34** to atmosphere, relieving the conduits **23, 22** and **33** and the working cylinder *a*. The pressure spring **29** now returns the control rod **27** with the pistons **25** and **26** to the lower terminal position. The circuit breaker is now opened. The pipe **47** and the cylinder **38**, after the passing of the key spindle **39** into the lower position, are relieved of air through the discharge opening **46**. As the piston rod *c* is in this case connected with the contact lever of the circuit breaker, the piston *b* remains suspended in the upper position until the next impulse for the closing of the switch.

The device shown in Fig. 4 differs from the arrangements shown in Figs. 1, 2 and 3 by the working air instead of escaping to atmosphere out of the cylinder **50** at the end of the switching-in stroke of the working piston **53** in the cylinder **50**, being carried through an opening **54** and a by-pass **55, 57** terminating in the cylinder *t* under the control piston *u*. It also shows the mounting of the working cylinder directly underneath the regulator housing.

The method of operation of this device is as follows:

From the position of rest the valve cone *r* is lifted by the valve spindle *o* and the compressed air impinges on the upper annular surface u^1 of the piston *u* and forces it down, as previously described, to open the passage from the preliminary space **11** to chamber **17**, from which passages 18^1 lead to the cylinder **50**. Thus compressed air impinges on the working piston **53** throwing it suddenly into its lowest position.

As soon as the upper edge of the working piston **53** leaves the opening **54** free, working air passes through the by-pass **55, 57** in opening the return valve **58** in the housing **56** underneath the control piston *u* and counteracts the pressure of air acting on this piston *u* from the top, so that this piston is suddenly thrown into the closed position by the action of the spring **13**.

At the lower end of the working cylinder **50** is provided an opening **51** through which air in front of the piston **53** can escape to atmosphere when the piston **53** moves down.

A resilient buffer ring **59** for the piston **53** is provided in the cover **52** of the working cylinder.

I claim:

1. In a pressure fluid servo-motor device an intermediate valve device between the pressure fluid supply source and the motor, said valve device comprising a cylinder, a spring loaded piston in the said cylinder, a valve at one end of the piston adapted under the spring load to close a pressure fluid inlet, a reduced diameter part at said end of the piston carrying the valve to afford an exposed annular part on the piston to receive fluid pressure, a spring loaded snap action toggle device yieldingly opposing opening movement of said valve but adapted after a predetermined movement to accelerate full opening movement of said valve and piston, an inlet to the servo-motor-cylinder closed by said piston, and a key valve adapted to be moved to an opened position to admit pressure fluid to said cylinder to move the piston therein an extent to bring into effect the snap over action of the spring loaded toggle device to impart an accelerated movement to the valve-piston against the influence of its spring load, to open the inlet to the servo-motor cylinder and to be secured in the open position at one end of the piston for admitting pressure fluid to the servo-motor.

2. In a pressure fluid servo-motor-device an intermediate valve device between the pressure fluid supply source and the motor, said valve de-

vice comprising a cylinder, a spring loaded piston in the said cylinder, a valve at one end of the piston adapted under the spring load to close a pressure fluid inlet, a reduced diameter part at said end of the piston carrying the valve to afford an exposed annular part on the piston to receive fluid pressure, a spring loaded snap action tgogle device yieldingly opposing opening movement of said valve but adapted after a pretermined movement to accelerate full opening movement of said valve and piston, an inlet to the servo-motor-cylinder closed by said piston but opened thereby when the valve is moved to the open position, and a key valve adapted to be moved to an opened position to admit pressure fluid to said cylinder to move the piston therein an extent to bring into effect the snap over action of the spring loaded toggle device to impart an accelerated movement to the valve-piston against the influence of its spring load to open the inlet to the servo-motor-cylinder and to be secured in the open position at one end of the piston for admitting pressure fluid to the servo-motor, said servo-motor comprising a main cylinder, a main piston therein, and a pressure fluid escape opening adapted to be uncovered by the main piston when it has traversed nearly its full length under the action of the pressure fluid admitted by the beforesaid valve carrying piston so as to automatically relieve pressure of pressure fluid in the intermediate valve device to transmit the action of the pressure fluid to said valve carrying piston to move it to the closed position, whereby the main pressure fluid device is freed for movement independently of the influence of pressure fluid.

3. In a pressure fluid servo-motor-device, and an intermediate valve device between the pressure fluid supply source and the motor, said valve device comprising a cylinder, a spring loaded piston in the said cylinder, a valve at one end of the piston adapted under the spring load to close a pressure fluid inlet, a reduced diameter part at said end of the piston carrying the valve to afford an exposed annular part on the piston to receive fluid pressure, a spring loaded snap action toggle device yieldingly opposing opening movement of said valve but adapted after a predetermined movement to accelerate full opening movement of said valve and piston, an inlet to the servo-motor-cylinder closed by said piston but opened thereby when the valve is moved to the open position, and a key valve adapted to be moved to an opened position to admit pressure fluid to said cylinder to move the piston therein an extent to bring into effect the snap over action of the spring loaded toggle device to impart an accelerated movement to the valve-piston against the influence of its spring load to open the inlet to the servo-motor-cylinder and to be secured in the open position at one end of the piston for admitting pressure fluid to the servo-motor, a preliminary pressure space containing the reduced diameter part of said valve carrying piston, a by-pass conduit connecting said space to the opposite end of the said piston, a slidable member to actuate said key valve, an auxiliary piston on said slidable member which blocks said by-pass when the key valve is opened, spring means to return the key valve to the closed position and to open the by-pass, said servo-motor comprising a main cylinder, a main piston therein, and a pressure fluid escape opening adapted to be uncovered by the main piston when it has traversed nearly its full length under the action of the pressure fluid admitted by the beforesaid valve carrying piston so as to automatically relieve pressure of pressure fluid in the intermediate valve device to transmit the action of the pressure fluid to said valve carrying piston to move it to the closed position, whereby the main pressure fluid device is freed for movement independently of the influence of pressure fluid.

4. In a pressure fluid servo-motor-device an intermediate valve device between the pressure fluid supply source and the motor, said valve device comprising a cylinder, a spring loaded piston in the said cylinder, a valve at one end of the piston adapted under the spring load to close a pressure fluid inlet, a snap action spring loaded toggle device engaging said piston and opposing opening movement of the said valve but adapted after a predetermined movement of the piston in the valve opening direction to accelerate the opening movement, and a key valve adapted to be moved to an opened position to admit pressure fluid to said cylinder to move the piston therein an extent to bring into effect the snap over action of the spring loaded toggle device to impart an accelerated movement to the piston against the influence of its spring load to open the inlet to the servo-motor-cylinder and to be secured in the open position at one end of the piston for admitting pressure fluid to the servo-motor, a pressure fluid operated reversing device between the said piston and the servo-motor adapted to reverse the direction of admission of pressure fluid to the motor-cylinder, a conduit connecting said reversing device to the pressure fluid source, means to open such conduit contemporaneously with the opening of the key valve to operate the reversing device one way to effect a reversing action, and spring means to operate the reversing device the opposite way.

5. In a pressure fluid servo-motor an intermediate valve device between the pressure fluid supply source and the motor, said valve device comprising a cylinder, a spring loaded piston in the said cylinder, a valve at one end of the piston adapted under the spring load to close a pressure fluid inlet, a reduced diameter part at said end of the piston carrying the valve to afford an exposed annular part on the piston to receive fluid pressure, a spring loaded snap action toggle device yieldingly opposing opening movement of said valve but adapted after a predetermined movement to accelerate full opening movement of said valve and piston, an inlet to the servo-motor closed by said piston but opened thereby when the valve is moved to the open position, and a key valve adapted to be moved to an opened position to admit pressure fluid to said cylinder to move the piston therein an extent to bring into effect the snap over action of the spring loaded toggle device to impart an accelerated movement to the valve piston against the influence of its spring load to open the inlet to the servo-motor-cylinder and to be secured in the open position at one end of the piston for admitting pressure fluid to the servo-motor, a preliminary pressure space containing the reduced diameter part of said valve carrying piston, a by-pass conduit connecting said space to the opposite end of the said piston, a slidable member to actuate said key valve, an auxiliary piston on said slidable member which blocks said by-pass when the key valve is opened, spring means to return the key valve to the

closed position and to open the by-pass, said servo-motor comprising a main cylinder, a main piston therein, and a pressure fluid escape opening adapted to be uncovered by the main piston when it has traversed nearly its full length under the action of the pressure fluid admitted by the beforesaid valve carrying piston so as to automatically relieve pressure of pressure fluid in the intermediate valve device to transmit the action of the pressure fluid to said valve carrying piston to move it to the closed position, whereby the servo-motor is freed for movement independently of the influence of pressure fluid, a pressure fluid operated reversing device between said inlet and said main cylinder and comprising a rod, two axially spaced pistons on the rod, an inlet and exhaust opening at each end of the main cylinder, one pair being controlled by one of said pistons, and the other pair by the other of said pistons, spring means urging the rod and pistons in a direction to open an inlet at one and an outlet at the other end of the main cylinder, a conduit connecting said reversing device to said preliminary space to admit pressure fluid to the reversing device to reverse the opening and closing of said inlet and exhaust openings, a resetting valve and slidable member to operate it, a piston on the latter slidable member to open the conduit to the reversing device when opening the resetting valve, and another piston on the latter slidable member to open a fluid pressure exhaust to said latter conduit when the resetting valve is opened to allow said spring means of the resetting device to reverse the opening of said two pairs of inlet and exhaust openings.

6. In a pressure fluid servo-motor-device, an intermediate valve device between the pressure fluid supply source and the motor, a pressure fluid operated reversing device, a spring loaded fluid pressure opened valve in the said valve device, a snap action spring loaded device opposing opening movement of the said valve but adapted after a predetermined movement of the valve in the valve opening direction to accelerate the opening movement, and a key valve adapted to be moved to an opened position to admit pressure fluid to open said first mentioned valve an extent to bring into effect the snap over action of the spring loaded device to impart an accelerated movement to the said first mentioned valve against influence of its spring load, to secure it in the open position for admitting pressure fluid to the servo-motor, said reversing device comprising a valve, means to selectively open the valve, two spaced pairs of inlet and exhaust ports with the main operating device, two axially spaced pistons moving in unison controlling said two pairs of ports, spring means urging the pistons in a direction to open an inlet at one end and an outlet at the other end of the main operating device, a conduit connecting said reversing device to pressure fluid supply to reverse the opening and closing of said inlet and exhaust openings, a resetting valve and slidable member to operate, a piston on the latter slidable member to open the conduit to the reversing device when opening the resetting valve, and another piston on the latter slidable member to open a fluid pressure exhaust to said latter conduit when the resetting valve is opened to allow said spring means of the resetting device to reverse the opening of said two pairs of inlet and exhaust openings.

7. In a pressure fluid servo-motor-device an intermediate valve device between the pressure fluid supply source and the motor, said valve device comprising a cylinder, a spring loaded piston in the said cylinder, a valve at one end of the piston adapted under the spring load to close a pressure fluid inlet, a reduced diameter part at said end of the piston carrying the valve to afford an exposed annular part on the piston to receive fluid pressure, a spring loaded snap action toggle device yieldingly opposing opening movement of said valve but adapted after a predetermined movement to accelerate full opening movement of said valve and piston, an inlet to the motor-cylinder closed by said piston but opened thereby when the valve is moved to the open position and has passed the dead centre of the snap action device, and a key valve adapted to be moved to an opened position to admit pressure fluid to said cylinder to move the piston therein an extent to bring into effect the snap over action of the spring loaded toggle device to impart an accelerated movement to the piston against the influence of its spring load to secure in the open position the valve at one end of the piston for admitting pressure fluid to the motor, said motor comprising a main cylinder, a main piston therein, and a pressure fluid escape opening adapted to be uncovered by the main piston when it has traversed nearly its full length under the action of the pressure fluid admitted by the beforesaid valve carrying piston so as to automatically relieve pressure of pressure fluid in the intermediate valve device to transmit the action of the pressure fluid to said valve carrying piston to move it to the closed position, whereby the main pressure fluid device is freed for movement independently of the influence of pressure fluid, an exhaust opening in the main cylinder slightly beyond the working stroke end position, and a by-pass connecting said exhaust opening with the spring loaded side of said valve carrying piston.

8. In a pressure fluid servo-motor according to claim 1, such servo-motor comprising a main cylinder, a main piston therein, and a pressure fluid escape opening adapted to be uncovered by the main piston when it has traversed nearly its full length under the action of the pressure fluid admitted by the beforesaid valve carrying piston so as to automatically permit expansion of fluid pressure from the main cylinder and intermediate valve device, that the piston of the latter returns to its closed position, whereby the main pressure fluid device is freed for movement independently of the influence of pressure fluid.

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