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(54) Control for pneumatic tool eg a screwdriver

(57) A pneumatic tool (1) has a pneumatic motor (6) which can be driven selectively in either direction under the control of a trigger (30) which operates the piston (33) of a control valve. When the trigger (30) is moved anticlockwise from a central point, the valve allows compressed air to pass from coupling (3), through duct (60), the valve, ducts (66, 16 and 17) to drive the motor in one direction. Movement of the trigger (30) in the opposite sense directs the compressed air from duct (60) to duct (67) and thence via chamber (68) and passages (24 and 25) to drive the motor in the opposite direction.

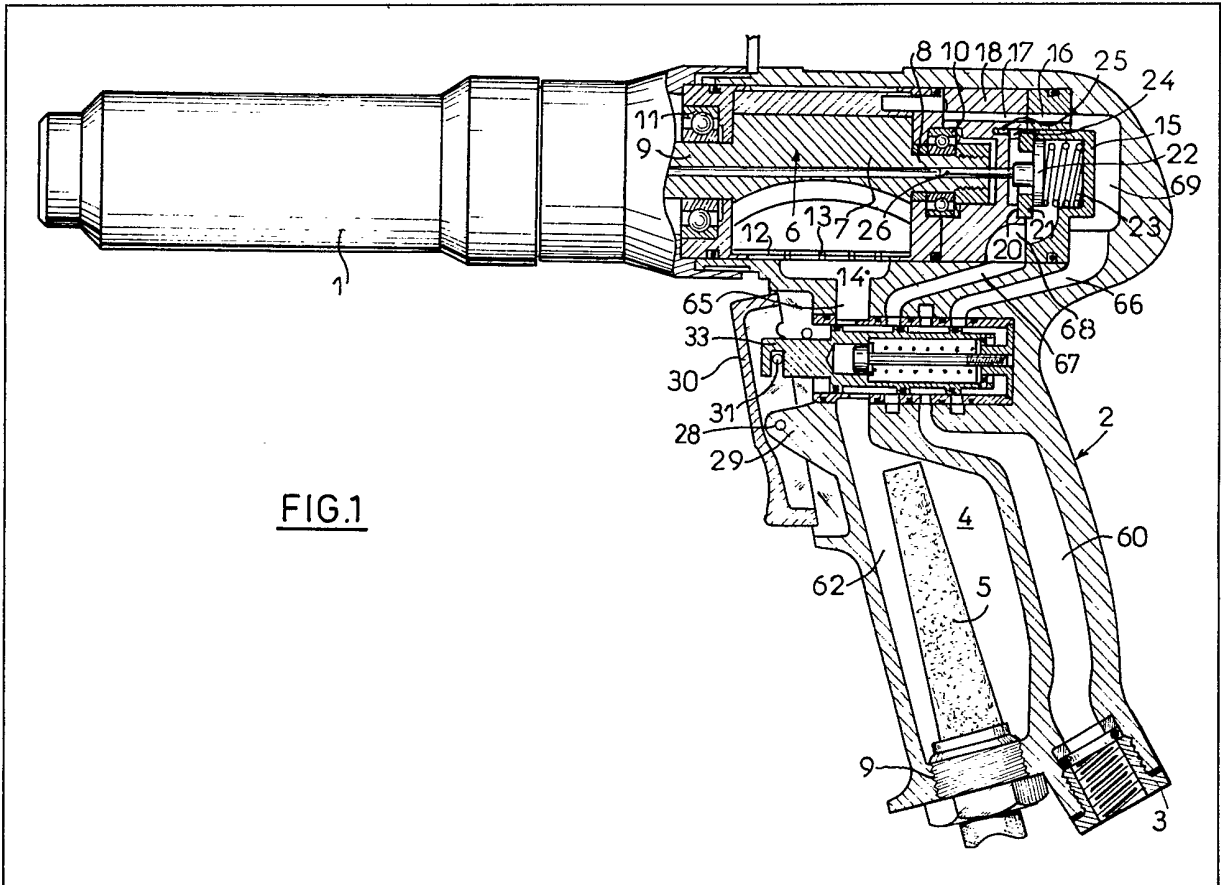


FIG.1

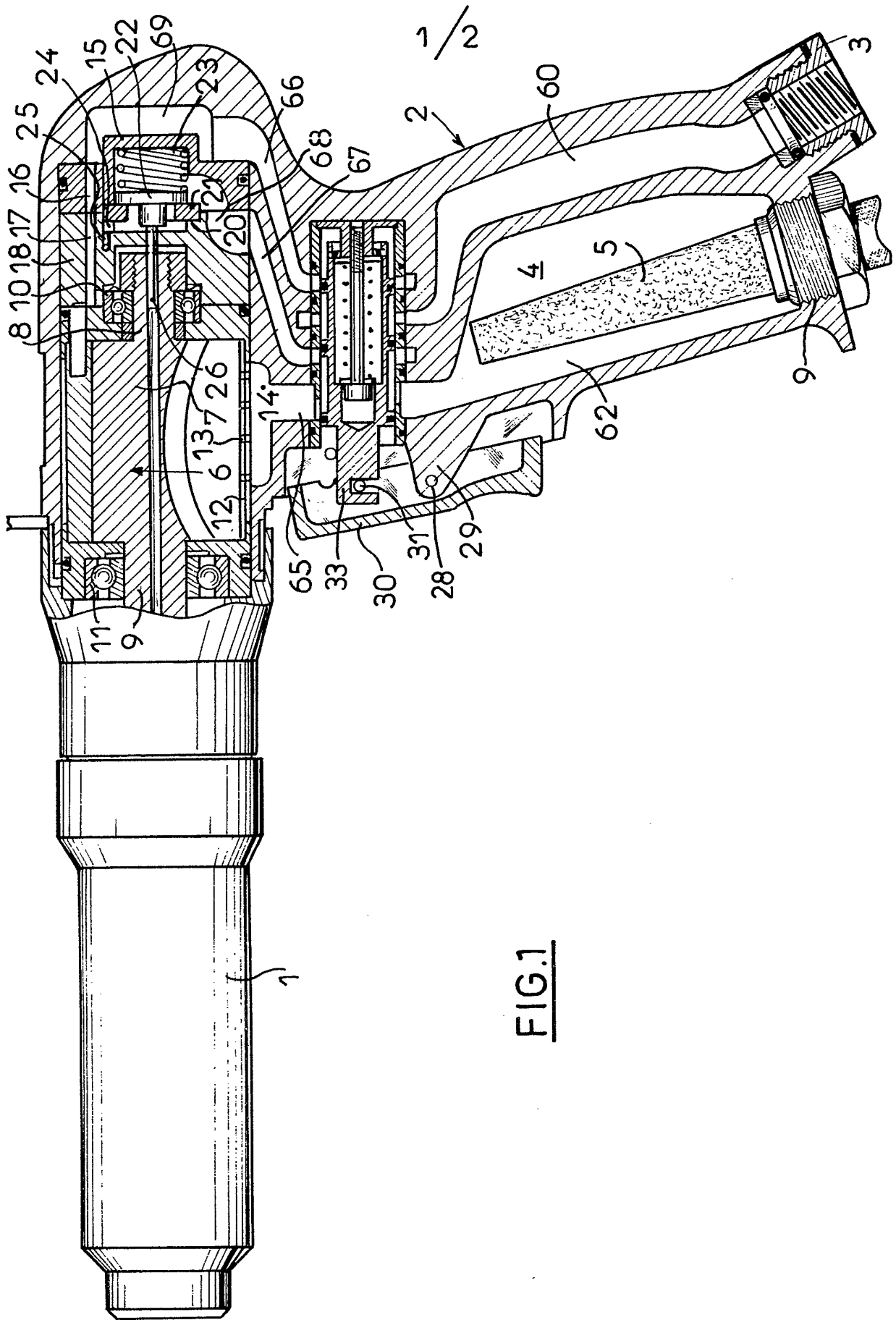


FIG.1

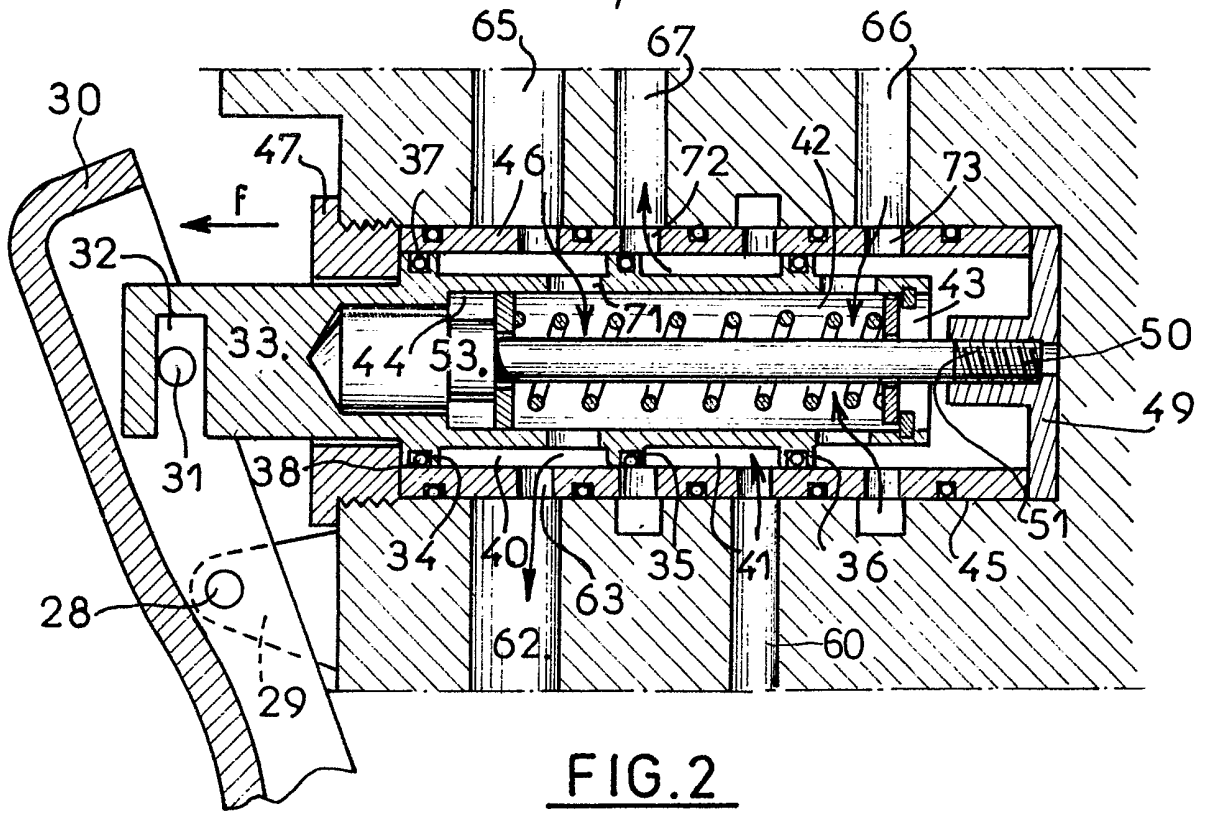


FIG. 2

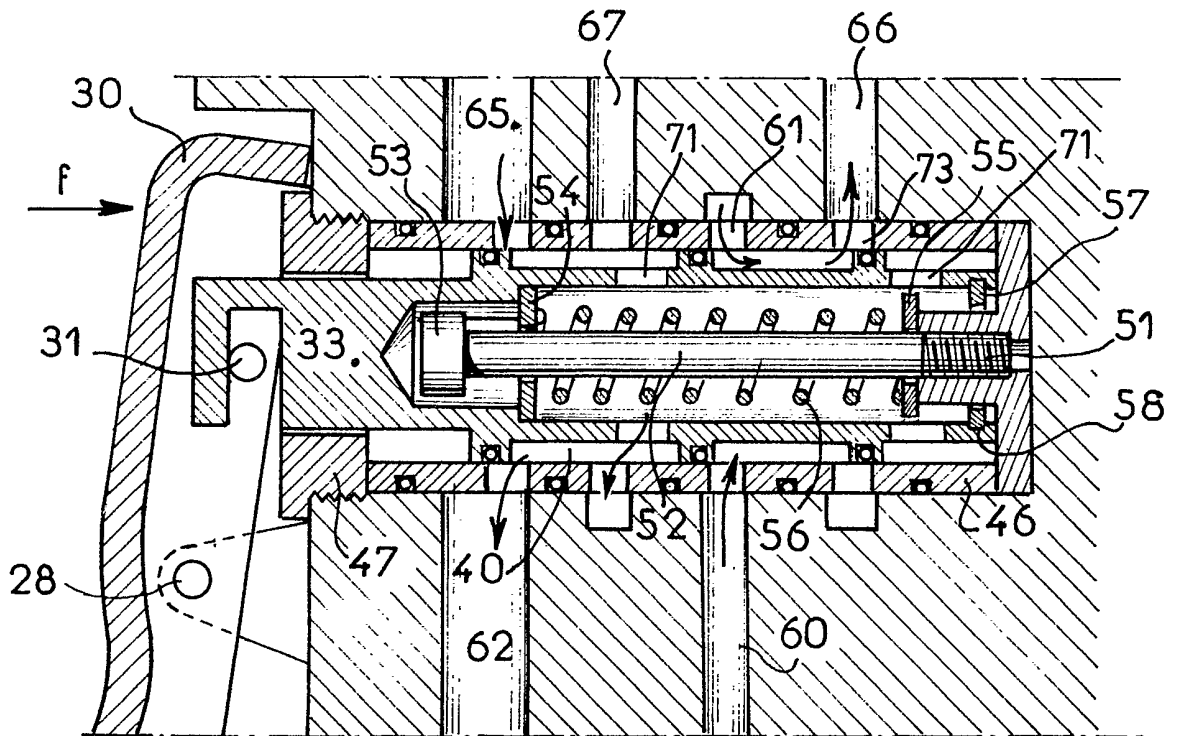


FIG. 3

## SPECIFICATION

**Control means for pneumatic apparatus**

5 The present invention relates to a control means for pneumatic apparatus or tools, more particularly but not exclusively for screw-drivers.

Pneumatic tools and especially screw-drivers are generally formed with a body or casing, inside which  
10 is fitted a pneumatic motor connected by a kinematic connection to a driving member. The casing comprises a control device which, when it is actuated, permits the fluid under pressure to be directed to the motor, so that the latter is driven in rotation.

15 In many cases, and particularly in connection with screw-drivers, it is desirable to be able to cause the motor to turn either in one direction or in the opposite direction.

Various arrangements are known from the prior art, which permit the fluid to be selectively directed under admission pressure and by way of corresponding ducts into the stator, so that the rotor is capable of being driven in one or other of the two directions of rotation.

25 The known arrangements are relatively complex and are generally formed by two separate controls, i.e. of a first control which, when it is actuated, always permits the motor to rotate in one direction, and of a second control, which has to be actuated  
30 simultaneously with the first control, so that the direction of rotation of the motor is changed.

Such an arrangement is complex and not very satisfactory.

One of the objects of the present invention is to  
35 provide a control means for pneumatic apparatus or tools and especially for screw-drivers which is simple and which does not require to have two separate members which have to be actuated for changing the direction of rotation of the motor.

40 The control means forming the subject of the present invention is of the type comprising a body or casing in which is fitted a pneumatic motor capable of turning in two directions of rotation, the motor being connected by its output shaft to a member to be  
45 driven, the casing comprising a first duct for conducting the admission fluid to the motor for its rotation in one direction, a second duct for conducting the admission fluid to the motor for its rotation in the opposite direction, and an exhaust conduit

50 connected to the exhaust of the motor, and means for selectively controlling the admission of compressed air through one or other of the ducts. The control means is characterised in that it includes a movable piston which is connected to a single

55 control member and is mounted so to be able to be displaced in one or other direction from an intermediate position in which the inlet of the admission fluid to both the ducts is closed, the said piston comprising means for intercepting or stopping the  
60 flow of the fluid under pressure into the first duct which it is moved into one extreme position, while permitting the passage into the second duct, whereas in the opposite extreme position, it interrupts the passage or flow of the fluid under pressure into the  
65 second duct, while permitting the flow into the first

duct.

Because of this arrangement, it is possible to obtain a compact control assembly which is very easy to handle.

70 In accordance with one particular feature, the pneumatic apparatus or tool is of the type comprising a handle and is characterised in that the single control member is formed by trigger mounted for pivotal or rocking movement at an intermediate point of its length and connected to the piston.

75 As a result of this arrangement, an extremely simple control means is obtained, in which it is sufficient to apply pressure to the trigger, close to one end of the latter, for controlling the rotation of the motor in one direction and, if it is desired to control the rotation in the opposite direction, it is sufficient to apply a pressure to the trigger close to its other end.

80 According to one particular feature as regards construction, the piston has a axial bore, into which extends a fixed rod, this latter comprising two discs between two stops, between which discs is interposed a compression spring, each of the discs bearing against internal stops of the bore.

90 In this way, there is obtained in an extremely simple manner a control means which returns automatically into its initial position as soon as there is no longer any pressure thereon.

In accordance with yet another construction feature, the piston has lands on its periphery, which lands each include a channel, in each of which is fitted an O-ring, the lands forming between them wide cavities, so that the displacement of the piston in one direction permits the supply of the fluid under  
95 pressure for the anti-clockwise rotation of the motor and the displacement in the other direction permits the supply of the fluid under pressure for the clockwise rotation of the motor.

100 According to yet another feature, the casing comprises, in the handle, a bore in which is mounted and fixed a sleeve having holes which communicate with the different ducts and conduits, the piston being mounted to be movable in the sleeve.

105 Finally, according to a last feature, the fixed rod, on which are mounted the two discs between which the compression spring extends, is screwed into a tapped hole of a stud which is fast with a plate enclosed between the bottom or base of the bore formed in the handle and the corresponding end of the sleeve.

115 The invention is now to be described by reference to one constructional form which is given simply by way of example and which is illustrated in the accompanying drawings, wherein:

120 *Figure 1* is a side elevation, partly in section, of a pneumatic tool including control means;

*Figure 2* is a section to a larger scale of the control means in a position for controlling the clockwise rotation of the motor;

125 *Figure 3* is a section to a larger scale of the control means in a position for controlling the counter-clockwise rotation of the motor.

130 *Figure 1* shows a pneumatic screw-driver comprising a body or casing 1 with a handle 2 provided with a coupling 3 adapted to be connected to a flexible

compressed air distribution pipe. The handle 2 also comprises a cavity 4 for evacuation of compressed air and with a silencer 5.

Fitted in the casing 1 is a blade-type pneumatic motor 6 which is capable of turning in both directions of rotation. Such a motor is known from the prior art and will not be described in detail herein.

The motor has a rotor 7 supported by two stub shafts 8 and 9, the shaft 8 being journalled in the casing by a bearing 10, while the shaft 9 is carried by a bearing 11.

The shaft 9 is connected through a torque limiter and a kinematic connection to a tool fitted into the casing.

The rotor 7 turns in a stator 12, which has holes 13 which form the exhaust and open into a cavity 14 in the handle 2.

Motor 6 is closed by an end plate 15 which includes a conduit 16 opening into a conduit 17 in a ring 18 and opening on to the rotor 7 in order to form a first inlet for fluid under pressure.

Arranged in cavity 20 of the ring 18 is a seating 21 of a valve 22 urged into the closure position by a spring 23 fitted between the said valve and the base of the end plate 15.

The ring 18 has an opening 24 which is connected by a conduit 25 to a second inlet for fluid under pressure in the stator (the conduit 25 is only partly visible in the drawing, since it extends outside the plane of the section). If the pressurised fluid is caused to pass through the conduit 16, the motor is caused to turn to the left, i.e. counter-clockwise, and if, on the contrary, the pressurised fluid is caused to pass through the conduit 25, the motor turns to the right, i.e. clockwise.

By means of a rod 26 extending through the rotor 7, the valve 22 is connected to the tool, which is mounted for sliding movement in the body or casing, against the action of a spring, so that, when used for screwing up or tightening, the apparatus is only able to operate if a pressure has been exerted on the tool, sufficient to open the valve 22.

Pivotaly mounted on the handle 2, by means of a pivot pin 28 supported by a lug 29, is a trigger 30. As best shown in Figures 2 and 3, the trigger carries a pin 31 engaged in a notch 32 of a piston 33 comprising three lands 34, 35 and 36, each land being formed with a channel 37 in which an O-ring 38 is fitted. The piston 33 is axially slidably located within a sleeve 46 located in a core 45 in the handle, the lands 34 - 36 sealingly engaging against the sleeve as shown. The sleeve 46 is held in place by a nut 47. The lands 34 and 35 define between them a wide annular groove or cavity 40, a similar wide annular cavity 41 extending between the flanges 35 and 36.

The piston 33 has an axial cavity 42 which is open at one end 43 and is provided with a shoulder 44.

Fitted between the end of the bore 45 distant from the trigger 30 and the corresponding end of the sleeve is a plate 49 having a central tapped stud 50, into which is screwed the corresponding thread 51 of a rod 52 which has a head 53 at its free end.

Fitted on the rod 52 are two discs 54 and 55 and a compression spring 56. The discs 54 bears against

the shoulder 44, while the disc 55 bears either against the free end of the stud 50 (Figure 3) or against a stop ring 57 fixed in a groove 58 of the piston 33 (Figure 2).

Formed in the handle or grip 2 and leading from the coupling 3 is a channel 60 and the sleeve 46 comprises a series of holes 61 situated to the right of the said channel. A second channel 62 is open to the right of the holes 63 of the sleeve 46, these said holes being disposed facing a conduit 65 opening into the cavity 14.

Two conduits 66 and 67 are provided, the first opening into a cavity 69 situated behind the plate 15, while the second opens into a passage 68 formed between the ring 18 and the plate 15, the sleeve 46 having holes 72 and 73 which are respectively aligned with the conduits 67 and 66.

As will be seen in Figure 1, the piston, in its rest position when trigger 30 is not operated, occupies a position which is such that the compressed air inlet duct 60 is in communication with the cavity 41. The location of lands 35 and 36 in that position shut off the conduits 66 and 67 from cavity 41 and hence from the fluid supply.

The piston 42 has holes 71 formed therein, which facilitate escape of residual air.

When pressure is applied to the lower part of the trigger (see Figure 2), the piston 33 is displaced in the sleeve 46 in the direction of the arrow "f", land 35 opens cavity 41 to conduit 67. The fluid then passes by way of the duct 60, the cavity 41, the conduit 67 and the passage 68 and, if the valve 22 is open, passes through the opening 24, in order to supply the motor, which turns towards the right, the exhaust being effected by way of the conduit 65, the groove or cavity 40 and the channel 62.

On the contrary, if pressure is applied to the upper end of the trigger, the piston 33 is displaced in the direction opposite to the arrow "f" (see Figure 3), the resulting movement of land 36 opens hole 73 to cavity 41. The fluid under pressure then passes by way of the duct 60, the cavity 41, the conduit 66, the cavity 69 and the conduits 16 and 17 in order to supply the motor for rotating it towards the left or counter-clockwise. The exhaust is effected by way of the conduit 65, the holes 46 and the passage 62, as before.

It will be noted that with the clockwise rotation of the motor, the residual air is able to escape through the holes 71, in order to discharge into the groove or cavity 40 and the channel 62, whereas with the anti-clockwise direction of rotation, the residual air passes by way of the conduit 67, the hole 72, the holes 71, the channel 70 and the duct 62.

Such an arrangement is very reliable in operation and makes easier the operation of the apparatus.

It is obvious that the invention is not limited to the constructional form which has just been described and illustrated. It will be possible to incorporate therein numerous modifications as regards details, without thereby departing from the scope of the invention.

## CLAIMS

1. Control means for pneumatic apparatus, such as screwdrivers, of the type comprising a body or casing, in which is fitted a pneumatic motor capable of turning in two directions of rotation, the said motor being connected by its output shaft to a member which is to be driven, the said casing comprising a first duct for conducting the admission fluid to the motor for its rotation in one direction, a second duct for conducting the admission fluid to the motor for its rotation in the opposite direction and an exhaust conduit connected to the exhaust of the motor, and means for selectively controlling the admission of compressed air by one or other of the ducts, characterised in that it includes a movable piston which is connected to a single control member and is mounted so as to be able to be displaced in one or other direction from an intermediate position in which the inlet of the admission fluid to both the ducts is closed, the said piston comprising means for intercepting or stopping the flow of the fluid under pressure into the first duct which it is moved into one extreme position, while permitting the passage into the second duct, whereas in the opposite extreme position, it interrupts the passage or flow of the fluid under pressure into the second duct, while permitting the flow into the first duct.

2. Control means according to claim 1, for pneumatic apparatus of the type in which the body or casing comprises a handle or grip, characterised in that the single control member is formed by a trigger mounted for pivotal or rocking movement at an intermediate point of its length and connected to the piston.

3. Control means according to claim 1, characterised in that the piston has an axial bore, into which extends a fixed rod, this latter comprising two discs between two stops, between which discs is interposed a compressed spring, each of the discs bearing against internal stops of the bore.

4. Control means according to claim 1, characterised in that the piston has lands at its periphery, each land including a channel in which is fitted an O-ring, the lands forming between them wide grooves or cavities, so that the displacement of the piston in one direction permits the supply of fluid under pressure for the anti-clockwise rotation of the motor, and the displacement in the other direction permits the supply of the fluid under pressure for the clockwise rotation of the motor.

5. Control means according to claims 1, 2, 3 and 4, characterised in that the casing comprises, in the handle or grip, a bore in which is mounted and fixed a sleeve having holes communicating with the different ducts and conduits, the piston being mounted to be movable in the sleeve.

6. Control means according to Claim 3, characterised in that the fixed rod on which are mounted the two discs between which the compression spring extends is threaded into a tapped hole of a stud which is fast with a plate fitted between the bottom of the bore formed in the handle or grip and the corresponding end of the sleeve.

7. Control means for pneumatic apparatus, sub-

stantially as herein described with reference to the accompanying drawings.

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