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- (21) Application No. 37311/76
- (22) Filed 8 Sept. 1976
- (31) Convention Application No. 7 510 498
- (32) Filed 19 Sept. 1975 in
- (33) Sweden (SE)
- (44) Complete Specification published 10 April 1980
- (51) INT CL<sup>3</sup> F16K 5/04, 31/53
- (52) Index at acceptance F2V E1N2 N6



(54) ADJUSTABLE FLOW RESTRICTING VALVE

(71) We, ATLAS COPCO AKTIE-  
BOLAG, a Swedish Company, of Nacka,  
Sweden, do hereby declare the invention, for  
which we pray that a patent may be granted  
to us, and the method by which it is to be  
performed, to be particularly described in and  
by the following statement:—

This invention relates to an adjustable flow  
restricting valve intended for use in, for  
instance, the speed control of pneumatic  
motors. In particular the invention concerns  
an adjustable flow restricting valve for con-  
trolling the outlet of a motor and thereby  
obtaining a desired motor speed.

The object of the present invention is to  
make a novel restricting valve which is cheap  
to manufacture, simple as regards construc-  
tion and by which it is possible to obtain an  
accurate setting of the motor speed.

The present invention provides an adjust-  
able flow restricting valve having an inlet and  
an outlet and comprising:

a housing, a first passage extending through  
said housing and providing one of said inlet  
and outlet, said first passage comprising a  
cylindrical bore, a tubular valve body rotat-  
ably supported in said cylindrical bore, a  
second passage in said housing extending  
laterally from said first passage and providing  
the other of said inlet and outlet, said tubular  
valve body having a lateral opening therein  
arranged to control communication between  
said first and second passages according to  
the angular position of the tubular valve body  
in said cylindrical bore and position adjust-  
ment means arranged in said housing for  
angular displacement of said valve body in  
said first bore about the longitudinal axis of  
the valve body, characterized in that the  
tubular valve body is open-ended at both ends  
and that said position adjustment means com-  
prises a control screw which extends trans-  
versely relative to the rotation axis of the  
tubular valve body and is arranged to function  
as a worm gear in engagement with the outer  
periphery of the valve body.

A preferred embodiment of the invention  
is hereinbelow described in detail with refer-  
ence to the accompanying drawings in which:

Figure 1 is a partly sectioned side-elevation  
of a standard type control valve with a sub-  
plate in which there are mounted two restrict-  
ing valves according to the invention; and

Figure 2 is a partly sectioned plan view of  
the valve assembly of Figure 1 but with the  
control valve omitted.

In the Figures is shown a standard type  
control valve 10 and a subplate 11 associated  
with the valve. (As the control valve 10 itself  
does not constitute a part of the invention, it  
is not described in further detail.) All of the  
conduit connections of the control valve 10  
are located on the subplate 11. Communica-  
tion between the valve and the subplate is  
established through a plurality of openings  
12 to 16. When used in connection with a  
pneumatic motor 17, one opening 14 is con-  
nected to a pressurised air source through the  
conduit 18. Two openings 13 and 15 are  
connected to the motor 17 via service conduits  
19 and 20, while two other exhaust openings  
12 and 16 communicate with air discharge  
conduits 21 and 22 via air outlet passages in  
the subplate.

In one of its positions the control valve 10  
interconnects the openings 14 and 15 as well  
as the openings 13 and 12, whereby the part  
of the motor 17 that is connected to the  
opening 15 is pressurized, whereas the other  
part of the motor 17 is exhausted through  
conduit 21.

In its opposite position the control valve 10  
interconnects the openings 14 and 13 as well  
as the openings 15 and 16, whereby the motor  
17 is powered in its opposite direction.

In order to control the motor speed the  
subplate 11 is provided with two restricting  
valves 23, 24 designed in accordance with  
the invention. These valves are located in the  
outlet passages of the subplate 11 and are  
arranged to restrict the exhaust flow from the  
motor 17.

Above there is described one application  
using two restricting valves according to the  
invention. There will now be described in  
detail one of these restricting valves.

The restricting valve 24 comprises a  
housing, in this case constituted by the sub-

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plate 11, which housing is provided with a first, air outlet, passage 26 and a second, air inlet, passage 25. The inlet passage 25 extends between the opening 16 and a bore 27. In the bore 27 there is rotatably supported an open ended generally tubular valve body 28. In the embodiment shown in the drawing, part of the bore 27 constitutes the outlet passage 26 and extends perpendicularly to the inlet passage 25.

The valve body 28 is provided with a recess in the form of an opening 29 which, according to its angular position, is arranged to fully or partly uncover the proximal end of inlet passage 25 and thereby connect the latter to the outlet passage 26 through the interior of the valve body 28.

For obtaining angular displacement of the valve body 28 and thereby a proper setting of the restriction there is provided a position adjustment means in the form of a control screw 30. The control screw 30 is rotatably supported in a bore 31 which extends transversely relative to the rotational axis of the valve body 28. The control screw 30 is operable from outside the housing 11 through the mouth of the bore 31.

In the described embodiment of the restricting valve the control screw 30 is constituted by a standard type self tapping screw, the head of which is received in a wider portion 32 of the bore 31. The wider portion 32 of the bore 31 is provided with an annular groove in which is secured a lock ring 34. The purpose of the latter is to prevent axial movement of the control screw 30.

The control screw 30 engages the outer surface of the valve body 28 to function as a worm gear by means of which the valve body 28 is rotatable. The valve body 28 may be preformed with longitudinally extending ribs (not shown) for co-operation with the thread of the control screw 30. However, according to a preferred embodiment of the invention the valve body 28 is made of a plastics material in which longitudinal slots are cut by the self tapping control screw itself.

The worm gear which is formed by the control screw 30 and the valve body 28 has a high gear ratio which makes it possible to obtain an accurate setting of the valve body 28.

The disclosed embodiment of the invention is advantageous in that the tubular valve body makes it possible to extend the outlet passage 26 right through the housing 11. This means that a number of control valves may be put together in a rack with their passages 26 aligned so that they all will have a common outlet passage, whilst each of them has a separate outlet flow restricting valve, to provide a control valve assembly.

The embodiments of the invention may be freely varied provided they do not depart

from the scope of the invention as defined by the claims. 65

#### WHAT WE CLAIM IS:—

1. An adjustable flow restricting valve having an inlet and an outlet and comprising: a housing, a first passage extending through said housing and providing one of said inlet and outlet, said first passage comprising a cylindrical bore, a tubular valve body rotatably supported in said cylindrical bore, a second passage in said housing extending laterally from said first passage and providing the other of said inlet and outlet, said tubular valve body having a lateral opening therein arranged to control communication between said first and second passages according to the angular position of the tubular valve body in said cylindrical bore and position adjustment means arranged in said housing for angular displacement of said valve body in said first bore about the longitudinal axis of the valve body, characterized in that the tubular valve body is open-ended at both ends and that said position adjustment means comprises a control screw which extends transversely relative to the rotation axis of the tubular valve body and is arranged to function as a worm gear in engagement with the outer periphery of the valve body. 70 75 80 85 90

2. A valve according to Claim 1, wherein said tubular valve body is formed of a plastics material, and the control screw comprises a self-tapping screw which is arranged to cut gear teeth on the outer periphery of the tubular valve body. 95

3. A valve according to Claim 1 wherein said tubular valve body has longitudinally extending ribs around a circumferential portion thereof for co-operation with the thread of said control screw. 100

4. A valve according to any one of Claims 1 to 3, wherein said lateral opening in said tubular valve body extends over a predetermined circumferential portion of said cylindrical tubular valve body. 105

5. A valve according to any one of Claims 1 to 4, wherein said cylindrical bore of the first passage provides the outlet of the valve and said second passage provides the inlet of the valve. 110

6. An adjustable flow restricting valve substantially as herein described with reference to and as illustrated in the accompanying drawings. 115

7. A valve according to any one of the preceding claims when in use in a speed control of a pneumatic motor. 120

8. A control valve suitable for use in a pneumatic motor and having a sub-plate substantially as described hereinbefore with reference to the accompanying drawings said sub-plate having valve means mounted therein so as to provide two restricting valves accord- 125

ing to any one of Claims 1 to 6 arranged for controlling air exhaust through respective air outlet passages in the subplate.

- 5 9. A control valve assembly comprising a plurality of control valves according to Claim 8 wherein the first passage of a respective flow restricting valve of each of the control

valves serving as an outlet passage are aligned so as to provide a common outlet passage.

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1980.  
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from  
which copies may be obtained.

