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54 **Apparatus for the automatic actuation of ventilation flaps in installations for the escape of smoke and heat.**

57 The apparatus has a piercing piston (8) which is disposed in a housing (2), can be acted upon by spring force, can be held in an initial position by means of a securing means comprising a releasable detent (10) and can be transferred into an actuating position releasing an energy carrier. To ensure reliable automatic actuation in different cases of disaster, the piercing piston (8) is divided into two with a piston portion (11) which can be locked by the releasable detent (10) and a piston head (12) which is movable in relation to this piston portion by fluid pressure.

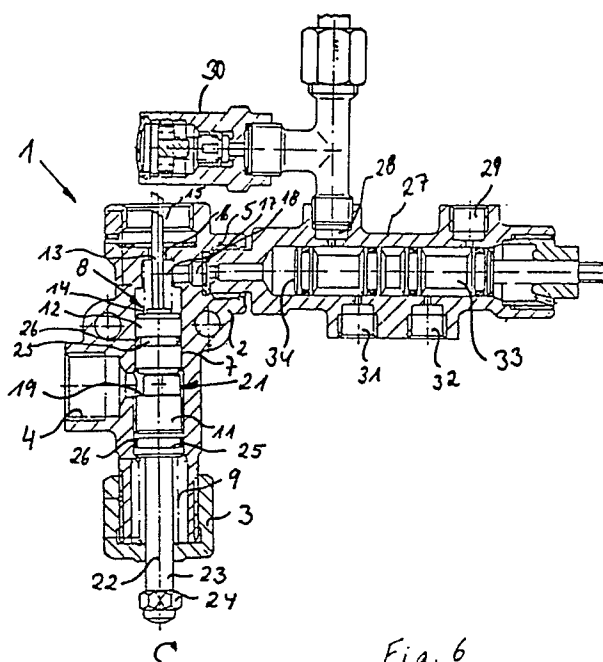


Fig. 6

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APPARATUS FOR THE AUTOMATIC ACTUATION OF VENTILATION FLAPS IN INSTALLATIONS FOR THE ESCAPE OF SMOKE AND HEAT

The invention relates to an apparatus for the automatic actuation of ventilation flaps, which term is to be taken to include ventilation louvres and the like movable ventilation members, in installations for the escape of smoke and heat.

It is known to provide an apparatus for the pneumatic automatic actuation of ventilation flaps, ventilation louvres and the like movable ventilation members in installations for the escape of smoke and heat having a piercing piston which is disposed in a housing and can be acted upon by spring force and which comprises a detent recess for the introduction of a detent and can be transferred from an initial position into an actuating position releasing a pressure reservoir.

For the piercing of compressed-air cartridges, known apparatuses of this kind have pistons which are provided with a groove-shaped marginal recess to secure the piston in the starting position, in which recess a movable locking pin can engage. In order to be able to discharge the cartridge in the event of fire, elements which respond when a critical temperature is exceeded, for example glass member which burst, are associated with the locking pins so that the locking pin can be unlocked and the piston acted upon by means of a compression spring can come into its piercing position. It is also known to move the piercing piston into its piercing position by means of a pressure medium when the critical temperature is exceeded, the pressure medium being stored in an actuating pressure cartridge which bursts when the critical temperature is reached. These known apparatuses only respond in case of fire, however, so that an automatic actuation of the ventilation flaps in the event of other disasters, for example on the appearance of poisonous gases and the like, is not possible.

If an automatic actuation of the ventilation flaps is also to be effected in the event of other disasters, additional automatic actuation apparatuses are therefore necessary, for example devices comprising locking members which can be moved by electric motors in order to unlock the piston, which devices can take into consideration parameters which are specific to disasters, through suitable measuring elements such as sensors. It is true that with unlocking by electric motor, it is possible to provide that the piercing piston is to be unlocked when a critical temperature is reached and hence in the event of fire, but after the outbreak of a fire, the electrical supply system in a building to be ventilated is often no longer operational or only to a

limited extent so that there is a danger that the electric energy necessary to unlock the piercing piston can no longer be made available. A reliable automatic actuation of the ventilation flaps for different cases of disaster therefore requires a plurality of devices of the conventional type. The resulting expenditure on building and costs is considerable.

It is the object of the present invention to provide, by structurally simple means, an apparatus of the type mentioned at the beginning which ensures an operationally reliable automatic actuation of the ventilation flaps on the outbreak of a fire but in addition is equally to be equipped in such a manner that automatic actuation can also be effected in the event of other disasters.

In order to solve this problem in accordance with the present invention, an apparatus of the kind mentioned at the beginning is characterized in that the piercing piston is divided in construction with a piston portion which can be locked by the releasable detent and a piston head which is movable in relation to this piston portion and comprises a surface for the action of pressure.

With regard to further developments of the invention, reference should be made to claims 2 to 10.

As a result of the piercing piston of divided construction, automatic actuation of the ventilation flaps can be initiated not only through the piston head but also through the portion of the piston which can be locked by the releasable detent. The releasing of the rear lockable portion of the piston may, for example, be effected by electric motor means so that a release of the energy carrying unit for the automatic actuation of the ventilation flaps is possible in cases of disasters which can be detected by measuring elements in operational communication with the electric motor drive. Besides this, the head of the piercing piston can be acted upon by compressed air, for example by means of a compressed-air cartridge bursting at a critical temperature, and can be brought into the operating position releasing the energy carrying unit independently of the lockable portion of the piston. The piercing piston unit of the apparatus according to the invention is accordingly an inexpensive part which is simple to construct and which can also be retrofitted with only little expense in apparatuses of conventional construction.

The detent of the lockable rear portion of the piston is preferably constructed in the form of a locking pin which can be unlocked manually in order to be able to actuate the apparatus either

centrally or locally. For this purpose, according to an advantageous development of the invention, the piston portion can be twisted about the longitudinal centre axis of the piston and has a piston portion which is eccentric in cross-section and which forms a detent recess changing over gradually into the peripheral surface of the piston, to receive the locking pin which can be unlocked manually. If the piston portion is to be unlocked by an electric motor for example, in the event of a disaster, the locking pin engaged in the recess is changed over into its release position by twisting the piston portion so that the piston portion can be moved into its operating position releasing the energy carrying unit without other expensive unlocking devices, for example by a compression spring.

One way of carrying out the present invention will now be described in detail by way of example with reference to drawings which show one specific embodiment. In the drawings:

FIG. 1 is a longitudinal sectional illustration of a piercing piston unit of an apparatus according to the invention;

FIG. 2 shows a front view of the piercing piston unit illustrated in Figure 1;

FIG. 3 shows, as a detail, a sectional illustration on the section line III-III in Figure 1;

FIG. 4 shows in a diagrammatic longitudinal section, a 5/2-way valve, with a suitable safety valve, which can be connected to the piercing piston unit of Figure 1;

FIG. 5 shows a front view of the distributing valve illustrated in Figure 4, without illustrating the adapted safety valve;

FIG. 6 shows, in a longitudinal sectional illustration, the assembled parts shown in Figures 1 to 5; and

FIG. 7 shows, in a front view without illustrating the adapted safety valve, the apparatus according to the invention illustrated in Figure 6.

With reference now to the drawings, the piercing piston unit numbered 1 in general in the drawing has a piston housing 2 with a lock nut 3 which can be screwed on, in which housing there is formed a pressure-gas connection 4 for connection to an actuating pressure cartridge which bursts when a critical temperature is reached and a connection 5 for securing a 5/2-way valve 6. Inside the housing 2 there is provided a piston guide compartment 7 in which the piercing piston, number 8 in general, is mounted for longitudinal movement.

In the example of embodiment illustrated, the piercing piston 8 is of two-part construction and has a rear piston portion 11 which is supported on the lock nut 3 of the piston housing 2 through a compression spring 9 and can be locked by means of a locking pin 10. In the initial position shown in

Figure 1, the piston portion 11 lies with its front end face against the rear end face of the piston head 12 comprising the piercing needle 13. The piston head 12 is in turn supported in the piston housing 2 through a compression spring 14. The compression spring 14 exerts a spring force which is directed counter to the direction of the actuating movement of the piston head 12 or of the piston portion 11. Not illustrated in detail is the energy carrying unit which, in the example of embodiment illustrated, should be constructed in the form of a compressed-air cartridge and, after being pierced, is discharged through the flow guides 15, 16, 17, 18 and the connection 5 of the piston housing 2 towards the 5/2-way valve 6.

The rear piston portion 11 has a detent recess, numbered 19 as a whole, in which the spring-loaded locking pin 10 can engage to lock the piston portion (Figure 1). In the example of embodiment illustrated, the spring-loaded locking pin 10 can be unlocked manually by means of a handle 20 so that, in the event of manual unlocking, the piston portion 11 and the piston head 12 resting against this can be transferred, under the influence of the compression spring 9, into the actuating position shown in broken lines in Figure 1. The detent recess 19 is formed by a front piston portion 21, which is eccentric in cross-section, of the rear piston portion 11 adapted for twisting about the longitudinal centre axis 22. As a result of twisting the rear piston portion 11, the locking pin 10 can thus be brought into its release position unlocking the piercing piston 8, without actuation of the handle 20, so that automatic ventilation can be initiated by activation by means of an electric motor drive without the necessity for other additional parts which are expensive in construction.

A piston rod 23, taken out of the piston housing 2 and having a nut 24 at the end, acts on the piston portion 11 for the connection to the electric motor drive. A connection piece 25 connected to the electric motor drive has to be placed on the nut 24. Thus the parts necessary for the twisting of the piston portion 11 are restricted to components which are inexpensive to manufacture and are not susceptible to wear. A plurality of measuring elements which respond to parameters of different cases of disaster may appropriately be associated with the electric motor drive not illustrated in the drawing.

The front piston head 12, which is movable in relation to the piston portion 11, has a surface for the action of pressure which, in the initial position of the parts illustrated in the drawing, is formed by the rear end face of the piston head which is not covered by the end face of the eccentric portion of the piston portion 11. The piston head 12 can be acted upon by a pressure fluid through the pres-

sure connection 4 and be moved, independently of the piston portion 11, into the actuating position releasing the energy carrying unit so that, in the event of a fire, an operationally efficient automatic actuation is ensured, for example in the event of failure of the electric motor drive. It is a further advantage of the piercing piston unit illustrated in Figure 1 that this can be used as a uniform component even for apparatuses comprising different actuating mechanisms. If an apparatus for automatic actuation is to be actuated at first only by an electric motor or through a pressure fluid, the piercing piston unit can nevertheless be used. The apparatus can be retrofitted with an actuating mechanism working by electric motor or with a pressure fluid or be converted to such a mechanism without the necessity for later cost-intensive alterations. The piercing piston unit 1 can also be installed, without great expense, in apparatuses of a conventional type. In order to seal the piston head 12 and the piston portion 11, these each have a marginal groove 25 in which a sealing element 26 has to be disposed.

As can be seen in more detail from Figures 4 and 6, the piercing piston unit 1 has to be connected to the 5/2-way valve 6 via the connection 5. The 5/2-way valve 6 has a housing 27 with connections 28 and 29 to which control pressure conduits from compressed-air cylinders not illustrated in detail are connected for opening and shutting ventilation flaps. Connected to the control pressure conduit 28 is a safety valve which is numbered 30 as a whole and which opens when a present operating pressure is exceeded and relieves the whole system. The housing 27 of the 5/2-way valve 6 additionally comprises connections 31 and 32 to which mains control conduits are connected to the actuation of the ventilation flaps during normal operation. The connections 28, 29, 31 and 32 are controlled by the longitudinally movable piston 33 of the valve 6 which, in the case of automatic actuation, is acted upon at its front face 34 by the pressure fluid of the freed energy carrying unit and is transferred into its operating position connecting the energy carrier to the control pressure conduit connection 28.

Claims

1. An apparatus for the pneumatic automatic actuation of ventilation flaps, ventilation louvres and the like movable ventilation members in installations for the escape of smoke and heat having a piercing piston (8) which is disposed in a housing (2) and can be acted upon by spring force and which comprises a detent recess (19) for the introduction of a detent (10) and can be transferred

from an initial position into an actuating position releasing a pressure reservoir, characterized in that the piercing piston (8) is divided in construction with a piston portion (11) which can be locked by the releasable detent (10) and a piston head (12) which is movable in relation to this piston portion (11) and comprises a surface for the action of pressure.

2. An apparatus according to claim 1, characterized in that the piston portion (11) can be twisted about the longitudinal centre axis (22) of the piston and has a piston portion (21) which is eccentric in cross-section forming a detent recess (19).

3. An apparatus according to claim 2, characterized in that the end face of the piston portion (11) adjacent to the piston head (12) is made eccentric in cross-section.

4. An apparatus according to any one of claims 1 to 3, characterized in that the piston portion (11) comprises a piston rod (23) taken out of the piston housing (2).

5. An apparatus according to any one of claims 1 to 4, characterized in that a compression spring (9) acts on the piston portion (11) with a spring force aligned in the direction of the piston head (12).

6. An apparatus according to any one of claims 2 to 5, characterized in that the piston portion (11) can be twisted by an electric motor.

7. An apparatus according to any one of claims 1 to 6, characterized in that the detent (10) of the piston portion (11) can be unlocked manually.

8. An apparatus according to any one of claims 1 to 7, characterized in that a compression spring (26) acts on the piston head (12) with a spring force aligned in the direction of the piston portion (11).

9. An apparatus according to any one of claims 1 to 8, characterized in that the piston head (12) can be acted upon by a pressure fluid through a pressure connected (4) formed in the housing (2) and the pressure connected (4) opens out into the piston guide compartment (7) of the housing (2) substantially in the region of the front end of the locked piston portion (11).

10. An apparatus according to any one of claims 1 to 9, characterized in that the piston head (12) and the piston portion (11) each have a marginal groove (25) to receive a sealing element (26).

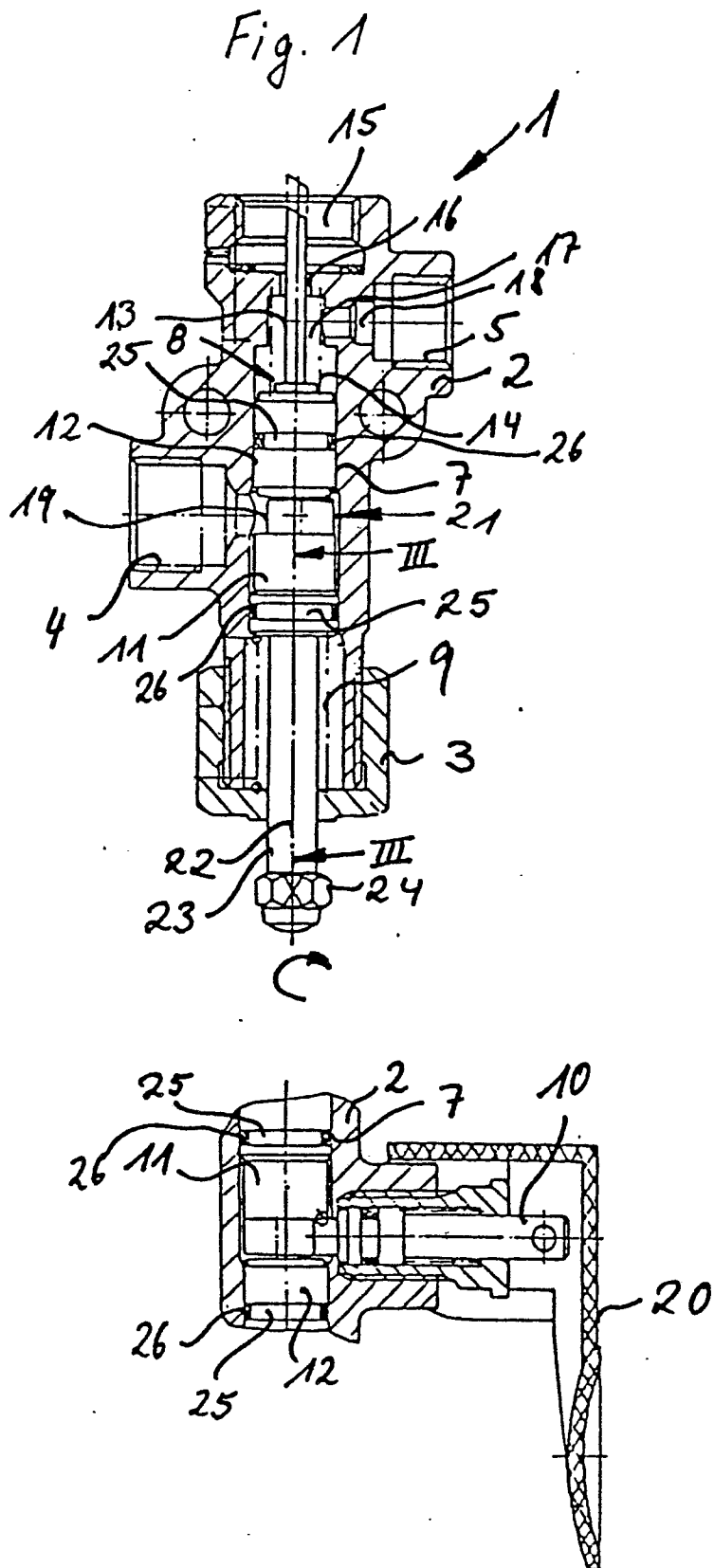


Fig. 4

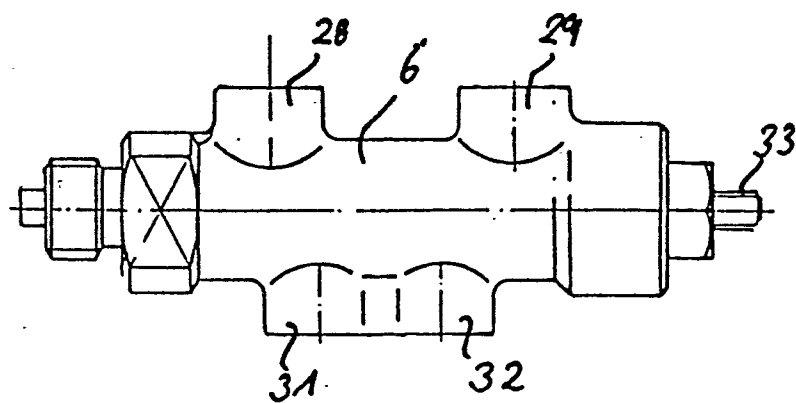
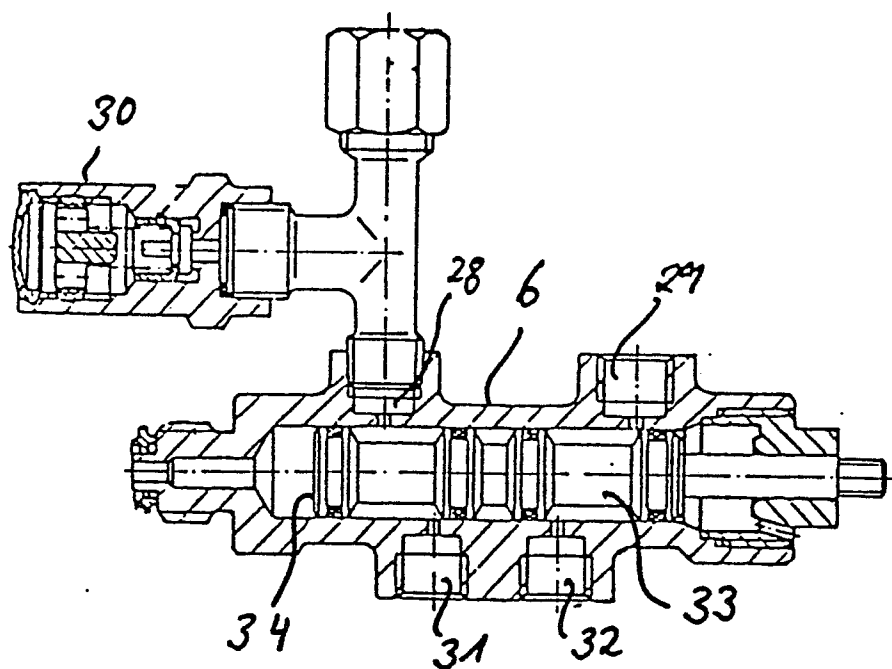


Fig. 5

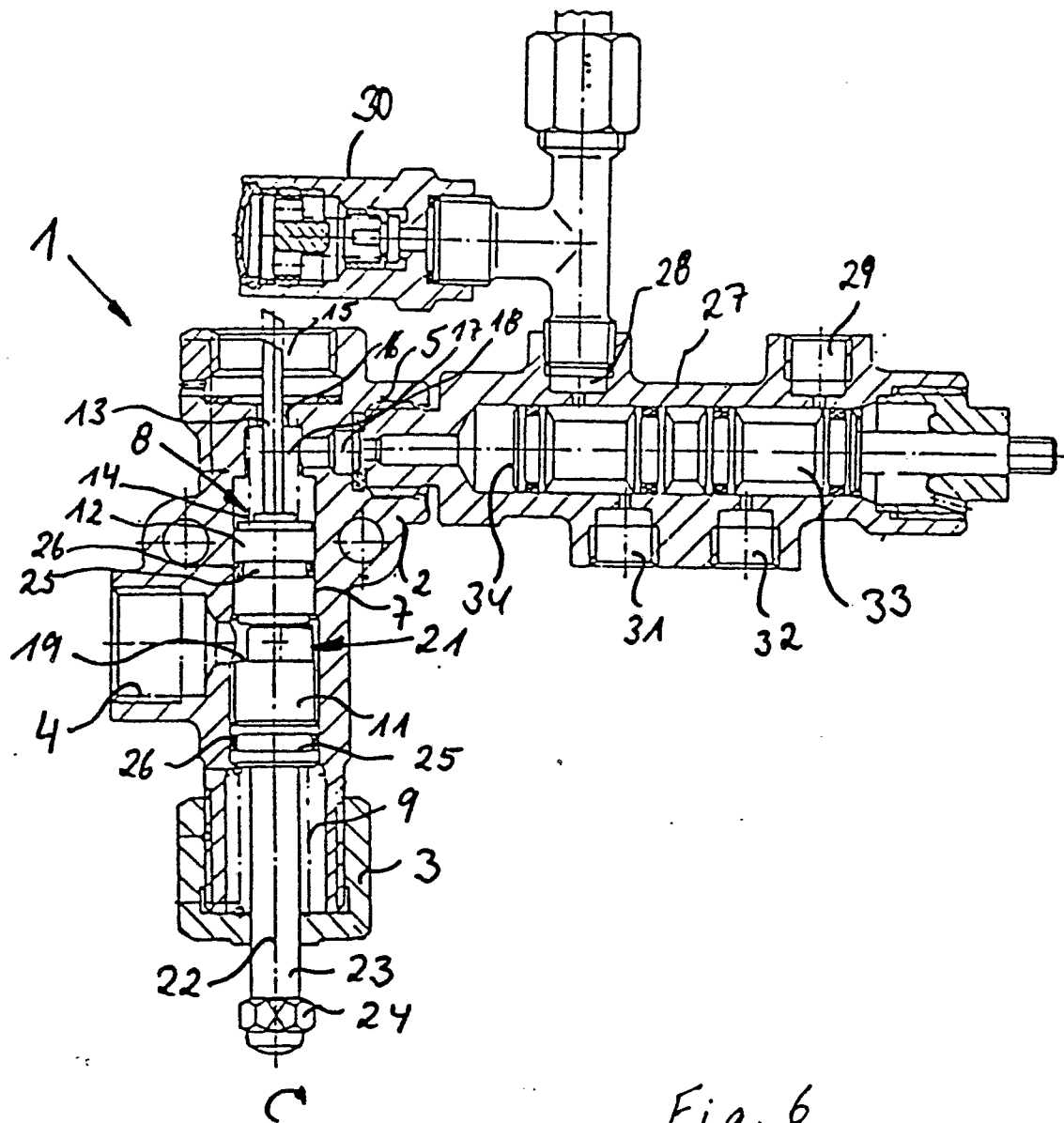
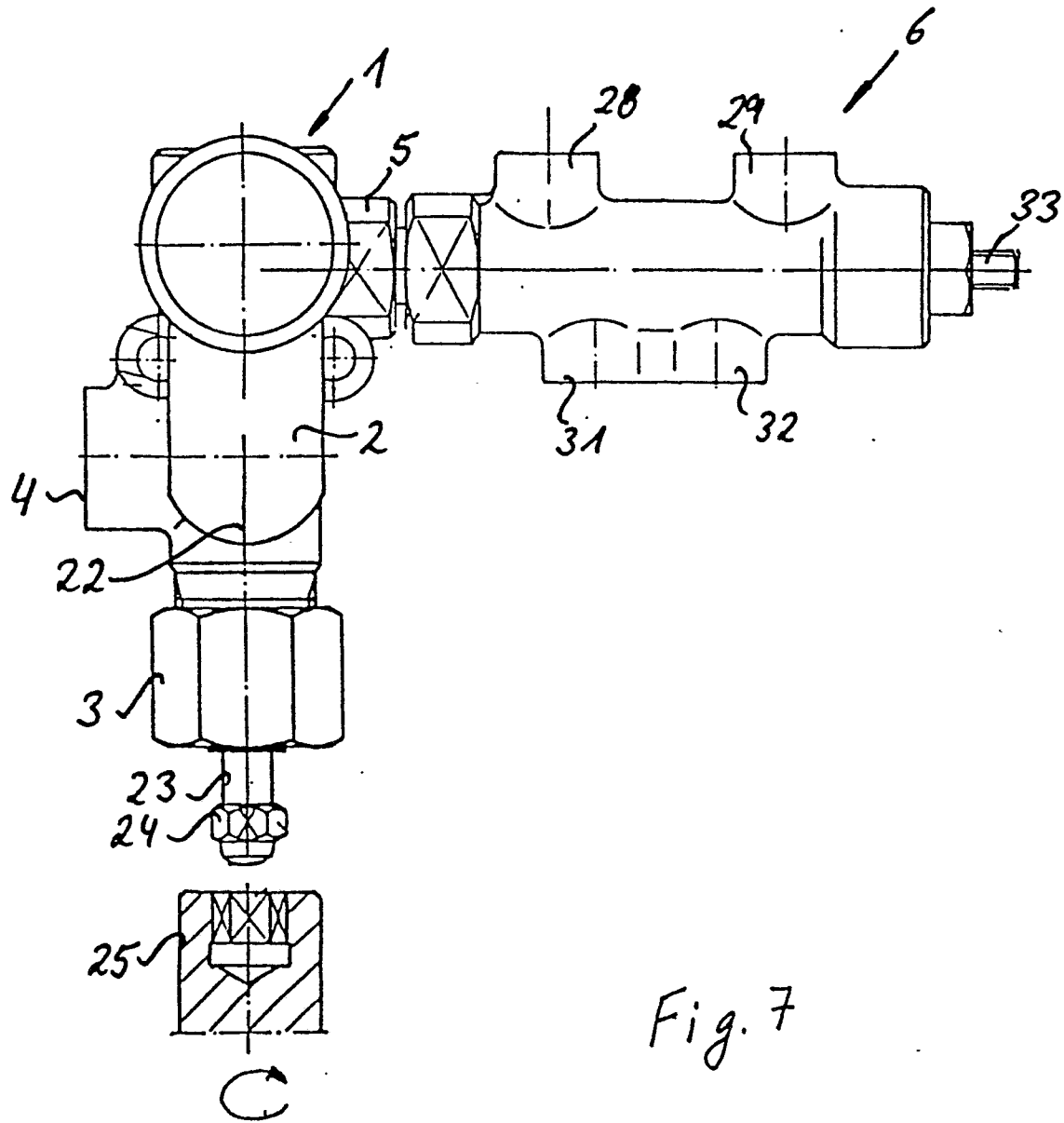


Fig. 6





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	DE-A-2 434 049 (J. FORTMEIER) * Pages 3,4; figure 1 * ---	1,4,5,7 ,8	A 62 C 3/14
A	DE-A-2 946 244 (B. BATKE) * Pages 5,6; figures 1,3 * ---	1,4,5,7	
A	DE-A-3 400 142 (FA. EBERSPÄCHER) ---		
A	EP-A-0 216 732 (BELIMO AUTOMATION AG) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			A 62 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22-11-1988	Examiner WOHLRAPP R.G.
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