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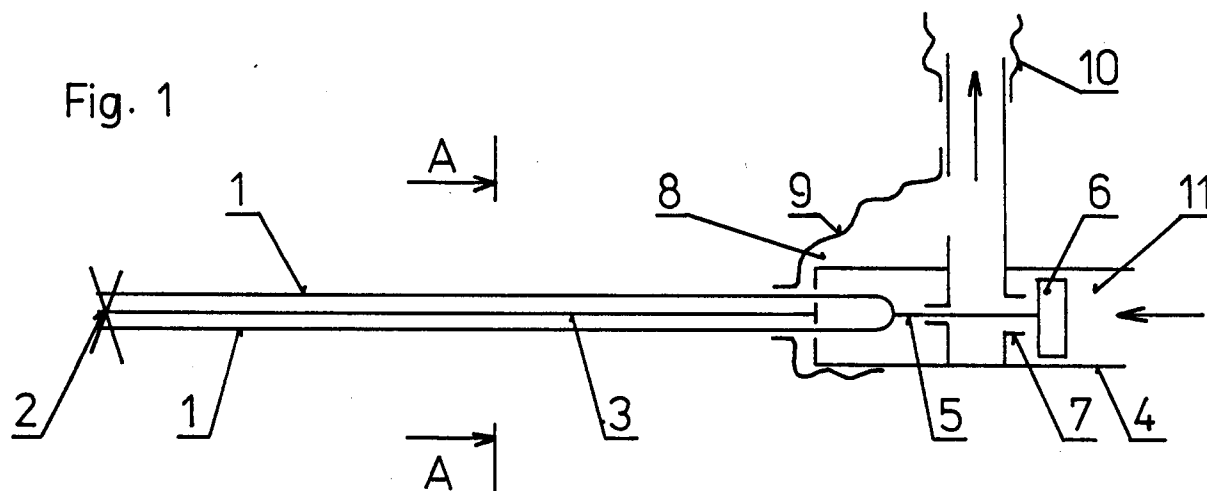
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**EUROPEAN PATENT APPLICATION**(21) Application number: **92107780.6**(51) Int. Cl.<sup>5</sup>: **F16K 31/126, A62B 9/02, A62B 7/04**(22) Date of filing: **08.05.92**(30) Priority: **10.05.91 CS 1368/91**(72) Inventor: **Kder, Miroslav**(43) Date of publication of application:  
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Na Urbance 632  
Roudnice nad Labem(CS)**(54) **Superatmospheric pressure controlled reducing valve.**

(57) The valve designed for being used in respirators adapted to operate exclusively in the superatmospheric pressure breathing regime is controlled by a straight stay or stays (1) immediately confining a space or cavity (8). In inoperative state where the cavity inlet is not exposed to any medium pressure, the stays (1) are tight and hold a valve (6) open until the pressurized medium has entered therethrough the cavity (8) where a superatmospheric pressure is produced consequently. Thereby the straight stay or stays (1) are bent, get shorter and release the valve

(6) which cuts off the medium flow. By aspirating from the apparatus, the superatmospheric pressure in the cavity (8) drops so that the stays begin to reassume their original shape and to reopen the valve (6). The cavity (8) is air-tightly separated from the ambient atmosphere by cementing an elastic fold onto the periphery of stay (1), which fold is followed by a sealed forechamber (9) closing the entire automatic stay system and allowing the medium to be let in and out.

Fig. 1



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The invention relates to a reducing valve adapted to be controlled by means of a stay or stays on the basis of a superatmospheric pressure.

Such valves find particularly use in respirators in which they serve for reducing inlet pressure from a pressurized vessel to the pulmonary pressure with a superatmospheric pressure relative to the ambient atmosphere.

Respirators are usually provided either with a one-stage automatic pulmonary system wherein pressure prevailing in a pressurized vessel (of, say, 20 MPa) is reduced to the pulmonary pressure by a single closing element, or with a two-stage system in which the first stage is associated with the pressurized vessel while the second as a rule with the mask. In the last years, however, such systems have not experienced any substantial progress, since any simplification of leverage mechanisms they are based upon are rather limited.

Among other systems there may be named a device according to the Czechoslovak Inventorship Certificate No. 250,347, comprising a single bent controlling stay which is received in the mask and air-tightly closed by a diaphragm as well as a device described in the Czech. Inv. Cert. No. 269,068 comprising a pair of bent stays provided in an air-tight bag. The two above-mentioned systems do not operate but in subatmospheric pressure respirators which, however, cannot be used for superatmospheric pressure breathing regimes. With subatmospheric apparatuses, namely, any leakage may cause contaminants to be aspirated from the ambient atmosphere so that the workers operating in media of concentrated toxicity may become endangered. On the contrary, the superatmospheric pressure respirators guarantee the operator's safety in such media even in case of any leakage within the breathing cycle, and particularly due to a constant superatmospheric pressure under the mask produced by lungs in any breathing regime, so that any of unwanted substances are rather ejected than aspirated.

It is the object of the present invention to provide a valve controlling stay system which operates solely under Superatmospheric pressure and the stays form directly a bag. The invention is based upon the disclosure of the above-mentioned Czech. Inv. Cert. No. 269,068 modified by the reversion of the function and by removing the bag. According to the two above-cited references, the bent stays have in the inoperative position the shortest length, the valve they control is closed, and the regulation occurs by producing a vacuum in the bag, such vacuum straightening the bent stays, i.e. prolonging them, and consequently opening the valve. On the contrary, in accordance with the present invention, the straight stays, in inoperative position when no pressure is let in from

the pressurized vessel, have the longest form and keep the valve open. The latter is closed until pressure is let in from said vessel, and the medium is allowed to flow through the opened valve into the space of reduced pulmonary pressure till an overpressure in this space has arisen. Such overpressure causes the stays to diverge or bend away whereby they become shorter, the valve takes up its seat, and the medium flow is cut off. Owing to the overpressure re-drop, the stays begin to assume their straight form, viz. to extend their length, and open thus the valve of throttle device. This cycle is then repeated ad infinitum. On their periphery, the stays are gas-tightly closed by means of an elastic fold joint so that they are allowed to diverge from each other and form thus therebetween a variable space or bag. The space communicates gas-tightly with a rubber forechamber which confines the entire automatic system and enables the medium to be let in and out. The device according to the invention makes it possible to control the valve, after having been exposed to pressure, with the exception that the stay is attached to the valve body at the opposite side, relative to the connection with a holder which latter constitutes then a valve tierod.

In order that the invention be better understood and carried into practice, some preferred embodiments thereof will hereinafter be described with reference to the accompanying schematic drawings in which

- Fig. 1 is a sectional view of the reducing valve;
- Fig. 2 is a section taken along the line A-A in Fig. 1 and showing the closure of stays on the periphery;
- Fig. 3 is a sectional view of the reducing valve in the closed state;
- Fig. 4 is a sectional view of the reducing valve comprising a single stay; and
- Fig. 5 is a sectional view of the reducing valve controlled after the pressure exposure.

As can be seen in the drawings, and particularly in Fig. 1 thereof, the straight stays 1 are in the point 2 fixedly attached to a holder 3 which is secured to the valve body 4, the free end of the stay 1 bearing on a needle 5 which latter bears in turn on the valve 6 of a seat 7. The stays 1, including the connection point 2, are enclosed on the periphery by means of a fold and define thus a cavity 8 together with a forechamber 9 air-tightly communicating with the straight stays 1, reduced pressure outlet for a hose 10, and the valve body 4.

The valve designed for being used in respirators adapted to operate exclusively in the superatmospheric pressure breathing regime is controlled

by a straight stay or stays 1 immediately confining a space or cavity 8. In inoperative state where the cavity inlet is not exposed to any medium pressure, the stays 1 are tight and hold a valve 6 open until the pressurized medium has entered therethrough the cavity 8 where a superatmospheric pressure is produced consequently. Thereby the straight stay or stays 1 are bent, get shorter and release the valve 6 which cuts off the medium flow. By aspirating from the apparatus, the superatmospheric pressure in the cavity 8 drops so that the stays begin to reassume their original shape and to reopen the valve 6. The cavity 8 is air-tightly separated from the ambient atmosphere by cementing an elastic fold onto the periphery of stay 1, which fold is followed by a sealed forechamber 9 closing the entire automatic stay system and allowing the medium to be let in and out.

One stay 1 is asymmetrically secured by one end in the point 2 relative to the holder 3 to the valve body 4 while it bears by its other end, via the needle 5, on the valve 6 between the inlet pressure and the reduced pressure cavities 11 and 8, respectively, the stay 1 being air-tightly joined by fold with the holder 3, and defining thus the cavity 8 air-tightly secured to the valve body 4 and, via forechamber 9, to the reduced pressure inlet of the cavity 8 from the ambient atmosphere.

According to a further embodiment one or two straight stays 1 controlling the valve 6 are secured to the valve body 4 at the opposite side relative to the point 2 or joint with the holder 3 which is constituted by a tierod bearing on the valve 6 of a seat 7.

## Claims

1. A superatmospheric pressure controlled reducing valve comprising two straight stays attached each by one end to a valve body and bearing by their opposite end on a valve between a space of inlet pressure and that of reduced pressure, the valve being **characterized** in that the straight stays (1) are connected at one end in a point (2) with a holder (3) secured to the valve body (4), and bear by the other, free end, via a needle (5) on a valve (6) through an inter-space or cavity (8) of reduced pressure, the stays (1) being joined together air-tightly at circumference by a fold and defining thus said cavity (8) which communicates air-tightly with the valve body (4) and, via a forechamber (9), with the reduced pressure inlet, from the ambient atmosphere.
2. A valve according to claim 1, wherein one stay (1) is asymmetrically secured by one end in

the point (2) relative to the holder (3) to the valve body (4) while it bears by its other end, via the needle (5), on the valve (6) between the inlet pressure and the reduced pressure cavities (11 and 8, respectively), the stay (1) being air-tightly joined by fold with the holder (3), and defining thus the cavity (8) air-tightly secured to the valve body (4) and, via forechamber (9), to the reduced pressure inlet of the cavity (8) from the ambient atmosphere.

3. A valve according to claim 1, wherein one or two straight stays (1) controlling the valve (6) are secured to the valve body (4) at the opposite side relative to the point (2) or joint with the holder (3) which is constituted by a tierod bearing on the valve (6) of a seat (7).

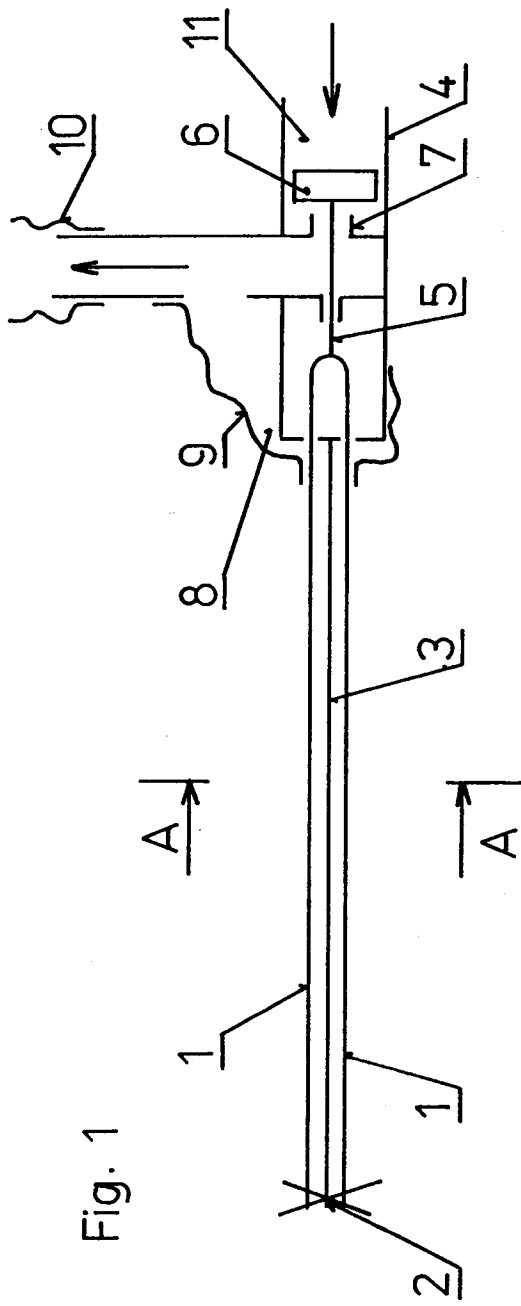


Fig. 2

A-A

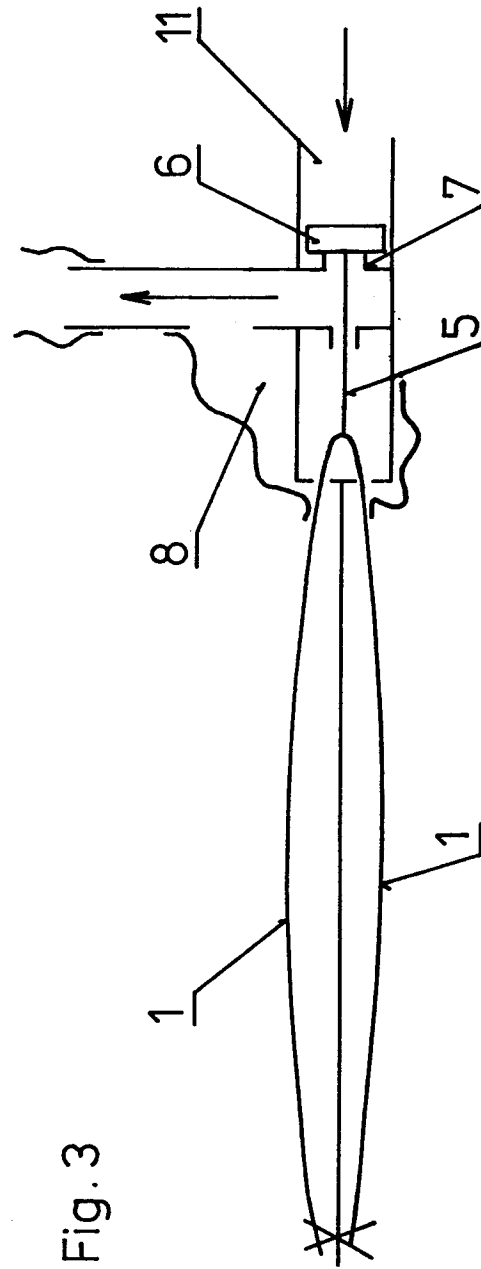
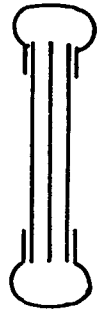


Fig. 4

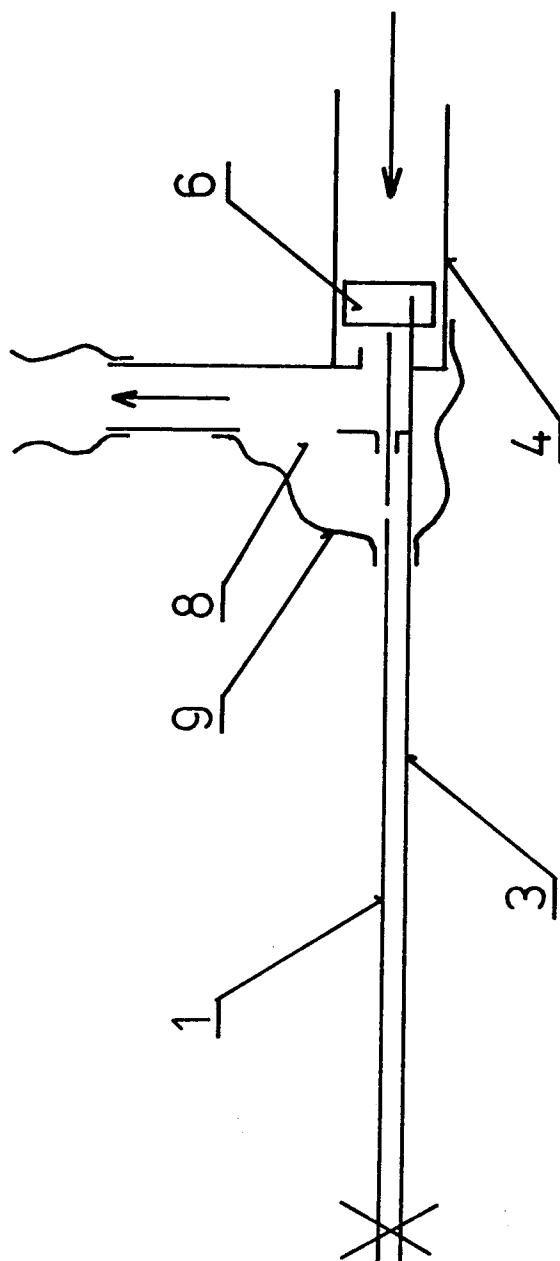
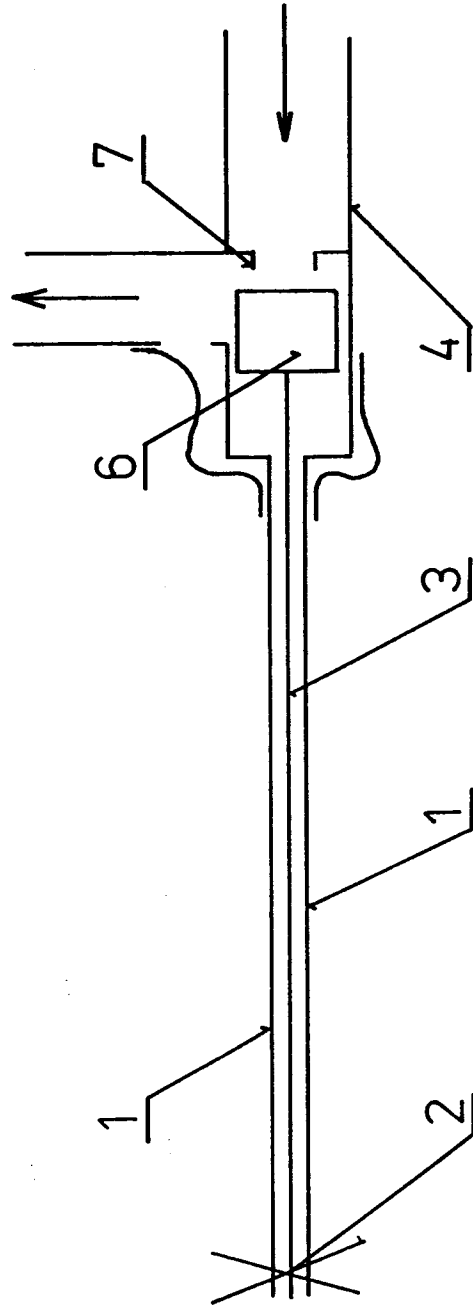


Fig. 5





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# EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 92107780.6
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D, A	<u>DE - A - 3 830 173</u> (MEVA NARODNI PODNIK) * Detailed description of the invention; fig. 1-3 *	1-3	F 16 K 31/126 A 62 B 9/02 A 62 B 7/04
A	<u>CS - B - 250 347</u> (KBER MIROSLAV) * Totality *	1, 3	
A	<u>DE - A - 2 646 338</u> (DRÄGERWERK AG) * Detailed description of the invention; fig. *	1	
A	<u>GB - A - 2 025 774</u> (A-T-O INC.) * Detailed description of the invention; fig. 2 *	1	
A	<u>GB - A - 2 160 108</u> (DRÄGERWERK AG) * Fig. *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			F 16 K A 61 M A 62 B
Place of search VIENNA		Date of completion of the search 17-08-1992	Examiner ROUSSARIAN
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			