(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 803 434 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.10.1997 Bulletin 1997/44

(51) Int. Cl.[6]: **B63C 11/22**, A62B 7/02

(21) Application number: **97106250.0**

(22) Date of filing: **16.04.1997**

(84) Designated Contracting States:
DE ES FR GB IT SE

(30) Priority: **23.04.1996 IT GE960034**
18.09.1996 IT GE960083

(71) Applicant: **HTM SPORT S.p.A.**
I-16035 Rapallo (Genova) (IT)

(72) Inventor: **Garofalo, Giovanni**
16035 Rapallo, Province of Genova (IT)

(74) Representative: **Porsia, Attilio, Dr. et al**
c/o Succ. Ing. Fischetti & Weber
Via Caffaro 3/2
16124 Genova (IT)

(54) Regulator for underwater breathing apparatus

(57) Regulator that comprises a box-like body (1) containing the device for regulating the admission of air from the first-stage reducer, and has a mouthpiece for inhalation of said air and a pipe for exhausting exhaled air, these latter being separate from the body of the regulator and connected to it by a flexible tube (2), said body (1) of the regulator being secured to the diver's trunk, and preferably to the suit (150) or to the stabilizer jacket (740), by suitable securing means; said body (1) of the regulator comprises, on the pipe (40) for admission of air from the first-stage reducer (20), a distributor block (302) provided with a plurality of outlets (113).

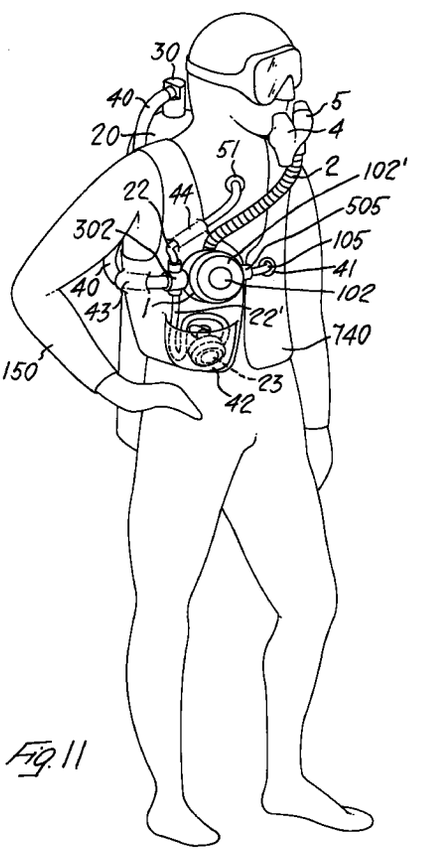


Fig. 11

EP 0 803 434 A2

Description

The present invention relates to two-stages regulators for underwater breathing apparatus.

Generally, such devices comprise a body, in which the device for regulating the admission of the air originating from the first reducing stage is contained, a mouthpiece for breathing the air and a discharge pipe provided with a non-return valve.

Devices thus far made in this manner, however, have a number of disadvantages. Firstly, the regulator as a whole can be rather voluminous and, since it is supported by the diver only by using the mouth, can cause weariness to the same. Moreover, the branch or branches which connect said regulator to the first reducing stage can become a hindrance to the vision and the movements of the diver during diving.

To this end, mounting the mouthpiece on a flexible tube of a certain length has already been thought of, which makes it possible to fix the body of the regulator to the trunk of the diver. In this manner, however, an accumulation of exhaled air is created in said connection tube, which is re-inhaled on the next act of breathing by the diver. This leads to a net drop in the efficiency of the breathing apparatus, cancelling out in practice the advantages of the expedient described above.

A further problem of the known two-stages regulators, resides in the fact that is practically impossible, with the said regulators, to use branches of great dimensions, pain an excessive stiffness and an elevated weight which would render too much difficult to maintain the second stage in the mouth of the user.

The advantages of the use of braches of diameter greaterthan the diameter of the branches actually on use are evident (greater flow rates and by consequence smaller breathing efforts and smaller influence on the breathing efforts of the other devices connected to the low pressure).

Moreover, in general, in a case in which the user desires to breathe the surface air for a certain period, he must of necessity equip himself with a suitable tube (snorkel), and during the use of this tube he must abandon the mouthpiece of the regulator, with obvious inconvenience.

Regulator devices are known that comprise a box-like body containing the device for regulating the admission of air from the first-stage reducer, and have a mouthpiece for inhalation of said air and a pipe for exhausting exhaled air, said air regulating device comprising a chamber containing the supply valve, and a chamber communicating with the external environment, said chambers being separated by a diaphragm that controls the supply valve.

The above described regulators can be equipped, as disclosed for istance in EP-A-0375939, with push-button means arranged on the cover that bounds the chamber communicating with the external environment around the regulator, for manual control of the supply valve.

A common problem with breathing apparatus is on the one hand how to provide a number of low-pressure outlets, and on the other hand how to reduce their size and make them simpler to control and regulate.

It is therefore a further object of the present invention to provide a regulator that will improve the control and regulation of the low-pressure outlets.

A still further object of the invention is to provide a regulator that will allow a moderate overall size and more efficient management of said low-pressure outlets.

The subject of the present invention is therefore a regulator that comprises a box-like body containing the device for regulating the admission of air from thefirst-stage reducer, and has a mouthpiece for inhalation of said air and a pipe for exhausting exhaled air, these latter being separate from the body of the regulator and connected to it by a flexible tube, said body of the regulator being secured to the diver's trunk, and preferably to the suit or to the stabilizer jacket, by suitable securing means, said air regulating device comprising a chamber containing the supply valve, and a chamber communicating with the external environment, said chambers being separated by a diaphragm that controls the supply valve, while push-button means for manual control of the supply valve are arranged on the cover that bounds the chamber communicating with the external environment around the regulator, which regulator is characterized in that said body of the regulator comprises, on the pipe for admission of air from the first-stage reducer and upstream of the supply valve, a distributor block provided with a plurality of outlets.

In a preferred embodiment, the pipe for admission of air from the first stage and the hoses connected to the distributor block, are held in pockets formed in the stabilizer jacket, or are secured to the latter by loops.

Another object of the invention is a regulator of the type described above, the box-like body of which comprises an alternative air supply duct, preferably for inflating a stabilizer jacket, and means, actuated by said push-button means for controlling the supply valve, for preventing the supply to said mouthpiece.

Further advantages and features will become clear in the following description of one embodiment of the present invention which refers, by way of non-restrictive example, to the attached drawings, in which:

Figure 1 illustrates diagrammatically a diver who is wearing a breathing apparatus provided with the regulator according to the invention;

Figure 2 is a perspective view of a first embodiment of the regulator according to the invention;

Figure 3 is an elevation, with parts in longitudinal section, of the regulator illustrated in Figure 2;

Figure 4 is a view in cross-section of a detail of Figure 3;

Figure 5 is a perspective view of a second embodiment of the regulator according to the invention;

Figure 6 is an elevation of the regulator illustrated in

Figure 5, with parts in section;

Figure 7 is a view in cross-section along the line VII-VII in Figure 6;

Figure 8 is a perspective view of a third embodiment of the regulator according to the invention, and

Figure 9 is an elevation, with parts in longitudinal section, of the regulator illustrated in Figure 8.

Figure 10 is a view in longitudinal section of a still further embodiment of the regulator according to the present invention, and

Figure 11 is a perspective view of the regulator according to the embodiment of figure 10 as worn by a diver.

In Figure 1, a diver is illustrated, who is wearing a breathing apparatus equipped with the regulator according to the invention. Said apparatus comprises the cylinder 20, to which the first reducing stage 30 is connected, from which the branch 40 which takes the air to the regulator 10 starts. The cylinder is worn by means of the straps 50 and secured to the body by means of the belt 60 which, with the buckles 61, is connected to the small straps 62 of the body of the regulator (see Figure 2).

In Figure 2, the regulator 10 is illustrated in perspective. 1 indicates the body of the regulator, comprising in its interior the device for regulating the admission of air, which is known per se and therefore not described in greater detail at this time. Said body 1 is provided with an admission duct 101 connected to the branch 40 which at the opposite end (Fig. 1) is connected to the first reducing stage, and with an emission duct 301. Projecting radially from said body are two lugs 201, to which are secured the two small straps 62 provided with buckles 61 which serve to connect the body 1 to the belt 60. Connected to the emission duct 301 is a flexible tube 2, in this case a corrugated tube, which at the opposite end is connected to the union 303 of the manifold 3. Said manifold 3 comprises an essentially L-shaped tubular element 103 which ends integrally at one end in a spheroidal connection 203, to which the mouthpiece 4 is in turn connected, and at the opposite end is connected to the discharge pipe 5.

In Figure 3, the regulator in Figure 2 is illustrated in front elevation. Identical numbers correspond to identical parts. In the figure, the manifold 3 is illustrated in longitudinal section. The union 303 of the tubular element 103 has, in the region of its opening onto the aperture of the tubular element 103, a non-return valve 313, the purpose of which will be described below. The tubular element 103 is at one end connected to the connection 203, and at the other connected to the discharge pipe 5. Close to the end of the tubular element 103 connected to said discharge pipe 5, a non-return valve 113 is inserted. The connection 203 is connected to the mouthpiece 4. At the end of the connection 203 opposite the mouthpiece 4, a duct 213 is formed, in the aperture of which a valve (223) is inserted, the purpose of which will be described below.

Figure 4 illustrates a detail of Figure 3 in cross-section. Identical numbers correspond to identical parts; in the figure, it is easier to identify the positioning of the valve 313 and the valve 113, and also the connection between said tubular element 103 and the discharge pipe 5.

Figure 5 illustrates a second embodiment of the regulator according to the invention. Only the manifold of the regulator is illustrated in the figure, given that the body 1 of the same is unchanged in relation to the embodiment described previously. 7 indicates the manifold which comprises two tubular elements 107 and 407 which are arranged diametrically opposite in relation to the connection 207, on which the mouthpiece 4 is mounted, and which are on the whole U-shaped, said connection being arranged on the top of the bend between said tubular elements. The tubular element 107 is provided with a union 307 which communicates with the tube 2, similar to what has been described above in the previous embodiment. The end of the tubular element 107 opposite the connection 207 is connected to the discharge pipe 5 and the valve 117 is inserted close to said end. The other tubular element 407 is connected at the end opposite the connection 207 to the flexible joint 106 which allows coupling to the tube 6 for surface breathing. Projecting from both the outer surface of tubular element 107 and that of tubular element 407 are the knobs 137 and 427, the purpose of which will be described below.

Figure 6 illustrates the regulator in Figure 5, with parts in section. In the figure, in particular the means of opening and of closing the aperture of the tubular elements 107 and 407 are indicated, that is to say the butterfly valve 127 and the butterfly valve 417 respectively which can be actuated with the knobs 137 and 427 respectively. Butterfly valve 127 is arranged in tubular element 107 between the connection 207 and the port of the union 307. The valve 417, however, is arranged in the element 407 close to the connection of the same to the flexible joint 106.

Figure 7 is a view in cross-section along the line VII-VII in Figure 6. Here, the positions of the butterfly valves 417 and 127 in the respective tubular elements 407 and 107 are shown more clearly.

Figure 8 shows a third embodiment of the regulator according to the invention. In this figure also, only the manifold of the regulator is illustrated, the rest of the regulator being unchanged in relation to the two other embodiments illustrated. 8 designates the manifold which comprises two tubular elements 108 and 308 which are arranged diametrically opposite in relation to the connection 208 on which the mouthpiece 4 is mounted and which are on the whole U-shaped. The connection 208 has, at the opposite end in relation to that connected to the mouthpiece 4, the union 228, connected to the tube 2 which originates from the body 1 of the regulator. Arranged on the surface of the connection 208 is the lever 218, the purpose of which will be

described below. The ends of the tubular elements 308 and 108 are connected, similar to the previous embodiment, to the tube 6 by means of the joint 106 and to the discharge pipe 5 respectively.

In Figure 9, the regulator in Figure 8 is illustrated in elevation, with parts in longitudinal section. Arranged inside the connection 208 is the three-way ball valve 238 which is controlled manually with the lever 218 (illustrated in broken lines in the figure). Arranged in the union 228 is the non-return valve 248, just as the non-return valve 118 is located in the region of the connection of the tubular element 108 to the discharge pipe 5.

The functioning of the regulator above described will be clear from the following. As illustrated in Figure 1, the regulator according to the invention has better portability in relation to known regulators. In fact, the mouthpiece 4 which is not directly connected to the body 1 of the regulator is easier to maintain in the mouth; furthermore, the branch 40 remains confined to a position which cannot cause interference to the user. Advantageously, the body of the regulator is positioned on the trunk of the user in the centre of the chest, in other words on the transverse axis of the lungs; in this manner, the creation of a pressure difference between the lungs and the body 1 of the regulator is avoided in phases of diving in which the attitude of the body is not horizontal. By virtue of the fact that a non-return valve 313 is inserted in the union 303, the arrangement of the mouthpiece 4 on the manifold 3 makes it possible to prevent the air exhaled through the mouthpiece 4 redescending towards the body 1 of the regulator. This exhaled air instead follows the course of the tubular element 103 and from here, through the valve 113, that of the discharge pipe 5. Furthermore, the manifold 3 has, in the region of its connection to the mouthpiece 4, the connection 203 in which the water which condenses from the vapour produced during breathing collects. This connection can be emptied by means of the duct provided with the valve 223 simply by blowing from the mouthpiece and expelling the water from the valve. Alternatively, the connection 203 can be without the valve 223 and any condensation can be discharged directly through the valve 113.

In the embodiment illustrated in Figures 5 to 7, the manifold 7 has a second tubular element 407 in relation to the manifold in the previous embodiment. Connected at the free end of this tubular element 407, by means of a flexible joint 106, is the tube 6 which permits surface breathing for the diver without the latter having to abandon the mouthpiece 4. The alternative use of the tube 6 for surface breathing or breathing air distributed by the breathing apparatus and originating from the tube 2 connected to the body 1 of the regulator is allowed by the two butterfly valves 127 and 417.

When said valves are in the state shown in Figure 7, that is to say with the valve 127 arranged parallel to the axis of the tubular element 107 of the manifold 7 and the valve 417 orthogonal to the axis of the tubular element 407, breathing is carried out by using the air originating from the body 1 of the regulator, which is then discharged in the usual manner through the discharge pipe 5. At the moment when the user wishes to breathe through the tube 6, it is only necessary to rotate the knobs 427 and 137 to bring the respective valves into respective opening and closing positions of the aperture of the respective tubular element of the manifold.

The embodiment illustrated in Figures 8 and 9 has a further variant in relation to the embodiment described above. In this case, in fact, the tube 2 connected to the body 1 of the regulator opens into the union 228 which starts from the connection 208. Located in this connection is the three-way ball valve 238 which makes it possible to select alternatively the type of air supply to be used by the diver. In fact, with the valve positioned as illustrated in Figure 9, the aperture of the tubular element 308 of the manifold 8 which communicates with the tube 6 is closed, while the mouthpiece 4 is placed in communication with the union 228 and the tubular element 108 connected to the discharge pipe 5. By a 90° rotation of the lever 218, the valve 238 closes the aperture of the union 228, and places the mouthpiece 4 in communication with the tube 6, through the aperture of the tubular element 308. In this manner, the control, which allows selection from the two alternative types of air supply, is simplified. Furthermore, the connection 208 of the manifold 8 does not have the discharge valve which is envisaged in the embodiments previously illustrated.

Having now regards to figures 10 and 11, a still further embodiment of the regulator according to the invention will be now described. In the said Figures, the same reference numeral have been used for the same or corresponding parts of the regulators described with reference to Figures 1 to 9.

With reference to figure 10, 1 denotes the cylindrical box-like body of said regulator. The internal cavity of said body is divided into two chambers 110 and 110' by a diaphragm 801 with a rigid plate 311 on its axis. The chamber 110' is bounded by the side walls of the body 1, by the diaphragm 801 and by a cover 102' which is screwed onto the open face of the body 1. This cover includes a plurality of through holes 202 that place the chamber 110' in communication with the external environment. The chamber 110 meanwhile is bounded by the side walls of the body 1, the end wall of said body and said diaphragm 801. The walls of the body 1 include two threaded radial holes 401 and 501, the first containing the distributor block 302, which communicates upstream with the pipe 40 for admission of air from the first stage, and which also houses the supply valve 504, and the second containing the alternative supply duct 505.

The distributor block 302 comprises an inlet 217 to which the abovementioned pipe 40 is connected, and two outlets 113, to which are connected the hoses 22, whose purpose will be described below. The end of the block 302 nearest and connected to the body 1 houses the supply valve 504. This valve comprises, as in the

prior art, a shutoff member 104 that acts on a seating 204, has a stem 214 and is loaded by a spring 304, the shutoff member being operated by the pivoting arm 404 on which the diaphragm 801 acts.

Inserted in the hole 501 is the alternative supply duct 505 which has a non-return valve comprising the ball 305 acting on the seating 205 and loaded by the spring 405; the duct is connected downstream of the valve to the hose 105, whose purpose will be described below.

The end wall of the body 1 of the regulator contains a funnel-shaped opening 611 placing the chamber 110 in communication with the pipe 601, which then connects with the mouthpiece. Above said opening 611 are the means 600 for preventing the supply of air to the mouthpiece. These means comprise a frustoconical shutoff member 206 having an opposing spring 216 and operated by means of a fork 226 connected to it. The shutoff member is located inside a cylindrical housing 306 provided at one end, the end directed towards the end wall of the body 1, with a threaded rim 116 that screws into the threaded annular cavity 701 formed on said body 1, while at its other end it has a through hole 126 through which the fork 226 is inserted.

Illustrated in Figure 11 is a diver wearing the regulator according to the invention in a preferred embodiment. The body 1 of the regulator is in this case connected, by suitable means (not shown here), to a stabilizer jacket 740 of known type. Said body 1 is connected to the pipe 40 for admission of air from the first-stage reducer 30 mounted on the top of the bottle 20. As described earlier, the distributor block 302, with its outlets 113, is located at the point where the body 1 connects to the pipe 40, the hoses 22 and 22' being connected to it to carry air respectively to the inlet 51 feeding into the air space of the drysuit 150, and to an auxiliary regulator 23. Both the pipe 40 and the hose 22 are guided across the jacket 740 by loops 43 and 44. The regulator 23 and its hose 22', however, are kept in a pocket 42 formed on said jacket. The hose 105, which is connected at one end to the alternative supply duct 505, is connected at the other end to the inlet 41 for feeding air into the stabilizer jacket 740. The mouthpiece 4 and the exhaust pipe 5 are separate from the body 1 of the regulator and are connected to it by a flexible tube 2.

The operation of the regulator according to the invention will now be explained. The regulator comprises, as in the prior art, a supply valve 504 controlled via the lever 404 by the diaphragm 801; movement of the diaphragm 801 towards the chamber 110, caused by inhalation through the pipe 601 and by the pressure exerted by the water through the openings 202 in the cover 2, causes air to be emitted through the valve. The regulator comprises, as is also known, a push-button 102 fitted into the cover 102' to allow manual control of the air supply in the absence of respiratory action. In the present invention the flow of air emitted by the valve 504 into the pipe 601 connected to the mouthpiece can be cut off by means of the cutoff means 600. When the diver exerts pressure on the push-button 102 such as to bring the plate 311 of the diaphragm 801 into contact with the fork 226, the shutoff member 206 closes the hole 611 and thus prevents the entry of air into the pipe 601. The air emitted by the valve 504 must then take an alternative way out; this is represented by the duct 505. The non-return valve located in the mouth of said duct is calibrated so that, under normal conditions, that is to say during breathing by the diver, the air does not enter this duct 505. The shutoff member is controlled by the fork 226 to ensure that the lever 404 has, under normal operating conditions, the greatest possible freedom of movement.

In addition, as can be seen, the fork 226 is positioned at a certain distance from the diaphragm 801 so as not to interfere with its movements. The housing 306 is provided with the holes 116 to facilitate the passage of the air during normal operation of the regulator. The spring 216 will of course be calibrated so as to respond to pressure exerted on the push-button 102.

With regard to the duct 505, the non-return valve positioned in its mouth is, as already stated, calibrated to allow the passage of air at a pressure equal to the maximum pressure which the valve 504 can release. Naturally, the shutoff member conceived as illustrated in Figure 1 could be replaced in the regulator with a shutoff member capable of cutting off the alternative duct 505 during normal operation, and of making it accessible after the duct 601 communicating with the mouthpiece has been cut off. In this case the non-return valve positioned in the mouth of the alternative duct would not need to be specially calibrated.

As thus conceived, the regulator allows air to be supplied at low pressure by a simple and practical control system. As Figure 11 shows, the hose 105 connected to the alternative supply duct 505 is connected to the inlet 41 of the stabilizer jacket 740. By this means, simple pressure on the push-button 102 located on the cover 102' of the regulator will inflate the jacket 740, with extremely efficient control over the injection of air.

Figure 11 shows clearly how the distributor block 302 works: the two hoses 22 and 22' tapped off from the outlets 113 of said block 302 are connected to the drysuit 150 inlet 51 and to the auxiliary regulator 23, respectively. As is clear from the drawing, the position of the regulator and the presence of the distributor block 302 provide increased convenience, reducing to a minimum the bulkiness of the hoses connected to the first stage.

It is clearly extremely advantageous to adopt a regulator of the type illustrated, that is to say a regulator connected to the diver's trunk, with the mouthpiece and exhaust pipe separate and connected via a flexible tube, because with this type of arrangement full control of the low-pressure outlets is moved onto the diver's trunk and in front of him or her, resulting in the least possible bulkiness and the greatest possible performance. The pockets, or loops, in which the hoses are arranged improve

the wearability of the breathing apparatus even further. As an alternative, the inlet of the stabilizer jacket may be connected directly to the pipe 601 connected to the mouthpiece.

Claims

1. Regulator for underwater breathing apparatus comprising a box-like body (1) containing the device for regulating the admission of air from the first reducing stage (30), provided with a mouthpiece (4) for breathing said air and with a discharge pipe (5) for the exhaled air, equipped with a non-return valve (113; 117; 118), characterized in that said mouthpiece (4) and said discharge pipe (5) are both arranged on a manifold (3; 7; 8) which is separate from said body (1) of the regulator and connected to it by means of a flexible tube (2), a non-return valve (313; 317; 248) being provided in the region of the connection between said tube (2) and said manifold, said body (1) of the regulator being connected to the trunk of the diver by suitable connection means.

2. Regulator according to Claim 1, in which said manifold (7; 8) is provided with a connection to a tube (6) for surface breathing, there being provided, in the aperture of said manifold, valve means (127, 417; 238) for opening and closing said aperture, located close to the connection of the manifold (7; 8) to said tube (2) originating from the body of the regulator and close to the connection to said tube (6) for surface breathing, so as to control the alternative use of one or other source of breathable air.

3. Regulator according to Claim 1, in which said manifold (3) comprises a tubular element (103), to which are connected, transversely to its longitudinal axis, said mouthpiece (4) and said flexible tube (2) connected to said body (1) of the regulator, this tubular element being at one end axially connected to said discharge pipe (5).

4. Regulator according to Claim 2, in which said manifold (7; 8) comprises a tubular element (107, 407; 108, 308), to which are connected, transversely to its longitudinal axis, said mouthpiece (4) and said flexible tube (2) connected to said body (1) of the regulator, this tubular element being at one end axially connected to said discharge pipe (5), and being connected at the other end to said tube (6) for surface breathing.

5. Regulator according to Claim 3, in which said tubular element (103) has at the end opposite that connected to the discharge pipe (5) a connection (203), said mouthpiece (4) being connected to said connection (203) and said connection being provided with an opening (213) equipped with a non-return valve (223) for the discharge of the water.

6. Regulator according to Claim 4, in which said tubular element (107, 407) has, in an intermediate position between the end connected to the tube (6) for surface breathing and the end connected to the discharge pipe (5), a connection (207), said mouthpiece (4) being connected to said connection (207) and said connection being provided with an opening (217) equipped with a non-return valve (227) for the discharge of the water.

7. Regulator according to Claim 4, in which said tubular element (108, 308) has, in an intermediate position between the end connected to the tube (6) for surface breathing and the end connected to the discharge pipe (5), a connection (208), said mouthpiece (4) and said flexible tube (2) being connected to said connection (208), and valve means (238) being arranged inside said connection for the alternative use of air originating from the tube (6) for surface breathing or from the flexible tube (2) connected to the body (1) of the regulator.

8. Regulator according to any one of the preceding claims, characterized in that said means of connection of the body (1) of the regulator to the trunk of the diver comprise two small straps (62) connected to the peripheral edge of said body (1) of the regulator.

9. Regulator according to any one of the preceding claims, characterized in that said body (1) of the regulator is connected to the trunk of the diver in the region of the centre of the chest of the diver himself.

10. Regulator according to claim 1,in which the said body (1) of the regulator is secured to the diver's trunk, and preferably to the suit (150) or to the stabilizer jacket (740), by suitable securing means, and in which said air regulating device comprises a chamber (110) containing the supply valve (504), and a chamber (110') communicating with the external environment, said chambers (110, 110') being separated by a diaphragm (801) that controls the supply valve (504), while push-button means (102) for manual control of the supply valve (504) are located on the cover (102') that bounds the chamber (110') communicating with the external environment around the regulator, which regulator is characterized in that said body (1) of the regulator comprises, on the pipe (40) for admission of air from the first-stage reducer (20) and upstream of the supply valve (504), a distributor block (302) provided with a plurality of outlets (113).

11. Regulator according to Claim 10, in which the pipe (40) for admission of air from the first stage and the hoses (22, 22') connected to the distributor block

(302), are held in pockets formed in the stabilizer jacket (740), or are secured to the latter by loops.

12. Regulator according to Claim 10 or 11, characterized in that said box-like body (1) comprises an alternative air supply duct (505), preferably for inflating a stabilizer jacket (740), and means (600), actuated by said push-button means (102) for controlling the supply valve (504), for preventing the supply to said mouthpiece.

13. Regulator according to Claim 12, characterized in that said means (600) for preventing the supply to said mouthpiece comprise a shutoff member capable, in the rest condition, of preventing the passage of air between the chamber (110) and the alternative duct (505), and of permitting the passage of air towards the mouthpiece, said shutoff member having the opposite effect when pressure is exerted on said push-button means (102).

14. Regulator according to Claim 12, in which said means for preventing the supply to said mouthpiece comprise a shutoff member (206) located coaxially relative to the hole (611) that communicates with the mouthpiece and to the push-button means (102), said shutoff member being provided with means for transmitting the movement of said push-button means (102) and with elastic return means (216), and being inserted in a housing (306) connected to said body (1) of the regulator.

15. Regulator according to Claim 14, in which said means for transmitting the movement of said push-button means comprise a fork (226) located axially on the nearest end of said shutoff member (206) to said diaphragm (801), the handle of said fork (226) being towards said diaphragm (801).

16. Regulator according to Claim 14, in which said fork (226) is arranged at a certain distance, under normal operating conditions, i.e. during breathing by the diver, from said diaphragm (801), so as to allow it to move freely.

17. Regulator according to any one of the previous Claims 14 to 16, characterized in that the alternative supply duct (505) comprises, in its end situated on the inside of the chamber (110) of the regulator, a non-return valve (205, 305, 405) calibrated for an air pressure equal to the maximum pressure that can be supplied by the supply valve (504).

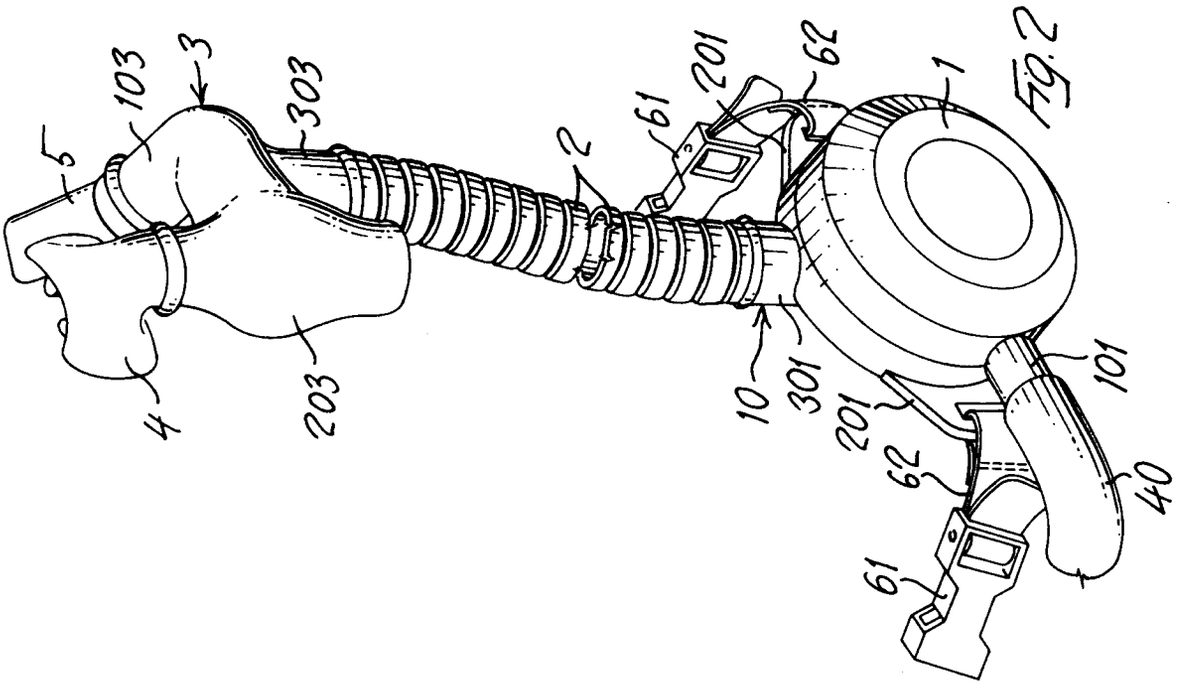

5
103
3
303
2
61
201
62
1
4
203
10
301
201
62
61
101
40

Fig. 2

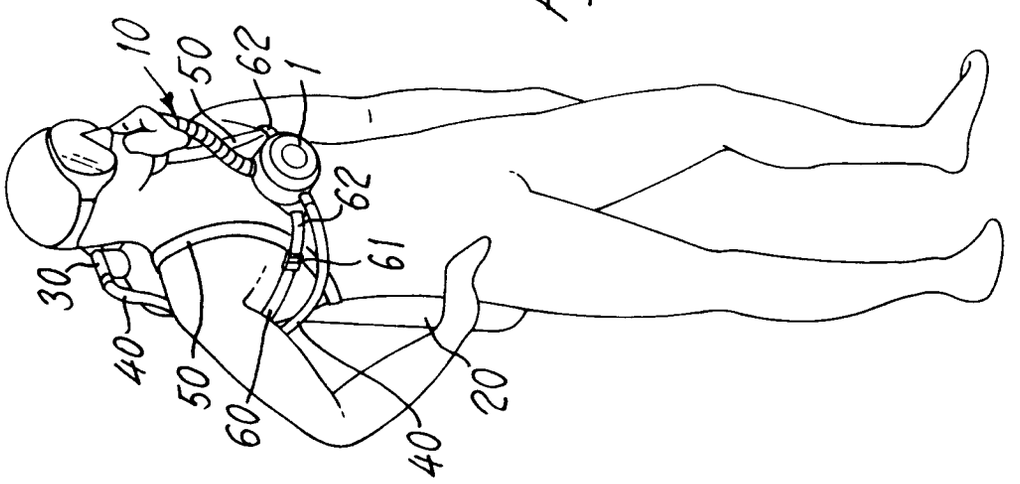

10
50
62
1
62
61
30
40
50
60
40
20

Fig. 1

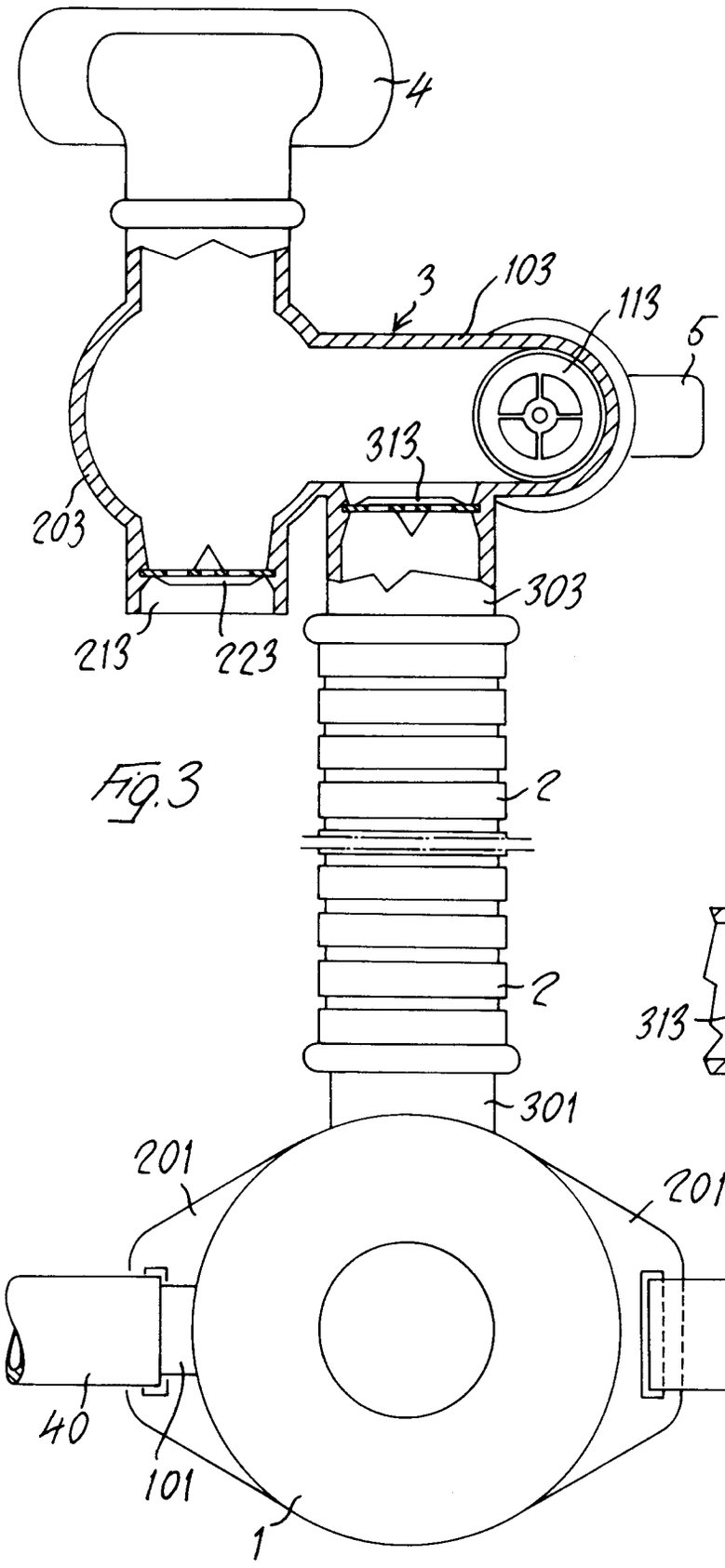

4
3
103
113
5
313
203
303
213
223
2
2
301
201
201
62
40
101
1

Fig.3

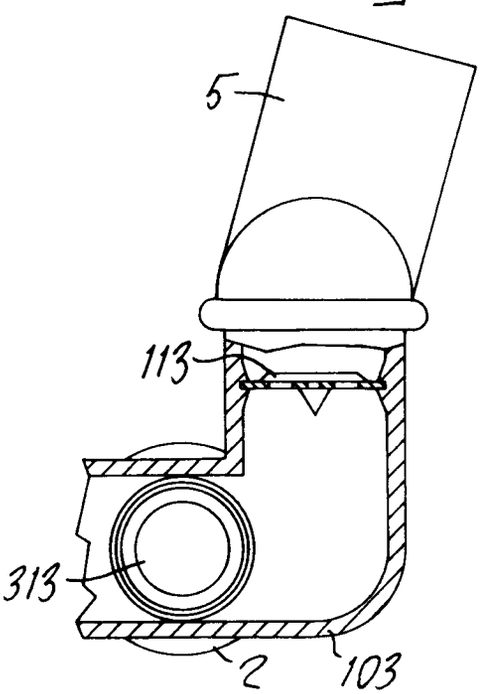

5
113
313
2
103

Fig.4

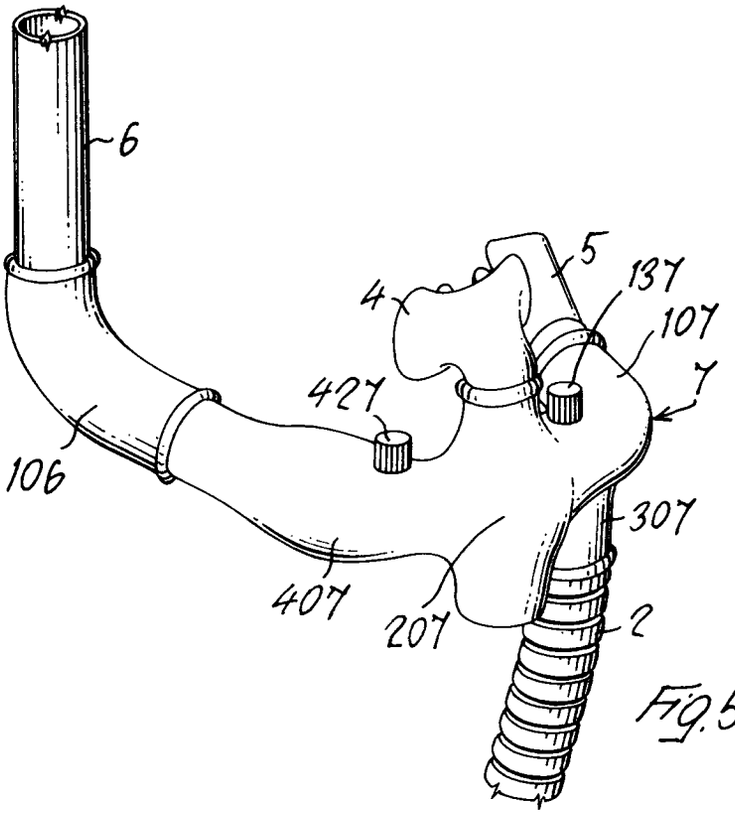

6
5
137
4
107
7
427
106
307
407
207
2

Fig. 5

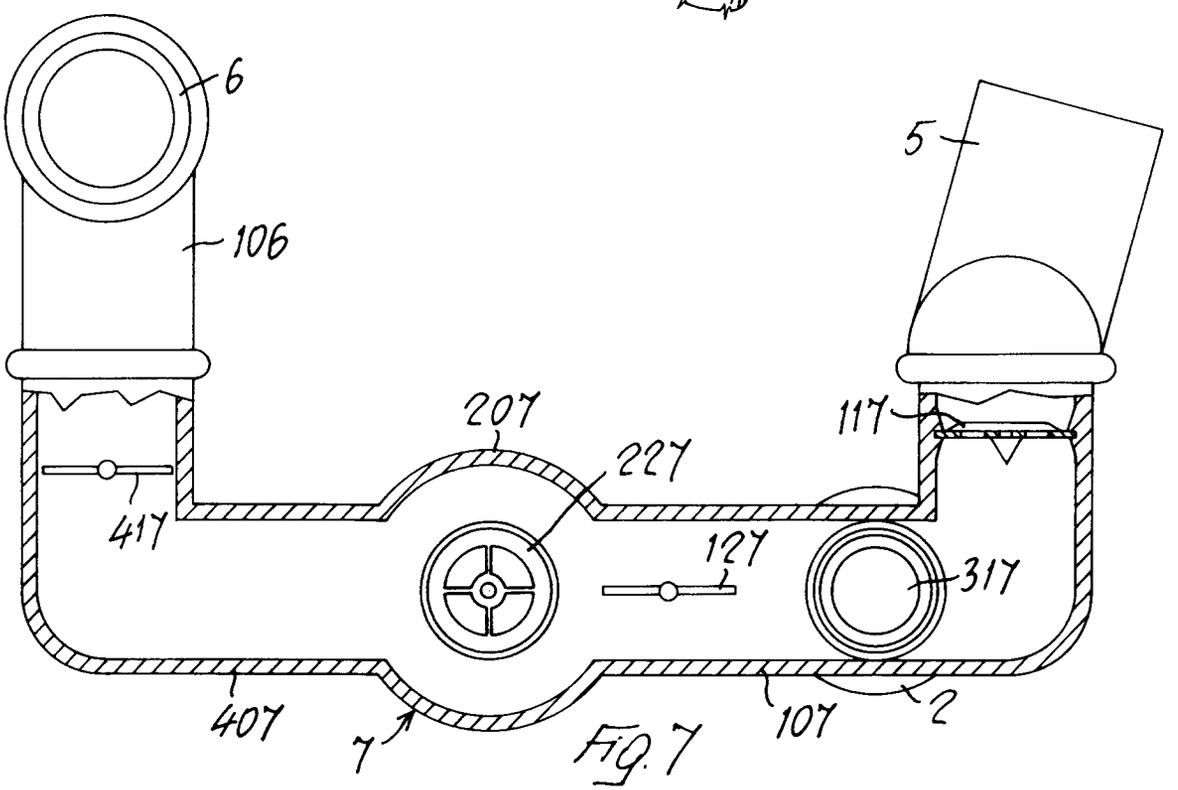

6
106
5
207
227
117
417
127
317
407
7
107
2

Fig. 7

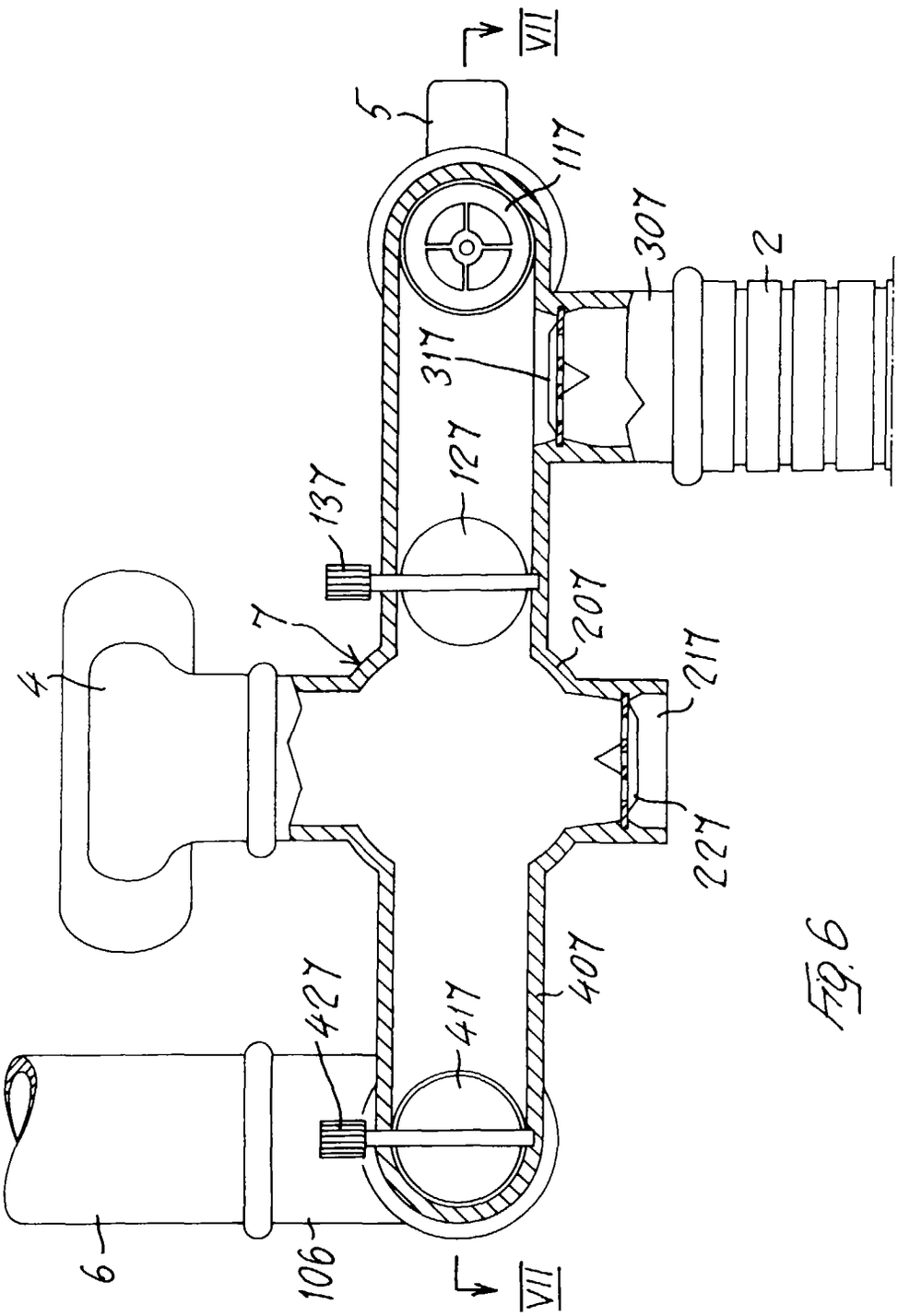


Fig. 6

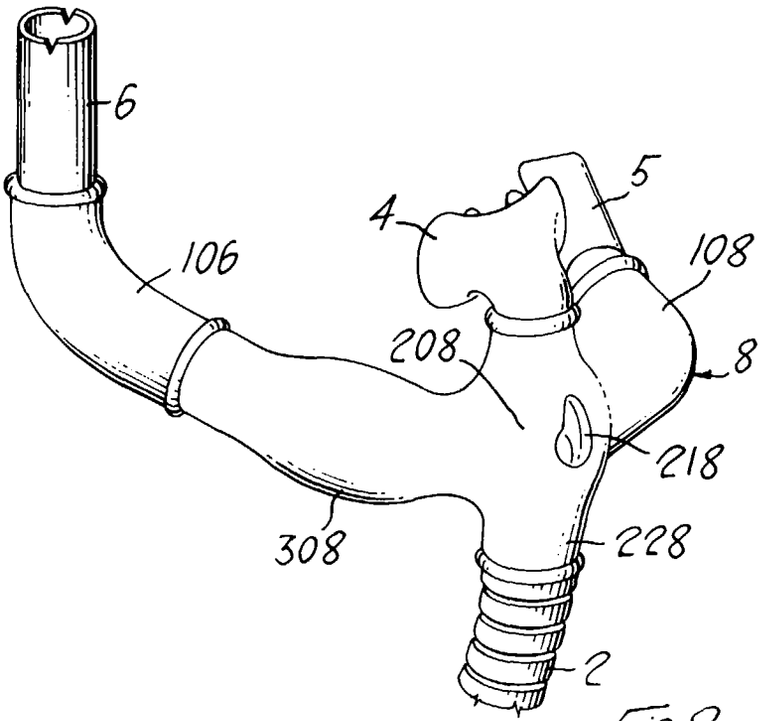

6
106
4
5
108
208
8
218
308
228
2

Fig. 8

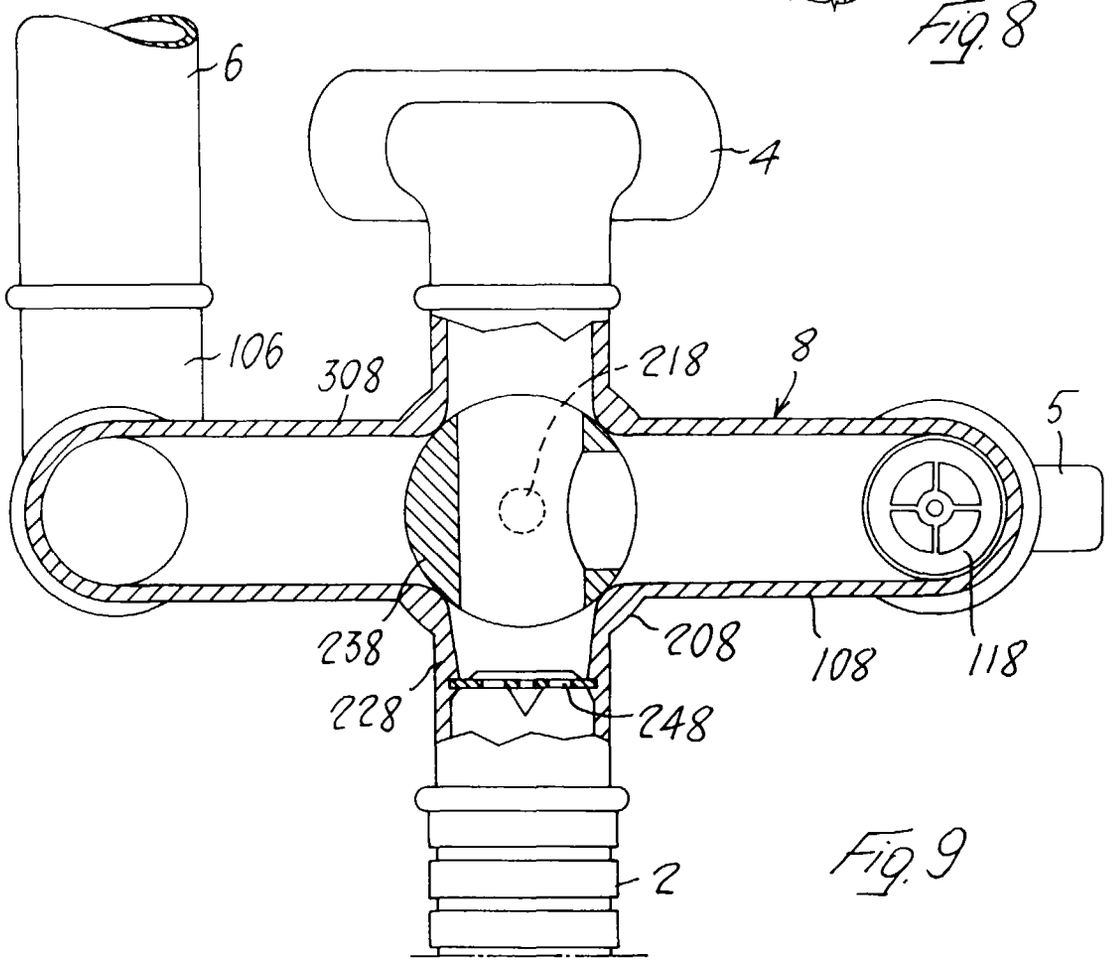
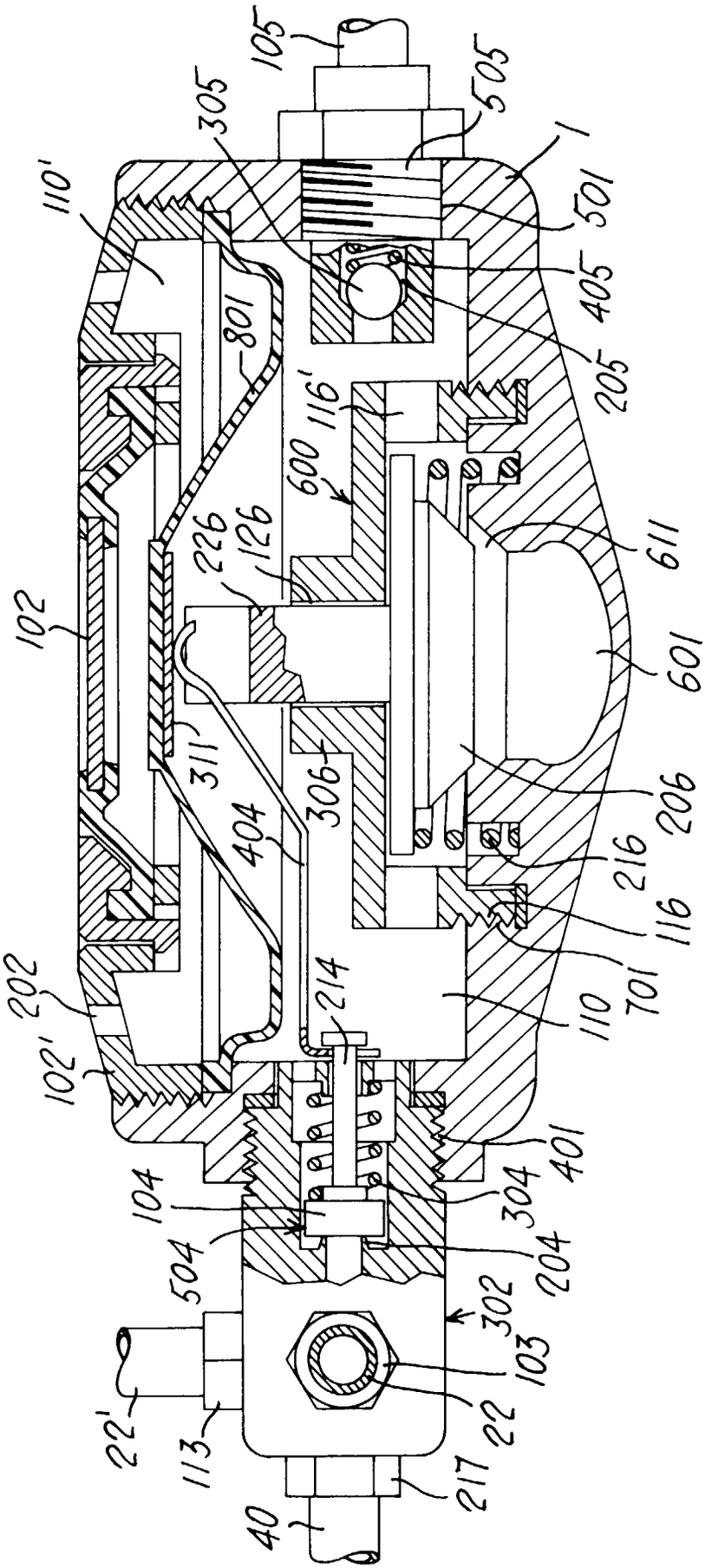

6
4
106
308
218
8
5
238
208
108
118
228
248
2

Fig. 9

Fig. 10


105
505
305
1
110'
501
405
801
205
116'
600
611
226
126
102
601
311
306
206
404
216
116
202
214
110
701
102'
401
104
304
504
204
302
103
22'
22
113
217
40

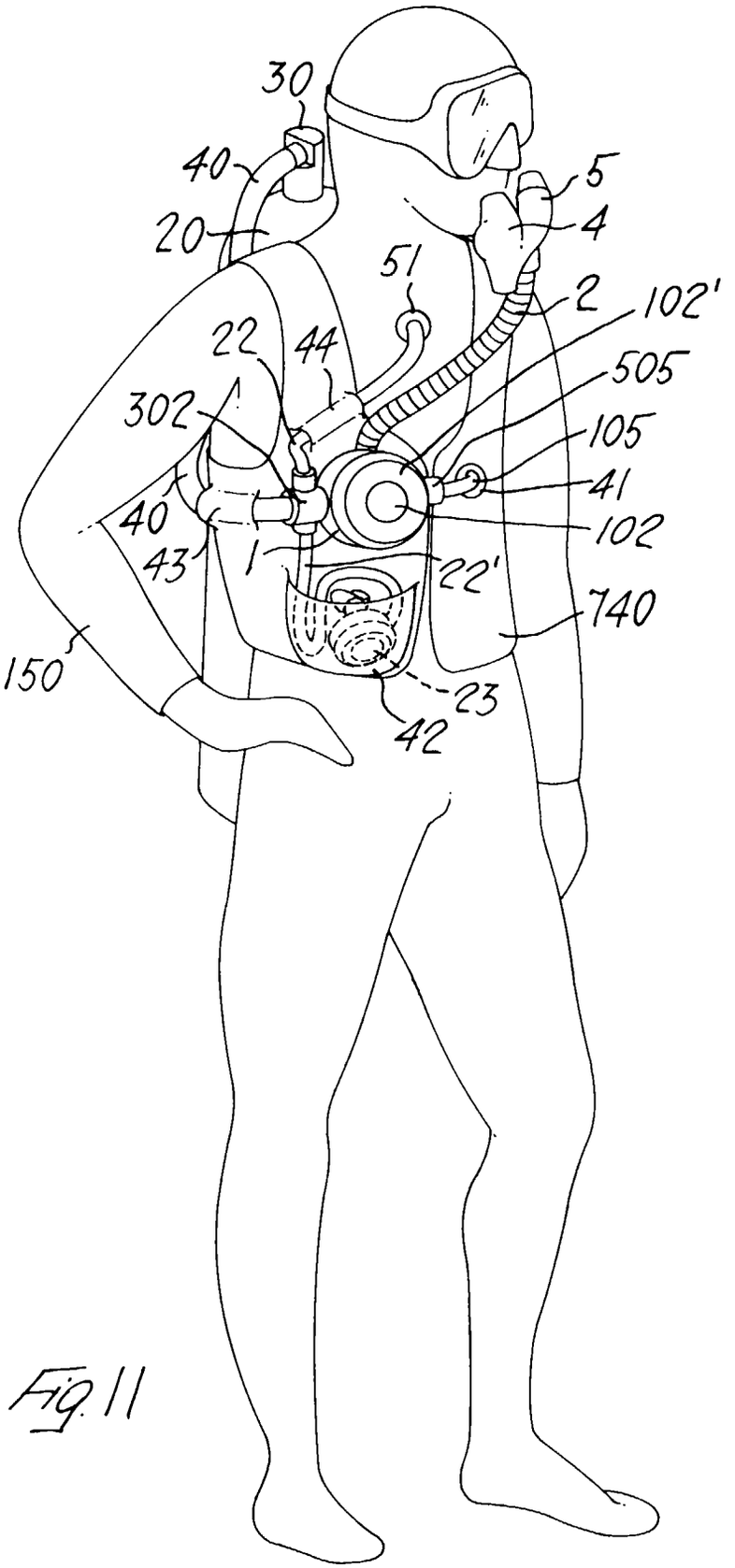


Fig. 11