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DEMAND REGULATOR

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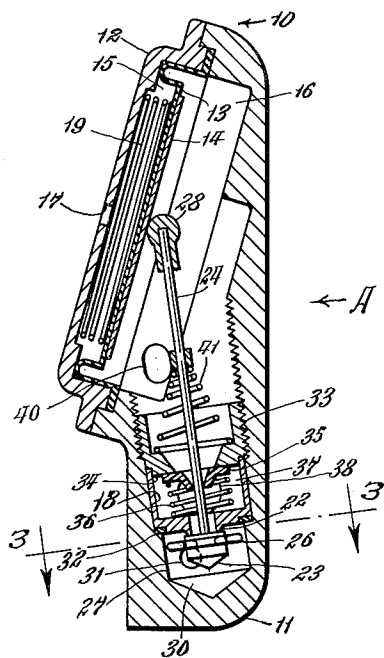


Fig. 1.

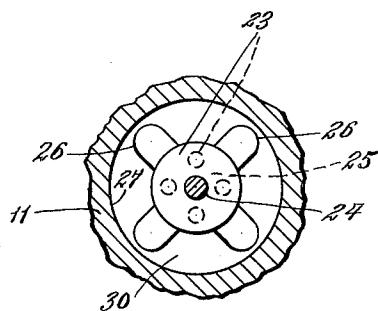


Fig. 3.

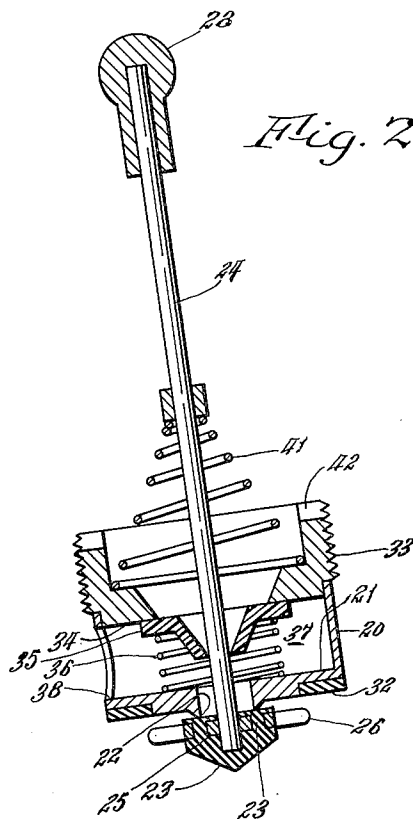


Fig. 2.

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1

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DEMAND REGULATOR

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Continuation of application Ser. No. 173,777, Feb. 16, 1962. This application July 13, 1964, Ser. No. 383,548
5 Claims. (Cl. 137—63)

This invention relates to a demand regulator for supplying breathing fluid to the person who is wearing a breathing apparatus and supplying it automatically whenever he inhales. This application is a continuation of my pending application Serial No. 173,777, filed February 16, 1962 for Demand Regulator, and since abandoned.

The principal object of the invention is to provide a demand regulator which is so arranged that, although its demand valve is actuated in accordance with the pressure in its breathing compartment, nevertheless a high-pressure breathing fluid emanating from said demand valve is not allowed to flow directly from it to said breathing compartment, but is first by-passed at high pressure and caused to perform certain desired functions which can only be efficiently effected at high pressure.

Other collateral objects of the invention and practical solutions thereof are described in detail in the following description and are illustrated in the accompanying drawing, where:

FIG. 1 is a vertical, medial section through a complete demand regulator;

FIG. 2 is an enlarged, longitudinal section through the demand valve 23 and its most intimately associated regulator components, removed collectively from the rest of the regulator A; and

FIG. 3 is an enlarged, fragmentary, transverse, substantially horizontal section through the demand regulator A taken on line 3—3, FIG. 1.

For expediency, this invention will be described precisely as it is illustrated, but it is to be definitely understood that the scope of the invention is to be measured solely by its intrinsic novelty and by the breadth of the appended claims.

The demand regulator A here disclosed is of the miniaturized, positive-pressure type which is adapted to be mounted directly on the face mask (not shown) of a breathing apparatus.

The aluminum alloy casing 10 comprises a main casing 11 and a cover 12, and between the latter and the main casing 11 is clamped a diaphragm 13 provided with the usual metal backing plate 14. This separates the casing 10 into two principal compartments, namely an ambient compartment 15 and a breathing compartment 16. The former compartment communicates with the ambient atmosphere through an ambient aperture 17 and houses a helical, compression spring 19 which causes the present invention to become a demand regulator of the positive pressure type.

Slidably fitted into a hole 18 that is bored out below the breathing compartment 16, is a cylindrical valve sleeve 20 having a transverse wall 21 at its lower end provided on its lower face with a coaxial, projecting, valve seat 22 which engages the resilient, upper face of a demand valve 23. The latter is provided with a metal stem 24 at the lower end of which is brazed a metal spider 25 having radial, outwardly-extending, guide fingers 26 that serve to center the demand valve 23 by slidable engagement with a cylindrical bore 27 which is bored in the main casing 11 coaxially with reference to the hole 18. The rubber portion of the demand valve 23 is so molded as to completely encase the inner portion of the spider 25 and the lower end of the demand

2

valve stem 24. The upper end of said valve stem 24 is provided with a spherical knob 28 to reduce friction with the metal backing plate 14 which is adapted to tilt the demand valve 23 to its open position. The central part of the bottom wall 21 of the valve sleeve 20 is suitably cut away to clear the lower part of the valve stem 24.

The interior of the cylindrical bore 27 constitutes a high-pressure, supply chamber 30 which receives breathing fluid under high pressure from a breathing fluid supply duct 31. Leakage out from said supply chamber 30 is prevented by a gasket 32 which is pressed down tightly by a threaded gland 33 whose lower face is machined very smooth to form a slide 34. Up against the latter is adapted to slide an annular, nylon, sliding excluder 35 whose central portion is molded conically so as to extend downwardly and to fairly snugly embrace the demand valve stem 24 at a point remote from said slide 34 and, concomitantly, relatively close to the metal guide fingers 26 of the spider 25. This provides increased leverage of stem 24 on excluder 35, thereby reducing the force required at the upper end 28 of stem 24 to move excluder 35. It also decreases the motion of excluder 35 on said slide 34. The sliding excluder 35 is lightly pressed up against its slide 34 by a light compression spring 36.

With this arrangement all of the breathing fluid passing out through the demand valve 23 passes into what may be termed a high pressure outlet compartment 37. All, or practically all, of this breathing fluid is prevented from passing up into the breathing compartment 16 despite the fact that it is the pressure in this breathing compartment 16 which controls the opening and the closing of the demand valve 23. Instead, all or practically all, of this breathing fluid is forced to pass out through the high-pressure, by-pass duct 38.

The pressure of this by-passed, high-pressure breathing fluid may be used in various ways before it is inhaled by the person who is using the breathing apparatus, with the breathing fluid being ultimately consumed at a pressure which is the same as that in the breathing compartment 16. This is effected by having said breathing compartment 16 tubularly connected by a "sensing" duct 40 with the face mask or breathing mouthpiece (neither of which is illustrated) which is being used by the person who is using the breathing apparatus.

While constituting no direct part in the present invention, it should be mentioned that the pressure of this high-pressure, by-passed, breathing, fluid, prior to being inhaled, can be advantageously used, for instance, for forcing a heavy stream of breathing fluid over the lenses of a face mask so as to prevent clouding or steaming, or for passing said breathing fluid into the breathing compartment 16 at a point which will not disturb the functioning of the regulator, or (when in combination with a suitable venturi), for lowering the pressure in the breathing compartment 16 while the demand valve is open, so as to obtain a correct fluid flow, or for picking up a medicated vapor.

The function of the conical spring 41 is to ensure the seating of the demand valve 23 when there is very low pressure in the supply chamber 30. The function of the screw driver slot 42 is to enable the threaded gland 33 to be conveniently screwed down into place against the upper end of the valve sleeve 20.

I claim:

1. A demand regulator for breathing apparatus comprising a hollow casing containing a breathing compartment adapted for connection to a breathing mask or mouthpiece, a diaphragm connected to said casing and forming a wall of said compartment, said diaphragm being responsive to the pressure in said compartment, a

3

breathing fluid supply chamber in said casing, a breathing fluid outlet compartment in said casing, means including a valve seat carried by said casing and a tilt demand valve tiltable on said seat for controlling passage of breathing fluid from said supply chamber into said outlet compartment, said outlet compartment being separated from said breathing compartment by means including a slide pierced by an aperture opening from said outlet compartment into said breathing compartment, said valve having a stem passing through said outlet compartment and said aperture into said breathing compartment for tilting by said diaphragm, and a sliding excluder sealingly embracing the stem of said demand valve at a location remote from said slide in the direction of said valve for increased leverage of said stem on said excluder and decreased travel of said excluder on said slide, said excluder engaging against said slide and being slidable on said slide upon tilting of said stem to accommodate such tilting while blocking passage of breathing fluid from said outlet compartment through said aperture into said breathing compartment.

2. A demand regulator as set forth in claim 1, wherein said excluder has a centrally dished portion engaging said stem between said valve and said slide in spaced relation thereto.

3. A demand regulator for breathing apparatus comprising a hollow casing having a breathing compartment adapted for connection to a breathing mask or mouthpiece and a breathing fluid supply chamber, a pressure responsive diaphragm carried by said casing and forming a wall of said compartment, said diaphragm being responsive to the pressure in said breathing compartment, means including a slide defining a breathing fluid outlet compartment in said casing, means including a valve seat mounted in said casing and a tilt demand valve tiltable on said seat for controlling passage of breathing

4

fluid from said supply chamber to said outlet compartment, said slide having an opening therethrough from said outlet compartment to said breathing compartment, said valve having a stem passing through said outlet compartment and said opening into said breathing compartment for tilting by said diaphragm, and a sliding excluder in said outlet compartment slidably and sealingly embracing the stem of said demand valve and engaging said slide for blocking passage of breathing fluid from said outlet compartment through said opening, said excluder being slidable on said slide upon tilting of said valve, and said excluder embracing said valve stem at a location therealong remote from said slide in the direction of said valve for increased leverage of said stem on said excluder and decreased motion of said excluder on said slide.

4. A demand regulator as set forth in claim 3, wherein said excluder has a central generally conical portion engaging said stem in spaced relation to said slide and said valve.

5. A demand regulator as set forth in claim 3, together with means resiliently urging said excluder against said slide.

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ISADOR WEIL, *Primary Examiner.*