Jan. 12, 1960 E. ADAMS 2,920,637

VALVE STRUCTURE FOR A DEMAND OXYGEN REGULATOR

Filed Nov. 8, 1954

Fig. 1

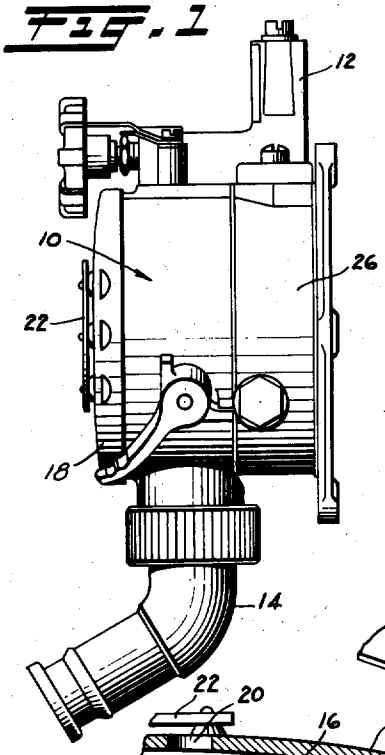
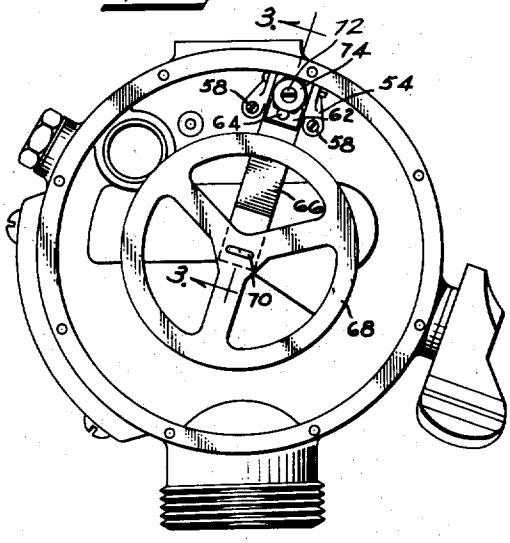


Fig. 2



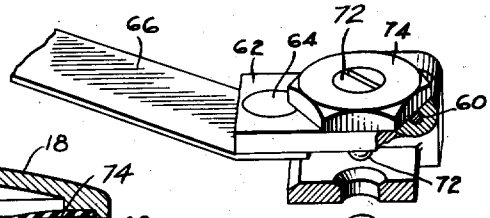


Fig. 3

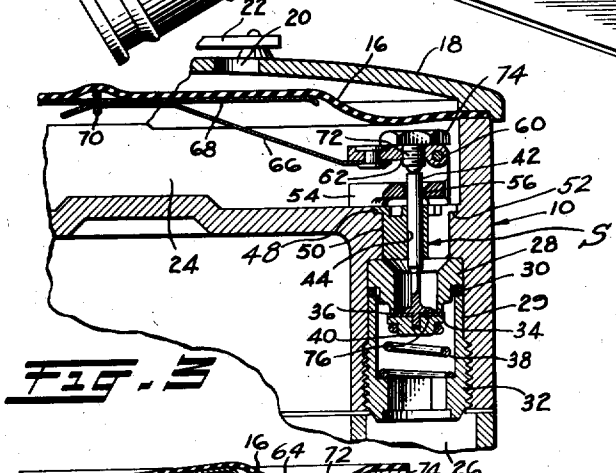


Fig. 5

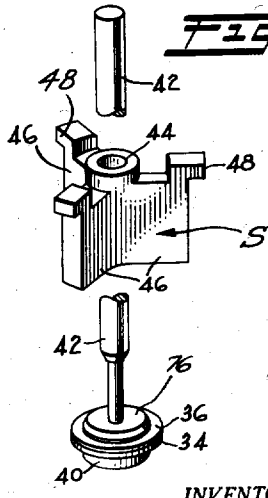
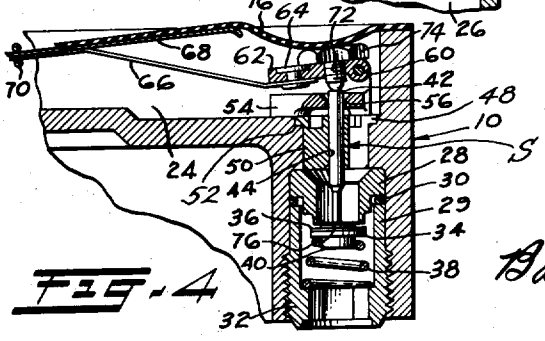


Fig. 4



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VALVE STRUCTURE FOR A DEMAND OXYGEN REGULATOR

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Application November 8, 1954, Serial No. 467,467

1 Claim. (Cl. 137—64)

My present invention relates to a valve structure, and particularly a demand valve of an oxygen regulator which incorporates a means to prevent binding during operation of the valve and assures proper and accurate proportional operation thereof in relation to the demand on the valve.

One object of the invention is to provide a valve structure of simple durable and inexpensive construction which may be readily installed initially or may be provided as replacement for the usual demand valve of an oxygen regulator to improve its operating characteristics in response to the demands thereon by the user of the oxygen regulator.

Another object is to provide a demand valve with an efficient guiding arrangement for the stem of the valve to prevent any possible cocking of the valve with relation to the valve seat during the operation of opening and closing the valve in response to a demand diaphragm.

Still another object is to provide a valve structure wherein a valve disc is opened by a stem that is guided in a spider accurately located in a bore aligned with the valve seat, a pivoted demand lever having an adjustable set screw being provided for actuating the pin with the set screw engaging the end of the pin and the spider guiding the pin independent of the setscrew so that a head on the pin may engage the valve disc and unseat it evenly throughout its entire area and likewise permit equal seating during closure of the valve without any possibility of a cocking action in connection therewith that would result in inaccurate seating of the valve disc on its seat.

A further object is to provide a spider and a coacting bracket and lever arrangement that can be readily substituted for existing demand valves in the field at oxygen regulator service stations, after a bore for the demand valve stem has been reamed out to receive the spider.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my valve structure, whereby the objects above contemplated are attained, as hereinafter more fully set forth, pointed out in my claim and illustrated in detail on the accompanying drawing, wherein:

Fig. 1 is a side elevation of a demand oxygen regulator of the type wherein my disclosed valve structure is adapted for installation.

Fig. 2 is a front view thereof with the demand diaphragm cover removed, as looking toward Fig. 1 from the left, the scale in Fig. 2 being slightly enlarged relative to Fig. 1.

Fig. 3 is a sectional view on the line 3—3 of Fig. 2 showing details of my valve structure on a further enlarged scale, the valve being in the closed position.

Fig. 4 is a similar sectional view showing the valve in the open position as when the user of the regulator is demanding oxygen; and

Fig. 5 is an exploded perspective view of the significant elements forming my improved demand valve structure.

On the accompanying drawing I have used the reference numeral 10 to indicate in general an oxygen regulator housing having the usual oxygen inlet at 12 and a mixed

oxygen and air outlet at 14 to the face mask or helmet worn by the aviator. Within the housing 10 there is a demand diaphragm 16 which is operated by inhalations to regulate the supply of air and oxygen to the user. The mechanism of the regulator will not be gone into in detail in this application, but is of the general type shown in the Johnson Patents 2,390,838, 2,421,700 and 2,475,840, whereas a demand valve for this type of regulator is shown in Glanz et al. Patent No. 2,412,330.

The demand diaphragm 16 has a cover 18 open to atmosphere as at 20 and the openings are covered by a cover plate 22 such as shown, for instance, in the Johnson patent above referred to, No. 2,421,700, so that atmosphere can impinge the outer surface of the diaphragm 16, the inner surface thereof being responsive to internal pressure changes in a chamber 24 of the housing 10 communicating with the outlet 14 and varied by the breathing of the user in the usual manner. The type of oxygen regulator disclosed has a "first stage chamber" 26 to which oxygen is supplied at a reduced pressure such as 30 or 40 p.s.i. by the valve mechanism shown in the Johnson Patent No. 2,390,838, the inlet 12 receiving oxygen at pressures in the neighborhood of 700 or 800 p.s.i. Thus, the pressure is reduced to one which can be readily handled by the demand valve, which will now be described.

A demand valve seat 28 is received in a bore 29 of the housing 10 and sealed therein by a gasket 30 and a retainer sleeve 32. A valve disc 34 has a facing 36 of neoprene or Teflon adapted to seat against the lower edge of the seat 28. To accomplish this, a spring 38 is provided interposed between a shoulder adjacent the lower end of the retainer sleeve 32 and the disc 34 with its upper end surrounding a hub 40 on the disc.

A stem 42 is provided for spacing the valve disc 34 from the valve seat 28 and is provided with a head 76 to engage the facing 36. The stem 42 is guided in a bore 44 of a spider S shown particularly in Fig. 5 as having, in addition to the central portion containing the bore 44, three wings 46 provided with stop projections 48. The housing 10 is bored out as indicated at 50 and counterbored at 52 so that the counter bore serves as a stop shoulder for the stop projections 48. The bore 50 is such that the spider S is a light press fit therein.

A bracket 54 is provided having an opening 56 therethrough which clears the stem 42. The bracket 54 is secured in position by two screws 58 as shown in Fig. 2 and carries a pivot pin 60. A lever bracket 62 is pivoted on the pin 60 and is connected by a rivet 64 to a demand lever 66. A demand diaphragm supporting disc 68 is secured to the outer end of the lever 66 by a loop of wire 70 and the chamber 24 within the housing 10 is enclosed by means of the diaphragm 16 and the cover plate 18 with the diaphragm on the outside of the disc 68 as shown in Fig. 3.

An actuating screw 72 is adjustable by being threaded in the lever bracket 62 and a lock nut 74 is provided therefor, the lower end of the actuating screw as shown in Fig. 3 being rounded for contact with the stem 42.

Practical operation

Normally, the facing 36 of the valve disc 34 is retained seated against the valve seat 28 by the spring 38 as shown in Fig. 3. This causes the stem 42 acting through the actuating screw 72 to support the lever 66 and the diaphragm 16 against opening of the valve. However, when a vacuum is created in the chamber 24 by inhalation through the connection 14 to the helmet, the relatively large diaphragm is sucked inwardly as in Fig. 4, causing the actuating screw 72 to depress the stem 42 and space the facing of the valve disc 34 from the seat 28 in proportion to the degree of inhalation. During this operation the valve disc 34 is kept in properly squared relation

to the seat 28 by the head 76 of the stem 42, the stem in turn being accurately guided by the bore 44 of the spider S.

Also, when the valve recloses, there is a smooth reclosing action and accurate alignment of the valve disc 34 with its seat 28, which avoids any erratic action of the valve and a proper proportioning in the opening thereof as reflected by the reduced pressure prevalent in the chamber 24 as caused by inhalation.

The arrangement disclosed provides guidance for the stem 42 in an improved manner over prior oxygen regulators and demand valves therefor, such as shown in the above noted Glanz et al. patent. In order for an oxygen regulator service man to adapt the present invention to existing oxygen regulators such as shown in said patent, it is merely necessary to provide the proper size reamer for reaming out the bore 50 to fit the spider S and substituting the associated parts shown in Fig. 5 for those previously used. The operation of the demand valve is thereby considerably improved and eliminates any possibility of cocking of the demand valve as experienced in previous regulators.

Some changes may be made in the construction and arrangement of the parts of my valve structure without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claim any modified forms of structure or use of mechanical equivalents which may reasonably be included within its scope.

I claim as my invention:

In a valve structure for a demand oxygen regulator having a demand chamber, a demand diaphragm, a valve seat, a valve disc and means biasing said disc to seat on said valve seat; a shouldered bore leading from said demand chamber to said valve seat, said valve seat being seated against the shoulder of said bore, retaining means for said valve seat threaded into the enlarged portion

of said bore, a spider received in the smaller portion of said bore beyond said shoulder, said spider having a central boss provided with a guide bore, a valve stem slidably guided in said guide bore and engageable with said valve disc to unseat the same against its biasing means, said valve stem having means cooperating with said valve disc to prevent cocking of said disc with relation to said seat under the action of said biasing means, said spider being aligned by said smaller portion of said bore in relation to said valve seat, a stationary bracket having a pivot pin, said stationary bracket being secured over said spider and retaining it in position, a lever bracket pivoted to said stationary bracket, a lever connected with said lever bracket, a diaphragm supporting disc carried by said lever and adapted to contact said demand diaphragm, and a projection from said lever bracket and engageable with the end of said valve stem opposite said valve disc, said projection being adjustable in said lever bracket.

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