Nov. 20, 1962 A. E. MILLER 3,064,854

EMERGENCY OUTLET

Filed April 21, 1961

Fig. 1.

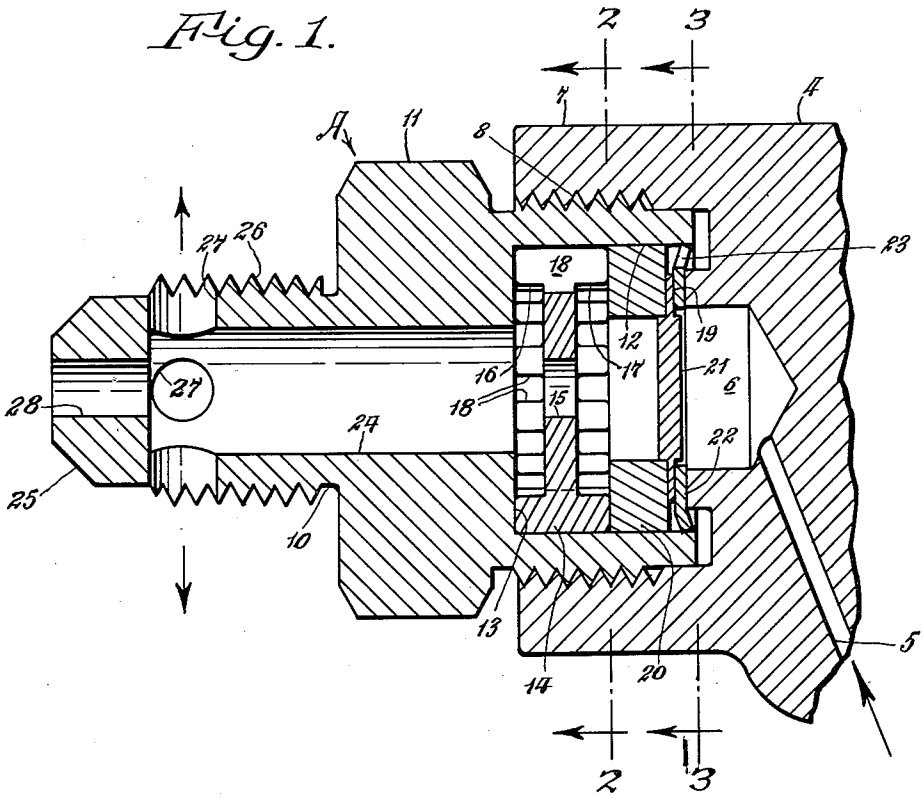
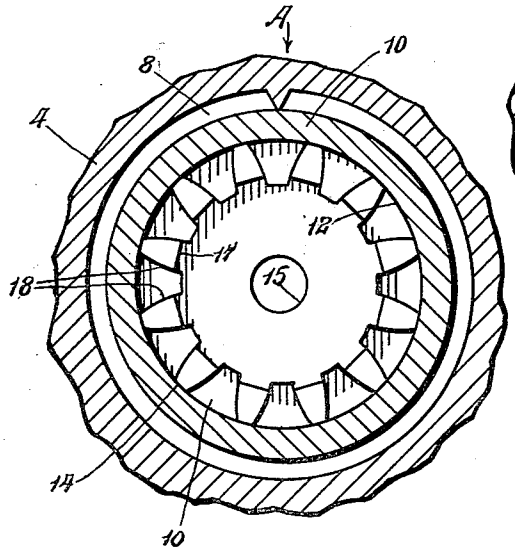


Fig. 2.



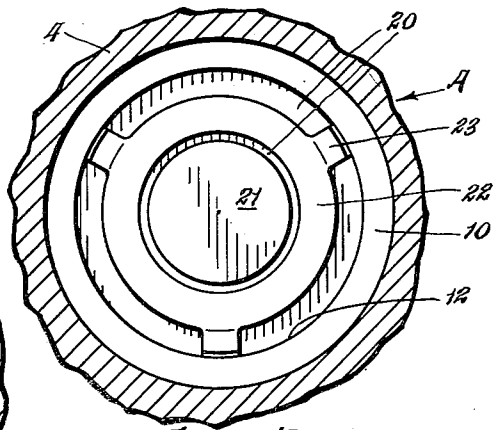


Fig. 3.

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EMERGENCY OUTLET

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This invention relates to a safety valve or emergency outlet which will allow the fluid in a container to be automatically discharged therefrom whenever the pressure in said container reaches a definite, predetermined maximum. In particular, the invention relates to an emergency outlet for a portable tank which contains oxygen under pressure, said emergency outlet being adapted to release the excessive pressure from said tank and to thereby prevent the bursting of said tank, whenever a fire or other cause results in an excessive or a near bursting pressure being built up in said tank.

One of the objects of the invention is to provide an emergency outlet which can be conveniently screwed into the standard discharge valve of a standard oxygen tank and which will automatically and reliably lower the pressure in said tank when the pressure in said tank exactly reaches a set, predetermined, maximum pressure. Another object of the invention is to provide an emergency outlet in which is incorporated a simple, shear-type of bursting disk, and in which that part of said disk which is sheared off is moved definitely to a position where it cannot possibly impede the proper action of the emergency outlet. Still another object of the invention is to provide a rugged but inexpensive emergency outlet which may be connected to a soft discharge tube by the use of a standard, soft-tube coupling.

Other objects of the invention and practical solutions thereof are disclosed in the following description and illustrated in the accompanying drawing, wherein:

FIG. 1 is a vertical, longitudinal section of my improved emergency outlet A showing the same screwed into position into a standard valve body 4 (broken away).

FIG. 2 is a fragmentary, vertical, transverse section thru said emergency outlet A, taken in line 2—2 FIG. 1.

FIG. 3 is also a fragmentary, vertical, transverse section thru said emergency outlet A, taken on line 3—3 FIG. 1.

For simplicity of explanation, this invention will be described exactly as it is shown, but it is to be definitely understood that the scope of the invention is to be measured solely by the intrinsic novelty of the invention and by the scope of the appended claims.

The numeral 4, as illustrated, indicates a fragmentary portion of the valve body of a standard, slow-action, tank valve which is screwed in the usual and well known manner into an oxygen tank (not shown) which latter is adapted to hold oxygen under high pressure. The oxygen in said tank flows into said valve body 4 thru a passage or hole 5 which is drilled obliquely in said valve body 4, and conveys the oxygen to an oxygen chamber 6 that is bored horizontally in the boss 7 of said valve body 4. Said boss 7 is internally threaded to receive the male threads 8 of the casing 10 of the emergency outlet A that constitutes the present invention. This casing 10 is provided, centrally of its length, with the usual enlarged collar or hub 11 whose periphery is of hexagonal shape so as to enable a wrench to conveniently and tightly screw the casing 10 into the valve body 4.

The inner (right) end of said casing 10 is concentrically bored out longitudinally (horizontally as shown) to form an inlet duct 12 whose inner end constitutes a shoulder 13. Resting against the outer face of said shoulder 13 is a gear-wheel-shaped spider 14 whose central part is coaxially bored out to form what we shall term a differential passage 15. The outer and inner faces of said spider

area also concentrically bored out 16 and 17 respectively, while the periphery of said spider is provided with an annular row of peripheral openings 18 which, for commercial reasons, are preferably of the same shape as the spaces between the teeth of an ordinary gear wheel.

Lying against the inner face of said spider 14 is a thick, washer-shaped, shearing spacer 20 that is constructed of hard or hardened metal. Lying against the outer face of said shearing spacer 20 is a bursting disk 19 whose central part is thickened at 21 and this thickened portion 21 is loosely, but not very loosely, received within the bore of said shearing spacer 20. This thickened portion 21 is symmetrical on both sides of said bursting disk 19 so that the latter will function properly irrespective of which way it is assembled. Lying against the outer face of the rim of said bursting disk 19 is a soft-metal, retaining gasket 22 which forms a hermetically-tight seal between said bursting disk 19 and the valve body 4 when all of the parts have been assembled, as shown in FIG. 1. However, before the casing 10 (which together with its contents constitute the emergency outlet A) is screwed into the valve body 4, it is desirable that the parts within said casing 10 do not accidentally fall out while the latter is being moved to or from storage, or while being assembled in the valve body 4, and for this reason the periphery of said retaining gasket 22 is formed peripherally to provide a plurality of outwardly extending prongs or holding barbs 23 which are adapted to tilt slightly (as shown) as the retaining gasket 22 is pushed into position. This prevents said gasket 22 from being accidentally moved outwardly (toward the right) after it and the rest of the movable parts in casing 10 have been properly assembled. The employment of these holding barbs 23 obviously permits of large machining tolerances in the outer diameter of the retaining gasket 22 and the inner diameter of the inlet duct 12, which would not be true if these holding barbs 23 were absent.

When the pressure of oxygen in the oxygen chamber 6 of valve body 4 reaches a certain definite amount, the annular, central, thickened portion 21 of the bursting disk 19 shears away from the rest of said bursting disk and forms a slug (not shown) which it is highly desirable be prevented from moving to any except one definite position where it will not interfere with the flow of oxygen from the oxygen chamber 6 to the coaxial outlet duct 24. This result is effected by confining said slug within the confines of the inner, bored-out portion 17 of the spider 14 so that the oxygen is free to pass thru the peripheral openings 18 of said spider into the outlet duct 24. In addition, because of the differential passage 15, said slug 21 is caused on its inner (right) face to be subjected to a considerably higher pressure than it is subjected to on its outer face, and thereby is caused to be firmly held in place after being severed from the bursting disk 19, at least until the dangerously high pressure of oxygen had been dissipated.

When the present invention is completely installed (together with its accompanying valve body 4 etc.) in the oxygen tank of an airplane, the oxygen from outlet duct 24 is conveyed to the ambient atmosphere by a soft metal tube (not shown) which is flared (in the usual and well known manner) over the conical nose 25 that is located at the extreme outer end of the casing 10. This soft metal tube is adapted to be held in place, in the usual and well known manner, by a standard coupling nut (not shown) whose internal threads engage the male threads 26 located near the outer end of the casing 10.

However, a fire may occur in the airplane, or the pressure in valve body 4 otherwise rise sufficiently to break the bursting disk 19, before the casing 10 has been piped to the ambient atmosphere outside the airplane. If, under these conditions, the oxygen were to be discharged

longitudinally directly out from the outlet duct **24**, a jet action would occur which would cause the casing **10** and everything connected with it (oxygen tank etc.) to become, in effect, a bucking bronco gyrating wildly about within the confines of the cabin of the airplane.

To prevent such a catastrophe from occurring just before the casing **10** is tubularly connected with the ambient air outside of the airplane, the outer end of said casing is provided with a plurality of radial, lateral discharge ducts **27**, which are preferably arranged in a symmetrical annular fashion, so that the jet-effect forces produced by the oxygen flowing outwardly from said discharge ducts **27** will be fairly well balanced and the jet-effect force from the discharge vent **28** materially reduced. Thus there will be no tendency for the casing **10** and the parts connected thereto to go slamming around the interior of the airplane when the bursting disk **19** bursts.

It will be noted that the bore of this discharge vent **28** is relatively small. The purpose of this small-diametered discharge vent **28** is to allow oxygen to flow out from the outlet duct **24** when the casing **10** is normally connected tubularly with its soft-metal, discharge tubing (not shown), and when, as a consequence, all flow out thru the lateral discharge ducts **27** is either cut off or partially restricted. It is true that, when said casing **10** has not thus been coupled up to its discharge tubing, there will be a certain amount of jet-effect because of the oxygen issuing from the discharge vent **28**, but there is only one discharge vent **28** and, as previously noted, it is small in diameter, whereas there are a plurality of lateral discharge ducts **27** and the diameter of each is relatively large. Hence, any danger due to the jet effect from oxygen issuing from discharge vent **28** is of no particular significance.

I claim:

1. An emergency outlet comprising: a casing having a large-diametered, coaxial, inlet duct and a small-diametered outlet duct; a spider arranged at the outer end of said inlet duct and having peripheral openings and a coaxial, differential passage and coaxially bored out on both its inner and outer faces; a washer-shaped, shearing spaced arranged in said inlet duct against the inner face of said spider; a shearing disk arranged in said inlet duct against the inner face of said shearing spacer; and a washer-shaped, soft-metal, retaining gasket arranged in said inlet duct against the inner face of said shearing disk and having peripheral retaining barbs which dig into the bore of said inlet duct when said gasket is push-fitted into place.

2. An emergency outlet comprising: a casing having an inlet duct; a coaxial outlet duct; a coaxial discharge duct whose inner end opens into the outer end of said outlet duct; a lateral discharge duct branching radially from said outlet duct; a spider arranged in said inlet duct and having a plurality of peripheral openings and a central differential passage; a washer-shaped, shearing spacer arranged in said inlet duct against the outer face of said spider; a bursting disk arranged in said inlet duct against the outer face of said spacer; and a soft-metal gasket arranged in said inlet duct against the outer, peripheral face of said bursting disk and having a peripheral holding barb which digs into the bore of said inlet duct when said gasket is push-fitted into place.

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