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DEVICE FOR PURIFYING OXYGEN AND THE LIKE

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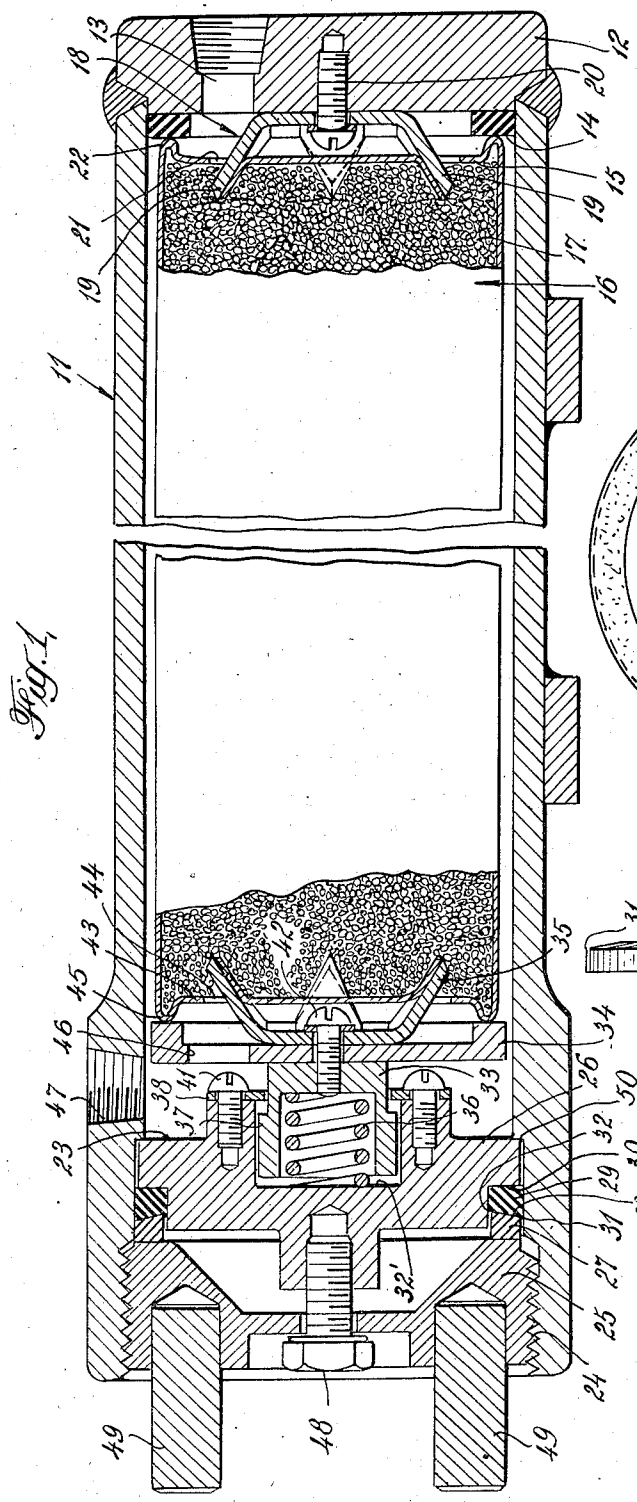


Fig. 1

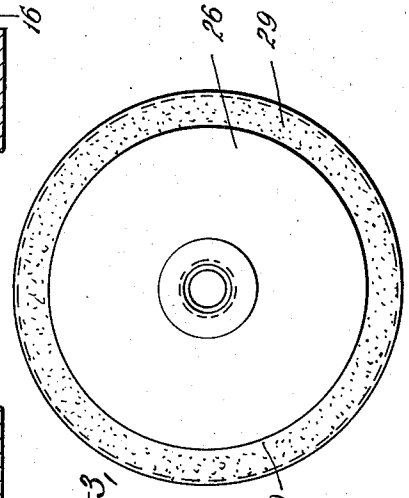


Fig. 3

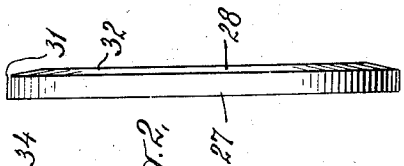


Fig. 2

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DEVICE FOR PURIFYING OXYGEN AND THE LIKE

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2 Claims. (Cl. 183—1)

This invention relates to high pressure tanks and more particularly to purifier tanks, such as for purifying oxygen where the tank houses the purifying material over which the oxygen entering the tank in the unpurified state is passed and emitted from the tank in a purified state.

Such tanks require large openings for the insertion of the purifying material for which closures must be designed which will withstand the high pressures which are generated. With tanks in which the material is added by ready filled puncturable cartridges, these specially designed closures must be so designed as to be provided with some means for puncturing the cartridge automatically as the closure means is coupled to the tank and with some means for retaining the cartridge against vibration when the tank is to be used in an airplane or some movable vehicle.

It is accordingly one object of the invention to provide an internal pressure sealed closure means having means to automatically puncture the material containing cartridge as the closure means is adjusted into place in the open end of the tank.

It is still a further object of the invention to provide means associated with the closure means for steadying the cartridge in the tank against axial play.

According to the present invention, a cartridge containing the purifying material is inserted into the tank and allowed to rest temporarily against one puncturing device which is located in the bottom of the tank.

This latter device will serve to place an opening in the cartridge through which fluid entering by way of a fluid opening in the bottom of the tank can enter the cartridge for circulation over the purifying material therein. The closure means carries a prong device and a steadying plate and on being screwed down into the tank advances the cartridge to puncture the forward end and its prong device simultaneously punctures the rearward end of the cartridge to emit the purified fluid from the cartridge and establish a fluid flow to an outlet in the tank body, and at the same time bring the steadying plate against the end of the cartridge to hold the cartridge against axial play.

For other objects and for a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is a cross-sectional view of the assembled tank, with the combined closure and puncturing means screwed down into the tank and cartridge;

Fig. 2 is an edge view of the collar projection having the receding or conical face which enters the recess of the movable closure part to compress the soft rubber gasket thereof; and

Fig. 3 is a plan view of the closure part and of a soft rubber gasket assembled in the peripheral recess thereof.

Referring now particularly to Fig. 1, there is shown a tank body 11 having a bottom 12 with a fluid opening 13 therein. Against this bottom 12, and particularly against an annular gasket 14 of soft material, there is forced an advanced face 15 of a cartridge 16 containing oxygen-purifying material 17 such, for instance, as calcium chloride. On the bottom 12 of the tank body is a prong device 18 comprising a set of axially extending prongs 19 and a screw 20 for securing the prongs to the bottom 12. These prongs serve to force openings 21 into the advanced face 15 to place the material 17 within the cartridge in contact with fluid from the inlet opening 13. The face 15 of the cartridge has an axially extending rim flange 22 which is forced into the annular gasket 14 to prevent the escape of entering fluid outside of the cartridge.

After the cartridge has been inserted into tank 11 and is temporarily rested upon the prongs 19 in the bottom of the tank, closure means 23 is screwed down into the threaded open end 24 of the tank body. This closure means 23 has a threaded securing part or plug 25 which is connected to the tank body and an unthreaded closure part 26 which is axially movable with respect to the plug 25.

Associated with the securing plug 25 is a collar or ring 27 having a forward or contacting face 28 which is adapted to engage a gasket 29 of flexible material located in an annular recess 30 of the closure part having at least one face opposing face 28. This contacting face 28 is of frusto-conical shape having its outer edge 31 receded axially from portions inwardly thereof or from its inner edge 32. As the pressure is built up in the tank it acts against the securing part 26 and the force in turn is applied against the annular gasket 29 to press the same into tight sealing engagement with the tank and with the faces of the recess in which it is positioned. Due to the receding face 28 of the collar 27, the gasket is flexed so that the compressed thickness at its outer edge is greater than the compressed thickness at points inwardly of its outer edge, as for instance at the inner edge of the gasket. The

force per unit area on the gasket is many times the gas pressure per unit area on the inner side of the closure part 26.

Mounted in a recess 32' in the closure part 26, for relative axial movement with respect thereto, is a supporting member 33 which carries a steadying plate 34 and a pronged device 35. The supporting member 33 is urged forwardly by a biasing spring 36 but is limited in this forward movement by engagement of a shoulder 37 thereon with a stop plate or ring 38 fastened by means of screws 41 to the closure part 26. The prong device 35 and the steadying plate 34 are secured to the supporting member 33 by a screw 42.

As the closure means is screwed down into the tank, the advanced face 15 is forced over the prongs 19 to puncture openings 21 therein and simultaneously prongs 35 puncture a rearward end face 43 of the cartridge 16 to provide leakage openings 44 therein. At the same time the steadying plate 34 engages a rim flange 45 to hold the cartridge 16 against axial play within the tank body 11 and the rim flange 22 tight against the annular ring portion 14 on the tank bottom 12.

The purified gas is then permitted to leave the cartridge, and, upon escaping through an opening 46 of the steadying plate, passes to an outlet or fluid opening 47 in the tank body adjacent its open end 24. Gas pressure is then applied against the closure part 32 and the gasket 24 is tightly compressed by the collar 27 into its recess 30 and against the tank body 11, making thereby a tight sealing engagement of the closure means with the tank body as above described.

A bolt 48 is loosely fitted in the securing part 25 and connects with the closure plate 32. When the securing part 25 is unscrewed from the tank opening 24, the bolt 48 serves to pull the closure part 32 and the parts coupled thereto from the tank. Pins 49 facilitate the puncturing operation and the final tightening of the securing part in the tank opening 24 to seat the closure part 26 against shoulder 50 therein.

What is claimed is:

1. In a device for use in purifying oxygen and the like having a cartridge-receiving tank provided with a fluid inlet and a fluid outlet, a cartridge containing purifying material positioned in the tank, and cartridge-penetrating means in one end of the tank for puncturing one end of the cartridge when the cartridge is forced into the tank, the improvement which comprises a closure for the other end of the tank having an outer part that has threaded engagement with the tank and an inner part that slides axially into the tank, means for limiting inward sliding movement of said inner part, compressible sealing material between said parts adapted to be expanded radially outward against the inner wall of the tank upon compression between the inner and outer parts of the closure, a cartridge steadying plate carried by said second part of the closure and capable of limited movement relative thereto axially of the tank, said steadying plate having a peripheral portion adapted to engage the peripheral portion of one end of the cartridge, means for yieldingly urging said steadying plate axially of the tank to bring its peripheral portion into engagement with said peripheral portion of the cartridge, and cartridge-penetrating means located centrally of said peripheral portion of the steadying plate for puncturing the corresponding end of the cartridge when the closure is positioned on the tank.

2. A device for use in purifying oxygen and the like comprising a cartridge-receiving tank, a cartridge containing purifying material positioned in the tank, a tank closure comprising an outer part that has threaded engagement with the tank and an inner part that slides axially into the tank, means for limiting inward sliding movement of said inner part, compressible sealing material between said parts of the closure, a cartridge-steadying plate carried by said second part of the closure and capable of limited movement relative thereto axially of the tank, said steadying plate having a portion adapted to engage one end of the cartridge, means for yieldingly urging said steadying plate axially of the tank to bring said portion into engagement with the end of the cartridge, at least one prong at the inner side of the steadying plate, at least one prong in the end of the tank opposite the closure end, and a fluid inlet and fluid outlet at opposite ends of the tank, whereby positioning of the closure causes said prongs to penetrate the opposite ends of the cartridge to permit fluid to flow from the tank inlet to the tank outlet longitudinally through the cartridge and also compresses the sealing material between the closure parts and whereby the pressure of the fluid in the tank also tends to compress said sealing material.

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