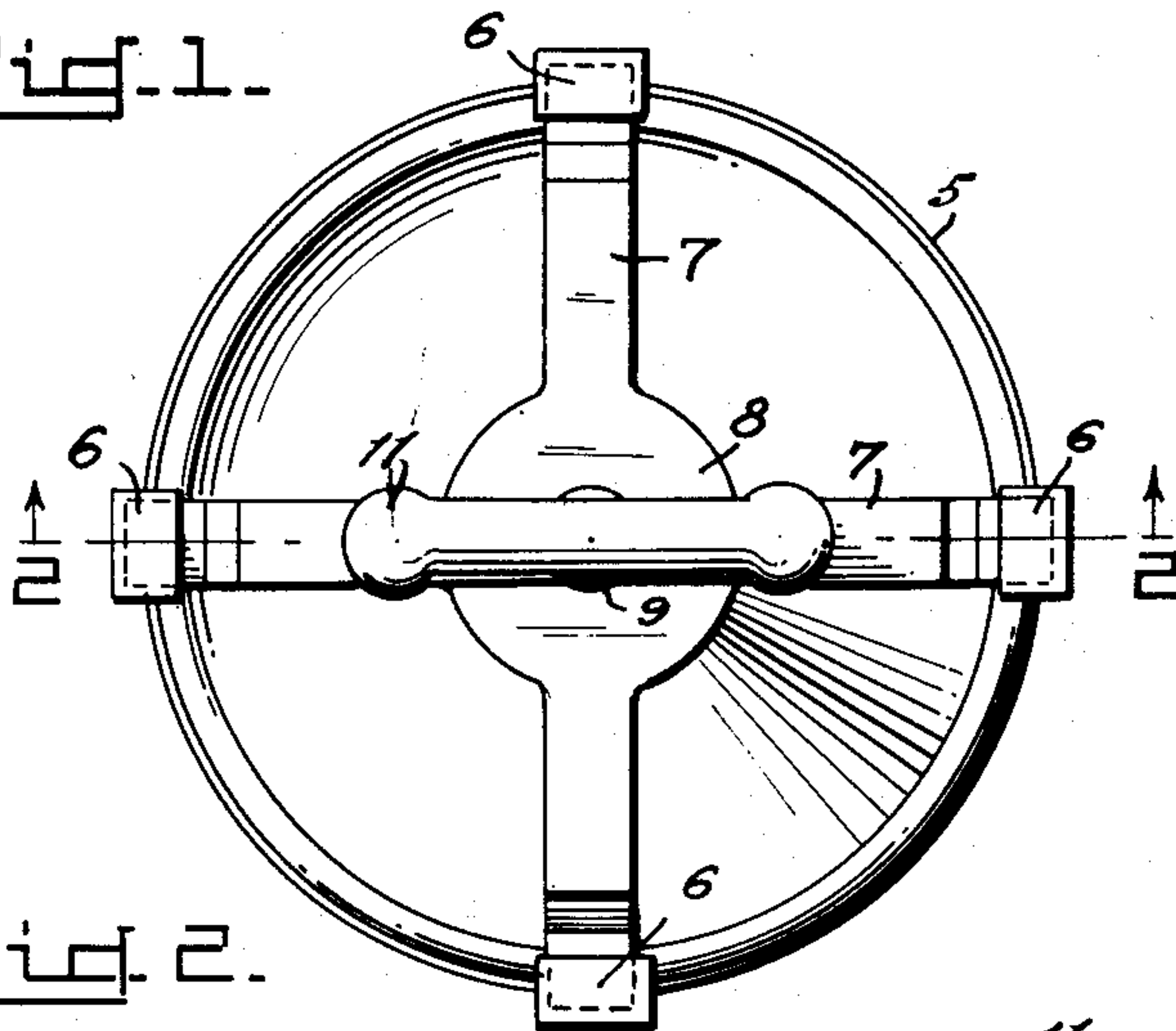


J. RICHTER

PRESSURE RESPONSIVE COVER FOR CONTAINERS

Fig-1-



Fiig. 2.

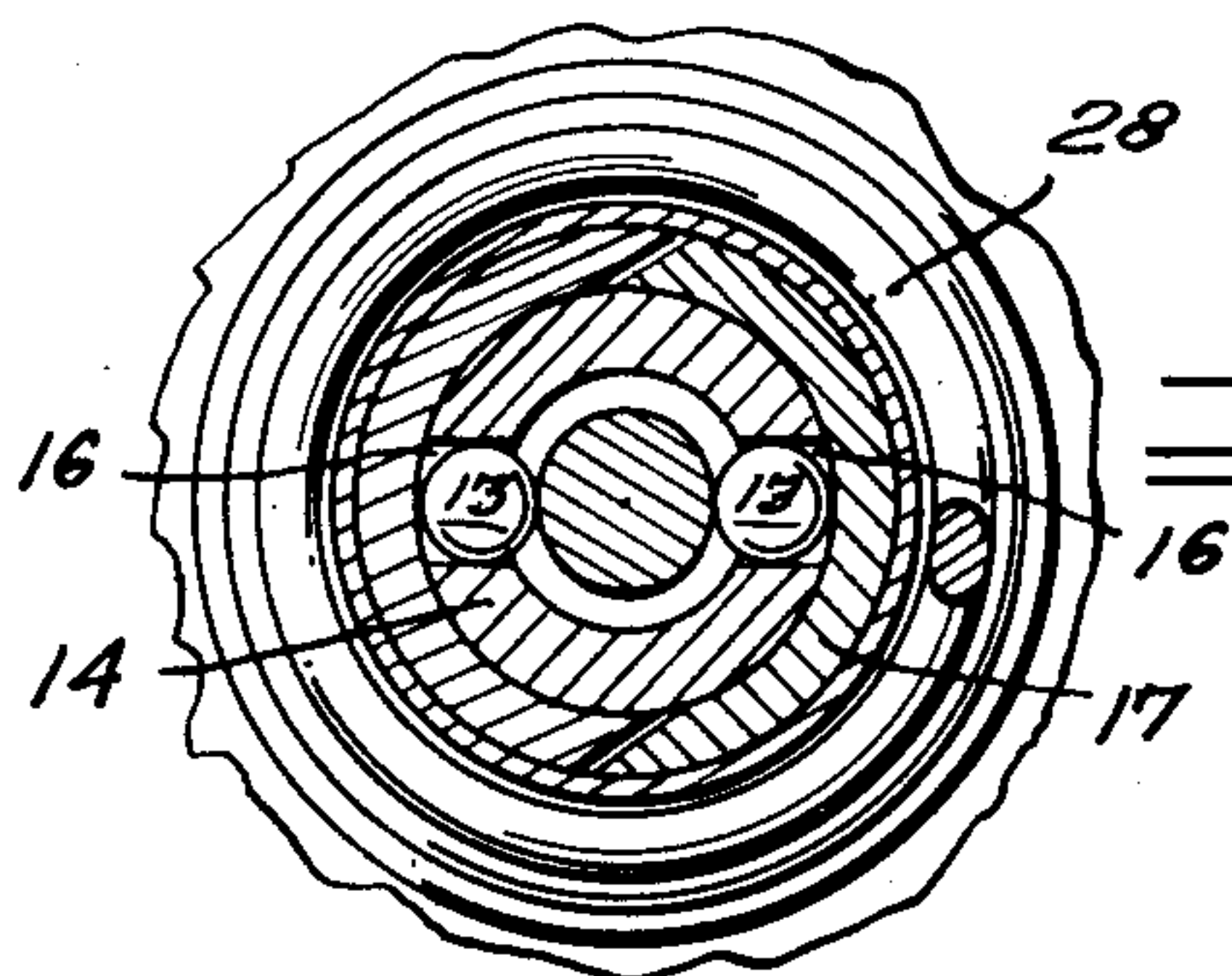
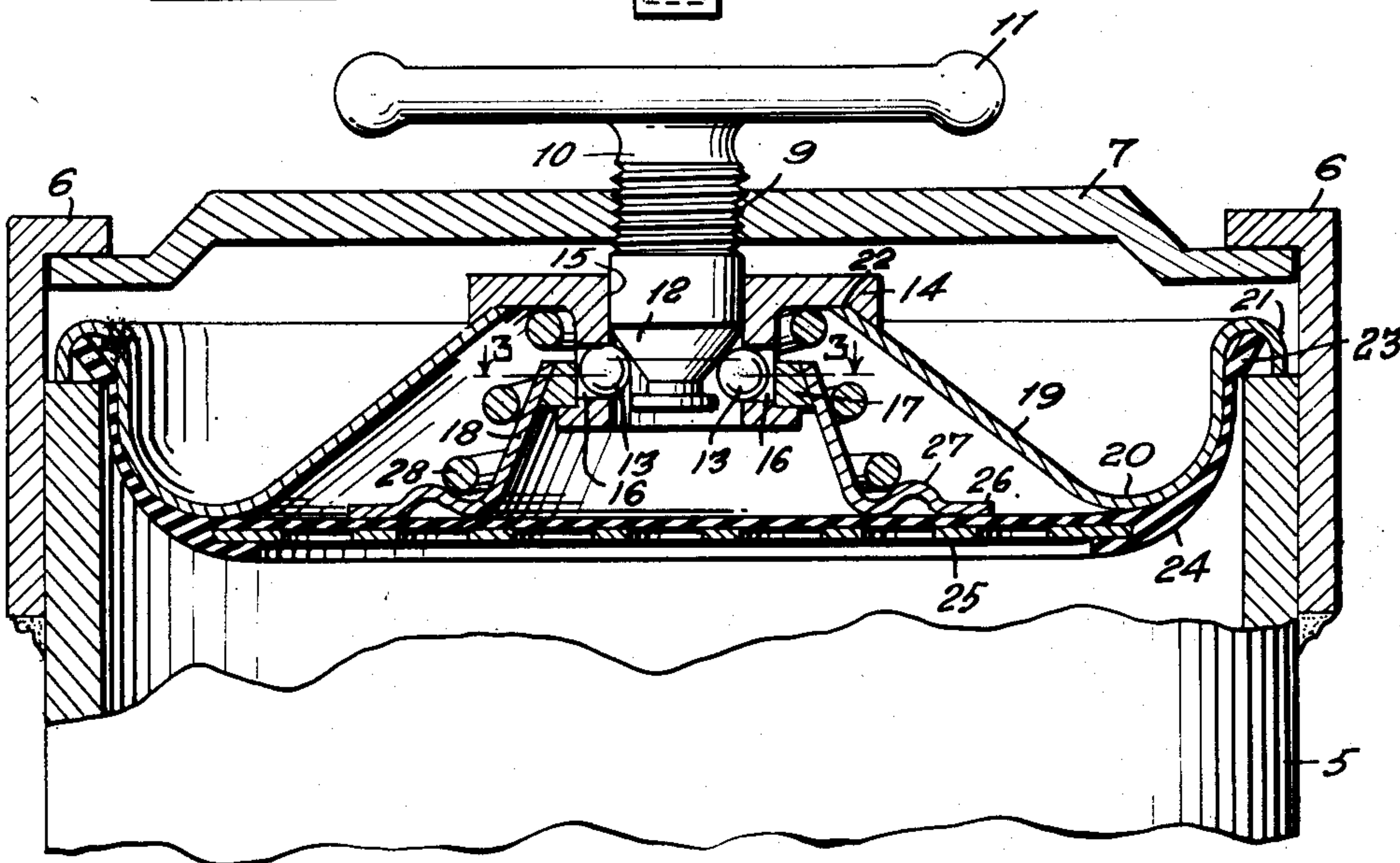


Fig. 3.

BY

G. J. Kessenich & A. W. Dew
ATTORNEYS

UNITED STATES PATENT OFFICE

2,653,729

PRESSURE RESPONSIVE COVER FOR
CONTAINERS

Joseph Richter, Fairlawn, N. J., assignor to the
United States of America as represented by the
Secretary of the Army

Application June 19, 1951, Serial No. 232,437

5 Claims. (Cl. 220—44)

(Granted under Title 35, U. S. Code (1952),
sec. 266)

1

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

The present invention relates to a novel sealing means for pressure containers wherein the component elements of the sealing means or closure cooperate to act as a pressure release or safety valve when the pressure in the container exceeds a predetermined amount.

While my invention is disclosed as providing a closure and pressure relief valve for a powder container it is to be understood that the invention is capable of use, for example, in a conduit carrying fluid under pressure, and in any tank, vat or container requiring the use of a closure which is fluid tight below a predetermined pressure but which will be forced open to act as a safety valve to relieve the pressure when the predetermined pressure is exceeded.

An object of my invention is to provide a sealing and closure device for pressure containers which insures a tight pressure fit, is easily applied to a container in closing and sealing position thereon, and which is capable of being released or "sprung" by a force which is different from and opposite to the closing force originally applied, to effect opening of the sealing means.

Another object of my invention is the design of a cover for a container which is tightened in place by a force outside the container but which may be acted upon by a different force, viz pressure within the container, to release the cover and dissipate the original force which tightened the cover in place.

A further object of my invention is to provide a simple design for a combination safety relief valve and closure for pressure containers which embodies a combination gasket and flexible diaphragm sealed upon the container in response to an outside force applied to a handle and screw and acting through the medium of detent balls, a split tapered ring and tapered retainer all arranged in a novel manner to maintain the cover in place to provide an hermetic seal, the same elements cooperating to dissipate the force applied, to force open the cover in response to excess pressure developed in the container.

With the foregoing general objects in view, as well as other more specific objects and results which will appear from a reading of the following specification, my invention consists in a certain novel construction and arrangement of elements more fully and particularly referred to and specified hereinafter.

2

Referring to the accompanying drawing:

Figure 1 is a top plan view of the combination closure and safety valve mounted in operative relation upon a container or pressure containing enclosure.

Figure 2 is a section to an enlarged scale taken on line 2—2 of Figure 1.

Figure 3 is a section taken on line 3—3 of Figure 2, showing the arrangement of screw, detent balls, and other retaining means.

The principles and several features of my invention can be mechanically expressed in a variety of other forms and embodiments, and my invention contemplates and includes all such other expressions thereof within its broad scope.

In the illustrated example my invention includes a container 5 to which lugs 6 have been spot welded or fixed in any convenient manner, to receive a spider 7 which is held in place in a manner to be hereinafter described. The spider 7 is provided with a central boss 8 having a vertical internally threaded bore 9 to receive a screw 10 which is provided with a handle 11 to be manually grasped when an outside force is applied to the cover. The lower end of the screw is beveled as at 12 to provide a reduced portion for receiving detent balls 13 for a purpose to be later described. Disposed below the spider is a stepped cylindrical retainer 14 shaped to form a shallow T in vertical cross section. Retainer 14 has a vertical bore 15 of diameter approximately equal to and in axial alignment with bore 9 in spider 7. Screw 10 extends into bore 15 and is axially slidable relative to retainer 14 when the screw handle is turned either clockwise or counterclockwise in actuating the sealing means. Two diametrically opposed radial bores 16 are formed in the upright section of T-shaped retainer 14, to receive the major portion of detent balls 13, the remaining portion of the detent balls fitting into the space defined by the reduced section of screw 10 to lock retainer 14 with respect to screw 10 and prevent relative axial movement therebetween when the balls are confined to the position shown upon Figure 2.

Concentrically disposed about the upright section of retainer 14 and in radial alignment with the radial bores formed therein is arranged a tapered split ring 17 which serves to contain each detent ball within its bore 16 and in contact with the beveled portion of screw 10, the split ring in turn being maintained in this locked position by virtue of a tapered collar or slide 18 which is slidable relative to the outer surface of tapered split ring 17, and which in closure-locking posi-

3

tion fits about the split ring and prevents it from opening, to thereby prevent outward movement of the detent balls within their radial bores.

The closure per se of the sealing device is dish-shaped in configuration and comprises a cover 19 of sheet metal which is removed from and concentric with collar 18. Cover 19 is a generally frusto-conical disc having its peripheral edge turned reversely as at 20 toward the apex and its rim again turned through 180° to form an inverted U having a short leg 21 engaging the rim defining an opening in the container, as clearly shown in Figure 2. The apex of the frusto-conical cover 19 is fixed to the flat under surface of the horizontal portion of retainer 14 as at 22 in any convenient manner so that the retainer and cover are actuatable as a unitary structure. A combination gasket and flexible diaphragm is incorporated in the closure to insure an hermetic seal with the container as at 23 and comprises a flexible diaphragm 24 contoured to follow the curved portion of cover 19, the central extension of the diaphragm forming a base of the frusto-conical section encompassed by cover 19. A perforated metallic baffle 25 is fixedly secured to the flexible diaphragm substantially coextensive with that portion of the diaphragm forming the base of the frusto-conical cover 19.

The base of tapered collar 18 is turned outwardly to form a flange 26 which is crimped as at 27 to provide a recess for receiving one end of a compression spring 28, the other end of spring 28 being received by the under surface of retainer 14 within the area included by the upper base of frusto-conical disc 19. Flange 26 of collar 18 is in contact with and urged against diaphragm 24 so that pressure exerted against the flexible diaphragm from within the container will move the diaphragm and baffle upwardly to cause collar 18 to slide upwardly relative to tapered split ring 17.

The device operates in the following manner. Spring 23 is biased to exert a force between retainer 14 and collar 18 to maintain the parts in operative relation. So also, spider 7 is maintained in force contact with lugs 6. The extremities of spider 7 are applied to the lugs distributed about the periphery of the container or opening and the short leg of the U forming the extremity of cover 19 is set to engage the rim of the container opening. Although screw 10 is retracted so that a portion of the detent balls are disposed within the lower extremity of the recess formed by the beveled portion of screw 10, the compression spring exerts sufficient force to retain the spider within the lugs and the remaining elements in locked and operative relation. In this position the ring 17 is not fully closed and the force applied is insufficient to provide a seal at 23. The handle of screw 10 is then turned clockwise and the bevel on the screw applies radially outward forces to the detent balls. Since the balls are held against movement at this time by ring 17 and collar 18, the force is transmitted to retainer 14 and cover 19 to seal the container at 23. The compression in spring 28 serves to bias collar 18 downwardly relative to cover 19 to thus force the collar against the tapered split ring 17 so that the detent balls are in position to prevent relative axial movement between retainer 14 and screw 10, as previously explained.

The closure will remain in hermetically sealed position until pressure in the container becomes greater than the "set" pressure which can readily be determined by a calibration of the spring and

4

associated parts. When the maximum set pressure within the container is exceeded, the force exerted by spring 28 is overcome and the diaphragm and perforated baffle are displaced upwardly to force collar 18 upwardly thereby leaving a gap between the collar and tapered split ring 18, as a result of which split ring 17 separates sufficiently to permit detent ball 13 to move outwardly to clear the smooth surface of screw 10 so that retainer 14 is free to move upwardly relative to screw 10. Cover 19 which is secured to retainer 14 also moves upwardly thereby destroying the seal at 23 and dissipating the excess pressure within the container.

What I claim for my invention is:

1. A combination pressure relief valve and sealing means for a container having an opening comprising, diametrically opposed lugs on said container about said opening, a spider engaging said lugs for removably supporting said sealing means in said opening, said spider having a centrally disposed internally threaded bore, a dish-shaped sealing member on said sealing means for sealing engagement with the rim of said opening, a screw threaded into said bore actuatable to engage said sealing means for applying a force to said sealing member to move said member into sealing engagement with the rim of said opening, detent means concentric with and coacting with said screw to lock said sealing member in sealed position, and means secured to said sealing member movable in response to an increase in pressure in said container to release said detent means whereby said sealing member is released to move upwardly to dissipate the pressure in said container.

2. A combination pressure relief valve and sealing means for a container having an opening comprising, diametrically opposed lugs mounted on said container about said opening, a spider engaging said lugs for removably supporting said sealing means in said opening, said spider having a central internally threaded bore, a screw in said bore having a tapered end extending below said spider and having a handle secured to its upper end adapted to be turned to apply a sealing force to said sealing means, a sleeve concentric about the tapered end of said screw and slidable relative thereto, said sleeve having an upper radially elongated flange, a lower radially shorter flange and a pair of diametrically opposed radial slots adjacent said lower flange, said sealing means comprising a frusto-conical dish-shaped member adapted to peripherally engage said container about said opening and having a central aperture to peripherally engage the lower side of said upper flange, a gasketed resilient diaphragm partly secured to the under side of said dish-shaped member and forming with the frusto-conical portion of said sleeve and said upper flange a frusto-conical space, a pair of detent balls received in said radial slots movable from a first inward position to abut the taper of said screw to lock said sleeve against sliding, to an outward position to release said sleeve for upward sliding movement, a split ring concentrically disposed about said detent balls and lying on said lower flange adapted to yieldingly retain said balls in abutting engagement with the taper of said screw, a frusto-conical collar having its upper end slidable engaging said split ring and its lower end turned radially outwardly and secured to the upper surface of said resilient diaphragm, and a helical spring concentric about said collar having its upper end abutting said upper flange and its lower end abutting the radially outwardly

5

turned end of said collar, whereby a rise in pressure in said container above a predetermined amount urges said resilient diaphragm and said collar upwardly against the bias of said spring to permit expansion of said split ring to thereby release said balls for outward movement and said sleeve and sealing means for upward movement to dissipate the pressure in said container.

3. A gasketed cover for sealing the opening of a pressure container comprising, lugs secured to the wall of said container, a spider engaging said lugs and removably supporting said cover in said opening, said spider having a centrally disposed internally threaded vertical bore, a screw threaded in said bore for applying an external force to said cover to effect a seal between said cover and said container, detent means intermediate said cover and said screw to lock said cover in sealed position, and means secured to said cover to unlock said detent means in response to an internal force opposed to the originally applied sealing force to unseal said cover and dissipate said internal force.

4. A gasketed cover for sealing the opening of a pressure container comprising, lugs secured to the wall of said container, a spider engaging said lugs, said spider having a centrally disposed vertical bore, a handle screw threaded into said bore and extending downwardly beyond said spider, a cylindrical member concentric about said screw and slidable axially relatively thereto, detent means intermediate said cylindrical member and said screw for locking said cylindrical member against axial movement, means secured to said cover adapted to engage said cylindrical member whereby an external force applied to said screw handle is transmitted to said cover to seal the same to said container, and slide means secured to said cover and operable in response to an internal force on said cover opposed to said original

6

force to unlock said detent means and release said cylindrical member and cover for upward movement to break the seal and dissipate said internal force.

5. In combination, a pressure container having an open end and a combined closure device and pressure relief valve for unitary mounting in and removal from said container and comprising, a sealing member for peripheral engagement with said opening, first means mounted on said container about said opening, means engaging said first means for supporting said sealing member in juxtaposition with said opening, means on said support means axially movable to apply an external force to said sealing member, detent means concentric about and releasably secured to said force applying means, said detent means cooperating with said sealing member to maintain the same in sealing engagement with said container below a predetermined pressure in said container, and means secured to said sealing member and movable in response to a rise in pressure in said container above said predetermined pressure to disengage and release said detent means whereby said force applying means and sealing member are unitarily moved out of sealing engagement with said container.

JOSEPH RICHTER.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,273,347	Ferris	July 23, 1918
1,821,726	Saporta	Sept. 1, 1931
2,297,003	Larson	Sept. 29, 1942

FOREIGN PATENTS

Number	Country	Date
474,095	Germany	Mar. 26, 1929