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RAPID ACTION SEAL-TIGHT CLOSURE COVER

Filed April 12, 1960

3 Sheets-Sheet 1

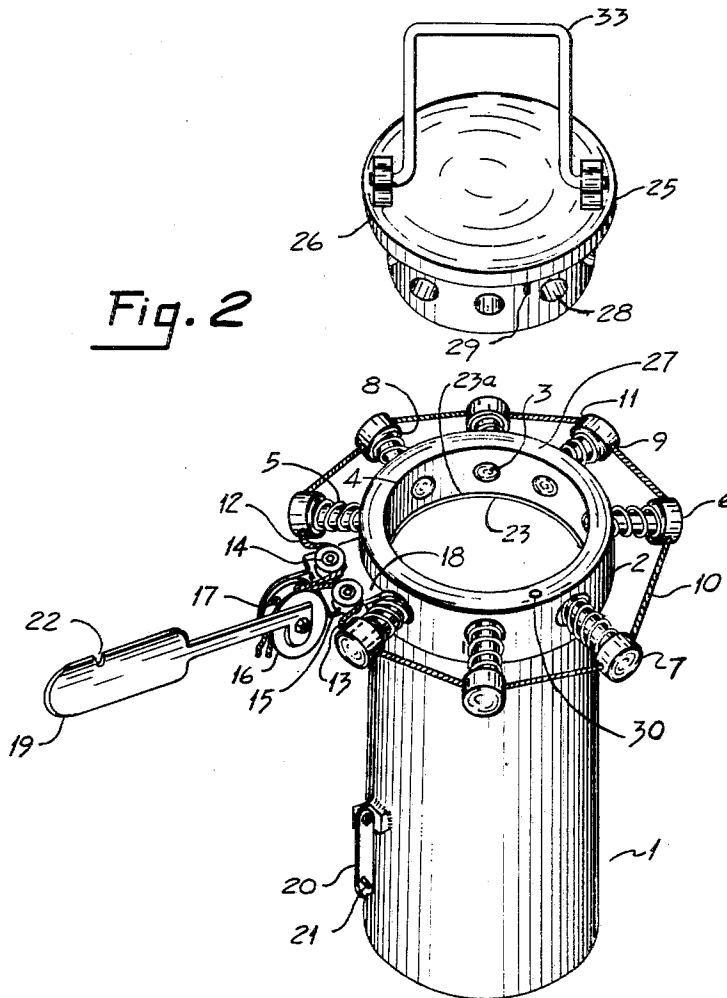


Fig. 2

Fig. 1

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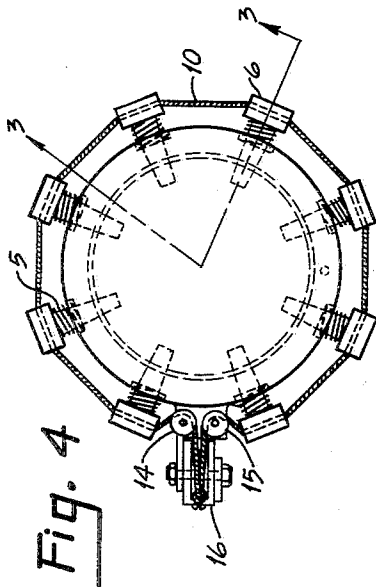
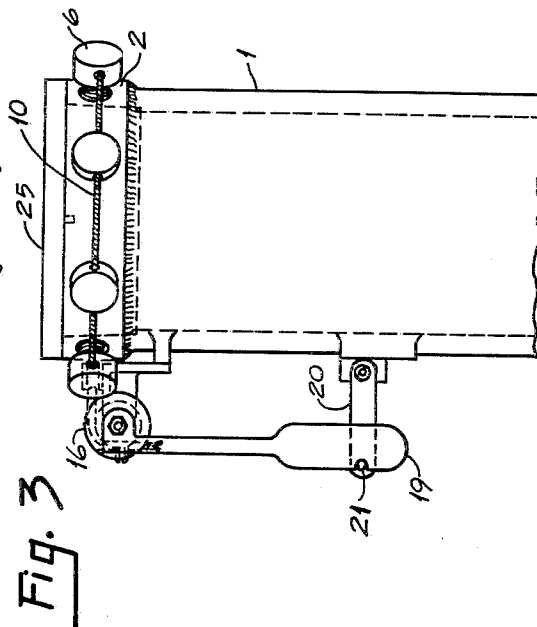
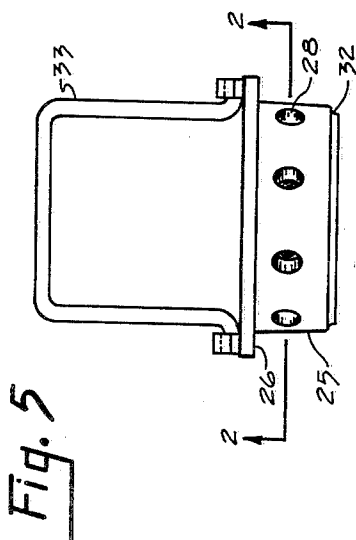
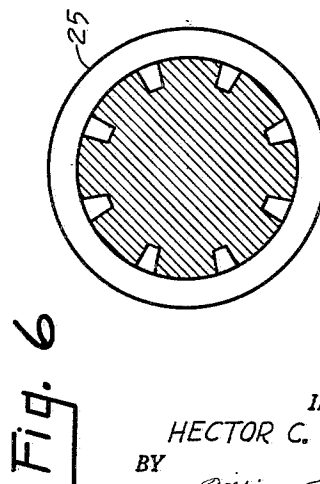
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

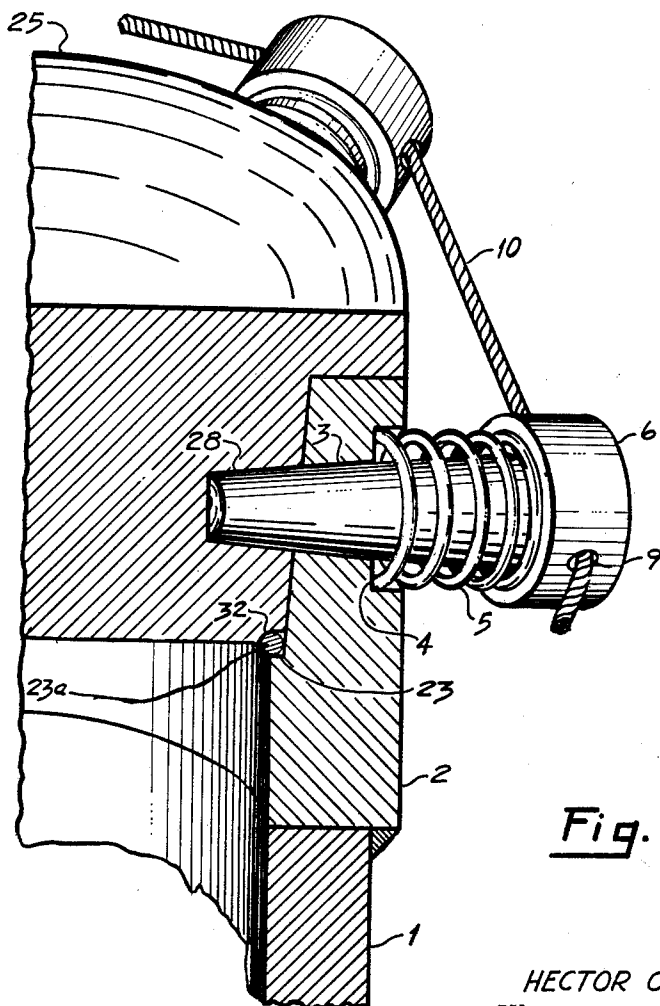


Fig. 7

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RAPID ACTION SEAL-TIGHT CLOSURE COVER

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5 Claims. (Cl. 220-46)

This invention relates to closure type covers and is particularly directed to rapid sealing and unsealing of closure covers for high pressure vessels or enclosures.

A principal object of the invention is to provide an efficient seal-tight closure for high pressure, vacuum and high temperature vessels and/or enclosures.

Another object of the invention is to provide a seal-tight closure for high pressure, high temperature vessels which can be rapidly opened and closed under various degrees of pressure and temperature with a minimum amount of lost time and motion.

A still further object of the invention is to provide a seal-tight closure for any type vessel or enclosure which can be simply and economically operated and controlled under all types of pressure and temperature conditions.

Other objects and advantages of the invention will be further understood from a study of the specifications and the accompanying drawings and wherein;

FIGS. 1 and 2 show in perspective a pressure type enclosure and the closure therefor according to the invention;

FIG. 3 shows a side elevation of the enclosure with the closure therefor in a sealed condition;

FIG. 4 shows a top plan view of the enclosure shown in FIG. 3;

FIG. 5 shows an elevation of the enclosure cover;

FIG. 6 shows a section of the enclosure cover in FIG. 5 through the line 2-2;

FIG. 7 shows a sectionalized enlarged portion of FIG. 3 through the line 3-3.

Now referring to the drawings and particularly with respect to FIG. 1 there is shown therein one embodiment of the invention comprising an enclosure 1 made from steel, aluminum, plastic or any other material suitable for carrying, transporting and/or storing any type of fluid media, in gas or liquid form, under various degrees of pressure and/or temperature. The enclosure or vessel as such can be a pipeline, container, tank, heat-exchanger and the like having any peculiar geometrical configuration and the invention as described herein will apply. The enclosure 1 has at the mouth or opening thereof a collar or annular ring type flange member 2 welded, sweated or otherwise secured thereon so as to form an integral part of the said enclosure. The annular flange member can be adapted to fit or mate any regular or irregularly shaped enclosure or carrying medium as well as the cylindrical type illustrated and shown in FIG. 1. The flanged member 2 has disposed about the periphery thereof a series of angularly spaced apertures or holes 3 extending throughout the thickness of the flange in a radial direction, the hole diameter at the inner portion of the flange member being smaller than the remainder of the hole to form a recessed seat or shoulder 4. The shoulder portion 4 forms a stop or rest for coil spring member 5 when the said spring is injected into the hole.

The coil spring 5, made preferably from tensile steel or some other suitable material, has an outside diameter comparable to the hole diameter 4 and is disposed to snugly fit therein and to be held therein by the recessed portion and not to become dislodged or otherwise removed therefrom in response to the operation of the closure to be subsequently described. The coil spring members are each disposed to receive and carry a bolt-

like tapered pin member 6, made from steel, aluminum or some other type material for the purpose, and having a pin diameter comparable to the hole 3 and readily communicable therewith when placed within and received by the said coil spring member. The outer portion of the pin member or head 7 is provided with a shoulder part 8 against which the spring 5 presses or otherwise engages when under compression to cause its movement outward, the said movement being responsive to the release of any radial inward forces bearing on and urging the pin members inward. The pins are also disposed to be held by the coil spring members when not under any compressive or inward forces, with a portion of the pin still remaining in communication with the hole.

The bolt-like tapered pin members 6 are further provided with a hole 9, through the head part thereof intermediate the top and transversely to the longitudinal axis of the pin, for receiving an elongated cable or wire 10, the cable or wire being of any tensionally strong material, circumferentially engages each of the pins to cause the movement thereof when operably engaged. The ends 11 of the respective holes in each of the pin members are arched or otherwise tapered to facilitate the reception and movements of the circumferentially attached cable. The cable 10, after completely circumferentially engaging each of the pin members 6 has its end parts 12 and 13 engaging respectively a pair of freely rotatable grooved rollers or guides 14 and 15 for guiding the ends of the cable. The end parts of the cable are finally anchored or pinned down to a rotatable pulley 16 by set-screws 17, the said pulley being rotatably mounted to a support member 18, which member is attached to and forms an integral part of the enclosure 1. The rotatably operated pulley 16 is connected to and operable by a manually operated lever arm 19 which arm is fixedly held in position by an arm bracket 20 attached to the enclosure 1 and having a protruding pin 21 for engaging the arm 19 at a small indenture or notch 22 of the said arm.

There is further disposed about the inner periphery of the flange member a groove-like annular ring 23 which forms an integral part thereof as shown in FIGS. 1 and 7, the grooved portion thereof being disposed to receive a ring-like gasket part 23a made of rubber, or any other suitable material capable of providing an air-tight seal with the particular fluid media carried or stored by the enclosure or vessel. It may be appreciated that although a single annular ring is shown, there can be additional spaced rings provided in a single radial plane with additional grooves therefore to assure more positive sealing.

The closure or cover 25 shown in perspective in FIG. 2 is designed to mate and operate with the flange and pressure vessel so that the combination forms a seal-tight closure for the said vessel under consideration. In FIG. 2, for the particular embodiment under discussion, the closure cover 25 is a flanged flat head type and is designed to have the flanged portion 26 seatably engage the upper part 27 of the collar or flange 2. The closure cover 25, however, can be dome-shape, or conical shaped or some other configuration, there being no stringent design necessary. The closure or cover 25 has disposed about the outer periphery thereof along its lower part a series of angularly spaced partially drilled tapered holes or apertures 28 corresponding to the number of holes in the flange 2 for receiving the tapered pins 6 held thereon when the said closure cover and flange member are operably engaged. A small pin 29 in the closure cover 25 along the bottom of the flanged portion is provided to engage a groove or slot 30 in the upper flange part 27 of the collar 2 so as to facilitate the placement of the closure and the flange collar to cause the holes in both parts to become radially aligned and to permit the tapered

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pins in the flange to operably engage the closure cover to cause a seal-tight connection and closure. The lower portion of the cover 32 is further beveled or grooved to provide a smooth surface for sealably engaging the gasket member 23a held by the annular groove in the flange.

To cause a rapid seal-tight closure, the operation of the component parts are as follows; the cover 25 is first seatably mounted upon the flanged member 2, the alignment of the holes of the two parts being facilitated and assured because of the mating of the pin 29 and groove 30 in the two parts. After the cover 25 is seated upon the flange member, the lever arm 19 is pulled down to cause the cable member 10 to undergo, in response thereto, a radial-type pressure inwardly. The inward pressure of the cable urges the tapered pin members correspondingly inward, since the cable is in operable engagement with the pins. This inward force on the pins is exerted in an opposite direction to the compressive pressure of the coil spring which carries the pins. The pins, when urged inward, engage the closure tapered holes to cause the closure to seal tightly against the flange with the beveled portion of the cover pressing against the gasket residing within the annular groove held by the collar 2. Because the holes within the closure are tapered, the tapered pins are easily mated therewith and simultaneously with this mating process the closure is pulled or forced downward to assure easy and rapid sealing. In other words, the taper of the pin, when inserted within the corresponding aperture of the closure, acts like a wedge in forcing downward the cover to effect more positive sealing. After the lever arm 19 is pulled down and all the pins 6 are operably engaged and communicating with the corresponding hole of the closure, the said arm is then held down against the compressive outward pressure of the coil springs by protruding pin 21, attached to pivotally operated arm 20, which engages the notched portion 22 of the said arm. With the arm 19 locked in position, the seal is complete and assured. The leverage provided by the arm requires small expendable efforts on the part of the operator and effects large operating forces on the pins to provide a good seal for high pressure vessels and enclosures.

To provide rapid opening of the enclosure cover, the arm 19 is released or otherwise disengaged from the locking or protruding pin 21. After disengagement, the compressive stresses in the coil spring operating outwardly against the flanged portion of the pin 8 will cause their outward radial movements, sufficiently so to completely release the closure cover from its seal-tight condition to permit the free flow of the fluid media previously sealed thereby. The release time of the closure cover is a direct function of the compressive stresses of the coil spring which in turn is a function of its free length, number of turns of wire or coil pitch, its wire diameter, and the compressive and resiliency tendencies of the particular type metal itself. After the pressure release of the closure cover, caused by the compressive action of the coil springs, the closure cover then can be completely removed from the enclosure vessel, if desired. A handle 33 can be provided for this purpose, if desired. The coil springs are so designed as to cause the pins to become partially free of the closure holes so that the said closure will not become completely dislodged from the enclosure. This is a safety factor so that personnel and property about the said enclosure will not be damaged if the closure were to completely fall away from the vessel after pressure release.

The cable tension 10 which causes the radial movements of the pins may be predetermined and so designed in accordance with the degree of seal required and also in accordance with the fluid media being stored or carried by the enclosure or pressure vessel. The tension in the cable may be advanced or slackened by means of the set-screws engaging the lever-operated pulley 16.

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Where more tension is desired, the cable is shortened and held fast by the anchoring pin or set-screws 17. Contrary, if less tension is required, the cable is slackened and again held fast by set-screws 17. The amount of tension desired is a direct function of the degree of seal required as determined by experience and requirements.

As illustrated in FIG. 1, there is shown a cable arrangement for causing the respective pins to move radially inward to engage the closure member in response to the actuation of the lever arm mechanism. It may be appreciated that other means may be provided for urging the pins inward to engage the sealing closure. Such a means, for example, would be an arrangement of an open or split collar or band encircling the pins and held thereby and being capable of urging the pins inward when the split or open end parts are brought together by some actuating device. It may be further appreciated that the actuation device although shown and illustrated as a manually operated lever mechanism, the same could be made to operate electrically or hydraulically. For example, an electric motor and gearing arrangement could be provided and so connected to cause the said lever arm to operate as previously described. Similarly the lever arm could be attached to some cylindrical or piston arrangement and made a part of some hydraulic system. There are still some other modifications and forms that can be made without detracting from the true purpose and intent of the invention.

Having described the invention, what is claimed is:

1. A seal-tight closure for a pressure vessel carrying a fluid media comprising in combination a cylindrical pressure vessel having an opening, an axially extending cylindrical flange member surrounding the said vessel at the opening thereof and attached thereto, the said flange member having its inner peripheral wall partially tapered and also having a plurality of angularly spaced holes directed in a radial direction, the inner portion of said holes being tapered inwardly and the outer portion of said holes being cylindrical where the division of said holes defines a surface area and where the holes are disposed to receive a plurality of bolt shaped tapered pins, compressive resilient means axially seated within the cylindrical portion of the said holes and upon the said surface area and disposed to hold radially the said pins, a cylindrical closure for the said cylindrical pressure vessel and composed of an upper radially extending flange and a lower axially tapered body wall terminating in a circumferential groove, the said wall having a plurality of angularly spaced partially drilled tapered holes directed in a radial direction which correspond to and are radially aligned with the holes in the said pressure vessel cylindrical flange member, the said closure being disposed to fit the vessel flange along their respective tapered walls, means for urging the said pins inwardly radially against the compressive forces of the said resilient means to engage the said closure holes and means responsive to the urging means to cause a seal-tight closure between the said pressure vessel and closure.

2. A seal-tight closure for a pressure vessel according to claim 1 and wherein the said compressive resilient means includes tensionally wound metal coil springs with one end thereof anchored to the surface area within the said hole and the other end contiguous with the bolt portion of the said tapered pins.

3. A seal-tight closure for a pressure vessel according to claim 1 and wherein the said pin urging means includes a circumferential cable, commonly carried by each of the pins, and disposed to expand and contract in response to expansion and contractual forces to thereby urge the said pins radially inward under contractual forces.

4. A seal-tight closure for a pressure vessel according to claim 1 and wherein the means to cause a seal-tight closure between the pressure vessel and closure includes a resin ring-like gasket disposed to reside within the

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closure circumferential groove and seal the said closure and vessel when subjected to the compressive forces created by the urging means.

5. A seal-tight rapid closure for a pressure vessel carrying a fluid media comprising in combination a cylindrical pressure vessel having an opening, an axially extending cylindrical flange member surrounding the said vessel at the opening thereof and attached thereto, the said flange member having its inner peripheral wall partially tapered and also having a plurality of angularly spaced holes directed in a radial direction, the inner portion of said holes being tapered inwardly and the outer portion of said holes being cylindrical where the division of said holes defines a surface area and where the holes are disposed to receive a plurality of tapered pins, compressive resilient coil means axially seated within the cylindrical portion of said holes and upon the said surface area and disposed to hold radially the said pins, a cylindrical closure for the said cylindrical pressure vessel and composed of an upper radially extending flange and a lower axially tapered body wall having a plurality of angularly spaced

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tapered holes directed in a radial direction which correspond to the holes in the said pressure vessel cylindrical flange member, the said closure being disposed to fit the vessel flange along their respective tapered walls, means for urging the said pins inwardly radially against the compressive forces of the said resilient means to engage the said closure holes to cause a seal-tight closure between the said pressure vessel and closure, and means for rapid partial release of the said pins from the closure to release the said seal while keeping the said closure from being totally dislodged from the pressure vessel.

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