

Oct. 21, 1969

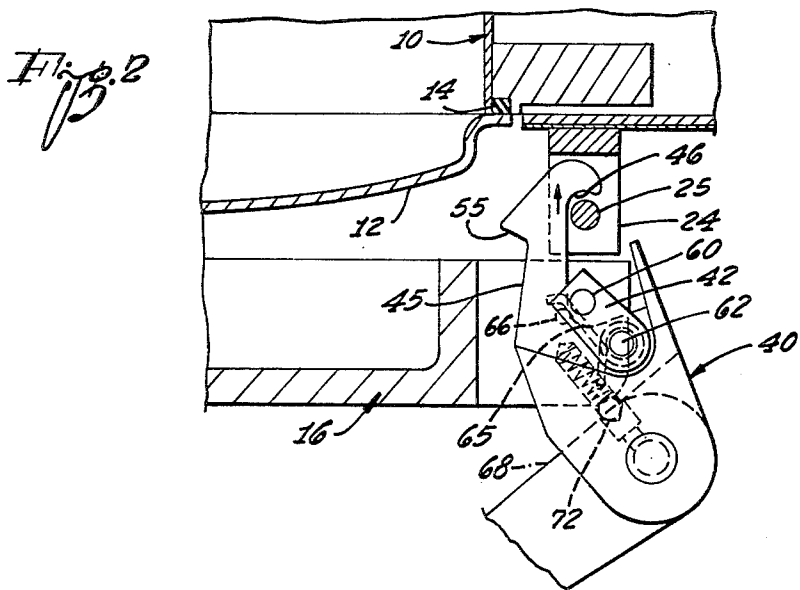
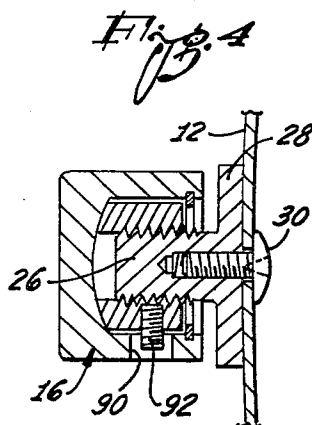
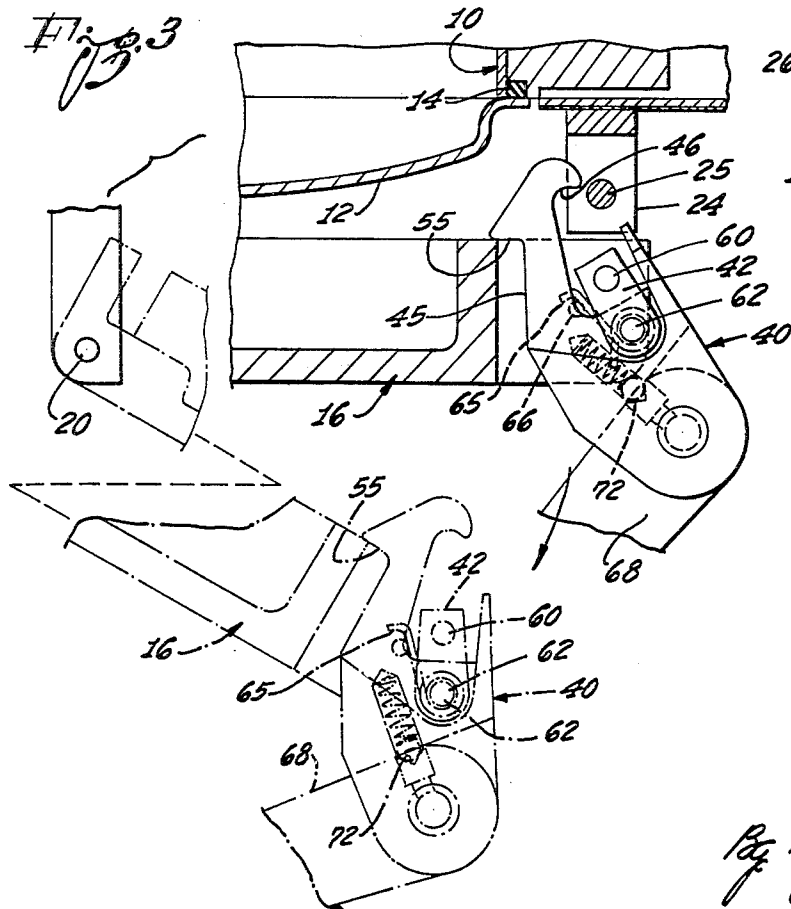
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3,473,693

PRESSURE CHAMBER COVER LATCH

Filed Aug. 26, 1968

3 Sheets-Sheet 2



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Fig. 5

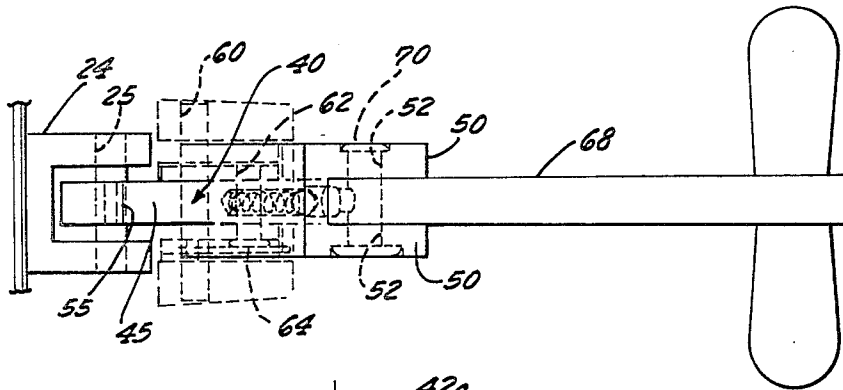
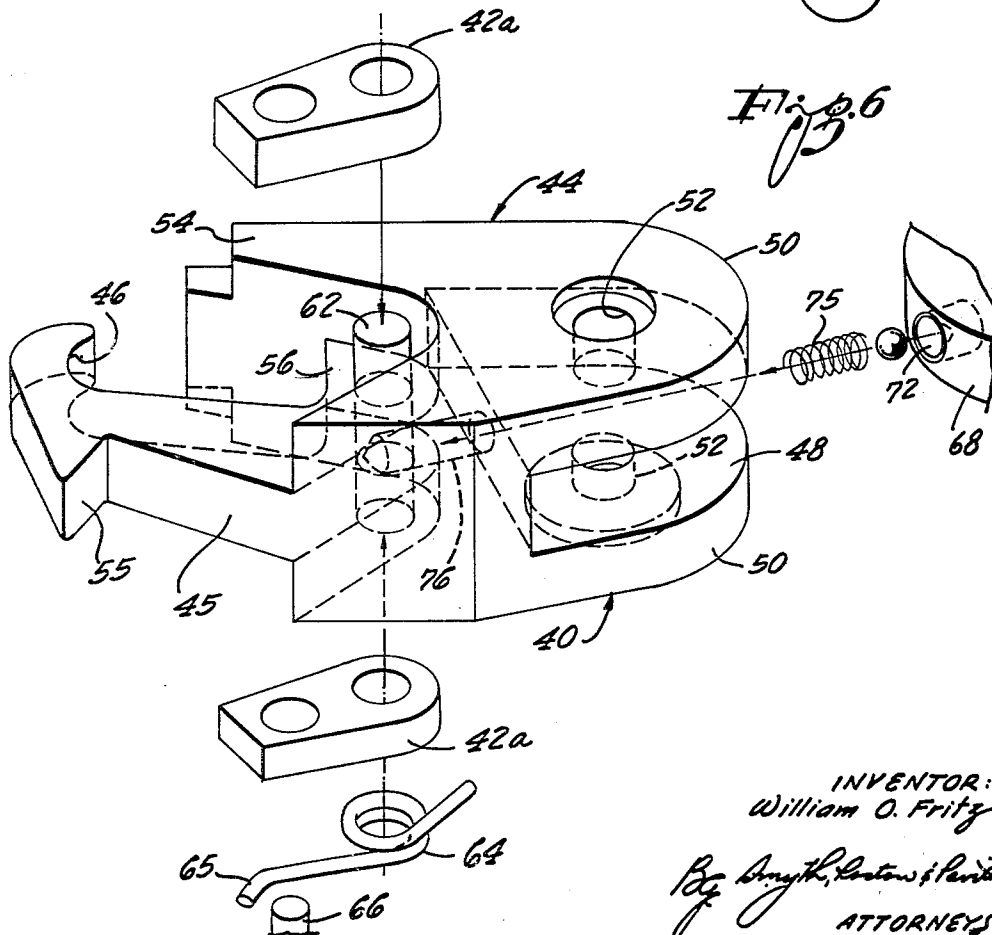


Fig. 6



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3,473,693

PRESSURE CHAMBER COVER LATCH

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10 Claims

ABSTRACT OF THE DISCLOSURE

A linkage functioning in the manner of a toggle linkage is contracted to interconnect two objects to resist a high magnitude separation force between the two objects. At its contracted state a pivot connection of the linkage is moved past center whereby the separation force locks the linkage with the linkage backed laterally against a stop. An operating handle has a detent connection with the linkage and if the separation force is nearly zero the handle is capable of returning the pivot connection past center for release expansion of the linkage. If the separation force is of hazardous magnitude, however, the detent connection yields to make the handle inoperative.

BACKGROUND OF THE INVENTION

It is common practice to retain a cover on a pressure vessel by extending a rigid bridge across the cover with both ends of the bridge in positive engagement with the vessel and with a manually operable screw on the bridge thrusting against the center of the cover. In a typical construction, for example in the disclosure of the copending Hendershot application Ser. No. 567,289, now abandoned, one end of the bridge is mounted on a pivot on the vessel with the axis of the pivot parallel with the axis of the cover and the other end of the bridge is releasably engageable with a shoulder of a fixed stud on the vessel. To open the cover, first the screw is retracted to free the cover from the vessel and then the bridge is rotated on its pivot to swing the cover to one side.

It would be highly desirable to connect one end of the bridge to the vessel by a hinge joint having its axis perpendicular to the axis of the cover and to employ a contractible latch mechanism to releasably connect the other end of the bridge to the vessel. In such an arrangement, the middle of the cover may be connected to the middle of the bridge by screw means but the sealing pressure of the cover gasket may be obtained by the contraction of the latch mechanism itself, the screw means being merely adjusted whenever necessary to make sure that the range of contraction of the latch mechanism is effective to compress the sealing gasket. Such an arrangement would be more convenient than the conventional arrangement and would save time and energy since only the latch mechanism would be manipulated for opening and closing of the pressure vessel.

To carry out this concept, however, requires solving certain problems. One problem is to construct an efficient contractible latch mechanism. A second problem is to provide such a latch mechanism that is reliable, it being especially essential that the latch mechanism be non-responsive to the separation force between the pressure vessel and the cover. A third problem is to provide some safeguard to prevent inadvertent release of the latch mechanism while the vessel is under high gaseous pressure.

The present invention is directed to the solution of these problems.

SUMMARY OF THE INVENTION

While the invention is broadly applicable for its purpose, the present disclosure is specifically directed to

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means for releasably retaining a cover on a pressure vessel. The pressure vessel is a sterilizer for such articles as instruments used by surgeons and dentists, the sterilizer employing a vaporized germicide under pressure.

In the present disclosure, the cover for the sterilizer tank is held under pressure against a resilient sealing gasket and for this purpose the cover is mounted on a bridge that extends across the cover. One end of the bridge is hinged to the pressure vessel with the direction of the hinge axis perpendicular to the direction of the axis of the pressure tank. The middle of the cover is connected to the bridge by the equivalent of a universal joint and for this purpose a stud fixedly extending from the middle of the cover threads into the equivalent of a ball member that is captivated by the bridge. The swingable end of the bridge is releasably connectible to the pressure vessel by a contractible latch mechanism that is constructed in accord with the teachings of the present invention.

The swingable end of the bridge is slotted to form a clevis, the slot being spanned by a transverse pivot pin, the axis of which is transverse to the direction of the separation force between the pressure vessel and the bridge. The relatively short link is pivotally mounted on the transverse pivot pin and is adapted to releasably engage a fixed element in the form of a fixed pin on the pressure vessel. The contractible latch mechanism comprises a relatively short link in combination with a latch member, which latch member has a base portion and an integral hook arm that forms a hook seat for releasable engagement with the fixed pin on the pressure vessel. One end of the relatively short link is pivotally mounted on the transverse pivot pin at the end of the bridge member and the other end of the link is connected to the base portion of the latch member by a suitable pivot connection. The link and the latch member form a linkage that functions in the manner of a toggle linkage, the linkage being movable past center into contracted locking position. When the linkage is contracted to releasably interconnect the transverse pivot pin on the end of the bridge and the fixed pin on the pressure vessel, the hook seat and the pivot connection of the link with the latch member are spaced apart with the transverse pivot pin approximately half way between the hook seat and the pivot connection. The transverse pivot pin on the bridge and the fixed pin on the vessel define a line along the direction of the separation force and the pivot connection of the link with the latch member is at a past-center position to one side of the extension of this line thereby locking the linkage in its contracted state.

With the linkage locked, the separation force acting between the pressure vessel and the bridge tends to shift the pivot connection further away from the extension of said line and thereby tends to expand the contracted linkage. The shift of the pivot connection further away from the extension of the line, however, and the consequent release expansion of the linkage are prevented by stop means on the bridge, the contracted linkage exerting pressure against the stop means in reaction to the separation force.

For the purpose of manipulating the linkage for engagement of its hook seat with the fixed element on the pressure vessel and for expansion and contraction of the linkage, a suitable operating handle is pivotally mounted on the base portion of the latch member. To prevent release expansion of the linkage when the vessel is under pressure of high magnitude, however, the handle is yieldingly connected to the latch member by detent means. If the vessel is under high pressure, any attempt to manipulate the handle to release the latch mechanism simply results in yielding of the detent means to make the handle inoperative.

An important feature of the invention is that the con-

traction of the linkage is utilized to place the sealing gasket of the cover under effective sealing pressure. Thus the screw thread connection between the cover and the bridge is adjusted and readjusted as necessary so that the sealing pressure against the cover gasket is accomplished solely by the contraction of the linkage.

The features and advantages of the invention may be understood from the following detailed description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, which are to be regarded as merely illustrative:

FIG. 1 is a sectional view of the pressure vessel cover and bridge showing the linkage or latch mechanism in its contracted state for interconnecting the vessel and the swingable end of the bridge;

FIG. 2 is a fragmentary view similar to FIG. 1 showing the handle swung to a position to release the swingable end of the bridge from the pressure vessel;

FIG. 3 is a similar view showing the continuation of the release operation to free the hook seat of the linkage from the pressure vessel;

FIG. 4 is a section through the bridge along the line 4—4 of FIG. 1;

FIG. 5 is a view of the latch mechanism as seen along the angular line 4—4 of FIG. 1; and

FIG. 6 is an exploded view of the latch mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows the front end of a pressure tank, generally designated 10, which is in horizontal position with the forward end of the tank closed by a dished cover 12. The circumferential margin of the cover 12 lies against a sealing gasket or ring 14 that seats in the circular groove 15, the sealing ring being normally compressed by the cover to prevent leakage of the high pressure gaseous fluid.

A bridge, generally designated 16, is pivotally connected at one of its ends to the pressure vessel and the swingable end of the bridge carries a latch mechanism in the form of a linkage that is generally designated by the numeral 18. In the construction shown, the pivoted end of the bridge 16 is mounted on a pivot 20 that spans a clevis 22 that is rigidly connected to the pressure tank. A second clevis 24 that is fixedly connected to the tank opposite the other end of the bridge is spanned by a fixed element in the form of a cross pin 25 and the linkage 18 is adapted for releasable engagement with this fixed element.

A screw threaded stud 26 having a base flange 28 is fixedly mounted on the center of the cover 12 by means of a screw 30. The stud 26 screws into a universal joint means comprising a metal body 32 that is mounted in a socket 34 of the bridge member 16, the socket 34 having a spherically curved surface 35 and the body 32 having a complementary spherically curved surface 36. The stud 26 screws into the body 32 and the body is retained in the socket 34 by a split ring 38 with an appreciable degree of freedom for the body to slide on the socket surface 36. By virtue of this arrangement, the cover 12 is free to accommodate itself to the open end of the tank 10 to cause the cover to press uniformly against the gasket 14.

The latch mechanism or linkage 18 comprises a latch member 40 and a link 42. The latch member 40 has what may be termed a base portion 44 and a hook portion or hook arm 45 that is formed with a hook seat 46 to releasably engage the fixed element or cross pin 25.

As may be seen in FIG. 6, the base portion 44 of the latch member 40 is provided with a slot 48 which forms two ears 50 and the two ears have aligned bores 52 and the base portion has a full width extension 54. The hook portion 45 which is formed with the hook seat 46 is narrower than the base portion 44 and is preferably formed

with a rearward shoulder 55. As may be seen in FIG. 1, by virtue of the hook portion 45 and the extension 54 of the base portion, the latch member 40 is of U-shaped configuration to permit it to straddle the link 42.

FIG. 5 further shows that the link 42 may be made in two sections 42a and 42b that straddle a web 56 of the latch member.

The swingable end of the bridge 16 is slotted to form a clevis and the clevis is spanned by a fixed pivot element in the form of a cross pin 60. One end of the two-piece link 42 is rotatably mounted on the fixed pin element 60 and the other end of the two-piece link straddles the web 56 of the latch member and is anchored to the latch member by what may be termed a pivot connection 62 in the form of a pivot pin. In the present embodiment of the invention, a suitable torque spring 64 wound around the pin 62 acts between the bridge 16 and section 42b of the link to urge the link clockwise as viewed in FIG. 1. For this purpose, one end of the torque spring is formed with a hook 65 to engage the link section 42b and the other end of the torque spring engages a small pin 66 inside the clevis of the bridge member.

It is apparent that when the linkage is in its locked position shown in FIG. 1 the torque spring 64 tends to swing the pivot connection 62 back across the line extension 80 but the torque created by the spring is relatively light and is not at all significant in comparison with the separation force even when the separation force is created solely by the resiliency of the sealing gasket 14. When the linkage is in its release state shown in FIG. 2, the tendency of the torque spring 64 to rotate the linkage 42 relative to the latch member 40 tends to shift the latch member to the right but, as shown in FIG. 2, the pivot pin 60 serves as a stop to limit the rightward shift of the latch member. Thus the latch member cooperates with the pivot pin 60 to prevent undue expansion of the linkage when the linkage is out of engagement with the cross pin 25 of the tank.

A suitable handle 68 is provided for manipulating the linkage 18 and is yieldingly connected to the linkage to limit the torque that may be transmitted from the handle to the linkage. In the present embodiment of the invention, the inner end of the handle extends into the slot 48 of the latch member and is pivotally connected to the latch member by a pivot pin 70 that extends through the bores 52 of the two ears 50 of the latch member. To provide the desired yielding connection between the handle 68 and the linkage 18, the inner end of the handle is curved concentrically of the pivot pin 70 and the inner end of the handle is provided with a detent recess 72 to releasably seat a detent ball 74 that is under pressure from a coiled spring 75, the ball and spring being mounted in a blind bore 76 in the latch member 40. If the separation force between the cover and the tank is of hazardous magnitude and the handle is swung in the direction to release the cover, the detent is overcome and the handle merely swings uselessly.

As may be seen by comparing FIG. 1 with FIG. 3, the latch member 40 is limited to a given relatively small range of rotation relative to the bridge 16 but the handle 68 may pivot through a much larger range of rotation relative to the latch member. If the detent connection between the handle and the latch member becomes unseated, the limited range of rotation of the latch member makes it possible to reseat the detent connection by simply reversing the swing of the handle through the larger range.

FIG. 1 shows the linkage 18 in its contracted state for interconnecting the pivot pin 60 of the bridge and the fixed element or cross pin 25 of the tank 10. In FIG. 1 the dotted line 80 is an extension of a solid line 82 that is defined by the axis of the fixed pin or element 25 on the tank 10 and the axis of the pivot element 60 on the bridge 16. It is to be noted that the pivot connection 62 between the link 42 and the latch member 40 lies to the left of the dotted line extension 80 as viewed in FIG. 1. Since

the separation force between the cover 12 and the tank 10 is exerted between the element 25 and the element 60 and is transmitted through the pivot connection 62, it is apparent that the separation force tends to swing the link 42 clockwise with consequent tendency to shift the latch member 40 bodily to the left. Thus the separation force tends to expand the locked linkage from its contracted state.

Such release expansion of the linkage is prohibited, however, by abutment of the back of the latch member 40 against a stop means, the stop means being the end wall 84 of the slot that forms the clevis on the swingable end of the bridge 16. As may be seen in FIG. 1 the end wall 84 is flat and the contacting back surface of the latch member 40 is also flat. The reaction to the separation force in backing the flat surface of the latch member against the flat surface of the end wall 84 causes the latch member to rigidly resist rotation relative to the bridge 16.

The fact that the pivot connection 62 is to the left of the dotted line 80 makes the linkage self locking in its contracted state, the greater the separation force the greater the pressure of the latch member against the end wall 84 of the bridge.

FIG. 2 indicates the initial release movement of the linkage in response to counterclockwise rotation of the handle 68 and FIG. 3 shows continuation of the release movement of the linkage. In the manipulation of the linkage at its expanded state for releasable engagement with the fixed element 25 of the tank 10 the linkage is moved in reverse from the position shown in FIG. 3 through the position shown in FIG. 2 to the position shown in FIG. 1.

It is apparent that in the engagement movement of the linkage the pivot connection 62 first approaches the extended line 80 from the right of the line and then moves "past center" across the line 80 to the left of the line where the linkage locks. Thus the engagement movement of the linkage involves first substantial longitudinal contraction of the linkage and finally only a minor expansion as the pivot connection 62 reaches its locked position. It is this longitudinal contraction of the linkage in its engagement movement that causes the cover 12 to exert sealing engagement against the gasket.

It is contemplated that the screw adjustment of the stud 26 relative to the bridge 16 will be normally fixed but may be changed whenever desired. As best shown in FIG. 4 the wall of the socket 34 is formed with a radial bore 90 and a set screw 92 that is somewhat smaller in diameter than the bore is threaded through the body 32 into engagement with the threaded stud 26. When it is desirable to adjust the threaded engagement of the stud 26 with the body 32, the set screw 92 is loosened sufficiently to permit rotation of the stud relative to the body. The cover 12 may then be rotated to screw the stud 26 inwardly or outwardly of the body 32.

Since the set screw 92 extends into the bore 90 it interlocks the body 32 and the bridge 16 to hold the body against rotation while the screw adjustment of the stud is carried out. It is to be noted, however, that the diameter of the bore 90 is sufficiently larger than the diameter of the set screw 92 to permit the freedom of angular movement between the body 32 and the bridge 16 that is required for self-adjustment of the cover relative to the sealing gasket 14.

When the device is first assembled the cover 12 is adjusted relative to the bridge 16 in this manner to cause the range of contraction of the latch mechanism to provide the sealing pressure against the gasket 14. In the event that the sealing pressure becomes inadequate in the course of time because of permanent deformation of the sealing gasket, it is a simple matter to loosen the set screw 92 to permit the cover 12 to be rotated to increase the distance of the cover from the bridge as may be necessary to cause the range of contraction of the linkage 18 to provide the desired sealing pressure against the gasket 14.

My description in specific detail of the presently preferred embodiment of the invention will suggest various changes, substitutions and other departures from my disclosure.

I claim:

1. In a latch mechanism to releasably interconnect a first object and a second object to resist a separation force between the two objects, the combination of:

- a fixed element on the first object;
- a pivot element on the second object;
- a latch member having a hook portion forming a hook seat to engage said fixed element on the first object;
- a link having one end pivoted on said pivot element of the second object;
- a pivot connection anchoring the other end of the link to the latch member,
- said link and latch member forming a linkage, said linkage being contractible to releasably interconnect the pivot element and fixed element,
- said pivot element and fixed element defining a line along the direction of the separation force when the linkage is contracted,
- said hook seat and said pivot connection being spaced apart with said pivot element between the hook seat and the pivot connection,
- said pivot connection being at a past-center position to one side of the extension of said line when the linkage is contracted whereby the separation force tends to shift the pivot connection further away from the extension of the line to expand the contracted linkage;
- stop means on said second member blocking such shift of the pivot connection thereby to keep the linkage contracted with the linkage exerting pressure against the stop means in reaction to the separation force; and
- a handle for said linkage operable to shift the pivot connection in one direction across the extension of said line to contract the link and to return the pivot connection in the opposite direction across the line for releasing expansion of the linkage.

2. A combination as set forth in claim 1 which includes spring means acting between the link and the latch member when the linkage is contracted to urge relative rotation of the link and the latch member in the direction to return the pivot connection past center across the extension of said line for release expansion of the linkage.

3. A combination as set forth in claim 2 which includes means to limit the release expansion of the linkage.

4. A combination as set forth in claim 2 in which said hook portion of the latch member extends between said stop means on the second object and said pivot element on the second object whereby the spring means urges said hook portion against the pivot element when the linkage is expanded in releasing manner and the pivot element serves as a stop for the hook portion to limit release expansion of the linkage.

5. A combination as set forth in any one of claims 1, 2, 3 and 4 in which said handle has a yielding operating connection with the linkage, said connection yielding at a relatively low torque to fail to return the pivot connection past center in the event that the magnitude of the separation force is above a predetermined relatively low magnitude.

6. A combination as set forth in claim 5 in which said handle is pivotally mounted on the latch member; in which one of said handle and said latch member is formed with a detent recess and the other of the handle and latch member is provided with a spring-pressed detent member to yieldingly seat in the recess; and in which means is included to limit the rotation of the latch member relative to the second object to a given relatively small angular range; and in which the handle is rotatable relative to the latch member through a substantially larger range,

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whereby when the detent member is unseated the handle may be rotated beyond said given range to reseat the detent member.

7. A combination as set forth in claim 6 in which said latch member is an elongated member with said hook seat at one end thereof and with said handle mounted on the other end thereof, said pivot connection being intermediate the two ends of the latch member.

8. Means to releasably connect a cover to a pressure tank to resist a separation force between the cover and the tank with the cover under sealing pressure against a resilient gasket, comprising:

a bridge pivotally connected to the tank at one of its ends;

a pivot element on the other end of the bridge;

a universal joint means on the bridge intermediate the two ends of the bridge;

a fixed element on the tank;

a latch member having a hook portion forming a hook seat to engage said fixed element on the tank;

a link having one end pivoted on said pivot element of the bridge;

a pivot connection anchoring the other end of the link to the latch member,

said link and latch member forming a linkage, said linkage being contractible to releasably interconnect the pivot element on the bridge and the fixed element on the tank,

said pivot element and fixed element defining a line along the direction of the separation force when the linkage is contracted,

said hook seat and said pivot connection being spaced apart with said pivot element between the hook seat and the pivot connection,

said pivot connection being at a past-center position to one side of the extension of said line when the linkage is contracted whereby the separation force tends to shift the pivot connection further away from the extension of the line to expand the contracted linkage;

stop means on said bridge blocking off such shift of the pivot connection thereby to keep the linkage contracted with the linkage exerting pressure against the stop means in reaction to the separation force;

a handle for said linkage operable to shift the pivot

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connection in one direction across the extension of said line to contract the link and to return the pivot connection in the opposite direction across the line for releasing expansion of the linkage; and

screw means connecting said cover to said universal joint means to permit adjustment of the spacing of the cover from the bridge whereby said spacing may be adjusted by screw action to cause the contraction of the linkage to place said gasket under sealing pressure.

9. A combination as set forth in claim 8 in which said handle has a yielding operating connection with the linkage, said connection yielding to a relatively low torque to make the handle inoperative in the event that the magnitude of separation force created by fluid pressure in the tank is above a predetermined relatively low magnitude when the linkage is contracted.

10. A combination as set forth in any one of claims 8 and 9 in which said universal joint means includes a body captivated by the bridge;

in which screw means fixedly extends from the cover into threaded engagement with said body;

and which includes a set screw threaded into said body for releasable engagement with said screw means to releasably secure the adjustment of the cover relative to the bridge, the outer end of said set screw extending through a bore of the bridge to engage the bridge to limit rotation of the body when the screw means is rotated to change said spacing, said bore being oversized relative to the set screw to permit a degree of universal movement of the body relative to the bridge required for self adjustment of the cover relative to the resilient gasket.

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GEORGE T. HALL, Primary Examiner

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21—91; 292—113