Nov. 1, 1955 A. F. SAXON 2,722,339

CLOSURE ASSEMBLY

Filed Nov. 15, 1951 2 Sheets-Sheet 1

Fig. 1.

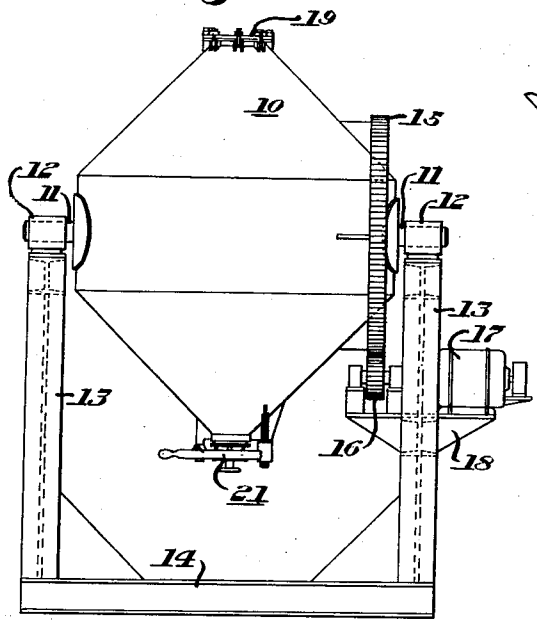


Fig. 2.

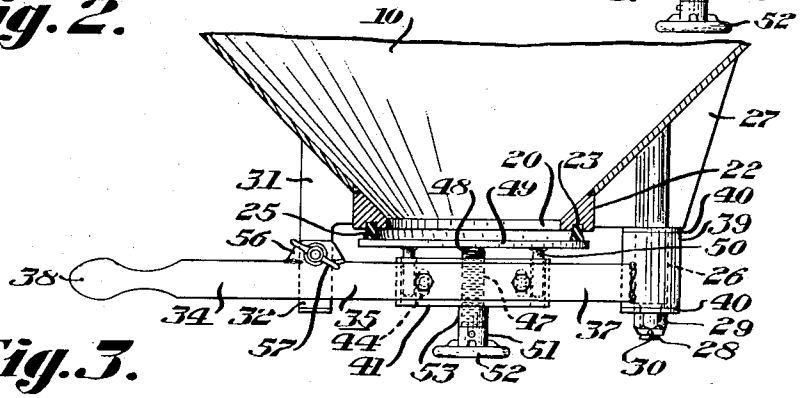


Fig. 3.

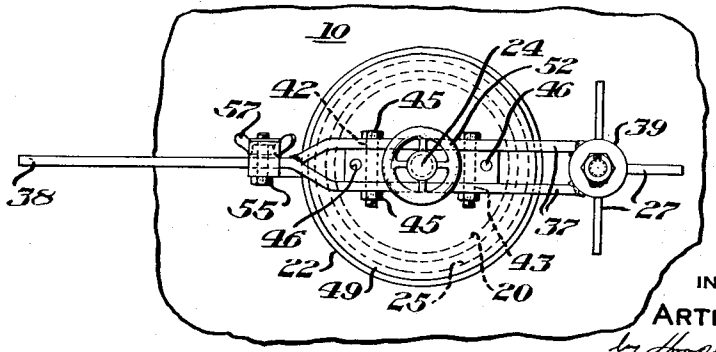


Fig. 4.

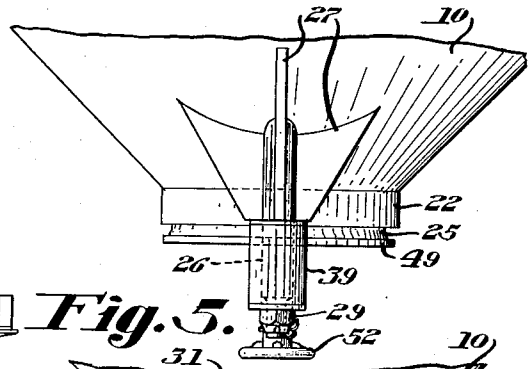
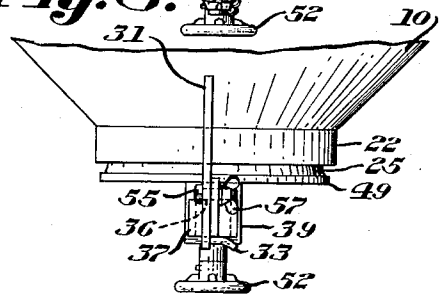


Fig. 5.



INVENTOR
ARTHUR F. SAXON
by Hopgood, Calimafde & Gilman
his Attorneys

Nov. 1, 1955 A. F. SAXON 2,722,339

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Filed Nov. 15, 1951 2 Sheets-Sheet 2

Fig. 6.

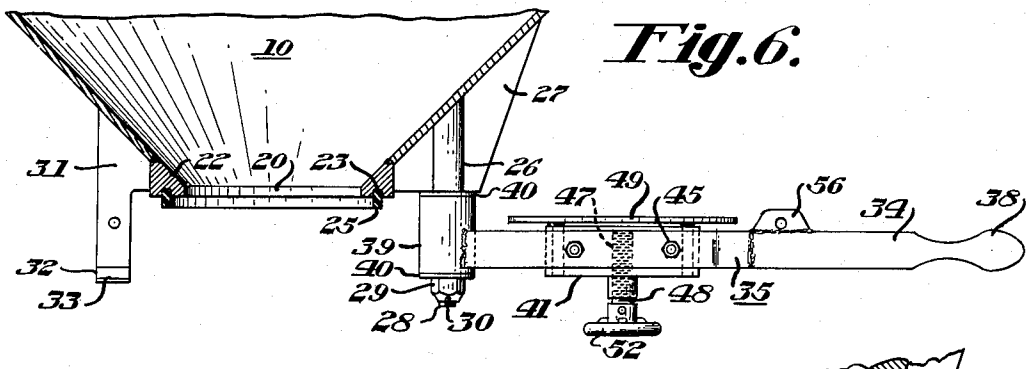


Fig. 7.

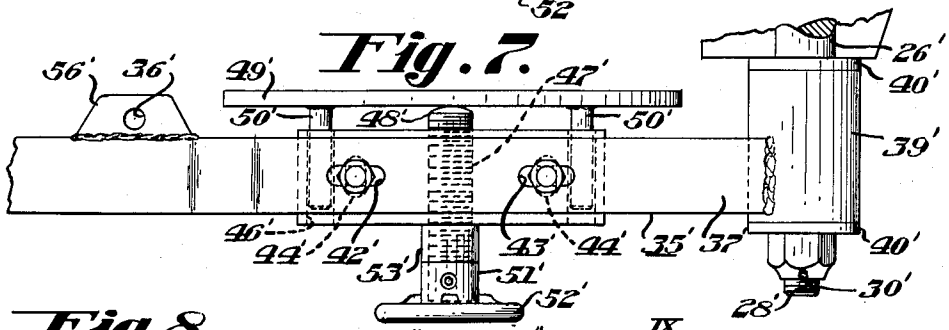


Fig. 8.

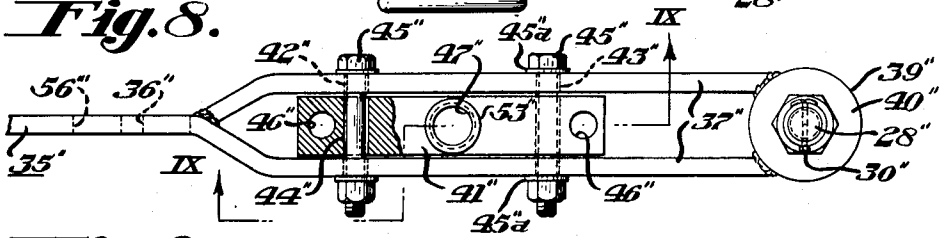


Fig. 9.

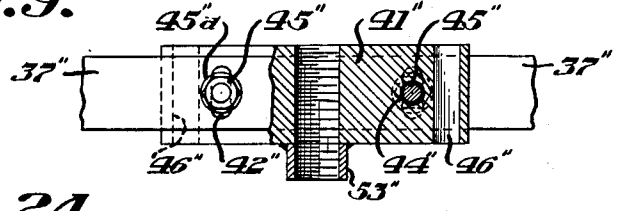
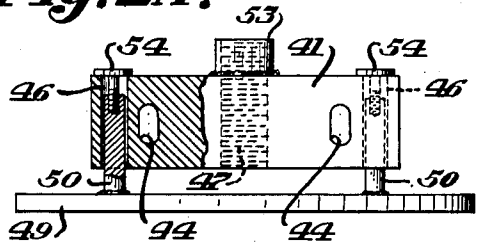


Fig. 2A.



INVENTOR
ARTHUR F. SAXON
by Hoopes, Leonard & Gifford
his attorneys

United States Patent Office

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CLOSURE ASSEMBLY

Arthur F. Saxon, Aspinwall, Pa., assignor, by mesne assignments, to Blaw-Knox Company, Pittsburgh, Pa., a corporation of Delaware

Application November 15, 1951, Serial No. 256,562

10 Claims. (Cl. 220—57)

This invention relates to a new closure assembly for vessels having an opening therein to be periodically opened and closed by such closure assembly. More particularly, this invention pertains to such a closure assembly which is readily opened and closed and is adjustable to provide control of the extent of movement of portions of said closure assembly. At the same time, means are provided to supportably engage and guide other portions of said assembly when moving it into said closed position.

In the field of tumblers and mixers of the kind used to blend and uniformly mix dry materials frequently of various weight, size and form, there may be one or more openings which require periodical opening and closing for charging and discharging as the case may be. In the case of many materials, a sliding type of door for such openings cannot be used. Thus, in cases where in the mixing there is an explosive dust atmosphere created or where the materials are inherently of an explosive nature, frictional heat of the kind generated by the sliding door must frequently be avoided. Further, where the packing material to be used is relatively soft or flexible, undue wear of that packing may occur with a sliding type of door. In some cases, such tumblers and mixers have been provided with doors which effected final closure by abutting movement toward the opening until the packing material was engaged. However, such last-mentioned type of doors generally were incapable of providing uniform closure throughout the life of the packing used. As the packing deteriorated, without such adjustment material might escape. On the other hand, excessive closing pressure when the packing material was new might impair its life and make the closure operation itself more difficult. Still further, in many prior doors the final closure thereof could not conveniently be performed because the parts involved were relatively difficult to reach.

In the new construction of this invention, the foregoing difficulties and problems have been overcome. By means of this invention, regardless of the aging of the packing or gasket material or the deterioration thereof that may be caused by the character of the materials passed through the opening in the vessel, the extent of the closure can be precisely controlled and also adjusted to continue obtaining satisfactory closure regardless of the wear or deterioration of the gasket or packing material used around the vessel opening. Other objects and advantages will be apparent from the following description and from the drawings, which are illustrative only, in which

Figure 1 is a view in end elevation of a mixer to which one embodiment of a new closure assembly of this invention has been applied;

Figure 2 is an enlarged view of the closure assembly embodiment illustrated in the closed position shown in Figure 1 with the adjacent portions of the mixer vessel in section;

Figure 2A is a possible variant of a part of the embodiment shown in Figure 2 for a purpose hereinafter described;

Figure 3 is a view of the embodiment shown in Figure 2 when looking along the axis of the vessel with said embodiment nearer the eye;

Figure 4 is a view of the embodiment shown in Figure 2 when looking at the hinged end thereof normal to the axis of the vessel;

Figure 5 is a view of the embodiment shown in Figure 2 when looking at the outer end thereof normal to the axis of the vessel;

Figure 6 is a view of the embodiment shown in Figure 2 with the vessel in the same relative position and with the new closure assembly in open position relative to the opening in said vessel;

Figure 7 is a modification of the embodiment shown in Figure 2, which modification permits adjustment both parallel to and normal to the axis of the vessel;

Figure 8 is a further modification of the embodiment shown in Figure 2, which provides a different mode of connection between parts of the new closure assembly; and

Figure 9 is a view taken on line IX—IX of Figure 8.

Referring to the drawings, a conventional vessel **10** is provided with trunnions **11** journaled in bearings **12**. Vessel **10** may be used for a variety of operations such as tumbling for mixing or other purposes and may have any of many various shapes. The bearings **12** are rigidly connected to pedestals **13** in turn rigidly supported on a structural base **14**. A spur gear **15** may be connected to the exterior of vessel **10** to rotate said vessel by the engagement of gear **15** with a pinion **16**. An electric motor and gear reducer **17** may be used to turn pinion **16**, said motor and pinion being mounted on a shelf **18** fastened to the adjacent pedestal **13**. If vessel **10**, for example, has a double conical shape, it may be provided with a relatively permanent cover **19** bolted to one end thereof to close the opening at that end. Vessel **10** may also be provided with an opening **20** at the other end thereof which opening is periodically opened and closed as desired by means of an embodiment **21** of the new closure assembly of this invention. An annular flange **22** may be welded to vessel **10** around opening **20** to define said opening and a groove **23** may be provided in the surface of flange **22** normal to the axis **24** of said opening **20** and vessel **10**. Packing material **25** which may be in the form of a ring gasket of rubber or other suitable material may be inserted in and held in groove **23**.

A hinge pin **26** may be welded to the outside of vessel **10** adjacent flange **22** and further is supported by gussets **27**, the axis of pin **26** being parallel to axis **24** in the embodiment shown. The outer end **28** of pin **26** may be reduced and threaded for engagement by a castellated nut **29** and cotter pin **30**. On the opposite side of flange **22**, a supporting bracket **31** may be provided and welded to the outside of vessel **10**. A lower end **32** of bracket **31** is L-shaped as shown in Figure 5. The outer end **33** of the bottom lateral extension of bracket **31** is bent downwardly to form a guiding surface for the handle end **34** of a frame **35**. A hole **36** may be provided through the upright portion of bracket **31** for a purpose to be described.

Frame **35** may comprise a pair of oppositely disposed spaced sides **37** welded or otherwise secured together and terminating in a handle **38** at handle end **34** and in a hinge bearing **39** at the opposite end. Hinge bearing **39** may be in the form of a hollow right cylinder which fits around the smooth sides of hinge pin **26**. Washers **40** may be respectively inserted around hinge pin **26** at the opposite ends of bearing **39** to maintain the freedom with which frame **35** can be swung in a fixed path toward and away from opening **20**. Opening **20** would be com-

pletely opened when frame 35 has its handle end 34 moved toward the viewer, as seen in Figure 2, until no part of the new closure assembly overlaps said opening 20. Frame 35 is in closed position in the positions shown in Figures 1 to 5, inclusive.

A block 41 is provided and has a width which enables it to fit between sides 37 and relatively closely thereto. Sides 37 are provided with registering openings 42 and 43 in respective alignment with vertically elongated slots 44 extending from side to side through block 41. A bolt and nut assembly 45 extends through each of the registering openings 42 and 43 and their respectively aligned slots 44. By tightening the nuts of the bolt and nut assembly 45, the sides 37 press against the sides of block 41 and rigidly connect block 41 to frame 35 in the particular adjustment position desired.

Block 41 is also drilled to provide openings 46, the axes of which are also parallel to axis 24 when frame 35 is in closed position as shown in Figure 3. Block 41 is also provided with bore 47 through the center thereof in alignment with axis 24 when frame 35 is in closed position. Bore 47 is tapped for threaded engagement with a screw 48, the inner end of which may engage a closure plate 49 to move it toward opening 20 when frame 35 is in closed position to compress gasket 25 to the desired extent. Closure plate 49 is provided with rearward or outwardly extending extensions 50 which extend into openings 46 thereby guiding closure plate 49 in the course of any movement under the influence of screw 48. The outer end of screw 48 is keyed to a hub 51 integral with a handwheel 52. A collar 53 is tapped through the center thereof in alignment with and corresponding to the pitch of the threads in bore 47, said collar 53 being welded to the under side of block 41. Hence, when hub 51 is seated against the adjacent surface of collar 53, as shown in Figure 2, such seating limits the inward movement of screw 48 and thereby controls the extent of movement of closure plate 49 toward opening 20 when frame 35 is in a closed position. Whenever additional movement of closure plate 49 is required toward opening 20 for proper sealing because of the deterioration of gasket 25 or otherwise, the bolt and nut assembly 45 may be loosened and block 41 moved correspondingly a sufficient distance toward the upper side of sides 37 as shown in Figure 2 to provide the desired adjustment. Thereupon the nut and bolt assembly 45 can be retightened and operations continued with assurance of complete and proper sealing. At the same time, the travel which occurs in the final closing by movement of closure plate 49 toward opening 20 and gasket 25 is limited when hub 51 stops against the adjacent surface of collar 53, thereby preventing undue compression of gasket 25.

The new closure assembly is a quick opening construction as well as a quick-closing one. Thus, in opening vessel 10 closed as shown in Figure 2, handwheel 52, which is within easy reach of an operator, is turned to separate hub 51 and collar 53, thereby lowering closure plate 49 out of engagement with gasket 25. Thereupon, handle 38 can be grasped and thrown in the direction of the arrow in Figure 3 to move the closure assembly wholly away from opening 20 through which rapid discharge may then take place. In its open position, the new closure assembly has been swung around hinge pin 26 as generally shown in the position shown in Figure 6. Charging of vessel 10 may be done by removing cover 19 and charging through the opening at that end when in the position shown in Figure 1. Otherwise, opening 20 may be turned away from the lowermost position as to a position 90° removed therefrom so that axis 24 may be generally horizontal and charged when frame 35 is moved to open position. In some cases, vessel 10 may be charged through opening 20 when opening 20 is generally in a topmost position of vessel 10 and when such is done, wide headed bolts 54 may be secured to the outer ends of the extensions 50 beyond the outer ends of openings 46 to prevent closure plate 49 from falling away from block 41, as shown in Figure 2A.

If desired, a bolt 55 when frame 35 is in closed position may be extended through opening 43 and a corresponding opening in a lug 56 welded to frame 35, the bolt being retained in place by a nut 57. The bolt and nut 55—57 may thus be used to insure against any swinging of frame 35 out of closed position when vessel 10 is rotated on its trunnions 11 after closure plate 49 has been moved into final closure against gasket 25. In swinging frame 35 into its closed position as shown in Figures 2, 3 and 5, handle end 34 engages the outer sloped end 33 of bracket 31 and is guided thereby, the underside of handle end 34 resting on the bottom of the L-shaped bracket 31 as shown in Figure 5. Thereby, if desired, the handle end of frame 35 can be supportably engaged by bracket 31 when frame 35 is in closed position by virtue of which wear of the hinge assembly 26—39—40 is minimized.

In the modification shown in Figure 7, those parts thereof corresponding in general construction and function to parts of the embodiment shown in Figures 1 to 6, inclusive, are correspondingly numbered with the addition of a prime accent thereto. In the modification of Figure 7, the openings 42′ and 43′ in sides 37′ take the form of horizontally elongated slots. Thereby, the adjustment of block 41′ relative to frame 35′ can be both parallel to axis 24′ and normal thereto in those cases where both such types of adjustment may find value.

Similarly, in the further modification of Figure 8, the parts thereof corresponding in general construction and function to parts of the embodiment shown in Figures 1 to 6, inclusive, are similarly numbered with the addition of a double prime accent thereto. The embodiment of Figure 8 may be used, for example, in larger size apparatus where the strength of the sides 37″ has to be such that they are too rigid to be conveniently pressed against the sides of block 41″. In this last case, the opening 44″ through block 41″ may correspond to the diameter of the bolts in assemblies 45″ whereas openings 42″ and 43″ may be elongated slots with washers 45″*a* being used on the outside of sides 47″ to provide a rigid positioning of block 41″ relative to frame 35″ in whatever adjustment position is selected.

Various other modifications such as that of providing a hinge pin with its axis normal to the axis of the vessel and offset so as not to be in alignment with the opening thereof may be made without departing from the spirit of this invention which may be variously practiced within the scope of the following claims.

I claim:

1. In a closure assembly for a vessel having an opening, in combination, a frame movably connected to said vessel adjacent said opening, an adjustable member rigidly connected to said frame, means extending between said frame and member for adjustment of said member relative to said frame, a closure member in engagement with and movably guided by said last-mentioned member, and means for moving said closure member relative to said adjustable member and frame when said frame extends across said opening to open and close said opening.

2. In a closure assembly for a vessel having an opening, in combination, a frame movably connected adjacent one end to said vessel for movement in a fixed path adjacent said opening, a bracket to engage said frame adjacent its other end when said frame extends across said opening, an adjustable member rigidly connected to said frame, means extending between said frame and member for adjusting said member relative to said frame, a closure member in engagement with and movably guided by said last-mentioned member, and means for moving said closure member a fixed distance relative to said adjustable member and opening when said frame extends across said opening.

3. In a closure assembly for a vessel having an open-

ing and packing to surround said opening, in combination, a frame hinged to said vessel adjacent said opening and movable toward and away from said opening, a block rigidly connected to said frame, means for adjusting said block respectively relative to said frame and opening to vary the position of said block relative to said opening, a closure plate mounted on said block, threaded means for moving said closure plate axially toward said opening to engage said packing when said frame extends across said opening, and a stop connected to said block for limiting the movement of said threaded means to control the extent of closure of said closure plate.

4. In a closure assembly for a vessel having an opening, in combination, a frame hinged to said vessel and movable toward said opening, a block rigidly connected to said frame, means for adjusting said block relative to said frame to vary the position of said block relative to said opening, a closure plate in guided engagement with said block and movable relative to said opening, means connected to said block and engaging said closure plate to move it axially relative to said opening, and cooperating means on said block and said last-mentioned means for limiting the movement of said last-mentioned means to control the extent of closure of said closure plate.

5. In a closure assembly for a vessel having an opening, in combination, a frame having spaced sides connected to said vessel and movable toward said opening, a block positioned between said sides, an adjustable slot and bolt assembly rigidly connecting said block and said sides, a closure plate in guided engagement with said block, said closure plate being positioned between said block and said opening, means for moving said closure plate axially toward said opening when said frame is in that position in which said closure plate is in registry with said opening, and means connected to said frame for limiting the movement of said last-mentioned means to fix the extent of closure of said closure plate.

6. In a closure assembly for a vessel having an opening, in combination, an elongated frame hingedly connected to said vessel, a block connected to said frame intermediate the ends thereof, slot and bolt means rigidly connecting said block and said frame, said block being adjustable relative to said frame, a screw extending through said block generally along the axis of said opening when said frame is positioned across said opening, said block having at least one opening therethrough parallel to said axis, a closure plate positioned between said block and said first-mentioned opening when said frame is positioned across said first-mentioned opening, an outward extension connected to said closure plate and slidably extending into said opening in said block to guide the movement of said closure plate, said closure plate engaging the inner end of said screw, and means for turning said screw to move said closure plate relative to said first mentioned opening when said frame extends across it.

7. In a closure assembly for a vessel having an opening, in combination, a frame having spaced sides hingedly connected to said vessel, a block positioned between said sides, an adjustable slot and bolt assembly rigidly connecting said block to said sides, a screw extending through said block generally along the axis of said opening when said frame extends across said opening, said block having at least one opening therethrough parallel to said axis, a closure plate positioned between said block and said opening when said first-mentioned frame extends across said first-mentioned opening, an outward extension connected to said closure plate and extending into said opening in said block to guide the movement of said closure plate, said closure plate engaging the inner end of said screw, means for turning said screw to move said closure plate relative to said first-mentioned opening when said frame extends across said first-mentioned opening, and means connected to said frame for limiting the axial movement of said screw toward said opening when said frame extends across said first-mentioned opening.

8. In a closure assembly for a vessel having an opening, in combination, a frame having spaced sides hingedly connected adjacent one end to said vessel about an axis parallel to the axis of said opening, a block fitting between said sides, an adjustable slot and bolt assembly rigidly connecting said block in said sides, a screw extending through said block generally along the axis of said opening when said frame extends across said opening, said block having openings therethrough parallel to said axis, a closure plate positioned between said block and said first-mentioned opening when said frame is in that position in which said closure plate is in registry with said first-mentioned opening, outward extensions connected to said closure plate and extending into said openings in said block respectively to guide the movement of said closure plate, said closure plate engaging the inner end of said screw, means for turning said screw a limited distance to move said closure plate axially relative to said first-mentioned opening when said frame is in said last-mentioned position, and a supporting bracket adapted to engage and guide the other end of said frame when moved into said last-mentioned position.

9. In a closure assembly for a vessel having an opening, in combination, a frame hinged to said vessel for movement toward and away from said opening, a block rigidly connected to said frame, said block being adjustable relative to said frame, a closure plate carried by said frame and movable with said block, said closure plate being in a plane parallel to the plane of said opening and between said opening and said frame and block when said closure plate is moved into registry with said opening, means for moving said closure plate axially relative to said opening during such registry, means carried by said frame for guiding said closure plate during such movement, said next to last mentioned means generally coinciding with the axis of said opening, and means carried by said frame for limiting the extent of axial movement of said last mentioned means, whereby non-sliding closure of said opening by said closure plate is obtained with a predetermined movement of said closure plate toward said opening in such vessel to preserve any packing that may be used between said closure plate and the edge of said opening.

10. In a closure assembly for a vessel having an opening, in combination, a frame hinged to said vessel for movement in a plane generally parallel to the plane of said opening, a block rigidly connected to said frame, said block being adjustable relative to said frame, a closure plate carried by said frame and movable with said block, said closure plate being movable in a direction normal to the plane of movement of said frame, said closure plate being in a plane intermediate the plane of said opening and said plane of movement of said frame, and means for moving said closure plate axially toward said opening when said frame has been moved into a position in which said closure plate is spaced axially of said opening, whereby a combination of parallel and axial closure movements is provided in that order for ready axial seating of said closure plate over said opening.

References Cited in the file of this patent

UNITED STATES PATENTS

49,170	Taylor et al.	Aug. 1, 1865
439,040	Ruscoe	Oct. 21, 1890
666,301	Campbell	Jan. 22, 1901
1,956,665	Cahall	May 1, 1934
2,176,306	Kuss	Oct. 17, 1939
2,386,293	Clements	Oct. 9, 1945
2,556,354	Williamson et al.	June 12, 1951

FOREIGN PATENTS

25,496	Great Britain	1902
631,548	France	Sept. 17, 1927