June 26, 1951 R. A. McLACHLAN 2,558,220

CONTAINER CLOSURE

Filed June 8, 1946 3 Sheets-Sheet 1

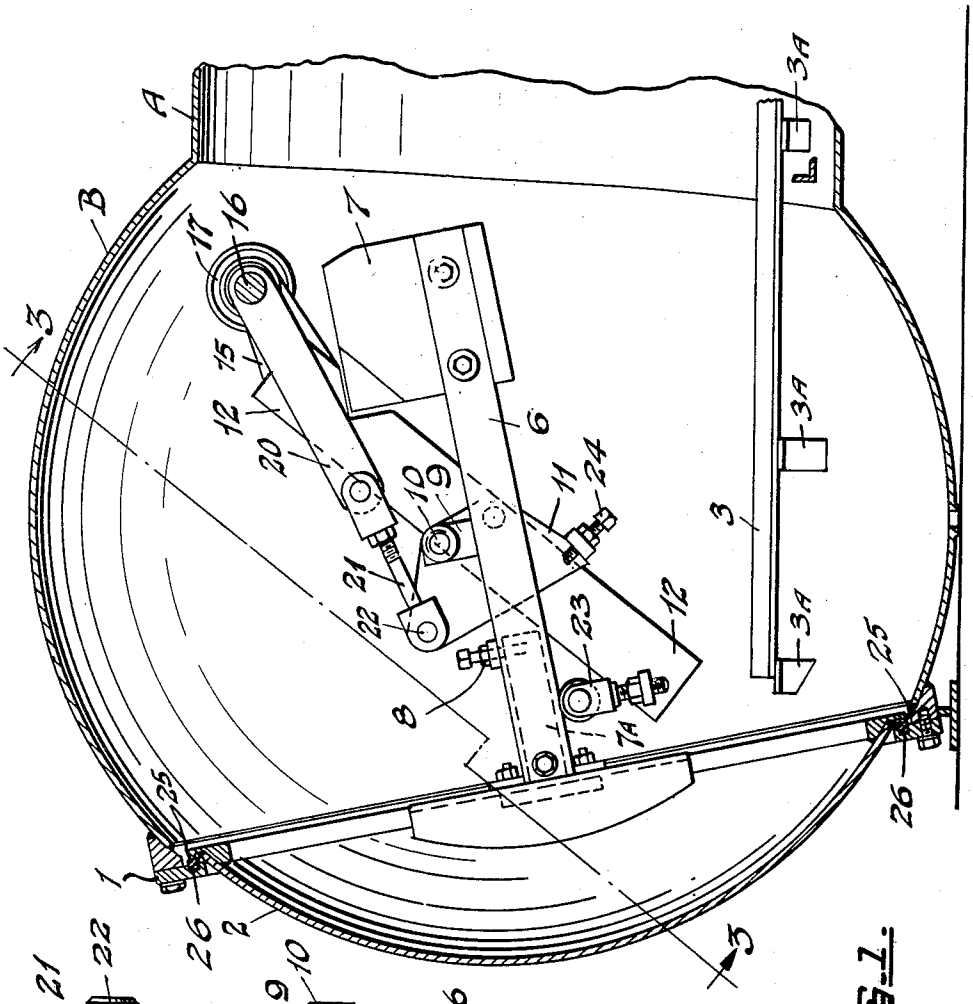


FIG. 1.

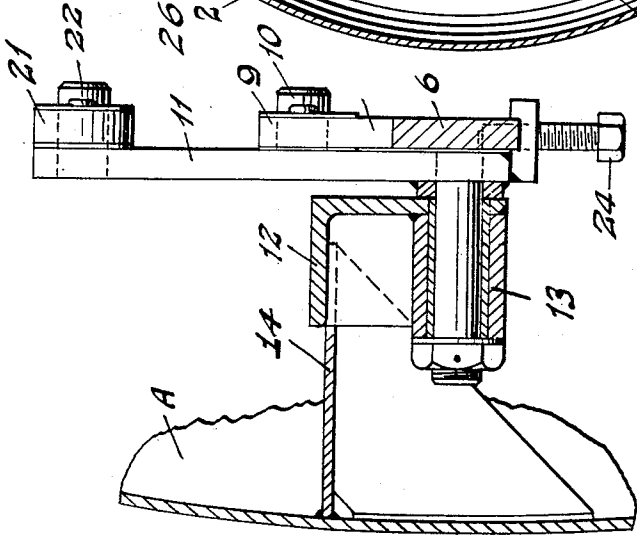


FIG. 4.

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CONTAINER CLOSURE

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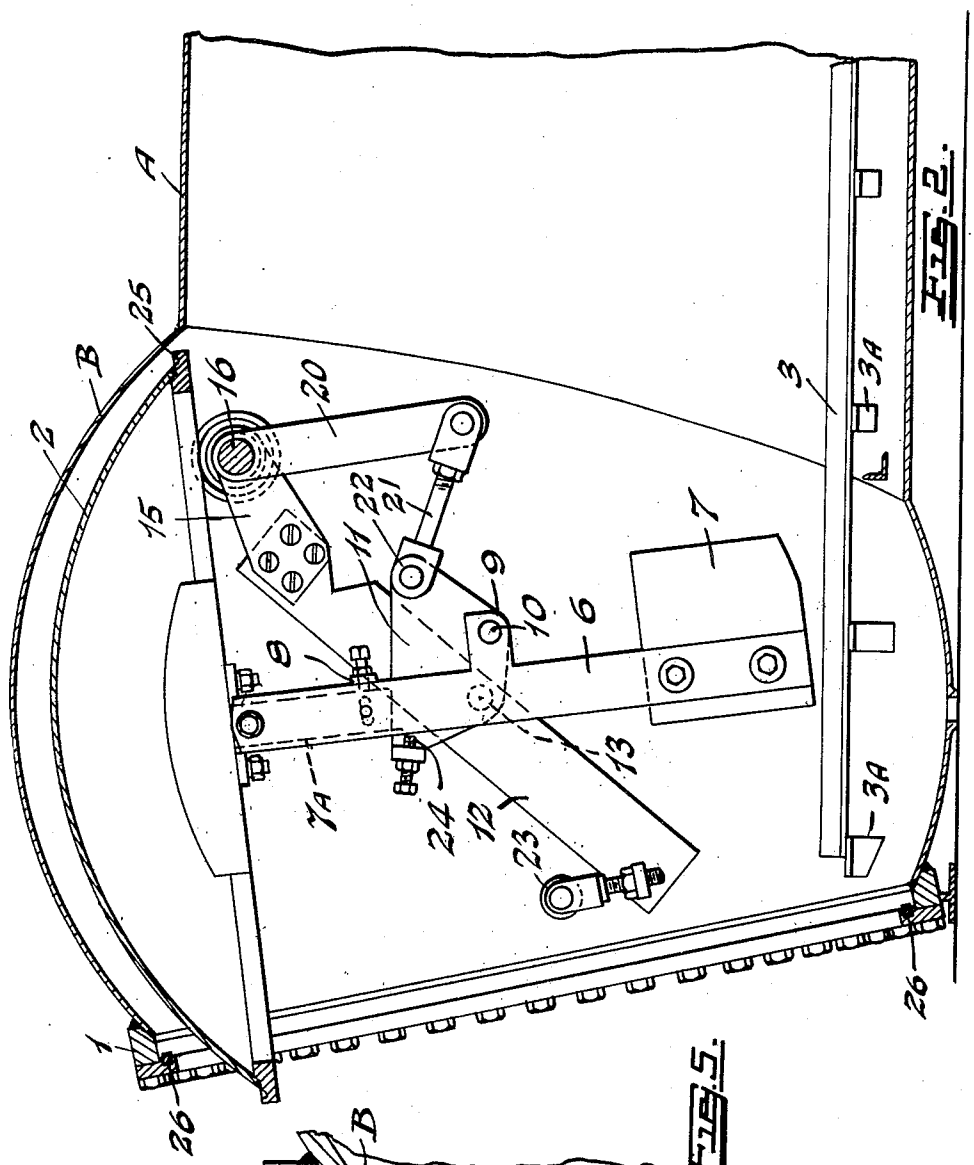


FIG. 2.

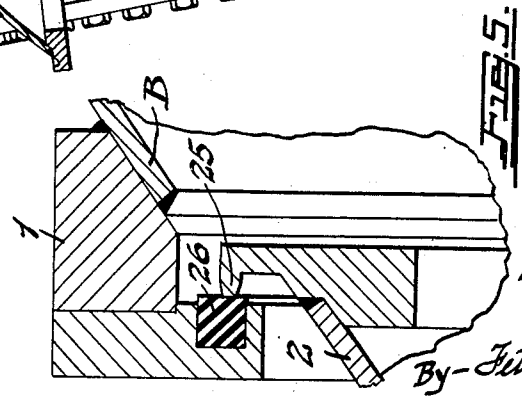


FIG. 5.

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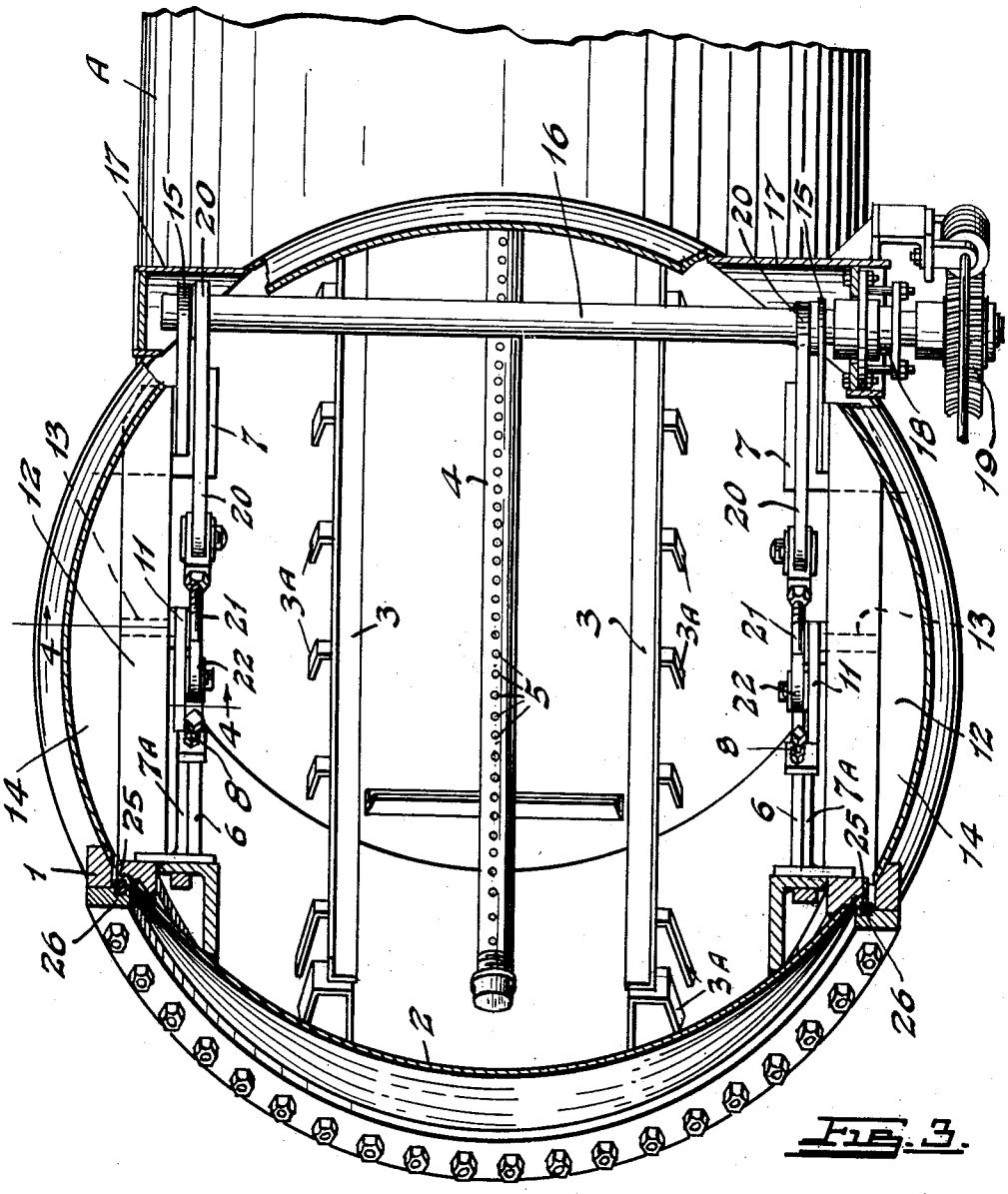


FIG. 3.

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CONTAINER CLOSURE

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7 Claims. (Cl. 268—50)

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This invention relates to closures for openings in containers and is particularly adapted for use in containers such as autoclaves, retorts and the like, in which pressures exceeding that of the atmosphere are produced so that it is desirable that the pressure in the container should assist in sealing the door against the frame of the opening, herein referred to as the door frame.

Many kinds of closures for openings in pressure containers have been proposed and some of these have been so designed that the higher pressure within the container contributes to the effective sealing of the opening by the door. All such container closures are objectionable for one or more of the following reasons:

1. They provide no positive control of the door during its movement from one or other of the open and closed positions.

2. They make use of a door or parts or accessories therefor detached from the container when not in use.

3. They have a door which, to open, requires to be moved through an auxiliary opening in the container.

4. They are unsuitable for power operation.

A form of closure has been devised which overcomes all these objections, is positive in its action throughout the movement of the door, is readily adaptable to relatively rapid power operation and constitutes an effective, conveniently operable closure which does not require any excessive expansion of the container, offers no appreciable obstacle to charging or emptying it, and the tightness of which is contributed to by any pressure outwards from the container.

The invention consists in a door which rotates between the open and almost closed positions around an axis spaced inwardly from the opening and between the almost closed and fully closed positions moves to or from the opening along a line substantially normal to the plane in which the opening lies. The door is positively movable irrespective of the position of the container by the application of energy to means which may be outside or inside the container walls. The mode of connecting the door to the side walls of the container and/or rotating and closing it will more fully appear from the embodiment of the invention shown in the following drawings and description.

In the drawings

Fig. 1 is a cross-section of the closure apparatus and part of the container with the door in a closed position and showing one of the two sets of parts adapted to move it,

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Fig. 2 shows partly in elevation a similar cross-section with the door nearly open,

Fig. 3 is a sectional view along the line 3—3 of Fig. 1,

Fig. 4 is a detailed cross-sectional view along the line 4—4 of Fig. 3, and

Figure 5 is a detailed cross-sectional view showing one form of the contact between the edge of the door and the frame thereof when the door is fully closed.

The container A, partly shown in the drawings, is provided with a closure casing B of approximately circular cross-section with a circular opening surrounded by a bolting ring 1 closed by a dished circular door 2, but the container opening and door may be of any convenient shape and curvature which permits the rotation of the door from the closed position shown in Figure 1 to the open position shown in Fig. 2. For certain purposes an elliptical opening and door with a sealing ring integral with the container instead of being bolted to it may be more convenient than an opening and door of the shape shown. The container shown is moreover one of considerable size and the opening in the closure casing is slightly off the vertical plane adapted to permit the entry into and withdrawal from the container of trucks on which the articles to be treated are carried and which are borne by rails 3 mounted on brackets 3A with between them a pipe 4 for the supply to the container of steam through openings 5. The container and closure casing may, however, be of any convenient size, the opening in any convenient plane, and any convenient method of treatment of the contents of the container may be used without affecting the applicability of this invention.

The door 2 is carried on arms 6 of which there is one at each side and which have counterweights 7 at their ends opposite from the door, these counterweights may be together less than sufficient to counterbalance the weight of the door.

The arms 6 are pivoted at the ends nearest the door to a plate 7a affixed to the door having attached to it an adjustable stop 8 whereby the angular relation of the arm 6 to the plate can be adjusted so that the door in the almost closed position will be parallel to the door frame. At their inside ends the arms 6 are pivoted at the points 9 through projections 10 on rockers 11 which are in turn pivoted on bearing brackets 12 by bearings 13, the bearing brackets 12 being affixed to the sides of the closure casing by means of members 14 from the end of which extend

members 15 forming bearings for the shaft 16. The pivot points 9 are spaced from the arms and lie substantially in the vertical plane thereof, whereas the pivot bearings 13 are beside the arms and in approximately the same plane as the arms, said plane being substantially at right angles to the first-mentioned plane.

For the ends of this shaft there are provided recesses 17 in each side of the casing and one end may pass through a stuffing box 18 to the outside of the container wall where provision is made as indicated at 19 for the application to it manually or otherwise of the energy necessary to cause the rotation of the door when this is desired. If desired, suitable means for rotating the shaft 16 and the door may be inside the casing, in which case the shaft 16 will not have to pass through the walls thereof and the stuffing boxes will not be required.

To the shaft 16 towards each end thereof are rigidly attached cranks 20 pivoted at their opposite ends to links 21 and the other ends of such links are pivoted at 22 to the rockers 11. At the end of the bearing brackets 12 nearest the door are adjustable stops 23 adapted to carry the weight of the door as it approaches the closed position by their contact with the arm 6, and on the rockers 11 are adjustable stops 24 adapted to contact the arms and lift the door when the rockers 11 have made part of their rotation. The shaft 16 does not necessarily have to be in the position shown relative to the door as long as the cranks 20 and links 21 are arranged to impart the desired motion to the rockers 11.

If the door 2 is in the open position as shown in Fig. 2 and the shaft 16 is rotated so as to move the cranks 20 from right to left, the links 21 will move the rockers 11 and consequently the stops 24 allowing the door by means of its unbalanced weight to move downwardly towards the closed position. This it will continue to do until the arms 6 come into contact with the stops 23, after which the continued movement leftward of the cranks 20 and the continued rotation of the rockers 11 will drive the door directly towards the door opening along a line substantially normal to its plane, determined by the stops 8 and 23. The tightness of the contact between the door edges 25 and the door frame constituted by the bolting ring 1, or an equivalent integral part of the door frame will be increased if the door edges 25 are shaped as indicated in Fig. 5 and they meet a sealing or packing ring 26 on the door frame. The closure will moreover be reinforced if the pressure inside the container becomes higher than that outside.

Conversely if the door is in the closed position shown in Fig. 1 and the shaft 16 is rotated so as to cause the cranks 20 to move from left to right, the door will first be drawn away from the door frame along a line substantially normal to the plane of the door opening and will commence its rotation only after the contact between the edges of the door frame has been cleared.

What I claim as my invention is:

1. A closure for a container, comprising a casing having an opening therein, a door inside the casing for closing and sealing the opening, an arm adjacent each side of the door connected thereto, rockers pivotally mounted in the casing adjacent the arms with their pivots beside and in the same plane as the arms, a pivot on each rocker adapted to carry the adjacent arm, each of said pivots being spaced from its arm and in the plane of the latter substantially at right angles to the first-mentioned plane, cranks connected to the rockers to rotate the latter about their pivots to move the arms with the door away from the casing opening, means for moving the cranks, adjustable means on the rockers for engaging the arms after said rockers have moved a predetermined distance to swing the arms with the rockers.

2. A closure for a container, comprising a casing having an opening therein, a door inside the casing for closing and sealing the opening, an arm adjacent each side of the door connected thereto, a stop supporting each arm adjacent the door to retain said door normal to the casing opening, rockers pivotally mounted in the casing adjacent the arms with their pivots beside and in the same plane as the arms, a pivot on each rocker adapted to carry the adjacent arm, each of said pivots being spaced from its arm and in the plane of the latter substantially at right angles to the first-mentioned plane, means for rotating the rockers about their pivot to move the arms with the door away from the casing opening, and adjustable means on the rockers for engaging the arms after said rockers have moved a predetermined distance to swing the arms with the rockers.

3. A closure for a container, comprising a casing having an opening therein, a door inside the casing for closing and sealing the opening, an arm adjacent each side of the door pivotally connected thereto, a stop carried by each arm adjacent the door, a stop supporting each arm adjacent the door co-operating with the first-mentioned stop to retain the door normal to the casing opening, rockers pivotally mounted in the casing adjacent the arms with their pivots beside and in the same plane as the arms, a pivot on each rocker adapted to carry the adjacent arm, each of said pivots being spaced from its arm and in the plane of the latter substantially at right angles to the first-mentioned plane, means for rotating the rockers about their pivot to move the arms with the door away from the casing opening, and means on the rockers for engaging the arms after said rockers have moved a predetermined distance to swing the arms with the rockers.

4. A closure for a container, comprising a casing having an opening therein, a door inside the casing for closing and sealing the opening, an arm adjacent each side of the door pivotally connected thereto, an adjustable stop carried by each arm adjacent the door, an adjustable stop supporting each arm adjacent the door co-operating with the first-mentioned stop to retain the door normal to the casing opening, rockers pivotally mounted in the casing adjacent the arms with their pivots beside and in the same plane as the arms, a pivot on each rocker adapted to carry the adjacent arm, each of said pivots being spaced from its arm and in the plane of the latter substantially at right angles to the first-mentioned plane, means for rotating the rockers about their pivot to move the arms with the door away from the casing opening, and adjustable means on the rockers for engaging the arms after said rockers have moved a predetermined distance to swing the arms with the rockers.

5. A closure for a container, comprising a casing having an opening therein, a door inside the casing for closing and sealing the opening, a plate fixed to the door at each side thereof and projecting inwardly therefrom, an arm at each side of the door pivotally connected to the adjacent plate close to the door, an adjustable stop at the inner end of each plate adapted to co-operate

with the adjacent arm to adjust the angle of the door in relation to the opening, means pivotally supporting the arms, means for moving the arm pivots and arms with the door towards and away from the opening, and means for swinging the arms about their pivots when the latter have been moved away from the opening, said swinging movement moving the door away from and towards its normal plane.

6. A closure for a container, comprising a casing having an opening therein, a door inside the casing for closing and sealing the opening, an arm adjacent each side of the door pivotally connected thereto, said arms carrying the full weight of the door, means pivotally supporting the arms, said arm pivots being spaced from the ends thereof, counterweights on the ends of the arms remote from the door, said counterweights together being less than sufficient to counterbalance the weight of the door, means for moving the arm pivots and arms with the door towards and away from the opening, and means for swinging the arms about their pivots when the latter have been moved away from the opening, said swinging movement moving the door away from and towards its normal plane.

7. A closure for a container, comprising a casing having an opening therein, a door inside the casing for closing and sealing the opening, an arm adjacent each side of the door pivotally connected thereto, rockers pivotally mounted in the casing adjacent the arms with their pivots beside and in the same plane as the arms, a pivot on each rocker adapted to carry the adjacent arm, each of said pivots being spaced from its arm and in the plane of the latter substantially at right angles to the first-mentioned plane, cranks connected to the rockers, a shaft carrying the cranks, means for rotating the shaft, rotation of said shaft being adapted to move the cranks and rotate the rockers about their pivots to move the arms with the door away from the casing opening, and means on the rockers for engaging the arms after said rockers have moved a predetermined distance to swing the arms with the rockers.

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