Feb. 8, 1955 C. R. ANDERSON 2,701,394

DOOR SEALING APPARATUS

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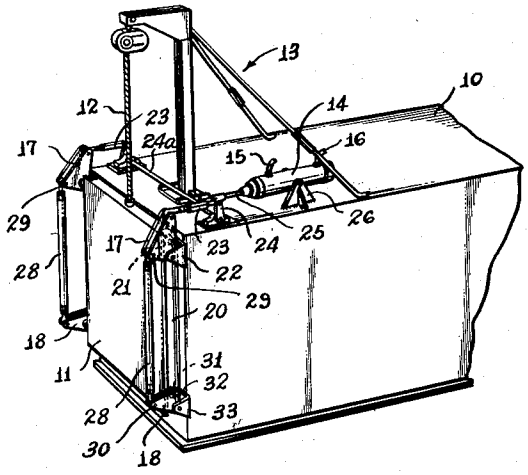


Fig. 1

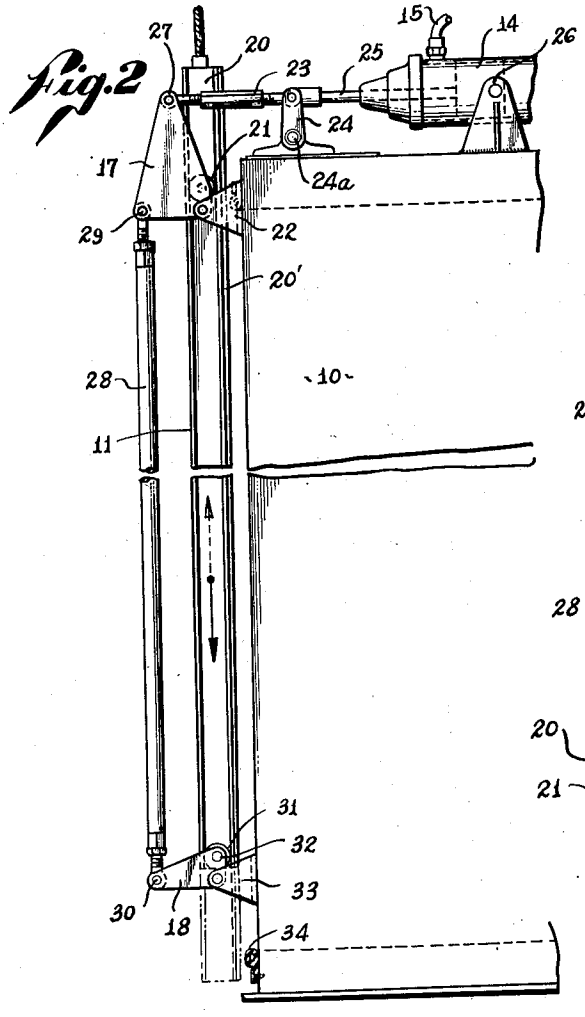
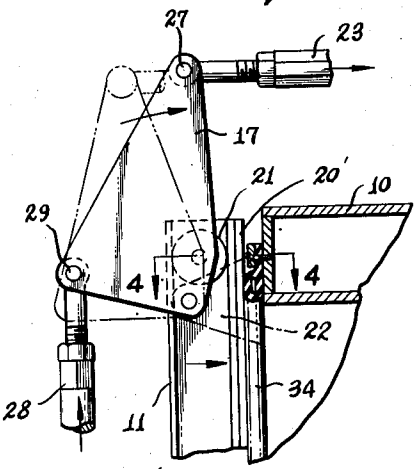


Fig. 2

Fig. 3



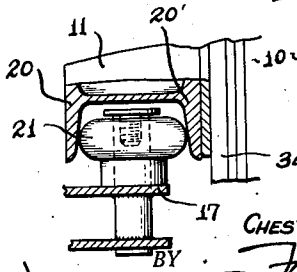


Fig. 4

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DOOR SEALING APPARATUS

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3 Claims. (Cl. 20—23)

This invention relates to an apparatus for guiding and hermetically sealing a closure member against an opening in a housing or chamber. More particularly it is directed to a system including in combination means for closing and sealing openings of relatively large areas against air pressures approaching atmospheric pressure.

The difficulties in providing hermetically sealed closures generally increase as the size of the opening to be closed increases. In the case of relatively large chamber such as the retort chambers employed in vacuum precooling processes for preserving perishable products, for example, the openings to these retorts must necessarily be of a reasonably large area to facilitate movement of the products into and out of the retort. Since these retorts are usually evacuated to an extremely low pressure, the closure member or door itself must be of sufficient strength to withstand the atmospheric pressure acting on it. This results in relatively massive type doors. In order to insure effective hermetical sealing of this door against the retort opening, it is important that substantially equal forces be applied and maintained against the door. It is also desirable however that such a door be easily moved from open to closed position and vice versa.

It is accordingly a primary object of the present invention to provide a combination door guiding and sealing mechanism that is rugged and thoroughly reliable and wherein certain portions of the specific sealing means are also employed for guiding the door in moving from its open to closed position.

Another object is to provide for a mechanical advantage in the sealing mechanism whereby a larger force may be exerted against the door than is necessary to operate the mechanism.

A further object is to provide means for exerting uniform forces at spaced portions of the door simultaneously to insure a uniform sealing over the entire periphery of the opening.

In accordance with the invention there is provided a closure member having guiding flanges along opposite side edges defining channels adapted to receive roller elements. Each roller element is rotatably mounted on a bell crank type of lever in turn pivoted to a stationary frame such as the retort or chamber which is to be sealed. Another portion of the bell crank lever is pivotally coupled to an actuating rod which serves to swing the bell crank lever about its stationary pivot point to move the roller with a mechanical advantage as to force over a small arcuate distance. Since the roller is confined within the channel defining an edge of the door, the whole door will be moved in a direction normal to the plane of the opening. A suitable seating gasket is provided about the periphery of the opening against which the door is urged by the roller.

In a preferred embodiment of the invention, four such bell crank members and associated roller elements are provided, one adjacent each of the four corners of the opening. Suitable actuating rods couple the bell crank levers together so that a single actuating force will operate to pivot the bell cranks all simultaneously and insure that a substantially equal force is applied to all four corner portions of the door simultaneously. Preferably a hydraulic cylinder and piston rod arrangement is employed for actuating these rods. The same roller elements and edge channels provide a track permitting the door to be moved laterally in its own plane with negligible friction to expose the opening.

A better understanding of the invention will be had by referring to the accompanying drawings in which:

Fig. 1 is a perspective view of a retort chamber including at one end a door and sealing apparatus designed in accordance with a preferred form of the invention;

Fig. 2 is an enlarged elevational view partly in section of the door sealing mechanism;

Fig. 3 is a still larger view of one of the bell crank levers and roller elements employed at one corner portion of the door; and

Fig. 4 is a cross-sectional plan view as seen along the lines 4—4 of Fig. 3.

Referring to Fig. 1 there is shown a retort chamber **10** adapted to be closed and hermetically sealed at one end by a door member **11**. In the preferred form of the invention the door member **11** is moved laterally in its own plane in a vertical direction to expose the opening to the retort by means of a hoist cable **12** and a hoisting mechanism designated generally by the numeral **13**.

To move the door **11** into sealing position once it has closed the opening, there is provided a power means comprising a hydraulic cylinder **14** including a piston and piston rod coupled to suitable actuating rod members. Hydraulic fluid is fed to the cylinder **14** through small conduits **15** and **16** to move the piston therein from one end of the cylinder to the other. The various actuating rods are coupled to upper bell crank type levers **17** and lower bell crank type levers **18** disposed at the upper and lower corners of the retort chamber **10**.

As shown more clearly in Fig. 2, the door **11** includes along each longitudinal edge a channel member **20** preferably in the form of an I-beam which may constitute an integral part of the door construction. The channel member **20** includes at least one flange **20'** defining one of the channel walls and adapted to guide a roller element **21**, as shown clearly in Fig. 4.

The roller **21** is rotatably mounted on the bell crank type lever **17** at a position intermediate the ends of the bell crank lever. The lower righthand end of the bell crank is pivotally mounted to a stationary frame, such as the frame of the retort chamber **10**, by means of a mounting support **22**. The upper end of the bell crank **17** is in turn pivotally coupled to an actuating rod **23**, the other end of the rod **23** being connected to a lever **24**. The two levers **24** at opposite edges of the chamber are mounted on a rock shaft **24***a*, so as to swing in unison. Also pivotally secured to one of the levers **24** is one end of a piston rod **25** connecting to a piston within the cylinder **14**. The cylinder **14** is pivotally mounted on the support **26** in order that the slight arcuate motion of the piston rod end can be accommodated by small arcuate movements of the cylinder **14**. The actuating rod **23** may include a turnbuckle as shown for adjusting its length.

A third end portion of the bell crank lever **17** is pivotally secured to a tie rod **28** as at the pivot point **29**, the lower end of the tie rod **28** pivotally connecting to the lower bell crank lever **18** as at **30**. The lower bell crank lever **18** similarly mounts a roller element **31** as at the pivot point **32** and is similarly pivoted to a stationary supporting member **33**.

As clearly shown in Figs. 3 and 4, the periphery of the opening in retort chamber **10** is provided with a gasket **34** against which the door is urged.

The operation of the door sealing apparatus will be readily understood from the foregoing. In the unsealed position of the door as depicted in Fig. 2 the hoisting mechanism **13** may easily and with negligible friction raise or lower the door **11** to expose or close the opening in the retort **10**. It is to be noted that the various roller elements **21** and **31** serve to guide the passage of the door between its open and closed positions. When it is desired to seal the door after it has been lowered into closing position, suitable hydraulic fluid is introduced into the inlet conduit **15** of cylinder **14** to move the piston rod **25** to the right, as shown in Fig. 2, thereby moving the actuating rod **23** longitudinally to swing the bell crank levers **17** about their stationary pivot points **22**. This motion also moves the lower bell crank levers **18** by virtue of the tie rod **28** connected therebetween.

As shown in phantom lines in Fig. 3, movement of the bell crank lever about its stationary pivot point causes the

roller elements **21** to move to the right against the side flange **20'** with a considerably greater force than that applied to the upper pivot point of the bell crank **27** by the actuating rod **23**. This greater force results from the fact that the pivotal mounting for the roller element **21** is considerably closer to the stationary pivot support mounting **22** than to the upper pivot coupling at **27** resulting in a mechanical advantage inversely proportional to the ratio of these distances. The action of the roller **21** against the side flange **20'** defining the side of the channel **20**, is to move the door in a direction normal to the plane of the opening in the retort **10**, against the peripheral gasket strip **34**. The engaging force as pointed out above, is considerably greater than the power supplied to the actuating rod **23** and is quite sufficient to maintain a hermetically tight seal.

When it is desired to remove the contents of the chamber **10**, the actuating hydraulic cylinder **14** is fed with hydraulic fluid through the inlet conduit **16**, the fluid on the other side of the piston passing out through the conduit **15**. This action moves the piston rod **25** to the left as seen in Figs. 2 and 3, to swing the bell crank levers **17** and the corresponding lower bell crank levers **18** counter-clockwise about their stationary pivot points and thus cam the door **11** away from the opening a sufficient distance to enable the door to be raised by the hoisting mechanism **13**.

It is thus seen that the present door sealing mechanism affords the dual functions of providing rollers for guiding lateral movements of the door to expose the opening in the retort **10** and also to move the door in a direction normal to the plane of the opening to effect an air-tight seal.

Furthermore, the apparatus permits a relatively large force to be exerted for the sealing function by virtue of the bell crank arrangement and the strategic location of the pivoting points and mountings for the guiding roller elements. It will also be noted that the various tie-rod connections **28** permit all four corners of the door to be

urged simultaneously against the sealing gasket **34** with substantially the same amount of force.

I claim:

1. In an apparatus for hermetically sealing a door against a sealing gasket about the periphery of an opening into a chamber, means for urging with substantially equal force the opposite longitudinal edges of said door into engagement with said gasket comprising: channel members on opposite edges of the door, each having a pair of longitudinal roller guiding flanges; rollers adapted to roll in the channels in engagement with said roller guiding flanges; a bell crank lever rotatably mounting each roller and pivotally secured to the chamber; a longitudinally actuating rod member pivotally connected to another portion of each bell crank lever; and power means for moving said rod members to swing said bell crank levers about their pivot points which are secured to the chamber, whereby each roller is caused to bear against a guiding flange of its channel member to move the door in a direction normal to the plane of the opening against the sealing gasket.

2. An apparatus according to claim 1, in which there are provided at least four bell crank levers, one disposed adjacent each of the four corners of said chamber opening, means interlinking said bell crank levers to operate in unison, said door being adapted to be moved laterally in its own plane to expose said opening, the rollers serving to guide said lateral movement of the door.

3. An apparatus according to claim 1, in which said power means comprises a hydraulic cylinder and piston rod arrangement, and means coupling said piston rod to said actuating rod members.

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