CLOSURE MECHANISM FOR CONCRETE MIXER RECEPTACLES

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Application June 13, 1939, Serial No. 278,988

10 Claims. (Cl. 259—176)

The invention relates to closure mechanism for concrete mixer receptacles, and has for one of its objects to provide apparatus of this character, which will be simple in construction, comparatively inexpensive to manufacture and install, and more efficient in use than those which have been heretofore proposed.

In prior U. S. Patent No. 2,006,206 granted June 25, 1935, on an application filed by me, there is disclosed and claimed a closure mechanism for the discharge openings of concrete mixer drums in which a closure disk is rotatably mounted upon one end of a swinging arm structure, the other end of which is pivotally connected to a portion of the framework in which the mixer drum is journaled for rotation. The said arm structure is oscillated to move the closure disk to and from the drum opening by toggle linkage connected to another portion of the frame and to the arm, and actuated by a lever carried by a shaft also journaled on the frame and arranged to be oscillated by a hand wheel through a worm and worm gear drive.

The present invention is a further development of the general idea embodied in said prior patent, but differs therefrom in numerous particulars. In the present instance, the closure instead of being mounted upon a swinging arm carried by the frame for oscillatory movements to and from the mixing receptacle opening, is axially slidably mounted upon the said receptacle itself, as for example by means of a rod or shaft mounted by the mixing blades or discharge buckets or troughs within the receptacle and extending outwardly through the receptacle opening. Axial alignment of the closure and the opening may thus be always maintained.

The present closure is preferably, although not necessarily, operated by means of a shaft journaled on the frame and oscillated by a hand wheel through a worm drive, as in said prior patent; which shaft carries an arm connected by linkage, of a different construction and arrangement from that of said prior patent, to the closure whereby the latter may be reciprocated to and from the receptacle opening upon its mounting rod or shaft. The said linkage includes a two-armed toggle lever, one of the arms of which is connected by a link to the operating arm referred to above. The other arm of said lever has a floating pivotal connection with a portion of the mixer frame, said connection having springs or other equivalent yielding means associated with it; and the said lever is connected by a link member to the closure disk through a gimbal or universal connection which also provides for rotation of the closure relative thereto.

The oscillatory actuating arm carried by the worm-operated shaft is connected to the toggle lever by a connecting rod which has pivotal connections adjacent its respective ends with said lever and arm, and the latter is preferably provided with an adjustable member, which may take the form of a screw threaded therein, engageable by the adjacent end portion of said connecting rod to limit the movement of the lever in the closing direction. Such limit is preferably when the pivotal connections between the link member and lever are in line with or even slightly beyond dead center with the pivotal connection of the lever with the frame and the connections between the link member and the gimbal ring, whereby to lock the closure against unintentional opening under the pressure of the mixture within the drum.

With the above and other features and objects in view, which will appear as the description proceeds, the invention comprises the novel details of construction and combinations and arrangements of parts more fully hereinafter disclosed and particularly pointed out in the appended claims.

Referring to the accompanying drawings forming a part of this specification, in which like reference characters designate like parts in all the views:

Figure 1 is a rear elevational view, partly broken away, of the essential portions of a typical concrete mixer unit of the truck mounted type, showing an illustrative example of closure mounting and operating mechanism constructed and arranged in accordance with the present invention applied thereto;

Fig. 2 is an enlarged sectional elevational view of a portion of the parts shown in Fig. 1, taken approximately on the planes indicated by the line 2—2 of Fig. 1, looking in the direction of the arrows, the parts being illustrated in the seated position of the closure;

Fig. 3 is a still further enlarged sectional plan view of the closure mounting and operating mechanism shown in Figs. 1 and 2, looking down;

Fig. 4 is a longitudinal vertical sectional view, on the same scale as Fig. 3, but with the parts illustrated in the open position of the closure; and

Figs. 5 and 6 are transverse sectional views, taken respectively on the planes indicated by the lines 5—5 and 6—6 of Fig. 2, looking in the direction of the arrows.

Referring more particularly to Figs. 1 and 2, there is shown by way of illustrative example only, a concrete mixer of the truck mounted type which...
may be of substantially the construction set forth in my prior U. S. Patent 2,006,728, granted July 2, 1935. The said mixer comprises a frame 10 in which the mixing drum or receptacle 11 is mounted for rotation about a horizontal axis, such rotation being provided for in part by rollers 12 journaled in said frame and receiving the combined bearing and drip ring 13 which surrounds the discharge opening 14 provided in the rear wall 15 of the said receptacle. As in the said prior Patent 2,006,728, the receptacle may be provided with the usual helical mixing blades, not shown, and with discharge chutes or troughs 16 which upon rotation of the drum or receptacle in one direction receive the concrete and conduct it to and through the discharge opening 14 and annulus 13.

The discharge opening is provided with closure 17 which normally seals the discharge opening during the mixing operation and which is moved therefrom for discharge purposes by the mechanism now to be described.

Mounted within the drum just inside of the opening is a tubular support 20 which may be rigidly secured to and rotate with the drum in any manner, as for example by being welded, bolted or otherwise secured in the drum 17 as shown in Figs. 2, 3 and 4. This tubular support 20 receives an axially extending rod or shaft 21 which may be secured within the support by a bolt 22 and which extends rearwardly through the annulus 13 to a point beyond the rear face of the drum. The closure member 17 is provided with a hub 23 which is slidably mounted upon the said rod or shaft 21 and may be provided with a suitable gland or stuffing box 24. Journaled upon the hub 23 is a bearing housing 25 which may contain a ball or other anti-friction bearing 26 and is slidable or relatively rotatable but not relative longitudinal movement between these parts. The housing 25 is provided with a pair of oppositely projecting pins 27 which are engaged by a gibral ring 28 which for convenience of assembly is preferably made in two parts as clearly indicated in Fig. 3, which parts are normally secured together by means of bolts 29. The said ring 28 has diametrically opposed sockets disposed at right angles to the pins 27 which sockets receive pins 30 carried by the ends of the legs 31 of a link member or structure 32. The two legs 31 of this member are pivotally secured together by means of a bridge member or plate 33 bolted or otherwise secured to angle brackets 34 welded or otherwise secured to the legs 31, as will be clear from Figs. 3 and 6.

The legs 31 of the link member 32 extend rearwardly and at their rearward ends are pivotally secured as at 35 to provide a knuckle joint with the intermediate portion of a two-armed toggle lever 36 the arms of which, as viewed in side elevation, as in Figs. 2 and 4, are arranged in substantially the shape of a V. One arm, 37 of said toggle lever is pivotally mounted as at 38 in a U-shaped saddle member 39 which is resiliently floatingly mounted upon a frame member 40 which may be of substantially semi-circular construction and constitutes a portion of the mixer framework. The U-shaped saddle 39 is provided with a pair of oppositely laterally extending ears 41 and a helical compression spring 42 is interposed between each of the said ears and the upstanding flange of the frame member 40, as clearly shown in Figs. 2 and 3. Bolts 43, surrounded by sleeves 44 and carrying nuts 45 at one end, pass through the ears 41 and the ears 41 of the saddle member 39 and constitute adjustable means whereby the inward motion of the saddle 39 under the influence of the springs 42 may be limited, as will be readily understood.

The other arm 46 of the toggle lever 36 is pivotally connected at its free end, as indicated at 47, to a connecting rod or link 48 which extends upwardly and is pivotally connected adjacent its upper end as indicated at 49 to an actuating arm 50 which is keyed or otherwise rigidly secured to the shaft 51 journaled in suitable bearings 52 carried by the frame 10 of the mixer. The said shaft 51 may be oscillated by any suitable means such as for example the worm and worm gear mechanism described and claimed in my said Patent 2,006,206, which mechanism may be contained within a housing 53 and operated by means of hand wheel 54, as shown in Fig. 1. The actuating arm 50 is preferably burred out at its outer end as indicated at 55 for the reception of the upper end of the connecting rod or link 48. Said arm also carries the adjustable screw 56 provided with a lock nut 57 and arranged to engage the upper projecting portion of the end of the connecting rod 48 to limit the closing movements of the parts, as will be readily understood from Fig. 2. As above explained, the pivot shaft 51 is normally reached when the pivots 39, 55 and 38 are in horizontal alinement or on dead center, as shown in Fig. 2.

By connecting the rod or link 48 to the toggle structure at a point other than the knuckle joint 35, as at the shaft 49, it is possible to obtain greatly increased movement of the toggle to broken position before the parts reach their limit of movement, which would be when the pivots 49, 47 and 38 are in line. Consequently this arrangement provides for relatively great movement of the closure 11 and resultant wide opening for discharge without excessive size of the toggle and actuating members.

In use the closure and the operating mechanism will normally occupy the positions shown in Figs. 2 and 3 during the mixing operation, after the closure and its supporting rod or shaft 21 is11-25-35 with the mixing receptacle. When it is desired to discharge the contents of the receptacle the hand wheel 54 will be manipulated to cause the worm and worm gear mechanism contained within housing 53 to move the shaft 51 in a counterclockwise direction when viewed in Fig. 2, which motion will be transmitted through the actuating arm 50 and connecting rod 48 to the toggle lever 36. This lever will in turn be moved about its resiliently floating connection 38 in a clockwise direction from the position shown in Fig. 2 to that illustrated in Fig. 4, and in so moving the link member 32 will pull the closure 17 toward the right, as viewed in Figs. 2, 3 and 4 through the universal or gibral connections 30, 28, 27 and the bearing 26 and housing 25, until the open position illustrated in Fig. 4 is reached. Of course reverse movement of the hand wheel 54 will produce a reverse action of the parts and return the closure to its closed position illustrated in Figs. 2 and 3.

It is to be noted that as distinguished from the construction described and claimed in my said prior Patent 2,006,206, the closure according to the present invention is mounted upon the receptacle itself, rather than upon the mixer frame and reciprocates in a straight line to and from the opening rather than oscillates about an exterior point as in the said prior construction. By mounting the closure and receptacle thereupon the position of the frame coaxial alinement of the closure with the discharge opening is always maintained.
even though the truck upon which the unit is mounted is upon rough ground which may result in distortion of the frame and a throwing of the drum out of true axial alignment in the frame.

The resiliently floating anchor mounting of the toggle lever on the frame member 40 provides for any such misalignment so far as the toggle is concerned, providing for proper functioning thereof in all positions which the frame may assume relative to the drum due to distortion of the former; and the capability of the toggle to maintain the closure into engagement with the aperture 13, as will be readily understood.

While one form of the invention has been illustrated and described it is obvious that those skilled in the art may vary the details of construction as well as the precise arrangement of parts without departing from the spirit of the invention and therefore it is not wished to be limited to the above disclosure except as may be required by the claims.

What is claimed is:

1. Operating mechanism for a reciprocatably mounted closure for a material transfer opening of a mixing receptacle, which receptacle is mounted in a frame and subject to variations in its position relative thereto; said operating mechanism comprising a toggle structure connected to the closure; a resilient connection between said structure and the frame for maintaining the toggle operative to move the closure toward and from the receptacle opening irrespective of the relative positions of the receptacle and frame; and means for actuating said toggle structure to cause it to move the closure.

2. Operating mechanism for a reciprocatably mounted closure for a material transfer opening of a mixing receptacle, which receptacle is mounted in a frame and subject to variations in its position relative thereto; said operating mechanism comprising a toggle structure connected to the closure; a resilient connection between said structure and the frame for maintaining the toggle operative to move the closure toward and from the receptacle opening irrespective of the relative positions of the receptacle and frame; and means for actuating said toggle structure to cause it to move the closure.

3. Operating mechanism for a reciprocatably mounted closure for a material transfer opening of a mixing receptacle, which receptacle is mounted in a frame and subject to variations in its position relative thereto; said operating mechanism comprising a toggle structure connected to the closure by a saddle member positioned adjacent a portion of the frame; a resilient connection between said saddle and another element of said toggle structure; resilient means interposed between said saddle and frame, whereby the saddle may float relative to the frame and maintain the toggle structure operative to move the closure toward and from the receptacle opening irrespective of the relative positions of the receptacle and frame; and means for actuating said toggle structure to cause it to move the closure.

4. Operating mechanism for a reciprocatably mounted closure for a material transfer opening of a mixing receptacle, which receptacle is mounted in a frame and subject to variations in its position relative thereto; said operating mechanism comprising a toggle structure connected to the closure by a saddle member positioned adjacent a portion of the frame and having laterally extending ears; a pivotal connection between said saddle and the other element of said toggle structure; springs interposed between said saddle ears and frame whereby the saddle is resiliently floatingly mounted to accommodate misalignment of the toggle structure when the receptacle is misaligned in the frame; and means for actuating said toggle structure to cause it to move the closure.

5. Closure operating mechanism for a mixing receptacle which is rotatably mounted in a frame that is subject to distortions whereby the angular positions of the receptacle and frame may vary, said receptacle having a material transfer opening and carrying a closure mounted upon a shaft projecting from said opening for reciprocating movements toward and from the opening; said operating mechanism comprising a toggle structure having a universal pivotal connection with the closure and an anchor connection floatingly mounted on the frame, whereby the toggle may be effective to move the closure throughout its range of travel upon its shaft irrespective of the relative positions of the receptacle and frame; and means for actuating said toggle structure to cause it to move the closure.

6. Closure operating mechanism for a mixing receptacle which is rotatably mounted in a frame that is subject to distortion whereby the relative angular positions of the receptacle and frame may vary, said receptacle having a material transfer opening and carrying a closure mounted upon a shaft projecting from said opening for reciprocating movements toward and from the opening; said operating mechanism comprising a toggle structure including two elements pivotally connected together at a knuckle joint; a gimballed ring providing a universal pivotal connection between one of said elements and the closure; an anchor connection for the other of said elements, floatingly mounted on the frame, whereby the toggle may be effective to move the closure throughout its range of travel upon its shaft irrespective of the relative positions of the receptacle and frame; and means for actuating said toggle structure to cause it to move the closure.

7. Closure operating mechanism for a mixing receptacle which is rotatably mounted in a frame and subject to angular displacement of its position relative thereto, said receptacle having a material transfer opening and a shaft projecting beyond said opening upon which a closure having a hub is rotatably and slidably mounted for movements toward and from said opening; said operating mechanism comprising a toggle structure including two elements pivotally connected together at a knuckle joint; a bearing member journaled upon the closure hub for transmitting axial movements thereto while providing for rotation thereof; a gimballed connection between said bearing member and one of said toggle elements; an anchor connection for the other of said elements, floatingly mounted on the frame whereby the toggle may be effective to move the closure throughout its range of travel upon its shaft irrespective of the relative positions of the receptacle and frame; and means for actuating said toggle structure to cause it to move the closure.

8. Operating mechanism for a closure for a material transfer opening of a mixing receptacle which receptacle is mounted in a frame; said operating mechanism comprising a toggle structure including two elements pivotally connected together at a knuckle joint and connected respectively to the closure and to the frame, one of said elements also having an extension disposed to one
side of a plane passing through its knuckle joint and other named connection; and means for actuating said toggle structure, connected to said extension, whereby relatively large travel of the closure toward and from the opening may be attained.

9. Operating mechanism for a closure for a material transfer opening of a mixing receptacle which receptacle is mounted in a frame; said mechanism comprising a toggle structure including a link element pivotally connected to the closure, and a two armed lever element, said elements being connected together by a knuckle joint and one arm of the lever element being pivotally connected to the frame; and means for actuating said toggle structure connected to the other arm of said lever element, whereby relatively large movement of the closure toward and from the opening may be attained.

10. Operating mechanism for a closure for a material transfer opening of a mixing receptacle which is mounted in a frame; said mechanism comprising a toggle structure including a link element pivotally connected to the closure, and a two armed lever element, the arms thereof being disposed in substantially V-shape and connected at their juncture to said link element to provide a knuckle joint, one of said arms being also pivotally connected to the frame; and means for actuating said toggle structure, connected to the other arm of said lever element, whereby relatively large movement of the closure toward and from the opening may be attained.

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