May 9, 1944. G. JAEGER ET AL 2,348,682

DOOR STRUCTURE FOR MIXERS

Filed April 10, 1942 4 Sheets-Sheet 1

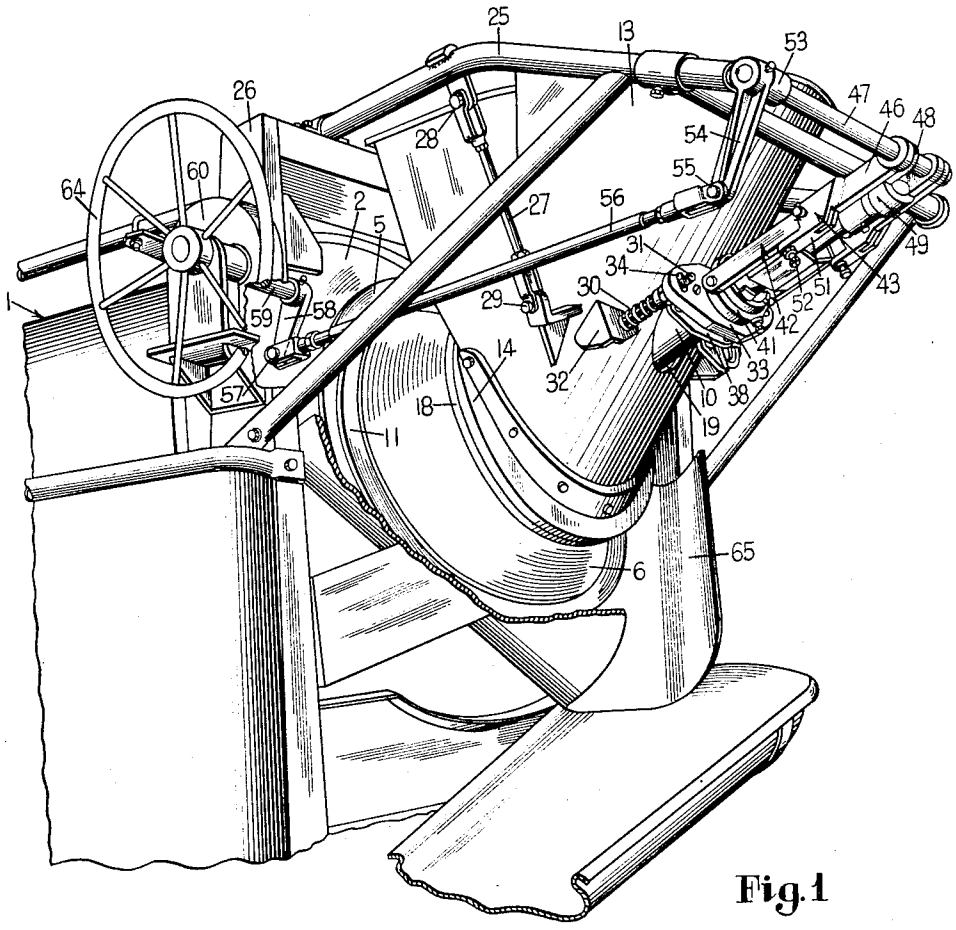


Fig. 1

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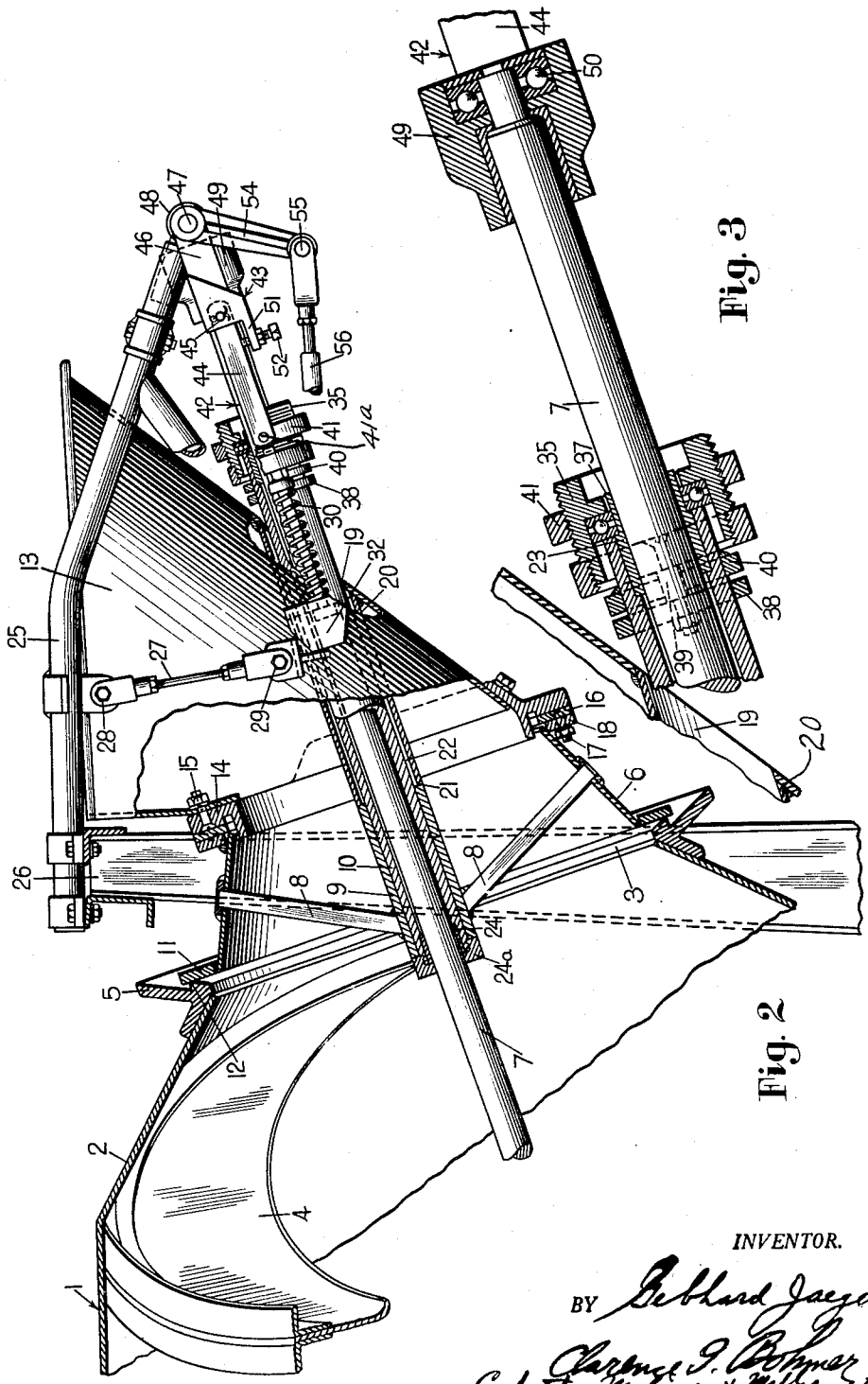


Fig. 3

Fig. 2

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DOOR STRUCTURE FOR MIXERS

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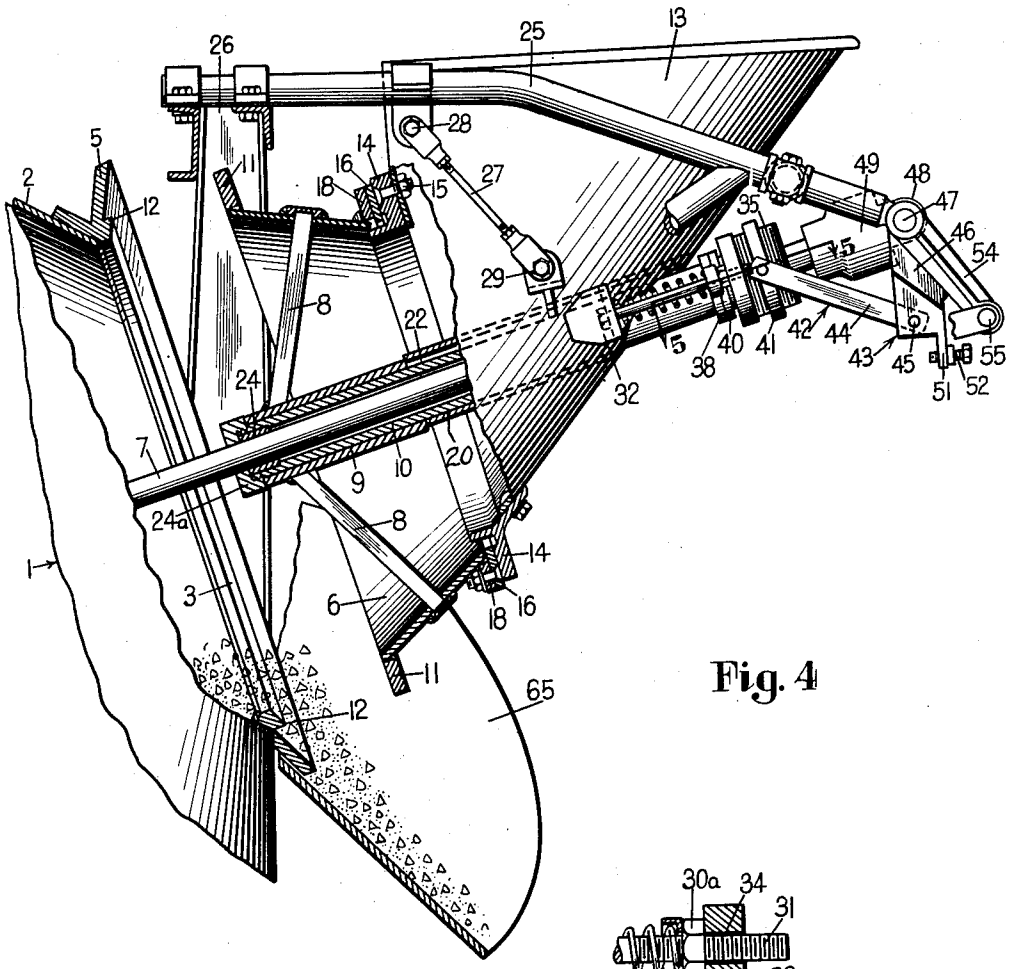


Fig. 4

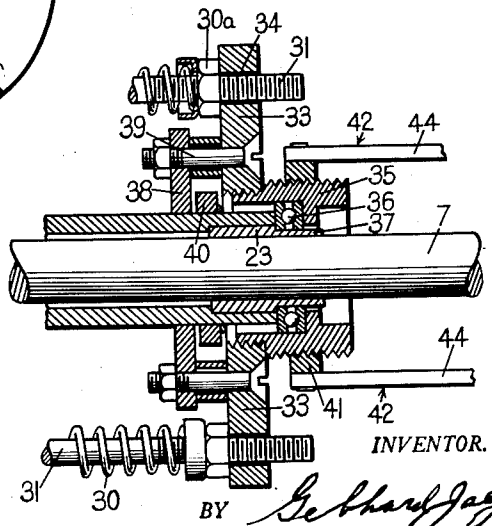


Fig. 5

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DOOR STRUCTURE FOR MIXERS

Filed April 10, 1942 4 Sheets-Sheet 4

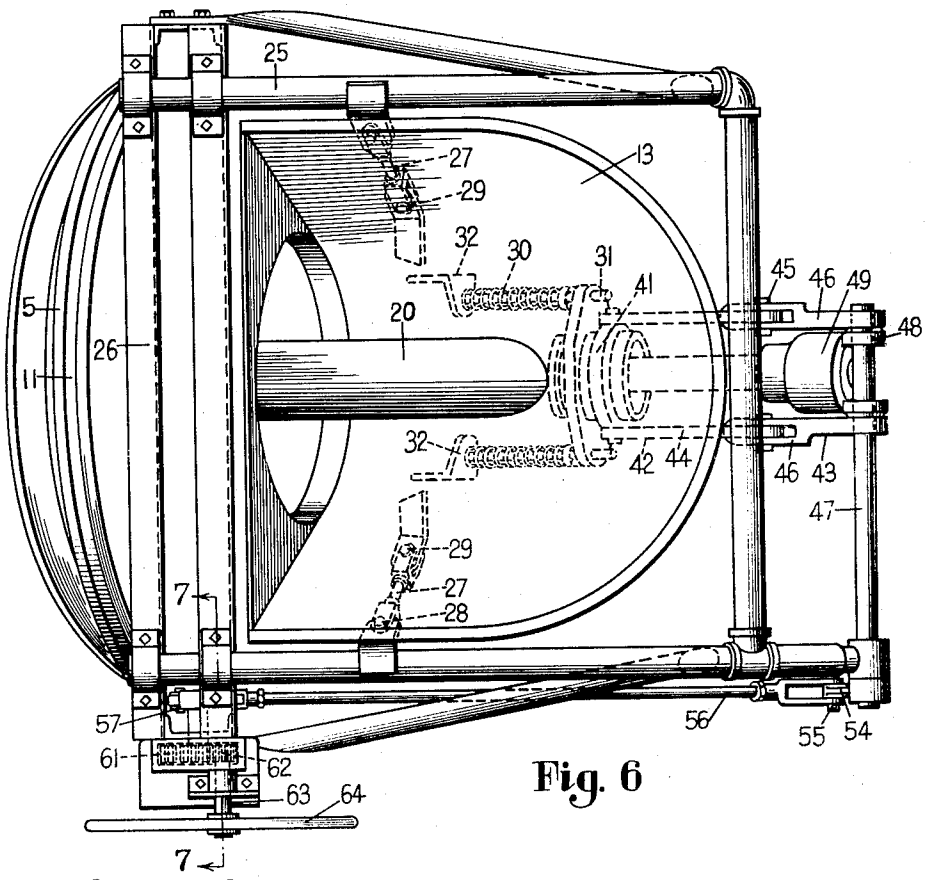


Fig. 6

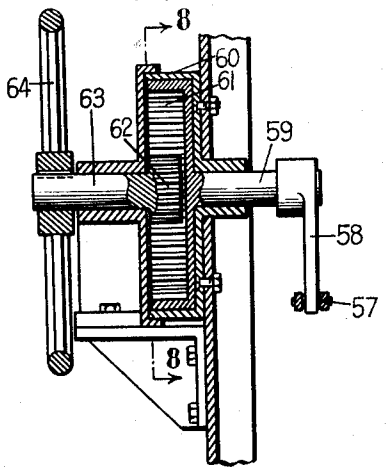


Fig. 7

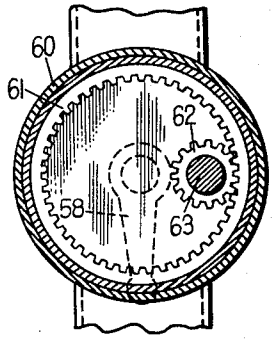


Fig. 8

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Patented May 9, 1944 2,348,682

UNITED STATES PATENT OFFICE

2,348,682

DOOR STRUCTURE FOR MIXERS

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Application April 10, 1942, Serial No. 438,432

18 Claims. (Cl. 259—161)

Our invention relates to a door structure for mixers. It has to do, more particularly, with a door structure for a truck mixer which is a combination loading and discharge door, although it is not limited to truck mixers.

At the present time, a type of truck mixer is in use which embodies a rotatable mixing drum having an opening in its rear end, the opening being used both for loading the drum and for discharging material from the drum. It is customary, to provide a combination loading and discharge door unit in association with this opening. This door unit must be of such a type that it will effectively guide the material into the opening during charging and will effectively prevent discharge of material from the drum during mixing.

One of the objects of our invention is to provide a combination loading and discharge door for a truck mixer which is of very simple construction and which is very efficient.

Another object of our invention is to provide a combination loading and discharge door which will effectively serve to guide the material into the mixing drum during charging and will effectively serve to prevent loss of material from the drum during mixing.

Another object of our invention is to provide a combination loading and discharge door for a track mixer which will always be in proper alignment with the opening in the drum since it will be self-aligning independently of the mixing drum supporting frame.

Another object of our invention is to provide a combination loading and discharge door for a truck mixer which is of such a nature that it may be moved readily and with little effort from charging position to discharging position.

Another object of our invention is to provide a combination loading and discharging door for a truck mixer having mechanism for moving it between charging and discharging positions which is of such a nature that it will not bind even if the mixer frame is distorted.

In its preferred form, our invention contemplates the provision of a combination loading and discharge door unit which is associated with the discharge opening in the rear end of a rotatable mixing drum. This unit consists of a door of frusto-conical form which is associated directly with the mixing drum and is mounted for axial movement on a pipe extending centrally through the opening in the rear end of the drum. This frusto-conical door has an annular seat on its forward edge which seats around the opening in the drum. It is adapted to rotate with the drum when associated therewith. Behind this frusto-conical door, we provide an independent hopper which has a sealing ring on its forward edge adapted to cooperate with a sealing ring on the rear edge of the frusto-conical door. The hopper serves to direct material, during charging, through the frusto-conical door into the drum. Resilient means is provided for urging the hopper forwardly so that the seat carried thereby will always be in resilient sealing contact with the seat carried by the frusto-conical door but relative rotation will be permitted. The hopper is so supported that it will not rotate with the drum and is supported in such a manner that it is free to float relative to said pipe and to the mixer frame so that the sealing ring carried thereby will be self-aligned relative to the sealing ring carried by the frusto-conical door. We provide a toggle structure for applying pressure directly to the frusto-conical door to move it away from the opening in the drum to permit discharge of material therefrom. This mechanism is a self-contained unit supported independently of the mixer frame so that distortion of the mixer frame will not cause binding thereof.

This application is a continuation in part of our copending application Serial No. 389,592, filed April 21, 1921, Door structure for mixers, now Patent No. 2,280,513, issued April 21, 1942.

The preferred embodiment of our invention is illustrated in the accompanying drawings wherein similar characters of reference designate corresponding parts and wherein:

Figure 1 is a perspective view illustrating a door unit constructed in accordance with our invention.

Figure 2 is a side elevational view, partly broken away, of our door structure.

Figure 3 is a vertical sectional view taken through a portion of the door-supporting and operating structure.

Figure 4 is a view similar to Figure 2 but showing the door in discharge position.

Figure 5 is a horizontal sectional view taken substantially along line 5—5 of Figure 4.

Figure 6 is a plan view of the structure shown in Figure 1.

Figure 7 is a transverse sectional view taken substantially along line 7—7 of Figure 6.

Figure 8 is a sectional view taken substantially along line 8—8 of Figure 7.

With reference to the drawings, we have illustrated our invention applied to a truck mixer

1 having a rotatable mixing drum 2. This truck mixer is of the high-dump type, the mixing drum 2 being tilted upwardly towards its rear end to provide a high discharge point. However, our invention is not limited to a truck mixer of the high discharge type. The drum 2 is provided with a circular opening 3 in its rear end. This opening is adapted to serve both as a charging opening and as a discharging opening. The drum 2 is provided with suitably disposed mixing blades 4 of the screw type which terminate adjacent the opening 3. When the drum 2 is rotated in one direction, the blades 4 will serve to draw in material and feed it forwardly into the drum. When the drum is rotated in an opposite direction, the blades 4 will serve to force material outwardly from the drum through the opening 3. The opening 3 is provided with a ring 5 which is suitably secured in position around the priphery thereof.

We provide an annular door 6 of frusto-conical form in association with the opening 3. This door is supported for axial movement on shaft 7 which is centrally supported within the mixing drum 2 in a suitable manner and projects rearwardly through the opening 3. The door 6 is supported for movement on the shaft by means of radially extending supporting arms 8 which have their outer ends secured to door 6 and their inner ends secured to a sleeve 9. This sleeve 9 is mounted for rotation on a second sleeve 10 which is supported on the shaft 7 for axial movement relative thereto. The shaft 7 is supported by the drum 2, as previously indicated, and will rotate therewith. The door 6 has an annular sealing ring 11 secured to the forward end thereof and around the periphery thereof. This sealing ring 11 has a flat forward surface adapted to contact with an annular knife edge 12 formed on the ring 5. Thus, an effective seal will be produced at this point.

Disposed directly behind the door 6, we provide a substantially independent hopper 13. This hopper 13 is adapted to receive material and to feed it into the door 6. The hopper extends from a point above the door 6 to the lower side thereof. The rear and side walls of the hopper are inclined downwardly and forwardly. The front wall of the hopper extends vertically above the door 6. The front wall of the hopper is provided with an opening corresponding to the opening in the rear end of the door 6 and around this opening the hopper carries a sealing ring 14. This ring is bolted to the front wall of the hopper by means of bolts 15. This sealing ring 14 has a flat forward sealing surface adapted to cooperate with the flat rearward sealing surface provided on a ring 16 carried by the door 6. This ring 16 is bolted by bolts 17 to a ring 18 welded to the rear end of door 6.

The hopper 13 has an opening 19 formed in the rear wall thereof around which the rear end of a sleeve 20 is disposed. This sleeve is welded to the rear wall of the hopper. The sleeve 20 extends forwardly in surrounding relationship to sleeve 10 with its forward end contacting the rear end of sleeve 9, as at 21. The sleeve 20 is larger than the sleeve 10 so that there is an annular space 22 between these two members. The sleeve 10 projects through the opening 19 in the rear wall of the hopper and a considerable distance beyond it. Its rear end receives a bushing 23 and its forward end receives a bushing 24 which support it for axial movement on the shaft 7. A cap 24a threaded on the forward end of sleeve 10 keeps bushing 24 in position.

The hopper 13 is suspended from a framework 25 which extends rearwardly from the main mixer frame 26. It is suspended therefrom by means of a pair of links 27 of a turnbuckle type which are disposed at opposite sides of the hopper. Each link 27 is pivotally or otherwise movably connected at its upper end, as at 28, to the frame 25 and at its lower end, as at 29, to the wall of the hopper 13. The links 27 are initially adjusted, as to length, to bring the sealing ring 14 carried by the hopper into proper sealing relationship with the ring 16 carried by the door 6. At this time the sleeve 20 will be completely spaced from the sleeve 10 which it surrounds (see Figure 2). Consequently, the hopper will be so suspended that it will be in floating relationship relative to the door 6 and will be self-aligning relative thereto. This will keep the sealing rings 14 and 16 in proper sealing contact even if the frame which supports the hopper becomes distorted. It will be noted that the links 27 are positioned with their lower ends extending rearwardly even when the rings 14 and 16 are in contact. This causes the hopper 13 to tend to swing forwardly and, therefore, tends to maintain the sealing ring 14 in contact with the sealing ring 16. By virtue of the space 22 shown in Figure 2, the hopper 13 will be allowed an up and down movement relative to the door 6 when the hopper and door are moved toward or away from the mixing drum 2.

As an additional means for maintaining the sealing rings 14 and 16 in contact, we provide a pair of springs 30. These springs 30 are disposed in surrounding relationship to bolts 31 which have their forward ends secured to brackets 32 which are carried by the rear wall of the hopper at points on opposite sides of the opening 19 in the rear wall of the hopper. These springs are of the compression type and their forward ends bear against the brackets 32 while their rear ends bear against a plate 33. This plate 33 extends diametrically from the shaft 7 and is provided with openings 34 in which the rear ends of pins 31 are mounted for sliding movement. Nuts 30a are threaded on pins 31 ahead of member 33 for adjusting the resistance of the springs (see particularly Figure 5). The plate 33 is threaded on the forward end of a sleeve 35. This sleeve 35 is carried by a ball bearing 36 which is mounted on a projecting portion 37 of bushing 23. To prevent rearward movement of plate 33 relative to sleeve 10 a collar 38 is loosely mounted on the sleeve 10. This collar is secured to plate 33 and is spaced forwardly therefrom by means of spacer and bolt units 39. A stop collar 40 is welded to sleeve 10 behind collar 38. Thus, when the springs 30 tend to force the plate 33 rearwardly, the collar 38 contacts with ring 40 and prevents this. Therefore, the springs will exert a forward pressure on hopper 13 and will keep the rings 14 and 16 in firm but resilient contact.

When the drum 2 rotates, the shaft 7 rotates therewith. The weight of the hopper 13 and the force exerted by springs 30 will tend to hold the sealing ring 11 in contact with the sealing edge 12 of drum ring 5. Therefore, the door 6 will rotate with the drum. This will cause door-supporting sleeve 9 to rotate on sleeve 10. The shaft 7 and sleeve 10 will rotate within the sleeve 20 secured to the hopper. The rear end of sleeve

10 and the shaft 7 will rotate within the sleeve 35. Therefore, rotation of these members will have no effect on the plate 33 and the springs 30 associated therewith. The sealing ring 16 carried by door 6 will rotate relative to the sealing ring 14 carried by hopper 13. However, these sealing rings will always be held in firm resilient contact so that an effective seal will be produced at this point.

With the hopper 13 and the door 6 in the position described and shown in Figures 1 and 2, the drum 2 may be loaded by dumping material into the hopper 13. The hopper will direct the material downwardly and forwardly into the door 6. The door 6 will direct it downwardly and forwardly through the opening 3 into the drum.

In order to move the door 6 away from the rear end of the drum to permit discharge of material through the opening 3, we provide a toggle structure. This toggle structure is completely supported by the rear end of the shaft 7. It includes a collar 41 having a threaded inner surface cooperating with the threaded exterior of sleeve 35. One link 42 of the toggle structure is connected to the collar 41 while the other link 43 of said structure is connected to the outer end of the shaft 7. The link 42 consists of a pair of spaced bars 44 which are connected at diametrically opposed points at their forward ends to collar 41. The rear ends of these bars 44 are pivotally connected, as at 45, to the forward end of a pair of spaced bars 46 which form the toggle link 43. The rear ends of bars 46 are keyed on a transverse shaft 47. This shaft 47 is rotatably carried by rearwardly extending bearing portions 48 which are formed on the rear end of a cap member 49. This cap member 49 is rotatably mounted on the rear end of shaft 7 by means including a ball bearing 50. Thus, the sleeve 35 and the cap 49 which carries the toggle structure are supported on the shaft 7 in such a manner that rotation of the shaft is permitted without affecting these members and the toggle structure carried thereby. Each of the arms 46 of the toggle structure is provided with an extension 51, adjacent the pivot 45, which carries a setscrew 52 adapted to serve as a stop to limit upward swinging movement of the links 42 and 43. At the extent of this movement, the screw will contact with the lower edge of the adjacent bar 44 of link 42. The screw is preferably so adjusted that when the toggle links 42 and 43 are swung upwardly to their final position, Figure 2, the pivot 45 will be above a line passing through the pivot points 41a and 47. Thus, the links will tend to remain in such position. Consequently, the toggle structure will serve as a lock for holding the hopper 13 and door 6 in charging position. The point of connection of the link 42 to the sleeve 35 may be adjusted by rotation of collar 41 on sleeve 35 before the bars 44 are connected thereto.

The toggle structure is operated by means of the shaft 47. The extreme outer end of this shaft fits in a bearing portion 53 carried on the rear end of frame 25 and this serves to brace the outer end of the shaft. A depending crank arm 54, see Figure 1, is keyed to the shaft. This crank arm is pivotally connected, as at 55, to the rear end of a rod 56. The forward end of this rod 56 is pivotally connected, as at 57, to the lower end of a crank arm 58. This crank arm is keyed on a shaft 59, Figures 1 and 2. This shaft extends within a gear housing 60 supported by the frame of the mixer and is formed integral with a large internally toothed gear 61. This gear 61 is rotated by means of a pinion 62 keyed on the inner end of a shaft 63 rotatably mounted in a hub portion of housing 60. The shaft 63 is rotated by a handwheel 64. The gear unit provides sufficient leverage for easily operating the toggle structure.

To move the door 6 and, consequently, the hopper 13 to discharge position shown in Figure 4, it is merely necessary to rotate the handwheel 64. This will cause the toggle structure to exert a pull on the rear end of sleeve 10. Consequently, it will pull the sleeve 9 and the door 6 supported thereby rearwardly so that the ring 11 will move away from the sealing edge 12 and permit material to be discharged through opening 3 into a discharge chute 65 disposed below the opening. When the door 6 is moved rearwardly, the hopper 13 will be moved therewith against the resistance of springs 30, the links 27 swinging upwardly and rearwardly to permit this. Because of the space 22 provided between sleeve 20 carried by the hopper and sleeve 10, binding of these two sleeves will not result. During this movement of members 6 and 13 to discharge position, the weight of the hopper and the springs 30 still function to keep the sealing rings 14 and 16 in contact. Since these rings are always in contact, there is no danger of material lodging between these rings and preventing a proper seal at this point.

After discharge of material, the toggle structure may be operated by handwheel 64 to exert a push on the rear end of sleeve 10 which will move the sleeve 9 and door 6 forwardly. The ring 11 will again seat on edge 12 and produce a seal at this point. Because the edge 12 is sharp, the material will not collect on this edge during discharge. Therefore, an effective seal will always be produced at this point.

It will be noted that the hopper 13 is so supported that it will be self-aligning with the door 6 since the hopper is not supported directly by shaft 7. Therefore, distortion of the pipe or the frame 25 which carries the hopper will not interfere with alignment of the sealing ring 14 with the sealing ring 16. It will also be noted that the hopper 13 is independent of the door 6. The toggle structure acts through sleeve 10 directly on the door 6 to move the door between charging and discharging position and the hopper 13 is correspondingly moved because it is held in resilient contact with the member 6. The toggle structure is supported by the shaft 7 independently of the frame of the mixer. Consequently, distortion of the shaft 7 or the mixer frame will not cause binding of the toggle structure and associated parts. The relatively rotatable sealing rings 14 and 16 will always be held in firm resilient contact. In other words, the hopper 13 will always be held in association with the door 6 by a constant pressure exerted by the springs 30. This pressure can be initially adjusted but will remain constant while the door is in closed position (Figure 2) or open position (Figure 4).

It will be noted that the pressure for moving the door 6 between closed and open positions is applied by the toggle structure directly to the door 6 through the medium of the sleeve 10 and is not applied through the cooperating sealing surfaces 14 and 16. Consequently, friction at the relatively rotatable sealing surfaces 14 and 16 can be reduced to a minimum and this will reduce wear at these relatively rotating surfaces which is an important feature. The pressure exerted on the door 6 by the toggle mechanism in

closing and opening it can be varied by adjustment of the ring 41. This adjustment will not disturb the initial adjustment of the springs 30 which keeps the rings 14 and 16 in contact under a constant predetermined resilient pressure. This adjustment of the springs 30 can be such as to produce a minimum amount of friction of the relatively rotating sealing surfaces. The relatively greater pressure used in closing the door 6 is necessary and is not undesirable because the sealing portions 11 and 12 do not rotate relative to each other and there will be no wear at this seal.

Various other advantages will be apparent from the preceding description, the drawings and the following claims.

Having thus described our invention, what we claim is:

1. In combination with a rotatable mixing drum having an opening at the end thereof, a supporting member disposed centrally of said opening and projecting rearwardly from said drum, said supporting member being supported by the drum for rotation therewith, an annular door mounted for axial movement on said supporting member from a position where its forward edge is associated with said opening to a position where said edge is spaced from the opening to permit discharge from the drum, said door being carried by a sleeve mounted for axial movement on said supporting member, a material-receiving hopper disposed behind said door and adapted to feed material into and through the door, an independent non-rotatable supporting member for supporting said hopper for floating movement relative to the door, said hopper being provided with a sleeve through which said first-named supporting member and said first-named sleeve extend, cooperating sealing surfaces between the forward edge of said door and said drum disposed around said opening, cooperating sealing surfaces between the rear edge of said door and said hopper, means for normally maintaining said sealing surfaces in contact, said means including resilient means supported by said first-named sleeve and forcing the hopper forwardly into contact with the door, and a toggle lock connected to said first-named sleeve for forcing the door forwardly and holding it in contact with the drum, said toggle lock being operable to move said door away from the drum to permit discharge of material.

2. The combination set forth in claim 1 wherein the toggle lock is supported completely by said first-named supporting member.

3. The combination set forth in claim 1 wherein the sleeve provided on the hopper is of greater diameter than said first-named sleeve so that the hopper will be supported completely by said second-named supporting member.

4. The combination set forth in claim 1 wherein the hopper is suspended from the second-named supporting member by means of pendulum links which always occupy such positions that their lower ends are swung rearwardly beyond the vertical.

5. The combination set forth in claim 1 wherein the toggle lock comprises a forward link connected to the first-named sleeve by means which permits relative rotation thereof and a rear link connected to said first-named support by means which permits relative rotation thereof.

6. The combination set forth in claim 1 wherein the effective length of said toggle lock is adjustable.

7. In combination with a rotatable mixing drum having an opening at the end thereof, a door associated with said opening, said door being movable from a position in association with said opening to a position away from said opening to permit discharge of material through said opening, said door being provided with an opening through which material is fed into the drum, a material-receiving hopper associated with the door and adapted to feed material through said opening in the door, a seal between the door and the drum, a seal between the hopper and the door, means for preventing the hopper from rotating with the drum, means for moving said door between a position in association with said opening and a position away from said opening to permit discharge, and flexible means for exerting a constant force with said door in either of such positions to maintain said door and hopper in association with each other.

8. The combination set forth in claim 7 wherein said flexible means comprises adjustable resilient means.

9. The combination set forth in claim 7 wherein said means for moving the door acts directly on the door without affecting said seal between the hopper and the door.

10. In combination with a rotatable mixing drum having an opening at the end thereof, a supporting member disposed centrally of said opening and projecting rearwardly from said drum, said supporting member being supported by the drum for rotation therewith, an annular door mounted for axial movement on said supporting member from a position where its forward edge is associated with said opening to a position where said edge is spaced from the opening to permit discharge from the drum, said door being carried by a sleeve mounted for axial movement on said supporting member, a material-receiving hopper disposed behind said door and adapted to feed material into and through the door, an independent non-rotatable supporting member for supporting said hopper for floating movement relative to the door, said hopper being provided with a sleeve through which said first-named supporting member and said first-named sleeve extend, cooperating sealing surfaces between the forward edge of said door and said drum disposed around said opening, cooperating sealing surfaces between the rear edge of said door and said hopper, means for maintaining said cooperating sealing surfaces between the door and hopper in contact, said means including resilient means supported by said first-named sleeve and forcing the hopper forwardly into contact with the door, and means for moving said door axially of said support from normal position to discharge position.

11. The combination set forth in claim 10 wherein the sleeve provided on the hopper is of greater diameter than said first-named sleeve so that the hopper will be supported completely by said second-named supporting member.

12. The combination set forth in claim 10 wherein the hopper is suspended from the second-named supporting member by means of pendulum links which always occupy such positions that their lower ends are swung rearwardly beyond the vertical.

13. In combination with a rotatable mixing drum having an opening at the end thereof, a supporting member projecting from said drum

and adapted to rotate therewith, a door mounted for axial movement on said supporting member from a position in association with said opening to a position spaced from the opening to permit discharge from the drum, said door being provided with an opening through which material is fed into the drum, said door being carried by a sleeve mounted for axial movement on said supporting member, a material-receiving hopper disposed behind said door and adapted to feed material through the door, an independent non-rotatable supporting member for supporting said hopper for floating movement relative to the door, said hopper being provided with a sleeve through which said first-named supporting member and said first-named sleeve extend, cooperating sealing surfaces between said door and said drum, cooperating sealing surfaces between the rear end of said door and said hopper, means for maintaining said cooperating sealing surfaces between the door and hopper in contact, said means including resilient means supported by said first-named sleeve and forcing the hopper forwardly into contact with the door, and means for moving said door axially of said support from normal position to discharge position.

14. The combination set forth in claim 13 wherein said resilient means is adjustable and exerts a constant force during movement of the door between its two positions.

15. The combination set forth in claim 13 wherein the sleeve provided on the hopper is of greater diameter than said first-named sleeve so that the hopper will be supported completely by said second-named supporting member.

16. The combination set forth in claim 13 wherein the hopper is suspended from the second-named supporting member by means of pendulum links which always occupy such positions that their lower ends are swung rearwardly beyond the vertical.

17. A mixing machine for concrete or the like comprising a rotatable mixing drum having a combined charge and discharge opening in its rear end, an annular door member having open ends movably associated with said mixing drum opening, a movably mounted hopper having an opening adapted to register with the rear open end of said door, said door and hopper being movable as a unit toward and away from said drum, means for moving said unit, means located to the rear of said drum and door for supporting the hopper in floating relation relative to said door, said means including transversely spaced longitudinal tubular frame members projecting rearwardly at opposite sides of said door and hopper and beyond the registering opening in the door and hopper, and independently adjustable hopper suspension means disposed at opposite sides of said hopper, said suspension means each comprising an axially adjustable link having its upper end portion swivelly connected to one of said frame members and its lower end portion swivelly connected to one side of said hopper, said pair of links remaining in upwardly and forwardly inclined positions toward said mixing drum at all times regardless of the positions of said door and hopper with relation to said drum, and relatively movable members fixed to the drum and hopper, such members permitting limited up and down movement of said hopper relative to said door when the hopper and door are moved into and out of engagement with said mixing drum.

18. A mixing machine for concrete or the like comprising a rotatable mixing drum having a combined charge and discharge opening in its rear end, an annular door member having open ends movably associated with said mixing drum opening, a movably mounted hopper having an opening adapted to register with the rear open end of said door, said door and hopper being movable as a unit toward and away from said drum, means for moving said unit, means located to the rear of said drum and door for supporting the hopper in floating relation relative to said door, said means including transversely spaced longitudinal tubular frame members projecting rearwardly at opposite sides of said door and hopper and beyond the registering opening in the door and hopper, and independently adjustable hopper suspension means disposed at opposite sides of said hopper, said suspension means each comprising an axially adjustable link having its upper end portion swivelly connected to one of said frame members and its lower end portion swivelly connected to one side of said hopper, said pair of links remaining in upwardly and forwardly inclined positions toward said mixing drum at all times regardless of the positions of said door and hopper with relation to said drum, an inner sleeve member carried by the drum and an outer sleeve member in telescopic relation, said outer sleeve member being fixed to said hopper and having a greater diameter than that of the inner sleeve member to provide a space between said sleeve so as to permit up and down movement of the hopper.

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