

[54] **SCREW LIFTER MIXER**

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[22] Filed: **Oct. 19, 1971**

[21] Appl. No.: **190,518**

[52] U.S. Cl. .... **259/3, 259/14, 259/30, 259/81, 259/177**

[51] Int. Cl. .... **B01f 9/06, B01f 15/02, B28c 7/16**

[58] Field of Search ..... **259/3, 6, 14, 30, 259/81, 161, 175-177, 82, 88; 222/167, 467**

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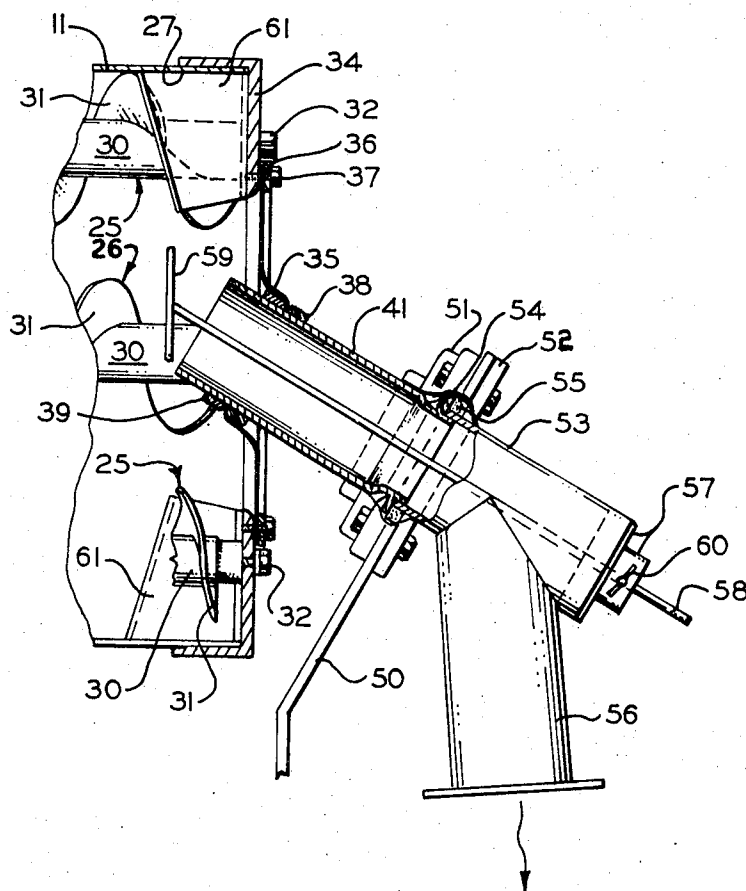
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[57] **ABSTRACT**

A mixer for particulate material has a cylinder supported for rotation about a substantially horizontal axis, the support means being adjustable for elevating its receiving end so as to be operated as a continuous mixer. A plurality of helically flanged screw tubes extend longitudinally as lifters, having their ends secured to the end walls of the cylinder adjacent the wall periphery. As the cylinder rotates the material being mixed is picked up and released by the screw flanges so as to shift parts of the mix axially in either direction. When the receiving end is elevated the total mix is also continually shifted by the incline of the cylinder toward the discharge end. Axial openings at either end are closed by diaphragms, each secured at its center to a rotating tube maintained at a constant angle to the axis of the cylinder by a floor supported bushing.

**3 Claims, 4 Drawing Figures**



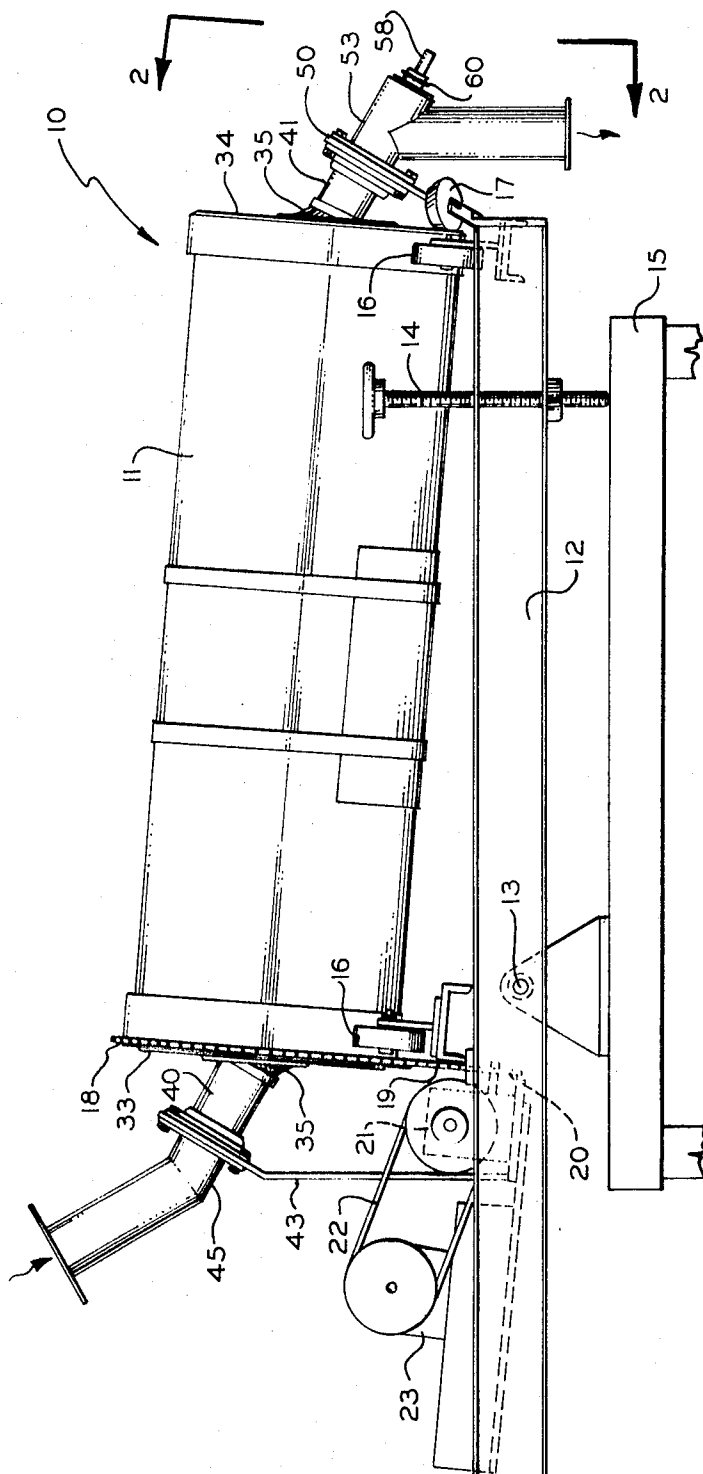


FIG. 1

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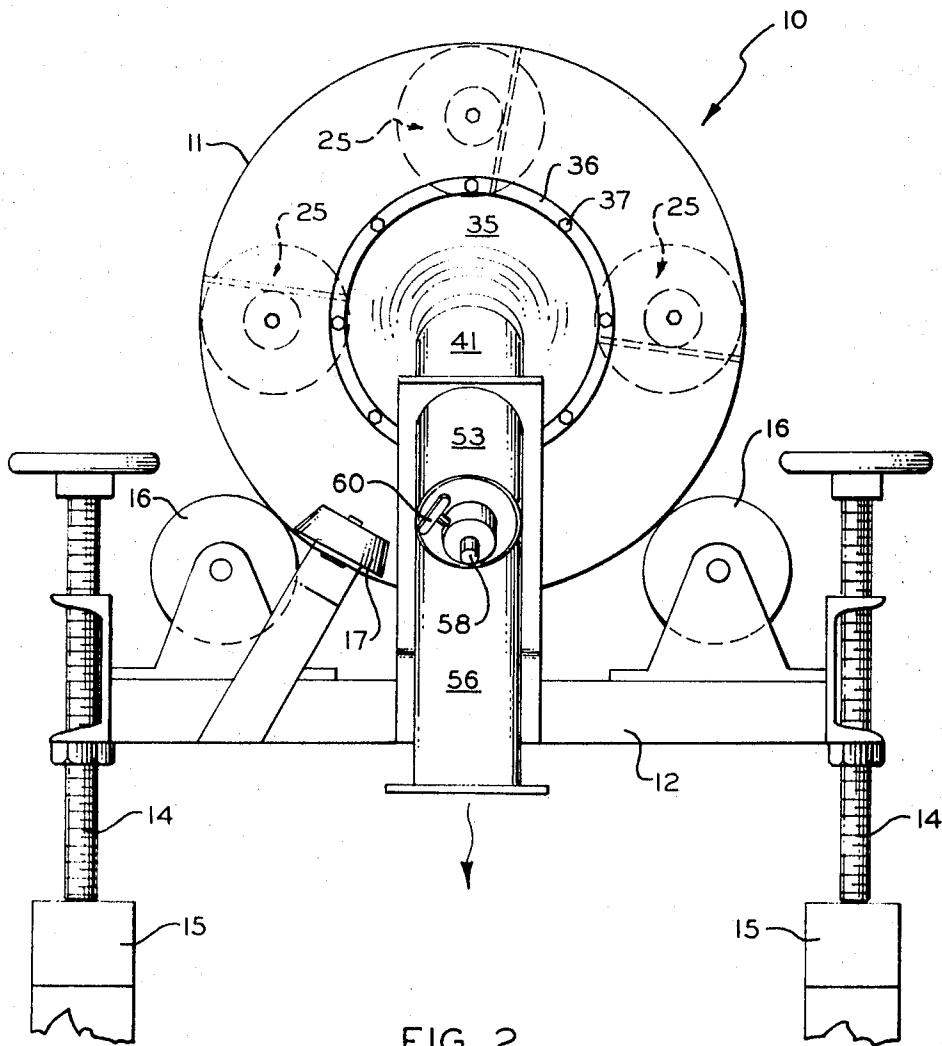


FIG. 2

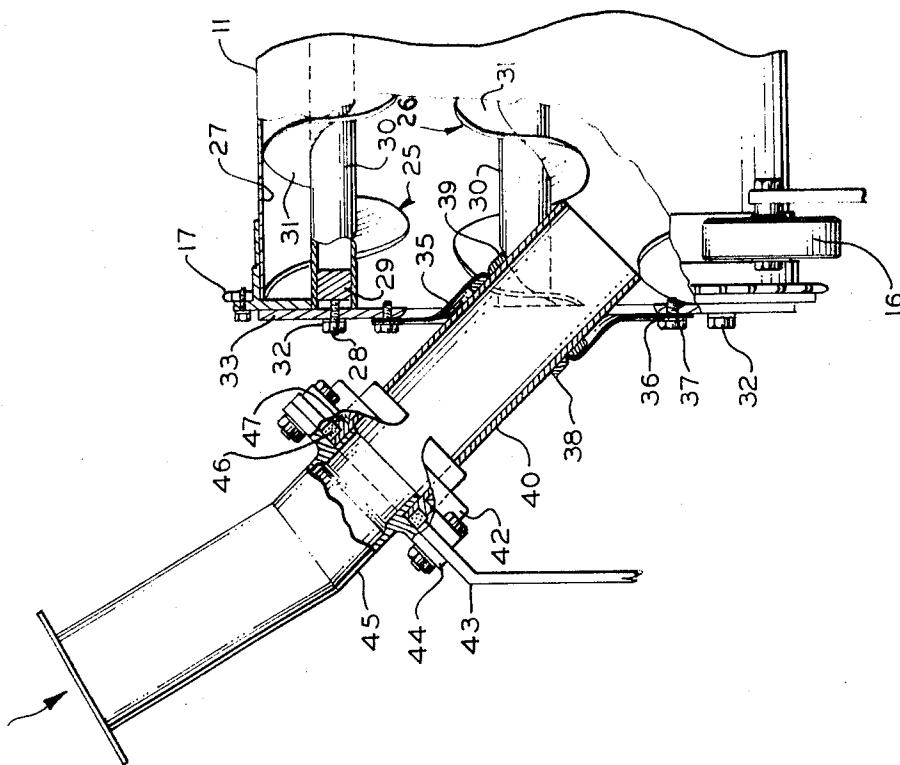


FIG. 3

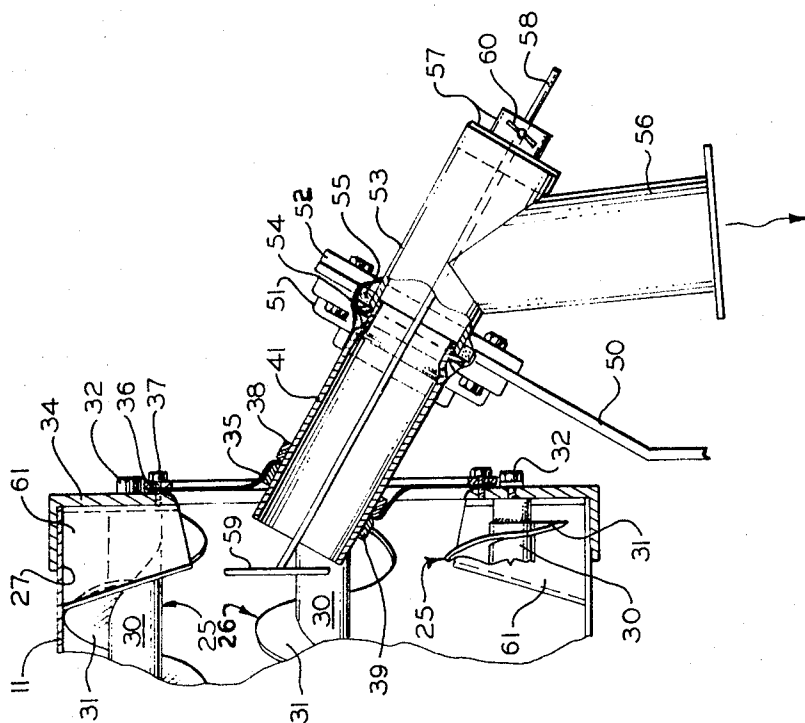


FIG. 4

## SCREW LIFTER MIXER

## BACKGROUND OF THE INVENTION

This invention relates to a blender or mixer for particulate or other dry materials and, more particularly to such a mixer having auger-like helical flights secured longitudinally along the inner wall of a rotating cylinder. Novel means are also provided for sealing the receiving and discharge ends of the mixer.

Heretofore known dryers and mixers with rotating cylinders having various shaped lifters or flights on the cylinder wall have been known. Deflectors for partial axial shifting of the material being mixed have either been secured to the lifters by rivets or by welding or have been screens or plates secured in the cylinder by braces from the lifters or secured on an axially extending shaft. Such lifters and deflectors have been difficult and expensive to make and have been subject to wear and breakage.

Rotating cylinder mixers heretofore known have been difficult to seal at the intake and discharge openings in that axial openings must be provided with moving part seals at the very point where the dry mixed material is continuously being moved resulting in rapid wear on the moving parts.

## SUMMARY OF THE INVENTION

A conventionally rotated cylinder mounted on its support so as to be rotated about a substantially horizontal axis or so as to be inclined from its intake end down to the discharge end, has a plurality of helically flanged screws whose ends are secured to the end walls of the cylinder extending longitudinally of the cylinder and contiguous to the cylinder wall as lifters or flights at spaced angular intervals. As the cylinder rotates the helical flanges pick up the particulate material being mixed in the cylinder and release it as each helical lifter approaches its elevated position. As each lifter enters the material being mixed lying on the bottom of the cylinder, the flange, by its nature, moves portions of the material axially of the cylinder in one direction or another. As the lifter nears the top of the cylinder it moves portions of the material axially a small distance as it releases the material to fall to the bottom of the cylinder. Adjacent lifter screws have their flanges alternately in right or left hand helices.

This forward and back motion of small portions of the material aids in the mixing of the material in addition to the ordinary mixing action of the rotating cylinder.

When the cylinder is inclined to act as a continuous mixer, the incline of the cylinder also shifts the bulk of the material from its intake end toward its delivery end in the usual manner.

Each cylinder end wall is annular providing axial openings for receiving and delivering the material being mixed and the openings are provided with novel closure means for simplifying the seals at the receiving and delivery ends. The perimeter of the axial opening through each end wall has an annular flexible diaphragm secured thereto, the opening through the diaphragm being secured around a rotating tube member.

Each tube member is supported in a journal supported from the support frame of the mixer, the tube member being inclined so that its axis intersects the axis of the cylinder substantially at the opening. An upwardly inclined supply tube is arranged to supply mate-

rial to be mixed to the rotating tube at the supply end and a downwardly inclined delivery tube is arranged to receive mixed material from the rotating tube at the other end. An adjustable baffle disk is supported on a rod projecting through the delivery tube and its cooperating rotating tube to control the rate of flow out the delivery tube or to shut off the flow entirely.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a mixing machine embodying the invention:

FIG. 2 is an end elevational view thereof as viewed from the delivery end; and

FIGS. 3 and 4 are fragmentary side elevational views of the supply and delivery ends thereof, respectively, partly in section.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2, the mixer 10 comprises a mixer chamber or cylinder 11, rotatably supported on a frame 12 which is tiltable about the axis 13 by adjustment of screws 14, the frame 12 being supported as shown on a base 15.

The cylinder 11 is conventionally supported by two rollers 16 on either side and secured against axial movement, when it is inclined, by the end roller 17 at the lower end of the cylinder. A sprocket flange 18 secured about the upper or supply end of the cylinder is connected by a chain 19 to the driving sprocket indicated at 20 on the driven shaft of a reducer indicated at 21 which, in turn, is driven by a belt 22 from motor 23 supported on frame 12.

Referring to FIGS. 3 and 4, the cylinder 11 has four angularly spaced lifters or flights 25-26 comprising helically flanged tubes or screws which are readily available, the lifters 25 being right hand and lifters 26 left hand. The lifters 25-26 are secured contiguous to the cylinder wall 27 by axially projecting screws 28 secured to plugs 29 welded to the ends of the tube portion 30 of lifters 25-26 to which the helical flange 31 is secured. Nuts 32 secure the screws 28 to the annular end walls 33 and 34 of the cylinder at the supply and delivery ends, respectively.

An annular diaphragm 35 of flexible material is secured at the axial opening in each end wall 33 and 34 by a clamping ring 36 and bolts 37. Each diaphragm 35 is secured at its central opening around a rotating tube by clamps 38 and 39 secured around the tube by appropriate set screws, not shown. Tube 40 is at the supply end and tube 41 at the delivery end.

The rotating supply tube 40 rotates in a journal 42 secured by suitable bolts to a support plate 43 extending up from frame 12, and also secured to plate 43 is a plate 44 welded around a fixed supply tube 45. The lower end of tube 45 is reduced in diameter as shown in FIG. 3 and extends inside the upper end of rotating tube 40. A felt seal 46 is contained in the support plate 43 in contact with the upper end of the rotating tube 40 and the tube 40 may have a thrust collar 47 for retaining the tube within its journal, as shown, or the inner race of a ballbearing journal may be secured to tube 40 by appropriate set screws.

The rotating delivery tube 41 is supported on a plate 50 extending up from the frame 12 and is rotatably contained in a journal 51 bolted to the plate 50 along with another plate 52 welded around a fixed delivery

tube 53. The rotating tube 41 has a reduced lower end shown in FIG. 4 extending into the upper end of the fixed tube 53 and may have a thrust flange 54 secured thereto, as shown, or a ballbearing journal with inner race secured to tube 41 may be used. A felt seal 55 in plate 51 is in contact with the upper end of tube 53 and flange 54.

The fixed discharge tube 53 has a downwardly directed tube 56 joined thereto at substantially a 45° angle for delivery of the mixed material to a conveyor or hopper or other container. The lower end of tube 53 has a plug 57 therein. A rod 58 extends through a hole in plug 57, and axially through tubes 53 and 41, and bears at its upper end a deflector plate 59 fixed at an angle to rod 58, as shown. A thumb screw 60 through the reduced end of plug 57 secures the rod 58 in adjusted position. Alternatively, a tube may be used, in place of rod 58, with a nozzle at its upper end for spraying liquid on the material being mixed.

The delivery end of cylinder 11 may also have four short auxiliary flights 61 secured by suitable bolts to the end wall 34 for delivery of the mixed material at this end to the upper end of delivery tube 41 as is common in such mixing machines.

In operation the particulate material to be mixed, such as sand and a coloring material, is let into the fixed supply tube 45 continuously at a slow rate or intermittently. Flowing down the tube 45 it enters the rotating tube 40 and falls to the bottom of the rotating cylinder 11. When the cylinder is inclined the material is continually shifted by the rotating cylinder toward the delivery end. When the lower end of cylinder 11 is raised by turning screws 14, the mixer acts as a batch mixer until the lower end is again lowered.

As each lifter 25-26 descends with the rotating cylinder it enters the accumulated material at the bottom of the cylinder and its helical flange shifts portions of the material toward the supply end or toward the delivery end according to the right or left hand disposition of the flange.

The material is lifted up by each flight as it rises toward the top and, again, portions of the material are released axially shifted one way or the other from the helical flange. This axial shifting occurs all along the flange while the general shift of the material is toward the delivery end of the cylinder when it is inclined.

At this latter end the flights 61 pick up material and allow it to fall into the open end of the rotating tube 41 where it flows down into the fixed tube 53 and onto a conveyor or into a receptacle. The rate of flow or discharge of the material through tube 53 can be controlled by the angular and endwise adjustment of the rod 58 which bears the plate 59. When the mixer 10 is used as a batch mixer, the flow can be turned on or off by adjustment of plate 59.

Dust and grit caused by the material falling into the cylinder from tube 40 or caused by the mixed material falling to the tube 41 is contained in the cylinder by the diaphragms 35 and is kept away from the journals 42 and 51 where the simple felt seals 46 and 55 are sufficient to keep the journals free of particulate material.

By controlling the flow into the cylinder and regulating its discharge therefrom a truly continuous flow can be obtained when it is so desired.

I claim:

1. A mixer comprising an elongated cylinder rotatably supported on a frame, and means for rotating the cylinder, the cylinder having a plurality of helically flanged screws extending axially of the cylinder and secured to the cylinder as lifters contiguous to the cylinder wall, the cylinder end walls being annular and adapted for receiving material to be mixed at the supply end and adapted at the delivery end for delivery of the mixed material therefrom, the annular end walls having flexible annular diaphragms secured thereto about their openings, each diaphragm being secured at its central opening around a rotating tube, the rotating tube being rotatably supported in a journal supported independently of the cylinder, the rotating tube at the supply end extending diagonally upward from the cylinder and the rotating tube at the delivery end extending diagonally downward from the cylinder, a fixed tube at the supply end adapted to convey material to be mixed to the rotating tube, and a fixed tube at the delivery end adapted to carry away mixed material from the rotating tube at that end, the fixed tubes being in sealed relation with the rotating tubes.

2. The mixer defined in claim 1 having short flights secured to the cylinder wall adapted to drop mixed material toward the rotating delivery tube, the fixed delivery tube having two sections secured together at an angle, a rod adjustably secured in and extending axially through one section and axially through the rotating delivery tube, the rod having a deflector plate secured to its end in the cylinder for regulating the flow of mixed material through the delivery tubes.

3. In a mixer for particulate material having a rotating hollow cylinder mixing chamber and means for rotating the cylinder about its axis, the cylinder having an axial opening in at least one end; a closure for the opening comprising: an annular diaphragm secured to the cylinder end about the opening therein, the diaphragm being secured at its central opening around a rotating tube, the rotating tube being rotatably supported by means independent of the cylinder at an angle to the axis of the rotating cylinder, whereby the inclined rotating tube is adapted for passage therethrough of material being mixed and the tube may be sealed at a point remote from the mixing chamber.

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