Dec. 4, 1962 L. L. THOMPSON 3,066,831

APPARATUS FOR FEEDING COMMINUTED MATERIAL FROM A HOPPER

Filed May 5, 1960

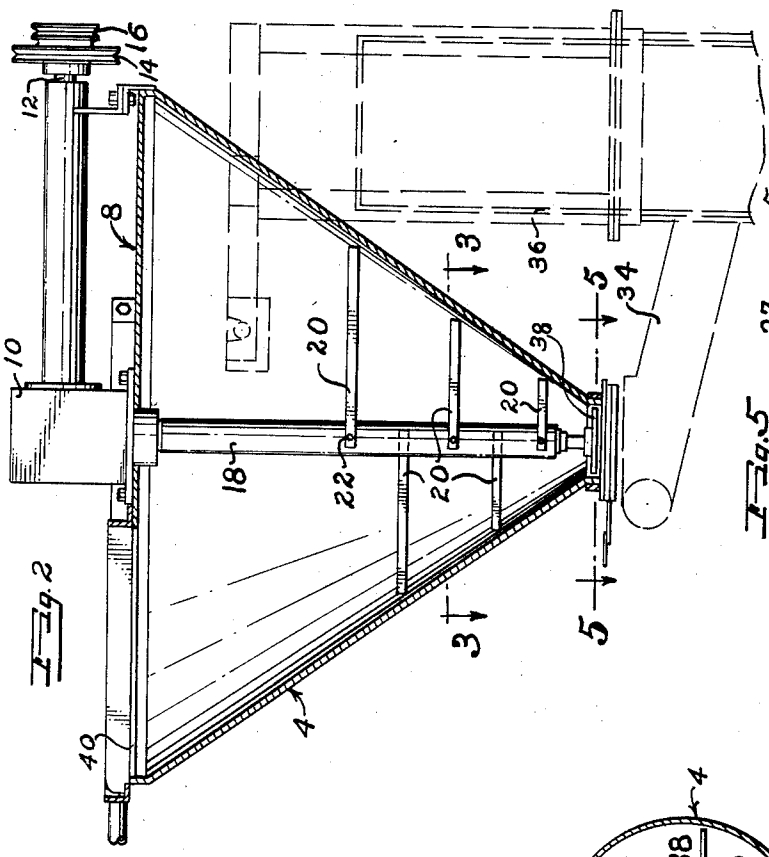

Fig. 2

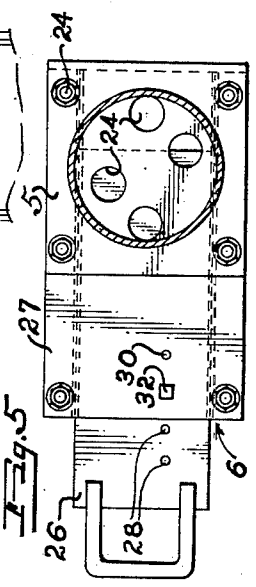

Fig. 5

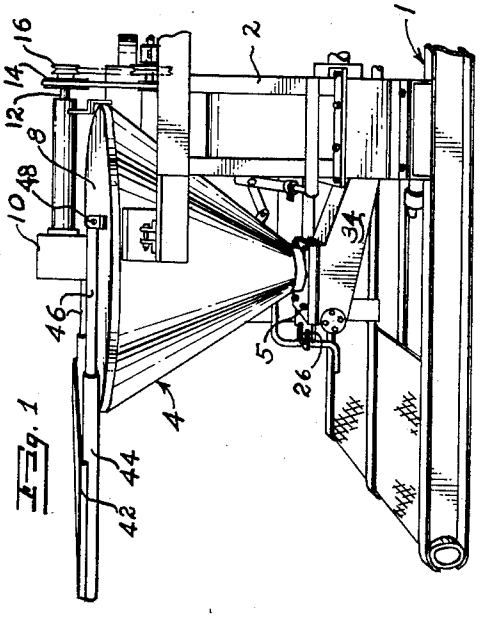

Fig. 1

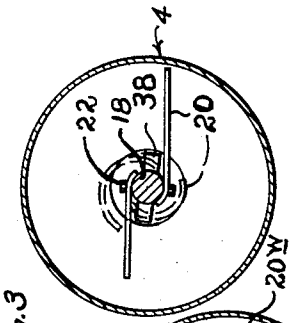

Fig. 3

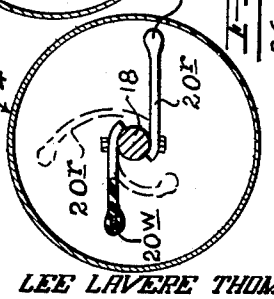

Fig. 6

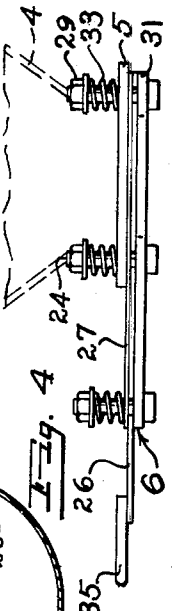

Fig. 4

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APPARATUS FOR FEEDING COMMINUTED MATERIAL FROM A HOPPER

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This invention relates to improvements in mud mixers for mixing dry materials, that go into drilling mud, with the drilling mud for a well, so as to maintain proper consistency of the drilling mud. The invention is more specifically directed to the specific feeding arrangement for a hopper which contains dry material, such as bentonite clays and other additives for drilling mud, such as weight producing material and the like.

Certain materials which are fed through hoppers and feeders have a tendency to bridge over in such manner as to prevent uniform and accurate feeding of the material into the drilling mud.

Various feeding arrangements have been proposed heretofore for feeding dry materials into a hopper, however some of these were complex in construction, and others did not properly feed all materials under all conditions. It was with these deficiencies in mind that the present device was designed.

An object of this invention is to provide a feeding unit for feeding dry materials, wherein the power driving unit of the feeding device will not be stalled if the material becomes tightly packed.

Another object of the invention is to provide a self-contained feeding device for a hopper which will feed dry, impalpable bentonite clays and the like in such manner that they will flow into a fluid stream in a uniform, gauged amount.

A further object of the invention is to provide means whereby the entire contents of the feeding hopper will be agitated so that none of the material will bridge and fail to be fed into the mixing hopper.

Still another object of the invention is to provide a hopper arrangement for a mud mixing device which is simple in construction and operation, which has the minimum number of parts to become worn or to get out of order, the cost of manufacture of which will be low, as will be the maintenance cost, and which device is reliable under all working conditions.

With these objects in mind and others which will become manifest as the description proceeds, reference is to be had to the accompanying drawings in which like reference characters designate like parts in the several views thereof, in which:

FIG. 1 is a perspective view of a portion of a mud mixer showing the feeding hopper thereon, and showing the drive arrangement therefor, with parts being broken away to bring out the details of construction;

FIG. 2 is an enlarged, vertical sectional view through the feeding hopper, with parts being broken away and with parts shown in section, with cooperating parts shown in dashed outline;

FIG. 3 is a cross sectional view taken on the line 3—3 of FIG. 2, looking in the direction indicated by the arrows, with an alternate position of certain elements being shown in dashed outline;

FIG. 4 is an enlarged, detailed, elevational view of the feed gate shown apart from the feeding hopper;

FIG. 5 is an enlarged sectional view taken on the line 5—5 of FIG. 2, looking in the direction indicated by the arrows;

FIG. 6 is a fragmentary view, partly in section, of a modified form of the mixer elements.

With more detailed reference to the drawing, the numeral 1 designates generally a base, which, in the present instance, is of structural steel construction, as will best be

seen in FIG. 1. A framework 2 is mounted on the base 1 and extends upward to embrace and support a hopper 4. The hopper 4 is preferably of conical shape and has an apertured plate 5 welded or otherwise secured to the lower end thereof, the aperture in which plate is adapted to register with the opening in the lower end of the hopper 4.

A gate mechanism, designated generally by the numeral 6, is attached to plate 5, as will be more fully brought out hereinafter. The gate mechanism is shown enlarged in FIGS. 4 and 5.

The hopper 4 has a cover 8 which partially covers the upper portion thereof, and which provides a base upon which a bevel gear drive 10 is mounted. The bevel gear drive 10 is of conventional type and has a shaft 12 extending outward from one side thereof on which shaft the respective pulleys 14 and 16 are mounted.

A shaft 18 extends downward from bevel gear unit 10, which shaft 18 has resilient, spring-like members 20 secured thereto along the length thereof, which members 20 extend outward from shaft 18 at a right angle thereto. These resilient, spring-like members 20 are secured to shaft 18 as by screw fastening means 22. These spring-like members 20 are sufficiently flexible to wrap around the shaft 18, as the shaft rotates, if the material in the feeding hopper is too tightly packed. However, as the shaft 18 is rotated by belt driven pulleys 14 or 16 through shaft 12 and bevel gear unit 10, and as the rotational speed of the shaft 18 increases, the centrifugal force created thereby will urge the spring-like members outward, which outward movement of the members 20, together with the inherent resilient quality thereof, will cause these spring-like members 20 to attain a position as shown in full outline in FIGS. 2 and 3, that is, a whipping action will be accorded the spring-like members 20. This movement of the members 20 will agitate and loosen the material within the feeding hopper so that it will be continuously fed downward within the hopper 4 and out from the lower end thereof into the mixing hopper. Thus, the dry material is not allowed to become compacted or abridged within the hopper 4, but the entire contents of the hopper 4 will be subject to action by the members 20 so that the feeding downward thereof will be uniform.

The dry material feeds out of the hopper 4 through holes 24 in a plate 27 in the gate mechanism 6. The slide member 26 of gate mechanism 6 is provided with a series of holes 28, which holes are adapted to register with holes 30 in the plate 27 of gate mechanism 6, when the slide member 26 is in selected positions, so that a pin 32 may be inserted through certain of the holes 28 and 30 to hold the slide gate 26 in a fixed position with respect to plate 27, so that the holes 24 will feed the dry, comminuted material into the drilling mud stream which passes through chute 34 of mud mixing device 36 and into the mud stream in the mixing hopper, as is more fully shown in my co-pending application, which is directed primarily to a pump for a mud mixing device. For further reference to the drive mechanism of the present device, reference is to be had to this co-pending application, or the present mixer may be driven by an independent power drive, such as a directly connected electric motor, or the present device may be driven by a motor driving through the shaft 12, or the like.

The shaft 18 has a crossbar 38 on the lower end thereof, which crossbar rotates in close proximity to the upper face of plate 27 of gate mechanism 6, so as to prevent holes 24 from becoming clogged with the dry powder being fed therethrough.

The plate 5 has spaced apart holes therein to receive bolts 29 therethrough and through complementary holes in plates 27 and 31. Each of the bolts 29 has a spring 33 telescoped thereover to hold the slide member 26 in

binding engagement between plates **5** and **31**. In this manner the tension of the slide member **26** may be regulated by tightening nuts **35** on bolts **29**, so as to maintain plates **27** and **31** in tight relation therewith to prevent leakage of the loose, pulverized material between the plates and the slide member of the gate mechanism.

By having the holes **24** formed within plate **27**, it is possible to remove the plate **27** by removing the bolts **29**, thereby the plate may be readily removed and replaced as wear occurs, likewise, the slide member **26** may be replaced when its becomes worn. A handle **35** is provided on slide member **26** to enable manual movement thereof transversely across the bottom of feeding hopper **4** so as to open or close holes **24** in plate **27** a gauged amount, thereby the size of the openings may be regulated to control the amount of dry material flowing into the mud stream within chute **34**.

An opening **40** is formed through one side of the cover **8**, through which opening the dry, comminuted material is introduced into the feeding hopper **4**. The opening **40** may be provided with a sliding cover **42**. The sliding cover **42** is welded or otherwise secured to tubular members **44**, which tubular members slide on bars **46**, which bars are pivotally mounted on lugs **48** which are secured to the cover **8**, therefore, the sliding cover **42** may be moved about pivot point **48**, or the cover **42** may be moved outward to form a platform adjacent the opening **40**, as will best be seen in FIG. 1.

MODIFIED FORM OF RESILIENT MEMBER

FIG. 6 shows a modified form of resilient members which are designated at **20***r*, which members are of elastomer material such as rubber, synthetic rubber, or plastic, which members **20***r* are provided with weights **20***w* near the distal ends thereof, so when the shaft **18**, to which the members **20***r* are attached, is rotated, the weighted members will be thrown outward by centrifugal force. However, these members are sufficiently flexible to coil around the shaft substantially in the same manner as shown in FIG. 3.

While the invention has been illustrated and described in one embodiment thereof, it is to be understood that minor changes may be made in the details of construction and adaptations made to different installations without departing from the spirit of the invention or the scope of the appended claim.

Having thus clearly shown and described the invention, what is claimed as new and desired to be secured by Letters Patent is:

An apparatus for mixing within and feeding from a hopper, dry comminuted material in a controlled, uniform manner, which apparatus comprises;

(*a*) a conical hopper,
  (1) said conical hopper having a material receiving opening in the upper side thereof,
  (2) the lower end of said hopper having a central discharge opening formed therein,

(*b*) a support mounted on the upper side of said hopper,

(*c*) a bevel gear drive mounted on said support,

(*d*) a rotatable shaft journaled in said bevel gear drive,
  (1) said shaft extending axially downward into said hopper to a point a spaced distance from the lower end thereof,

(*e*) elastomer members,
  (1) which elastomer members are of unequal lengths,
  (2) which members are secured to said shaft at spaced apart intervals through a portion of the length thereof,
  (3) which elastomer members extend horizontally outward with the ends thereof being in close proximity to said conical hopper,

(*f*) metallic weights,
  (1) each said metallic weight being completely encased within one of said elastomer members near the distal end thereof, and

(*g*) means connected with said axial shaft through said bevel gear drive, to rotate said shaft.

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