Sept. 5, 1950 E. INGLE ET AL 2,521,633

MACHINE FOR MIXING OR BLENDING GRANULAR AND SIMILAR MATERIALS

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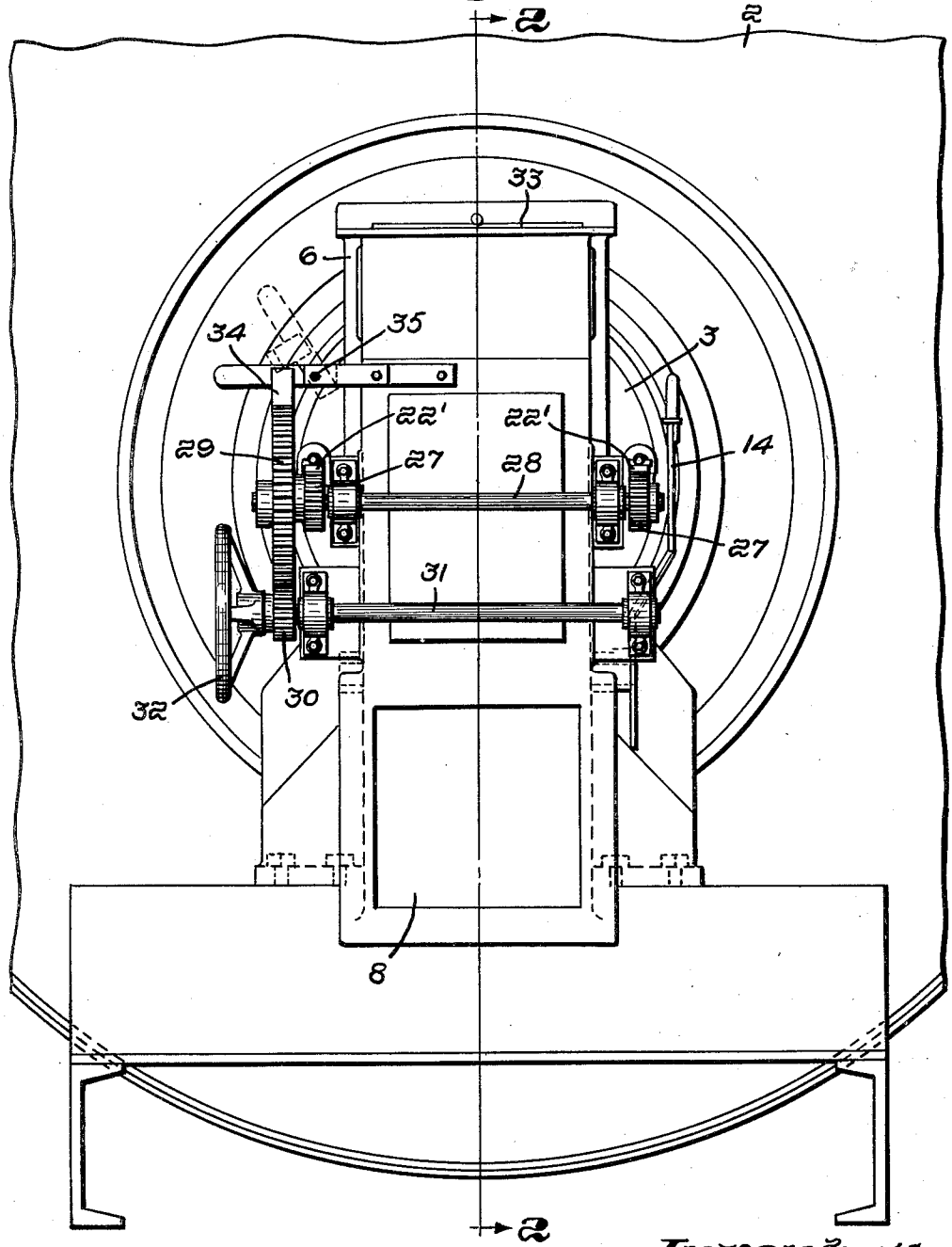
Fig. 1.



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3 Sheets-Sheet 2

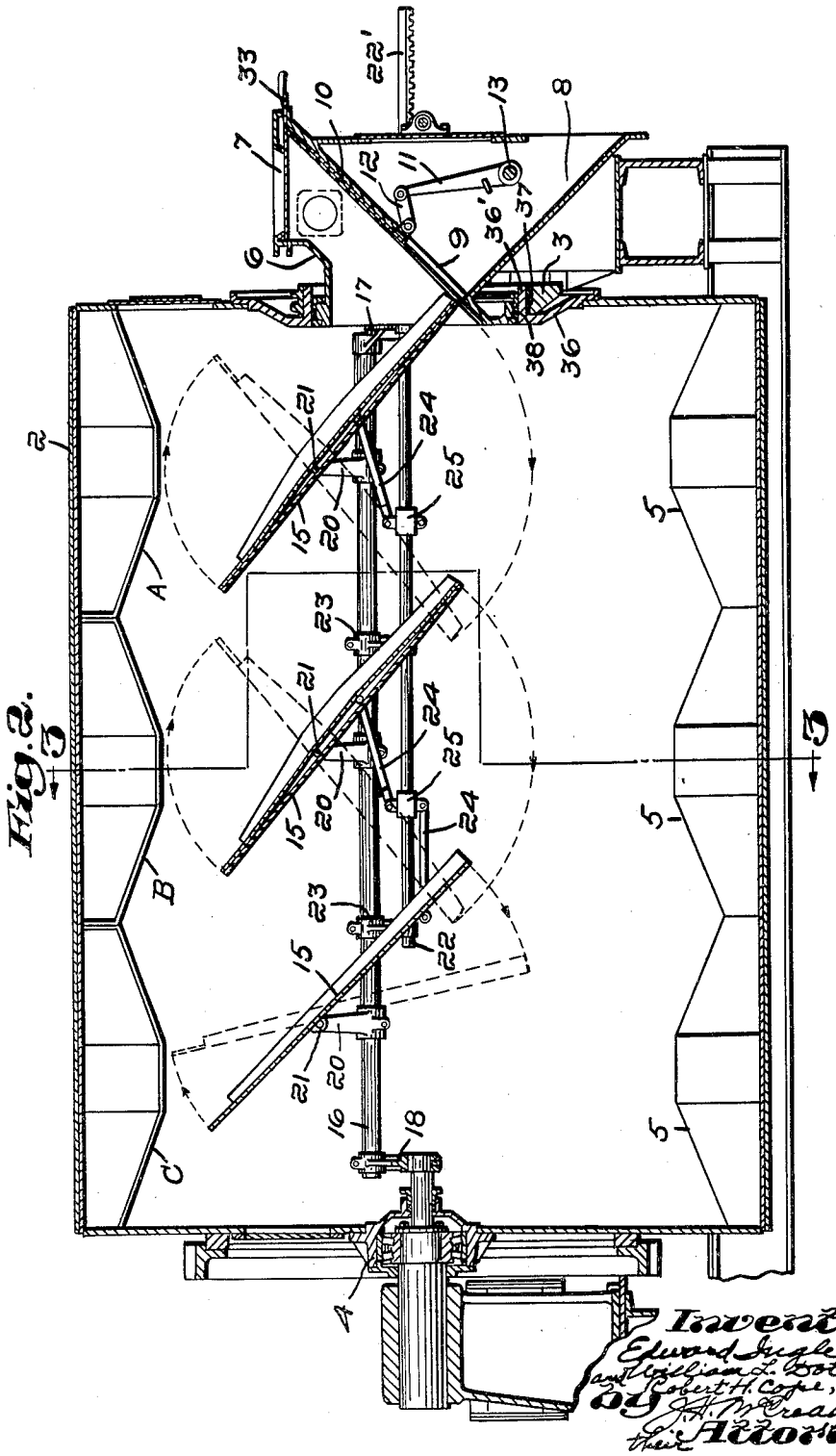

Fig. 2.

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Fig. 3.

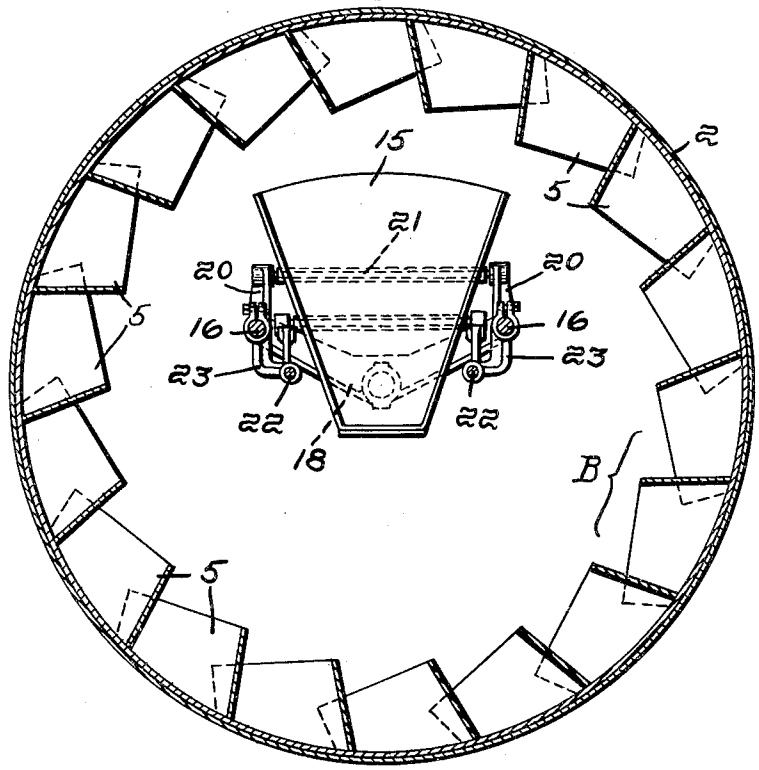
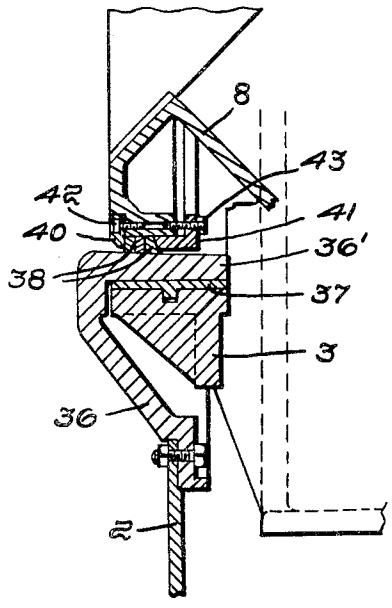


Fig. 4.



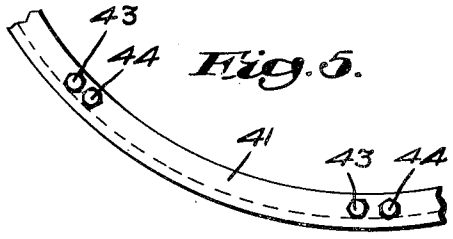


Fig. 5.

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Patented Sept. 5, 1950 2,521,633

UNITED STATES PATENT OFFICE

2,521,633

MACHINE FOR MIXING OR BLENDING GRANULAR AND SIMILAR MATERIALS

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Application February 5, 1948, Serial No. 6,504

6 Claims. (Cl. 259—3)

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This invention relates to machines for intimately intermingling or blending granular, powdered, or similar materials, all hereinafter included in the term "granular materials," and producing substantially homogeneous mixtures notwithstanding great variation in them of such characteristics as weight, density, particle size, color, and the like.

Typical prior art machines of this type usually consist of a drum mounted to revolve about an approximately horizontal axis and provided with pockets or buckets on its inner surface to pick up the material and discharge it again as the drum revolves, these operations being continued until the desired degree of mixing or intermingling has been produced. A common form of blender of this type includes provision for loading and unloading the drum from the same end of the machine.

In order to design such machines for different capacities, most of the variations in dimensions must necessarily be made in the diameter of the drum because of the difficulty in producing axial or horizontal distribution of the material in a machine of any great length. The present invention deals particularly with this condition and it aims to devise a construction in which practically any desired degree of axial distribution of the materials being blended can be produced automatically with relatively simple and reliable equipment, thus making it possible to use blenders of much greater length than has been heretofore deemed practical.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a front end view of a blender embodying features of this invention;

Fig. 2 is a sectional view taken approximately on the line 2—2, Fig. 1;

Fig. 3 is a similar view on substantially the line 3—3, Fig. 2;

Fig. 4 is a sectional view showing a preferred form of packing for sealing the joint at the journal or bearing at the end of the drum; and

Fig. 5 is a plan view of a portion of the packing mechanism.

The construction shown in the drawings comprises a drum 2 mounted in the customary manner on front and rear trunnion bearings 3 and 4, respectively, to rotate around the axis of the drum. Secured to the inner wall or shell of the

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drum are buckets 5 which may be of the customary form, but in this instance they are arranged in three circular or circumferential series A, B and C. The material to be blended is introduced into the drum through the hopper 6 having an intake opening 7, Fig. 2, leading directly into the interior of the drum. Also associated with this hopper is a discharge chute 8, the hopper, the chute, and the stationary bearing 3 forming parts of a single structure. Connecting the inlet and discharge passages is an aperture or port 9 in the division wall of the hopper. During the introduction of a charge into the drum this port is closed by a slide or gate 10 but it is open during the operation of emptying the drum or discharging it. The operating mechanism for the gate comprises an arm 11, Fig. 2, connected with the gate by a link 12, the arm being mounted fast on a rock shaft 13 to which a lever 14, Fig. 1, also is secured.

So far as the construction above described is concerned, it is essentially like those which have been used heretofore, except that the latter have included only one series of buckets.

According to the present invention a series of short chutes or deflectors 15, best shown in Figs. 2 and 3, are mounted in the central portion of the drum, and each deflector is positioned approximately in vertical, transverse alignment with one of the rings of buckets 5. As best illustrated in Figs. 2 and 3, a pair of supporting bars 16 is mounted in brackets 17 and 18 which, in turn, are secured to stationary parts inside the front and rear trunnions, and these bars carry additional stationary brackets 20 supporting rock shafts 21 on which the respective deflectors 15 are mounted for swinging adjustment into positions which may be vertical or inclined either toward one end or the other of the drum, as desired.

In order to adjust these deflectors, two parallel rods 22—22 are slidably mounted at opposite sides of the vertical axis of the drum in brackets 23 carried by the bars 16. Links 24 connect the respective deflectors with blocks 25 which are adjustably secured on said rods 22, so that the angular positions of the deflectors may be changed by moving the rods backward or forward. The latter operation is facilitated by extending these rods forward through the trunnion 3 and securing racks 22' to them where they project in front of the trunnion. These racks mesh with pinions 27—27, Fig. 1, fast on the end portions of a shaft 28, and this shaft also carries a gear 29 driven by another pinion 30 fast on the

shaft 31 to which the hand wheel 32 also is secured. Consequently, by revolving this hand wheel the rods 22—22 may be moved backward or forward simultaneously, and such movements will be transmitted to the deflectors 15, through the connections above described, to adjust the angular positions of said deflectors.

It will be seen from an inspection of Fig. 2 that, with this arrangement, if the material to be blended is introduced into the drum through the hopper 6 while the deflectors are in their dotted line positions, and the drum is revolving, the buckets 5 will pick up loads of the granular material as they swing through the lower portions of their path of revolution, carry it around to the upper portion of said paths and dump it. As it falls it will strike the deflectors associated with the respective rings of buckets and those opposite the first two circles of buckets A and B will divert the material toward the inner or left-hand end, Fig. 2, of the drum. As many of these rings of buckets and cooperating deflectors may be used as desired for the capacity of any particular machine to be built. The extreme left-hand deflector 15 usually is not given the same range of adjusting movement as the others because there is ample distribution of the material to the inner end of the drum without depending upon this innermost deflector for this particular purpose, although it can be adjusted to produce added distribution toward the inner end of the drum if desired. This particular deflector, however, is employed more particularly to assist in the unloading or discharging of the material from the drum. When it is desired to perform this latter operation the lever 14 is operated to open the gate 10 and the hand wheel 32 is revolved in such a direction as to swing the deflectors back into the full line positions in which they are shown in Fig. 2 where they will cooperate with the buckets 5 to direct the material toward the front end of the machine. Consequently, as the drum continues to revolve, the material in it will be conveyed to the front end of the drum and fed through the delivery chute 8 until approximately the entire batch has been discharged.

In the preferred embodiment of the invention illustrated in the drawings, it will be observed that the deflectors are of a substantially flat form and are constructed of a length such that in positions of inclination either toward the front or the rear of the drum, as suggested in Fig. 2 for example, the lower edge of any one of the deflectors common to one row of buckets overlies and extends across and above an immediately underlying bucket of an adjacent row. Each deflector, therefore, is adapted to cooperate with its respective row of buckets to receive material dumped therefrom and then to discharge the material on to buckets of an adjoining row so that there is provided a positive successive transfer of material from one row to another in a controllable manner.

Thus, with a machine organization of this nature, capacity can be increased either by increasing the diameter of the machine or its axial length. Even with a great increase in length, the material to be blended can be distributed rapidly and automatically throughout the entire length of the drum. As will be seen from an inspection of Figs. 2 and 3, each of the deflectors 15 includes flanges at its opposite lateral edges, and the deflectors are much wider at their upper edges than at their lower ends so that, consequently, they form rather shallow chutes or guides for the material dumped on them by the buckets.

Because both the supporting means for the deflectors and also the operating rods for adjusting their angularity are located at opposite sides of the deflectors, these parts do not interfere with the adjusting movements of the deflectors. Also, the sliding and bearing surfaces of the supporting and operating mechanisms are out of the path of the streams of granular material dropped upon the deflectors by the buckets.

It is important to seal any joints where the granular material might escape. The chief problem occurs at the front end of the machine and a novel mechanism for this purpose is illustrated in Figs. 4 and 5. As will be evident from an inspection of these figures the drum 2 includes an annular hub or trunnion member 36 which has a tubular or cylindrical journal section 36', the outer surface of which is supported on a bearing bushing 37 set into the stationary bearing 3. Thus there is no opportunity for dust created inside the drum to work in between the bearing surfaces of the parts 37 and 36'.

In order to close the joint between the journal member 36' and the part of the hopper inside this member, a packing is provided which includes several packing rings 38 held between inner and outer packing glands 40 and 41, respectively. The inner faces of these glands bear against the opposite ends of the entire series of packing rings 38, and screws 42 and 43 are threaded through the respective glands and into the adjacent stationary portion of the hopper structure to pull these glands up tightly against the packing and compressing it sufficiently to close the joint just referred to. Immediately beside the screws 43 are additional screws 44 which are threaded through the outer gland 41 and have rounded or flat ends which bear against the outer surface of the hopper 8. These screws are useful in removing the outer packing gland for renewal of the packing, it simply being necessary in removing said gland to back out said screws 43 and then to turn the screws 44 inwardly, this operation having the effect of backing off the gland.

A machine of this type usually is equipped with vents which can be opened or closed, as desired, and the mouth of the hopper 7 likewise can be closed or opened by the slide 33. Also, a stop 34 pivoted at 35 can be swung into position to enter the teeth of the gear 29 and lock it, when desired.

While we have herein shown and described a preferred embodiment of our invention, it will be evident that the invention may be embodied in other forms without departing from the spirit or scope thereof.

Having thus described our invention, what we desire to claim as new is:

1. A machine for blending granular and similar materials comprising a drum mounted to revolve around an approximately horizontal axis, buckets mounted on the inner surface of the shell of said drum and arranged in circular rows spaced longitudinally of the drum, said buckets presenting substantially straight longitudinally extending edges and being shaped and positioned to pick up said material as they move through the lower part of their path of rotation and to dump the material so picked up as they swing through the upper part of said path, a plurality of substantially flat deflectors positioned in the paths of the material dumped by said respective rows of buckets, said deflectors when in an inclined position being of a length adapted to cooperate with the buckets of one row to receive

material therefrom and transfer this material to buckets of an adjacent row, means supporting said deflectors in the central part of said drum for swinging movement from positions inclined toward one end to positions inclined toward the opposite end of said drum, whereby they serve to direct the granular material discharged upon them from said buckets toward one end or the other of the drum depending upon their positions of adjustment, and means connecting said deflectors together for adjustment simultaneously.

2. A machine according to preceding claim 1, in which said supporting means for the deflectors includes stationary parallel bars supported in the central part of said drum at opposite sides of said deflectors, and means mounted on said bars supporting said deflectors for pivotal adjustment about axes transverse to the axis of the drum to swing said deflectors simultaneously into either of said inclined positions, as desired.

3. A machine according to preceding claim 1, in which said means connecting the deflectors comprises parallel rods supported at opposite sides of said deflectors, links connecting said rods with the respective deflectors, said rods extending through one end of said drum, and means outside said drum connected with said rods and operable to move both rods backward and forward to swing said deflectors into either of said inclined positions, as desired.

4. A machine for blending granular and similar materials comprising a drum mounted to revolve around an approximately horizontal axis, buckets presenting substantially straight longitudinally extending edges and being secured to the shell of said drum internally of the latter to revolve with said drum around said axis from a filling position below said axis through a dumping position above it, whereby the material picked up by the buckets falls through the space in said

drum, a series of substantially flat reversible deflectors constructed and arranged to cooperate with the buckets and successively transfer material from one row of buckets to an adjacent row of buckets in a direction axially along the drum, and means supporting said deflectors for simultaneous adjustment into positions inclined so as to divert said material toward either end of said drum, as desired.

5. A machine according to preceding claim 1, in combination with a gear mechanism positioned outside of said drum at one end thereof and cooperating with said means connecting the deflectors together to swing said deflectors into either of their inclined positions, as desired.

6. A machine according to preceding claim 4, including means for introducing material to be blended into one end of said drum and discharging it from the same end, a construction in which the deflector farthest away from the delivery end of the drum has a range of adjusting movement smaller than the deflectors near said delivery end of the drum.

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