

May 1, 1951

C. C. DICKINSON

2,551,206

ROTARY AGITATOR FOR GENERATING OSCILLATING MOTION

Filed Nov. 21, 1949

3 Sheets-Sheet 1

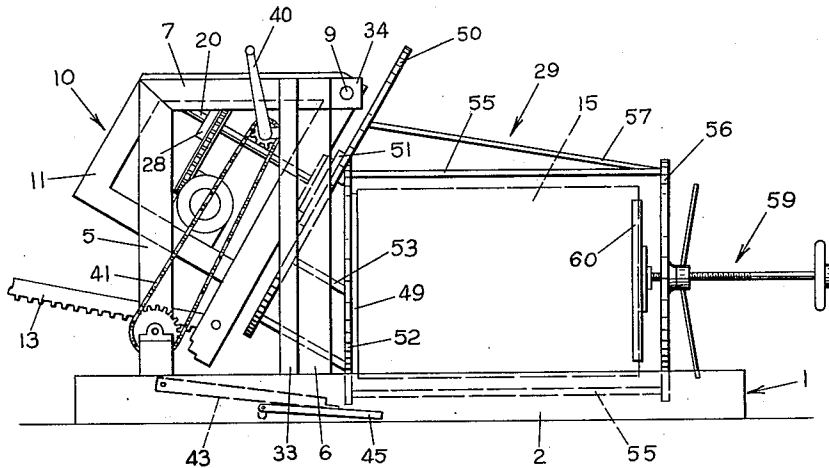


fig. 1

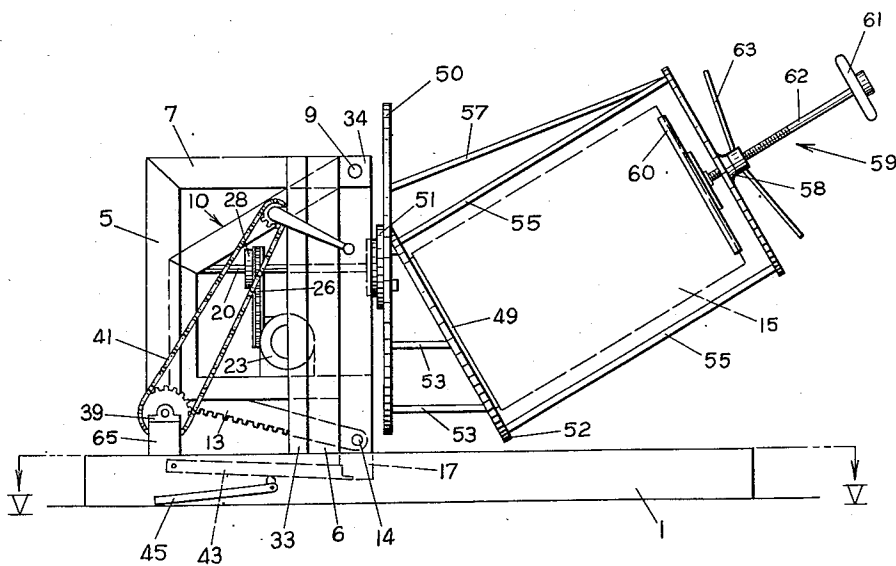


fig. 2

CHARLES C. DICKINSON

Inventor

 $\mathfrak{B}_Y$

by Peter F. Price Attorney

Attorney

May 1, 1951

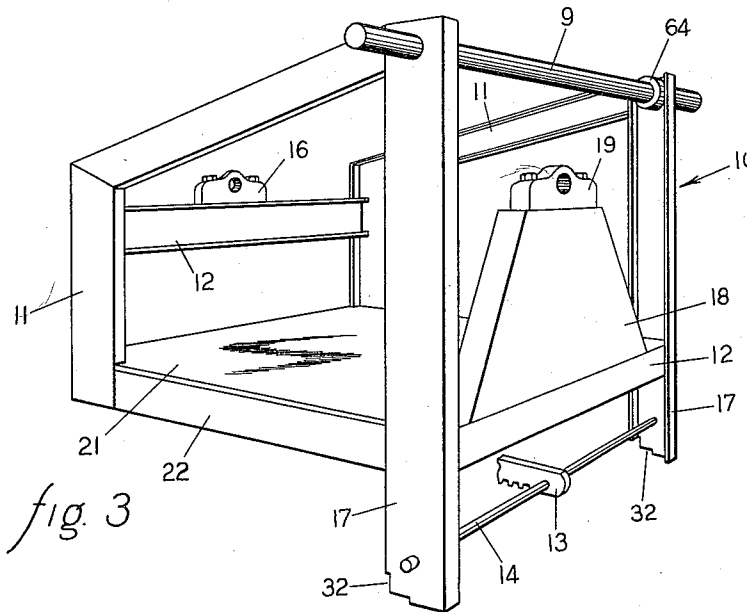
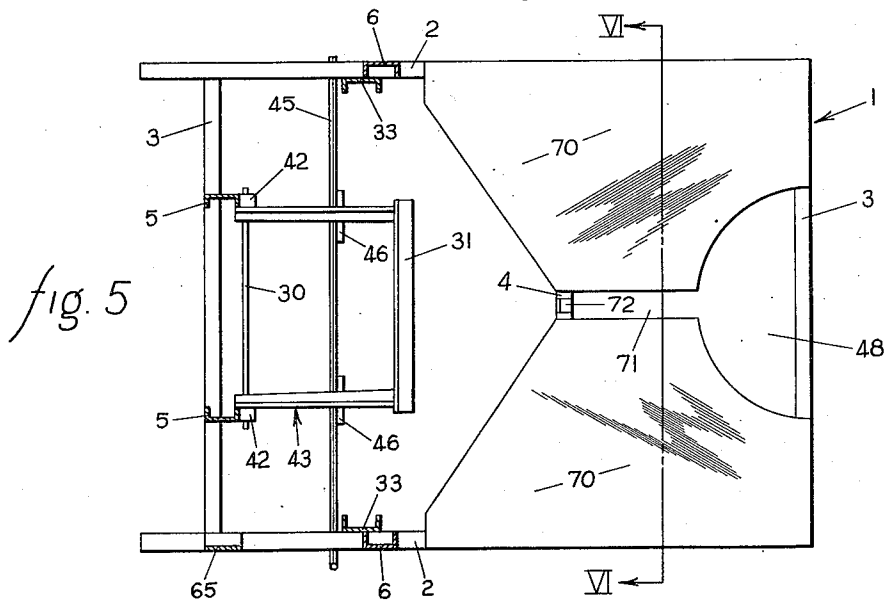
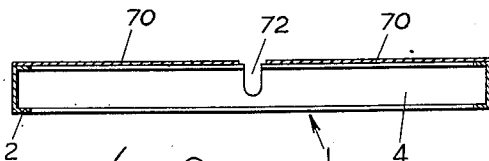
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CHARLES C. DICKINSON

Inventor

33

Arthur P. Price

Attorney

May 1, 1951

C. C. DICKINSON

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3 Sheets-Sheet 3

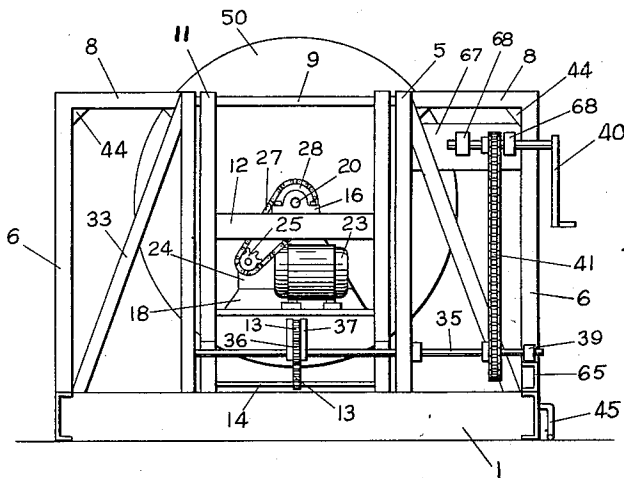


fig. 4

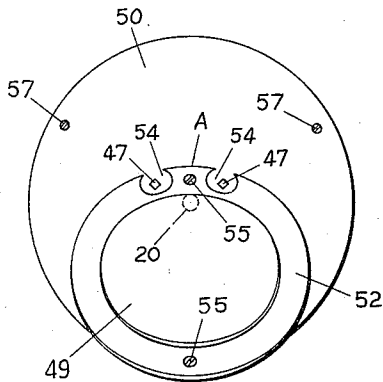


fig. 7

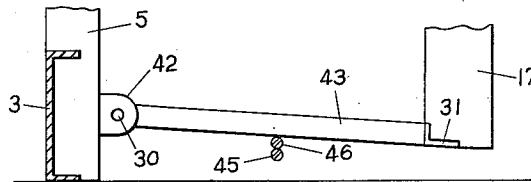


fig. 8

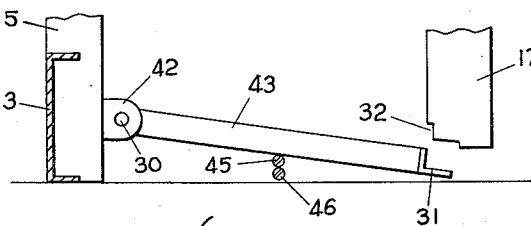


fig. 9

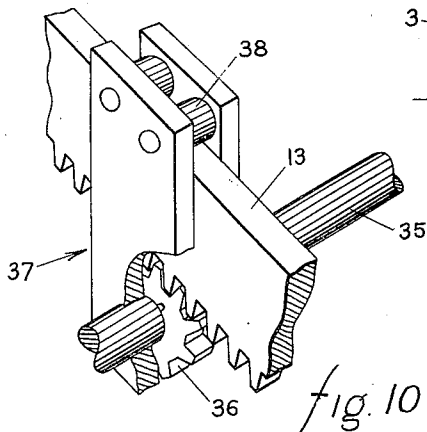


fig. 10

CHARLES C. DICKINSON

Inventor

By *Peter P. Price*

Attorney

UNITED STATES PATENT OFFICE

2,551,206

ROTARY AGITATOR FOR GENERATING
OSCILLATING MOTION

Charles C. Dickinson, St. Johns, Mich.

Application November 21, 1949, Serial No. 128,538

10 Claims. (Cl. 259—81)

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The invention relates to agitating and mixing machines and more particularly to a machine designed to receive, in the original container, an entire drum or barrel of liquid or dry material and to rotate it slowly in such a fashion that the entire contents is thoroughly and completely agitated by being moved circumferentially and oscillated longitudinally of the barrel or drum as the barrel or drum is rotated about one of its diagonal axes.

The existing products of this type have been subject to several disadvantages. Primary among these disadvantages has been the necessity for providing a special container for holding the material being processed by the machine. These special containers normally have to be cleaned after each operation. Particularly is this true when such materials as paints are processed and the different mixing operations involve different colors. Another major disadvantage has been the fact that most of the products of this type are so constructed that it is necessary to lift the material containers in loading and unloading them from the machine. This is strenuous, time-consuming work when the material involved is heavy. Other disadvantages include the complexity of the machines and the high initial cost attendant such complex and expensive structures.

My invention provides an agitating machine eliminating these disadvantages by providing a structure in which the heavy containers may be mounted on and removed from the machine without the necessity of any lifting by the operator or by special machines. My invention is also designed to receive and process the materials in their original drum or container, and it is capable, within a limited range, of handling containers of various sizes. Furthermore, my invention accomplishes these ends by means of a simple and sturdy structure suitable for economical manufacture.

My invention has another distinct advantage over existing products of this type in its versatility. Existing products are limited to one or two types of operations whereas my machine will successfully perform a wide variety of operations. Besides operating as an efficient mixer and disperser for chemicals, paints and similar liquids, it may be used to mix plaster and deburr such items as machine parts and castings. By placing a length of heavy chain in the container or drum it may be used to mix such products as sweeping compounds or to clean barrels. No successful machines have heretofore been developed for such operations as plaster and sweeping com-

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pound mixing or for barrel cleaning. The capacity of my machine to successfully embrace all of these varied operations is due in part to the type of motion generated by the machine and in part to its ability to carry on its agitating operation in the material's original container. Such a machine is ideally adapted to plants carrying on a number of varied operations since the machine is not limited to just one of their operations.

Therefore, the objects of my invention are to provide a machine capable of agitating numerous types of materials and, further, which is capable of having the containers of materials to be agitated mounted thereon and demounted therefrom without lifting by the operator. Other objects of my invention include the construction of a machine utilizing standard material containers, eliminating the necessity for cleaning numerous special containers as the types of materials are changed. It is also my purpose to provide a sturdy, low cost machine adaptable to a wide variety of seemingly unrelated operations.

Other objects and purposes of my invention will be quickly seen by those acquainted with the art of material mixing and agitating upon reading the following specification and the accompanying drawings.

In the drawings:

Figure 1 is a side elevation view of my invention showing the agitating rack in loading position.

Figure 2 is a side elevation view of my invention showing the agitating rack in operating position.

Figure 3 is an oblique view of the cradle structure for my invention.

Figure 4 is a rear elevation view of my invention.

Figure 5 is a sectional view of my invention taken along the plane V—V of Figure 2.

Figure 6 is a sectional elevation view of the base for my invention taken along the plane VI—VI of Figure 5.

Figure 7 is a sectional elevation view of the disk and structure for the rack of my invention taken along a plane perpendicular to the axis of the rack supporting shaft.

Figure 8 is a fragmentary side elevation view of the cradle clamping mechanism for my invention showing the clamping mechanism in operating position.

Figure 9 is a fragmentary side elevation view of the cradle clamping mechanism for my invention showing the clamping mechanism in inoperative position.

Figure 10 is a fragmentary oblique view of the

rack and gear mechanism for pivoting the cradle of my invention.

In executing the objects and purposes of my invention I have provided a mixing machine having its entire driving mechanism cradled in a frame. This frame is pivotally mounted in order that the material container will, in mixing position, have one of its diagonals substantially parallel to a horizontal plane and, in loading position, will have its longitudinal axis parallel to the horizontal plane. The structure includes a drive and a rotatable mixing rack for supporting the container during the mixing operation.

In the following description the terms "upwardly" and "downwardly" are freely used and are to be taken as meaning "upwardly" in the direction as shown in Figure 1 and "downwardly" away therefrom. The terms "inwardly" and "outwardly" are also freely used and are to be taken as meaning "inwardly" toward the geometric center of the machine and "outwardly" away therefrom.

Referring now specifically to the drawings, the numeral 1 indicates a base having a pair of side members 2 and end members 3. The base 1 is equipped with a cross-member 4 welded to the side members 2. A pair of side vertical standards 6 and a pair of end vertical standards 5 are welded to the base 1. The end vertical standards 5 are spaced in from the side members 2 an appreciable distance and are each secured at their upper end to inwardly extending headers 7. The side vertical standards 6 are each rigidly connected to one of the headers 7 by a top element 8. Each of the frames formed by one of the end vertical standards 5, side vertical standards 6, headers 7 and top elements 8 is braced by an inclined buttress member 33. Each of the buttress members 33 is welded to a header 7 and a side member 2. The side vertical standards 6, end vertical standards 5, headers 7, top elements 8 and buttress members 33 collectively constitute the main supporting frame. Since the mixing machine, by its mode of operation, generates severe oscillating motions throughout the entire machine structure, the main supporting frame must be constructed of heavy gauge, rigid materials, welded together to form a strong, rigid unit. For additional strength the joints of the supporting frame are reinforced with gussets 44.

The ends 34 of the headers 7 adjacent the side vertical standards 6 project, longitudinally of the machine, a short distance beyond the top elements 8. A spindle or axle 9 is mounted between these projecting ends 34 of the headers 7, transversely of the machine, for pivotally supporting the cradle 10 by means of the bushings 64. As so mounted, the hereinafter described cradle 10 may be pivoted longitudinally of the mixing machine for adjusting the angular position of the material drum or container 15. The cradle 10 consists of a pair of substantially trapezoidal side frame members 11 and cross-members 12. The inward verticals of the frame members 11 are extended downwardly to provide the legs 17. The cradle 10, adjacent the lower end of the legs 17, is equipped with a rod 14 for mounting the half rack 13. The half rack 13 is mounted substantially midway between the legs 17.

At the forward end of the cradle 10 is a pillow block 18 supporting at its upper end a main thrust bearing 19. At the outward end of the

cradle 10 is a second bearing 16 mounted on the outward one of the cross-members 12. The bearings 16 and 19 are aligned and a shaft 20 passes through them. A heavy gauge plate 21 (Fig. 3) is welded to the horizontal members 22 of the side frame members 11 and to the inward one of the cross-members 12. The side frame members 11, cross-members 12, and plate 21 are all welded together to provide a strong, integrated unit. On the plate 21 a motor 23 and associated gear reduction assembly 24 are mounted by bolts. A sprocket 25 is mounted on the gear reduction assembly and is operatively connected to another sprocket 26 on the shaft 20 by means of a chain 27. The sprocket 26 is associated with an overrunning clutch 28 for driving the shaft 20. The inward end of the shaft 20 projects beyond the confines of the cradle 10 for mounting the rack 29.

A shaft 35 is rotatably mounted in the lower ends of the end vertical standards 5. The shaft 35 is equipped with a spur gear 36 (Fig. 10) for engaging the half rack 13. A guide or yoke 37 is mounted on the shaft 35 about the spur gear 36 and is equipped with a pair of rollers 28 at its upper end. The yoke 37 receives the half rack 13 between its sides and by means of the rollers 38 maintains the half rack 13 in constant engagement with the spur gear 36. One end of the shaft 35 projects beyond the end vertical members 5 and is supported by a bearing 39. The bearing 39 is supported by the bracket 65. This end of the shaft 35 is operatively connected to a crank arrangement 40 by means of a sprocket and chain assembly 41. The crank 40 is mounted (Fig. 4) by means of a plate 67 and suitable bearings 68 to the supporting frame adjacent the upper end of one of the side vertical standards 6.

Below the shaft 35 a journal 42 is mounted on each of the end vertical standards 5 (Figs. 5, 8 and 9). A rod 30 extends between these journals 42 for pivotally mounting the clamp element 43. The clamp element 43 is equipped with an L-shaped channel member 31 at its inward end for engaging the notch 32 at the bottom of the legs 17. Pivotal movement of the clamp element 43 is controlled by the actuator rod 45 which constitutes a cam member by means of the sections of secondary rod 46 welded to it. The operation and purpose of this arrangement will appear more fully hereinafter.

The rack 29 consists of a large disk 50 mounted on the inward end of the shaft 20 by means of the boss member 51 (Figs. 1 and 2). The boss member 51 is bolted to the disk 50 and secured to the shaft 20 by means of a key and keyway arrangement and a set screw. A substantially circular mounting plate 52 is secured to the disk 50 but projects radially outwardly from the disk 50 at an angle of approximately 30 degrees to the axis of the shaft 20 (Figs. 2 and 7). Thus, the mounting plate 52 contacts the disk 50 only at one small point A on the periphery of the mounting plate 52. At this point the mounting plate 52 is welded to the disk 50. The radially outer ends of the outer portions of the mounting plate 52 are braced and secured to the disk 50 by pillars 53. The point of contact A of the mounting plate 52 and the disk 50 is closely adjacent but not at the center of the disk 50. This point of contact A is sufficiently removed from the center of the disk 50 that when a drum, such as a standard 50 gallon alcohol or oil drum is mounted in the rack 29, its upper inward

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corner substantially corresponds with the axis of the shaft 20. A circular guide 49 is concentrically mounted on the mounting plate 52 for properly seating the container 15. The guide 42 may be made detachable from the mounting plate 52 in order that guides of various diameters may be used to correspond to the diameter of the drum to be mounted. It is also possible to replace the circular guide 49 by a number of small projecting shoulders. The shoulders would be arranged in concentric circles, the size of each of the circles corresponding to the inside rim diameter of one size of drum.

A pair of access holes 54 (Fig. 7) are cut in the mounting plate 52, one on each side of the point of contact A, to permit installation of the bolts 47 securing the disk 50 to the boss member 51. A pair of rods 55 diametrically positioned across the mounting plate 52 are welded to the mounting plate and extend therefrom at a right angle. One of the rods 55 is mounted between the access holes 54 adjacent the point of contact A between the mounting plate 52 and the disk 50. The other of the rods 55 is diametrically spaced therefrom across the mounting plate 52. The rods 55 are of such length that they will project substantially beyond any barrel or container which might be placed on the mounting plate 52. At their outward ends the rods 55 are welded to a terminal plate 56. The terminal plate 56 is further secured to the disk 50 by means of the braces 57. The terminal plate 56 is equipped with a central opening for receiving an internally threaded collar 58 which collar is rigidly secured to the terminal plate. The collar 58 mounts the clamp assembly 59 to the terminal plate 56. The clamp assembly 59 consists of a bearing plate 60 on one end and a handle 61 on the other end connected by a threaded spindle 62 passing through the collar 58. A winged locking member 63 is mounted on the spindle 62 between the handle 61 and the collar 58.

The base 1 projects outwardly from the area of the cradle 10 beneath the rack 29 the entire length of the rack 29. The outward end of the base 1 is covered by a platform 70 (Fig. 5) welded to the side members 2, end member 3 and cross-member 4. The platform 70 is divided, longitudinally of the base 1, by a channel 71. The outward end of the channel 71 is widened to form an opening 48 for receiving a portion of the terminal plate 56 as the rack 29 is lowered into the loading position as shown in Figure 2. The cross-member 4 is notched 72 (Fig. 6) to receive one of the rods 55.

The various parts making up the rack 29 are welded together and, like those making up the frame and base 1 and the cradle 10, should be fabricated from a strong and rigid material, such as steel, to withstand the heavy load imposed upon them.

Operation

With the cradle 10 pivoted such that the rack 29 is in its horizontal position as shown in Figure 1, the machine is ready for loading. When pivoted into the loading position, the lower of the rods 55 seats within the channel 71 and the notch 72 in the cross-member 4. In this manner the lower one of the rods 55 is placed below the level of the platform 70 whereby it will not interfere with the loading of a container such as a drum 15 between the mounting plate 52 and the bearing plate 60. For the load-

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ing operation the winged locking member 63 is loosened to permit the clamp assembly to be opened. When the drum 73 is in position the clamp assembly 59 is tightened to cause the bearing plate 60 to press the drum 15 securely over the guide 49 and against the mounting plate 52. The winged locking member 63 is then tightened to secure the clamp assembly 59 in position. The drum 15 having been loaded, the crank 40 is operated to rotate the rod 35 by means of the sprocket and chain assembly 41. This in turn operates the spur gear 36, moving the half rack 13 inwardly. The movement of the half rack causes the cradle 10 and its associated rack 29 to pivot inwardly raising the rack 29 to its inclined operating position. When the cradle 10 has reached a position wherein the legs 17 are vertical, the clamp element 43 is forced upwardly into the notch 32 by rotation of the cam rod 45. Rotation of the cam rod 45 moves the secondary rods 46 from a position below the cam rod 45 (Fig. 9) to a position above the cam rod 45 (Fig. 8), thus, elevating the clamp element 43. Engagement of the clamping element 43 with the legs 17 not only locks the cradle 10 against accidental outward movement but provides an additional support for the cradle 10 during the operation of the machine. For additional safety a ratchet may be mounted on the crank 40 to prevent outward pivoting of the cradle 10 should the clamping element 43 become accidentally disengaged.

The machine having been pivoted to place the drum 15 in the position shown in Figure 2, the machine is ready to operate. By activating the motor 23, the rack 29 is caused to rotate with the shaft 20. This rotation causes the drum 15 to travel a substantially conical path by which an oscillating motion of the contents of the drum is generated. The rotation of the shaft 20 is relatively slow, but as it turns, the material within the drum 15 is caused not only to circulate radially within the drum by means of a combination of inertia and centrifugal forces but also to oscillate back and forth lengthwise of the drum due to the repeated changes in relative vertical position of all of the various parts of the drum except that adjacent the geometric center of the drum. When it is desired to mix liquids, it is preferable to fill the drum only partially in order to permit a sloshing motion within the drum to expedite the mixing process. This combination of rotatory and oscillating movements ensures not only intermixing of the various particles of material with those particles immediately adjacent such particles but ensures constant redistribution of the particles throughout the length of the drum. Thus, the formation of pockets of unmixed or partially mixed materials is prevented. Further, by constantly redistributing the material throughout the drum, a product processed in my invention is of identical consistency throughout its entire mass.

The use of the overrun clutch 28 also contributes materially to the mixing action of the machine by rotating the drum at uneven speeds. The rack 29 will be turned at the velocity of the movement of the chain 27 throughout a portion of one revolution. It will then come to a point at which the overrun clutch will disconnect the sprocket 26 and the shaft 20, at which point the rack 29 will cease to move until the movement of the sprocket 26 catches up with the overrun clutch 28. At this time the rack 29 will be jerked forwardly again to continue its

revolution. This stopping and starting motion causes the material within the drum to be oscillated with much greater velocity than would be created by a movement of constant angular velocity. When an even oscillating motion is desired the overrunning clutch 28 may be replaced by a standard friction clutch or similar mechanism to provide a constant connection between the motor 23 and the shaft 20. Whatever type of motion is desired, it is preferable to have some type of clutching mechanism between the motor 23 and the shaft 20. Unless such a clutch is provided, it is substantially impossible to halt the revolution of the rack 29 at a point where the rod 55 will enter the channel 71 and slot 72. When a clutch is used, the motion of the machine may be stopped at any point in its revolution and, by disengagement of the clutch, the operator may rotate the rack 29 to the proper position for lowering the rack to unload the drum 15.

When the machine is used for cleaning barrels or mixing such materials as sweeping compound, a chain is placed in the drum before the drum is loaded on the machine. As the machine is operated, the motion of the barrel 15 causes the chain to oscillate from one end to the other and to slide along the entire inside surface of the drum. In a cleaning operation, the chain serves to scrape off the dirt and scale, and in a mixing operation the movement of the chain serves as an agitator for thoroughly mixing the different materials.

Upon completion of a mixing or cleaning operation, the rack 29 is lowered and the drum 15 disengaged by the clamp assembly 59. After the drum of processed material has been rolled away, a new drum may be placed on the machine. Since the material is already in its own container, it is unnecessary to transfer the material from the drum into a regular container or to clean containers between operations.

Numerous modifications of my machine may be made, such as by redesigning the frame and the cradle and cradle-supporting structure or providing more or less complicated equipment to replace the half rack 13. It is also possible to equip the machine with automatic switches and solenoids for preventing operation of the motor 23 unless the cradle is locked in the proper operating position. It is also possible to provide powered means for pivoting the cradle 10 and rack 29. The terminal plate 56 may be replaced by a simple bar between the rods 55, and the bearing plate 60 may be replaced by a spider. These and other refinements to the mechanism herein described may be made without departing from the principle of my invention, but each of these modifications are to be considered as included within the hereinafter appended claims except where the language of such claims expressly provides otherwise.

I claim:

1. In an agitating machine having a supporting frame and adapted to process materials in their original containers, the combination comprising: a cradle; a shaft rotatably mounted on said cradle; a rack for clamping and supporting a container, said rack free on one of its ends and mounted on the other of its ends to one end of said shaft eccentrically of and inclined at a substantial angle to the axis of said shaft; means on said cradle for rotating said shaft; means for mounting said cradle and rack to said supporting frame for pivotal movement parallel to said shaft;

a platform vertically aligned with said rack for supporting and aligning containers being loaded on said rack when said rack is at one extremity of its pivotal movement.

2. In an agitating machine having a supporting frame and adapted to process materials in their original containers, the combination comprising: a cradle assembly; a shaft rotatably mounted on said cradle; a base plate mounted on one end of said shaft for rotation therewith; a mounting plate; one edge of said mounting plate secured to said base plate adjacent the center of said base plate; another edge of said mounting plate spaced substantially outwardly from both the center and the surface of said base plate whereby it is inclined to the axis of said shaft at a substantial angle; rods secured to said mounting plate and extending outwardly therefrom; clamping means on the ends of said rods for securing a material container to said mounting plate; a source of mechanical energy mounted on said cradle for rotating said shaft; pivot means mounting said cradle at its upper end to said frame for pivotal movement axially of said shaft; whereby said mounting plate in one position is inclined at a substantial angle to a horizontal plane and in another position is substantially perpendicular to said horizontal plane; latching means for securing said cradle with said rack in inclined position.

3. In an agitating machine as described in claim 2, wherein a rack and gear assembly is provided for moving said cradle pivotally; a loading platform vertically aligned with said rack for supporting and positioning containers being loaded on and unloaded from said rack.

4. In an agitating machine as described in claim 2, wherein a source of mechanical power is mounted on said cradle; an overrunning clutch for connecting said motor and said shaft; a loading platform vertically aligned with said rack for supporting and positioning containers being loaded and unloaded from said rack.

5. In an agitating machine having a supporting frame and adapted to process materials in their original containers, the combination comprising: a cradle; a shaft rotatably mounted on said cradle; a rack mounted on said shaft for rotation with said shaft; spindle means for mounting said cradle on said frame for pivotal movement parallel to the axis of said shaft, whereby said rack may be pivoted to a loading position and to a processing position inclined substantially from said loading position; a platform vertically aligned with said rack; the walls of said platform defining a channel for receiving a portion of said rack when said rack is in its loading position.

6. In an agitating machine adapted to receive drums of material to be processed and having a supporting frame, the combination comprising: a cradle assembly; a shaft rotatably mounted on said cradle assembly; a rack mounted on one end of said shaft for rotation therewith; said rack including a mounting plate mounted eccentrically of said shaft and inclined at a substantial angle thereto and means for clamping a drum against said mounting plate; a substantially horizontal platform below said rack; means for pivotally mounting said cradle and associated rack to said supporting frame whereby in one pivotal position said mounting plate is perpendicular to said platform and in another position is inclined at a substantial angle to said platform.

7. In an agitating machine having a support-

ing frame and adapted to process materials in their original containers, the combination comprising: a cradle assembly; a shaft rotatably mounted on said cradle; a rack free on one of its ends and on the other of its ends mounted to said shaft eccentrically of and at a substantial angle to said shaft; means on said rack for clamping a material container thereto; means mounting said cradle assembly to said frame for pivotal movement parallel to said shaft whereby in one pivotal position of said cradle, said rack is substantially parallel to a horizontal plane and in another pivotal position said rack is inclined at a substantial angle to said horizontal plane; a platform vertically aligned with said rack for supporting and aligning containers being loaded on said rack when said rack is in its horizontal position.

8. In an agitating machine having a supporting frame and adapted to process materials in their original containers, the combination comprising: a cradle assembly; a shaft rotatably mounted on said cradle; a rack free at one of its ends and on the other of its ends mounted to said shaft eccentrically of and at a substantial angle to said shaft; means on said rack for clamping a material container thereto; means mounting said cradle assembly to said frame for pivotal movement parallel to said shaft whereby in one pivotal position of said cradle, said rack is substantially parallel to a horizontal plane and in another pivotal position said rack is inclined at a substantial angle to said horizontal plane; a platform vertically aligned with said rack; the walls of said platform defining a channel for receiving a portion of said rack when said rack is in its horizontal position.

9. In an agitating machine having a supporting frame and adapted to process materials in their original containers, the combination comprising: a cradle; a shaft rotatably mounted on said cradle; a rack for receiving and supporting a

container, said rack free on one of its ends and mounted on the other of its ends to one end of said shaft eccentrically of and inclined at a substantial angle to the axis of said shaft; means for rotating said shaft; means for mounting said cradle and rack to said supporting frame for pivotal movement parallel to said shaft; a platform vertically aligned with said rack for supporting and aligning containers being loaded on said rack when said rack is at one extremity of its pivotal movement.

10. In an agitating machine having a supporting frame and adapted to process materials in their original containers, the combination comprising: a cradle; a rack for receiving and supporting a container and having a pair of ends, said rack free on one of its ends and rotatably mounted at the other of its ends to said cradle; means for rotating said rack; the axis of said rack between said ends disposed eccentrically of and inclined at a substantial angle to the axis of said rotation; means for mounting said cradle and rack to said supporting frame for pivotal movement parallel to the axis of said rotation; a platform vertically aligned with said rack for supporting and aligning containers being loaded on said rack when said rack is at one extremity of its pivotal movement.

CHARLES C. DICKINSON.

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