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SHAKING MECHANISM FOR CAN FILLING MACHINES

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Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

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This invention relates to means for shaking down granular or pulverized material filled into cans or boxes from a weighing or measuring machine. It is common for this purpose to raise the can or receptacle with its contents off its carrier or support and then permit it to drop back again suddenly to jar down the contents, this operation being usually performed repeatedly in order to effectually settle down the material within the receptacle. In gang weighing or measuring and filling machines, a continuously-moving traveling conveyor (belt or chain) has been used with means for continuously shaking the cans to jar down the contents filled into them.

In such machines the rapidity with which they operate frequently results in a spilling of the contents at the points of discharge from the filling chutes into the cans, because of the weighed or measured charges being dumped into the cans too rapidly to permit them to be thoroughly shaken down. To avoid such spilling, recourse has been had to traveling hoppers, or to guides or deflectors over the receptacles, and to additional shaking devices, which has resulted in an expensive and bulky apparatus.

The present invention has for its object to provide means for accomplishing a more rapid and effective shaking down and to prevent spilling at the point of filling, so that the entire weighed or measured charge may be settled into the can before leaving the filling position; it also aims to discontinue the shaking down operation during the feeding out of the filled receptacles and during the advancing of the empty receptacles to the filling positions.

The present invention provides means whereby is imparted a different motion to the receptacle than the ordinary lifting and dropping operation; to this end a lateral tilting movement is imparted to the can while jarring down its contents. For this purpose means are provided for alternately lifting and dropping the can on opposite sides so as to impart simultaneously lateral tilting movements and a jarring-down effect. Not only is the can lifted alternately on opposite sides, but it is also subjected to a slight turning or rotative movement. This rotation may be imparted alternately on opposite sides, each lifter both lifting and slightly turning the can, this operation occurring in frequent alternation on opposite sides.

To prevent spilling, a cover is provided, fitting lightly over the top of the can and so mounted as to be capable of participating in the lateral tilting movements of the can; this cover has an upright extension or inverted hopper loosely enclosing the lower end of the filling spout, and receiving the excess of material as dumped and holding such excess until, by the shaking down of the contents beneath, it is lowered into the top portion of the can. Operating means are provided for holding up the cover while the can is feeding under to the filling position and for lowering it onto the can, and, after the filling and shaking-down operations, lifting the cover at the instant when the feed is released for causing the filled can to be carried out and a new can to be fed to the filling position.

While in practice the invention finds its best application in connection with gang weighing or measuring and filling machines, yet essentially it is applicable to unitary machines for filling one can at a time. It is illustrated in the accompanying drawings as applied to a gang weighing machine for simultaneously filling six cans with granular material, such as ground coffee.

In the accompanying drawings, which show the preferred embodiment of the invention—

Figure 1 is a front elevation, partly in section; Figure 2 shows the lower portion of Fig. 1 during the operation of feeding out the filled cans, the shaking-down mechanism being in an inoperative position; Figure 3 is a horizontal section showing in plan the conveyor and shaking-down mechanism; Figure 4 is a transverse section on the line 4-4 in Figs. 1 and 3, drawn to larger scale; Figure 5 is a transverse section on the same scale as Figs. 1 to 3, showing the parts in the position for feeding out the filled can, as indicated in Fig. 2; Figure 6 shows an eccentric shaft in section and its connected link in elevation, on the same scale as Fig. 4; Figure 7 is a diagram showing the movements of the link in Fig. 6; Figure 8 is a front elevation, on a smaller scale than the preceding figures, of the right-hand end of the apparatus; Figure 9 is a sectional elevation showing Fig. 8 as viewed from the right; Figure 10 shows a modification of Fig. 6; and Figure 11 is a view similar to Fig. 5 showing a modification.

The apparatus shown is designed for shaking down the contents of tin cans that are filled in groups from automatic weighing scales (or measuring devices), and is illustrated in connection with a continuously-moving chain conveyor. It is to be understood that the receptacles are not
confined to any particular shape or size, and that the conveyor may be other than the endless chain or belt type.

In the drawings, the cans A, A are carried by a chain conveyor B into filling position under a series of filling spouts or chutes C, C. The conveyor is shown as constructed of two endless chains sliding in stationary troughs or channels D, D, so that the cans, while being fed in or out, rest on the chains and are supported thereby and by the channels—as shown in Fig. 5. On being fed to the filling position shown in Fig. 1, they are arrested by a stop arm E, whereupon the contents of the cans are measured, weighed or measured by any known or suitable weighing or measuring mechanisms (which form no part of my invention and are not shown), are discharged down the chutes C, C into the cans.

Beneath the opposite sides of the cans are located lifting and jarring bars or rails F, F. Operating mechanism is provided for elevating these bars so as to lift the cans off from the conveyor chains B, B; and for alternately lifting and dropping the bars for jarring down the contents of the cans on one side being raised while the other is lowered, so that each can is alternately tilted from side to side, as shown in full and dotted lines in Fig. 4. During this operation, the cans are supported on the bars so that as either bar is lifting one side of the can, the other bar is supporting the opposite side thereof, the bars thus serving alternately as lifters and supports. The two bars have a comparatively slow rising movement for lifting the cans off from the conveyor, accompanied by a rapid up and down movement in laterally jarring the cans and jarring movements of the bars comparatively rapid—say, for example, for each bar at a rate of seven to eight hundred up and down movements per minute. This rapid motion may occur only during the period of elevation, or it may be continuous, since when the bars have descended to lower the cans back on the conveyor; while the shaking and jarring movements of the bars are comparatively rapid—say, for example, for each bar at a rate of seven to eight hundred up and down movements per minute. Such a rapid motion may occur only during the period of elevation, or it may be continuous, since when the bars have descended to lower the cans back on the conveyor; while the shaking and jarring movements of the cans and jarring movements of the bars are comparatively rapid. In order that the contents of each can after the cans such as to most effectually shake down and compact their granular contents. It results that the measured or weighed charge for each can is with great rapidity shaken down and concentrated in volume within the capacity of the can.

For the bodily lowering of the bars, provision is made for moving the connecting links J, J down from their nearly upright active position (Fig. 1) to an inclined position (Fig. 2), in which they pass so far beneath the level of the conveyor chains as to be wholly below the bottoms of the cans when they rest on the cans, as shown in Fig. 5. The movement down is such that the rapid movements imparted to the bars by the eccentric will not lift them into contact with the cans, so that the shaking-down device is inoperative while in this position. For performing these bodily lowering and restoring movements to the bars, a shaft K is provided, having an arm k to which, at a point l, is pivoted two links m, m', which, at pivotal points n, are pivoted to the connecting links or levers J, J. These links m, m' do not interfere with the opposite bars impelled by the opposite eccentrics—-as is apparent in Fig. 1, where the link m' appears behind the link m and at a different angle. The lever shaft K is oscillated at suitable intervals to lift the bars F, F to the position shown in Fig. 1, or lower them to the position shown in Fig. 5. For this purpose an arm k' on the shaft is connected by a link p to an arm j on a rock shaft L which is rocked at suitable intervals by any appropriate mechanism.

It is desirable to not merely tilt the cans from side to side, but also to impart to them slight rotary or twisting movements coincident with the rapid lifting and jarring-down movements. This is attained in the construction shown by causing the connecting links J, J to act as levers, with their pivotal points n constituting their fulcrums; thus, at each rotation of the lower end of each lever J is caused to move in a circle, while its upper end has a similar circular or nearly circular or elliptical movement at the center of its pivot o, where it is joined to the bar F. This is apparent from the diagram, Fig. 7, which is drawn to the same scale as the diagram which is shown in Fig. 5. As is apparent from the diagram, Fig. 5, the lower end of each lever J is shown as a single line, the lower dotted circle being the eccentric orbit and the upper dotted circle being the orbit of the center o—the dotted lines 12 and 13 showing the axis of the lever in its opposite inclined positions and the lines 14 and 15 showing the center line of the link m or m' at the extreme upper and lower positions of the lever.

It is, accordingly, apparent that each point of each of the bars F, F is participating in the elliptical movement of the upper dotted orbit in Fig. 7, so that each bar, as it lifts under a can, not only exerts a lifting movement, but also moves endwise, and thereby communicates partial rotation to the can; the same, but opposite, movement is imparted by the descending bar to the opposite side of the can; thus, the can, at each jarring, is not only lifted and dropped, but at alternately opposite sides it is given a slight rotary movement which contributes materially to the effective shaking down of the contents of the can. The contents are thus jarring vertically and are simultaneously shaken laterally and displaced rotary—a combination of movements which is ideally effective for compacting granular material.

In order that the contents of each can after
shaking down shall be just sufficient to fill the can level full, it is necessary that the charge of material before shaking down shall occupy a greater volume than the capacity of the can, so that it would be liable to spill over the top of the can if means were not provided for preventing such spilling. For this purpose each can is provided with a removable temporary cover M, which originally is lifted off, as shown in Fig. 5; and as the can is brought into the charging or dumping position, it is lowered onto it, as shown in Fig. 1. For a gang machine, the cover M extends over the entire series of cans that are to be simultaneously charged, as shown in Fig. 1. The cover has (for each can) a chute or inverted hopper Q extending up sufficiently to provide ample capacity to hold the excess material that is shaken down, and sufficiently larger than the spout C to admit of the oscillating or tilting movement of the cover accompanying the lateral tilting of the cans, as shown in Fig. 4. The cover is preferably made of light material, such as wood, in order that, while it effectually closes the tops of the cans against spilling, sufficient space exists in order to be sure as to interfere with the later shaking-down operation. On its lower side it has preferably a yielding facing N of rubber, leather, or fabric. This yielding facing or packing does not make a sufficiently frictional engagement with the can tops to interfere with the slight rotary movements imparted to them, as above described. For lifting the cover or covers M, lever arms R, R are provided mounted on a rock shaft R' and connected at their ends by links r, r with the cover. These lever arms are operated from the rock shaft L by a link or links h connecting with an arm i on the shaft L. These movements occur synchronously with the movements of the stop arm E, by which the filled cans are free to be fed out by the conveyor chains; this is readily accomplished by operating the stop arm also from the rock shaft L,—which can be done, as shown in Fig. 4, by connecting the stop arm with a lever S pivoted at s on a stud or rock shaft and having an arm with a pin t engaged by a slotted arm T on the rock shaft L—all as shown in Fig. 4.

It is desirable to be able to adjust or graduate the amplitude of the oscillation or the amount accomplished by the rapid vertical movements of the bars F, F.

With the illustrated mechanism this is readily accomplished by varying the degree of lift imparted through the shaft K and arm k, links m', m", and levers J, J to the bars F, F. In the position shown in Fig. 1, with the levers J, J standing vertically, the bars F, F are in the highest position, and they are imparting their full jarring lift, due to the eccentricities g, g, to the cans; but by lowering them somewhat toward the position shown in Fig. 2, they are brought down to such levels that when one bar is lifting one side of the can, the other bar is lowered out of contact with the opposite side, so that the can on that side then rests solely on the support afforded by the conveyor chain or its channel D. For thus varying the lift imparted to the levers J, J and bars F, F, a convenient means is the provision of an adjustment for the length of the connecting link P, which may be accomplished by introducing a turnbuckle p' on engaging oppositely threaded of the link sections in a well understood manner and tightened by lock nuts as shown, or in any equivalent way. For adjusting the movement to a nicety, an adjusting screw U is preferably provided against which the arm k may contact, springs s, u being provided for drawing the levers J, J to their highest position.

It will be understood that the bars F, F are essentially jarring lifters, and since their movement is derived wholly from the upper ends of the levers J, J, it is quite apparent that the bars can be omitted and the levers caused to engage directly against the cans as shown in Fig. 10. This would be suitable for a single can, but for a gang machine operating simultaneously a series of cans, the long bars with their parallel motions are preferable.

The described shaking-down mechanism is readily adapted to any automatic weighing or measuring and filling machine. It is necessary only to provide for operating the rock shaft L and its connected parts from the timing shaft usual in such weighing or filling machines. The necessary sequence of operations is that the cans are advanced by the conveyor until stopped by the stop arm E; the cover then is lowered into place on the cans; the weighing (or measuring) device, which may have previously been set in operation, then will exert its dumping the contents through chutes into the cans; the bars F, F are raised up to lift the cans off from the chains or supports—an operation which may be performed simultaneously with the lowering of the cover M (if the eccentric shafts G, G be in continuous rotation)—so that the shaking of the cans begins to occur before the contents are dumped out. After a sufficient interval of time to effectually shake down the contents, the bars F, F are lowered, thus throwing the cans onto the support of the conveyor chains; the lowered cover is lifted and the stop E is swung out of the way (to the position shown in dotted lines in Fig. 4), and the conveyor chains are thereby made effective to carry the filled cans out to the position where the next operation is to be performed; while, after a brief interval, the next series of empty cans is carried forward by the conveyor to the filling position, and the operation is repeated.

Figs. 8 and 9 show means for operating the rock shaft L from the timing shaft V of a known type of weighing machine. This shaft has a cam t, which acts on a roller w' carried by a vertical link W, the lower end of which is connected to a weighted lever arm L' fixed to the rock shaft V. The lifting of this arm by the cam rocks the shaft and swings the lever S and stop E to the position shown in dotted lines in Fig. 4, thereby removing the stop from the path of the cans and permitting the conveyor chains to feed the filled cans onward. The return rocking movement occurs immediately after the filled cans have been carried beyond the stop arm E, and this restores the arm to its position shown in full lines in Fig. 4, where it intercepts the next series of empty cans which are fed into filling position. When the first of these cans strikes the stop arm E, it moves it forward to the position shown in Fig. 3, thereby transmitting an oscillating movement to the arm S, which turns as a shaft and to an arm S' fixed thereto, this movement being transmitted through a rod w to an arm on a vertical shaft Y, which is the starting shaft of the weighing machine, and the oscillation of which immediately starts the weighing-out of the charges which are to be dumped into the cans thus placed in position.

The conveyor chains are driven from any suitable source in the manner customary in weighing or filling machines of this general type. The eccentric shafts G, G are driven in any suitable manner,—as, for example, by a belt y on a pulley.
4. y' applied on either of these shafts, the belt taking motion from any convenient source.

Fig. 11 illustrates an adjustment of the shaker bars F, F by means of the screw U and turn-buckle p so that when the bar F on one side is lowered, the can will be supported on that side partly by the bar and partly by the conveyor chain B. At this instant the forward travel of the chain imparts a rotative tendency to the can, since the can rests on it only at one side, being lifted off from the other chain. This rotative effect may be utilized in addition to the rotative impulse imparted by the lifted bar F on the other side, due to its oblique movement, as described with reference to Fig. 7; or it may be used as a substitute for the angular movement imparted by the lever action of the links J, J.

It will be understood that the preferred embodiment of my invention thus described is subject to considerable variation in details of construction, according to the particular use for which the machine is designed. It may thus be varied according to the shape or size of cans or other receptacles, and depending upon the quantity of material to be introduced and shaken down. Any variations of construction which are within the skill or judgment of mechanics or engineers will be within the spirit of my invention and the scope of the appended claims.

1. In a machine for filling cans comprising a conveyor and controlling means therefor whereby cans may be intermittently advanced to a predetermined station and subsequently removed therefrom, the combination with a shaking-down mechanism at said station comprising means for repeatedly lifting a can at one side and dropping it so as to impart a lateral tilting movement thereto, of means whereby the conveyor and the shaking-down mechanism may each be rendered ineffective upon a can throughout the period during which the other is effective.

2. In a machine for filling cans, a conveyor for intermittently advancing the cans, and a shaking-down mechanism at a stopping point in the travel of the cans, comprising means for repeatedly lifting and dropping the can on opposite sides alternately so as to impart opposite lateral lifting movements to the can while jarring down its contents.

3. In a machine for filling cans, a conveyor for intermittently advancing the cans, and a shaking-down mechanism at a stopping point in the travel of the cans, comprising means for repeatedly lifting the can at one side, and dropping it, and simultaneously imparting to the can a partial rotation.

4. In a machine for filling cans, a conveyor for intermittently advancing the cans, and a shaking-down mechanism at a stopping point in the travel of the cans, comprising means for repeatedly lifting and dropping the can on opposite sides alternately, and simultaneously imparting partial rotative movements to the can.

5. In a machine for filling cans comprising a can support and conveyor, means for intermittently moving the cans out of contact with the conveyor, a shaking-down mechanism comprising means for tilting a can, by repeatedly lifting it at its opposite side, and simultaneously imparting to the can a partial rotation, and means for finally re-establishing contact between the can and conveyor.

6. In a machine for filling cans comprising a can support and conveyor, a shaking-down mechanism comprising means for repeatedly lifting the can at opposite sides alternately, and for finally dropping the can onto the conveyor, causing it to be carried away from the shaking-down mechanism.

7. In a machine for filling cans comprising a can support and an endless conveyor, a shaking-down mechanism comprising means for repeatedly lifting the can at opposite sides alternately, while out of contact with the conveyor, and for finally dropping the can onto the conveyor to permit the latter to carry the can away from the shaking-down mechanism.

8. In a machine for filling cans, an endless conveyor constituting a can support, a stop for arresting the can in the filling position, and a shaking-down mechanism comprising means for repeatedly lifting the can at opposite sides alternately off from said conveyor, and for dropping it to jar down its contents, and for finally lowering the can onto the conveyor and removing said stop to permit the conveyor to carry the can away from the filling position.

9. In a machine for filling cans comprising a can support and conveyor, shaker bars beneath the can movable up and down to lift the can above the conveyor and lower it onto the conveyor, and means for imparting to said bars rapid alternating lifting movements to repeatedly lift and drop the opposite sides of the can alternately.

10. In a machine for filling cans comprising a can support, a shaking-down mechanism comprising a shaker bar beneath one side of the can, and driving mechanism for slowly lifting and lowering the bar and for imparting to it simultaneously a rapid up and down movement for jarring down the contents of the can.

11. In a machine for filling cans comprising a can support, a shaking-down mechanism comprising a shaker bar beneath one side of the can, and driving mechanism for imparting to the bar simultaneous lifting and endwise movements whereby it imparts to the can a lateral tilting movement accompanied by a partial rotation.

12. In a machine for filling cans comprising a can support, a shaking-down mechanism comprising shaker bars beneath the opposite sides of the can, and driving mechanism for slowly lifting and lowering said bars and for imparting to said bars rapid alternating lifting movements to repeatedly lift and drop the opposite sides of the can alternately.

13. In a machine for filling cans comprising a can support, a shaking-down mechanism comprising a lifter beneath one side of the can, and driving mechanism for raising and lowering the lifter and for imparting to it rapid upward, endwise and downward movements whereby to impart to the can lateral tilting and partial rotating movements.

14. In a machine for filling cans comprising a can support, a shaking-down mechanism comprising shaker bars beneath the opposite sides of the can, and driving mechanism therefor, including transverse shafts having eccentric portions, and levers engaged by said eccentric portions and pivoted to the bars and having an intermittent alternation, while so out of contact with the conveyor, and means for finally re-establishing contact between the can and conveyor.
15. In a machine for filling cans comprising a can support, a shaking-down mechanism comprising shaker bars beneath the opposite sides of the can, parallel levers for each bar pivoted thereto, transverse shafts having eccentric portions engaging said levers, and means for imparting longitudinal movements to the bars and levers for raising and lowering the bars.

16. In a machine according to claim 10, means for adjusting the lifting movements of the bar whereby to determine the extent of the lifting of the can thereby.

17. A machine for filling cans comprising means for advancing successive cans to the filling position, a discharge spout through which the material is dumped into a can, means for tilting the can to shake down its contents, a cover for the can top movable to adapt it to the tilting movements of the can, and means for lowering and raising said cover by telescoping it with respect to the spout during the feeding in and out of the can.

18. In a machine for filling cans comprising a can support, a discharge spout through which the material is dumped into the can, means for tilting the can to shake down its contents, and a cover for the can top movable to adapt it to the tilting movements of the can, said cover having a portion loosely engaging the spout to receive within it the material discharged through the spout to prevent spilling until such material is shaken down into the can.

19. In a machine according to claim 18, the cover having a yielding packing loosely engaging the top of the can.

20. A machine for filling cans comprising means for advancing cans in succession to a filling station, a discharge spout at the filling station through which material may be charged into the cans in succession while at the station, means for tilting each can while at the station to shake down its contents, a cover for the top of a can located at the station, the cover being movable to adapt it to the tilting movements of the can, and means for raising and lowering the cover, the can advancing means and the cover raising and lowering means being so related as to cause the cover to be lowered as a can is moved to the filling station and raised as it is moved away from said station.

21. In a machine according to claim 8, a cover loosely engaging the top of the can and movable to adapt it to the tilting movements of the can, and means for lifting off the cover operated coincidently with said stop.

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