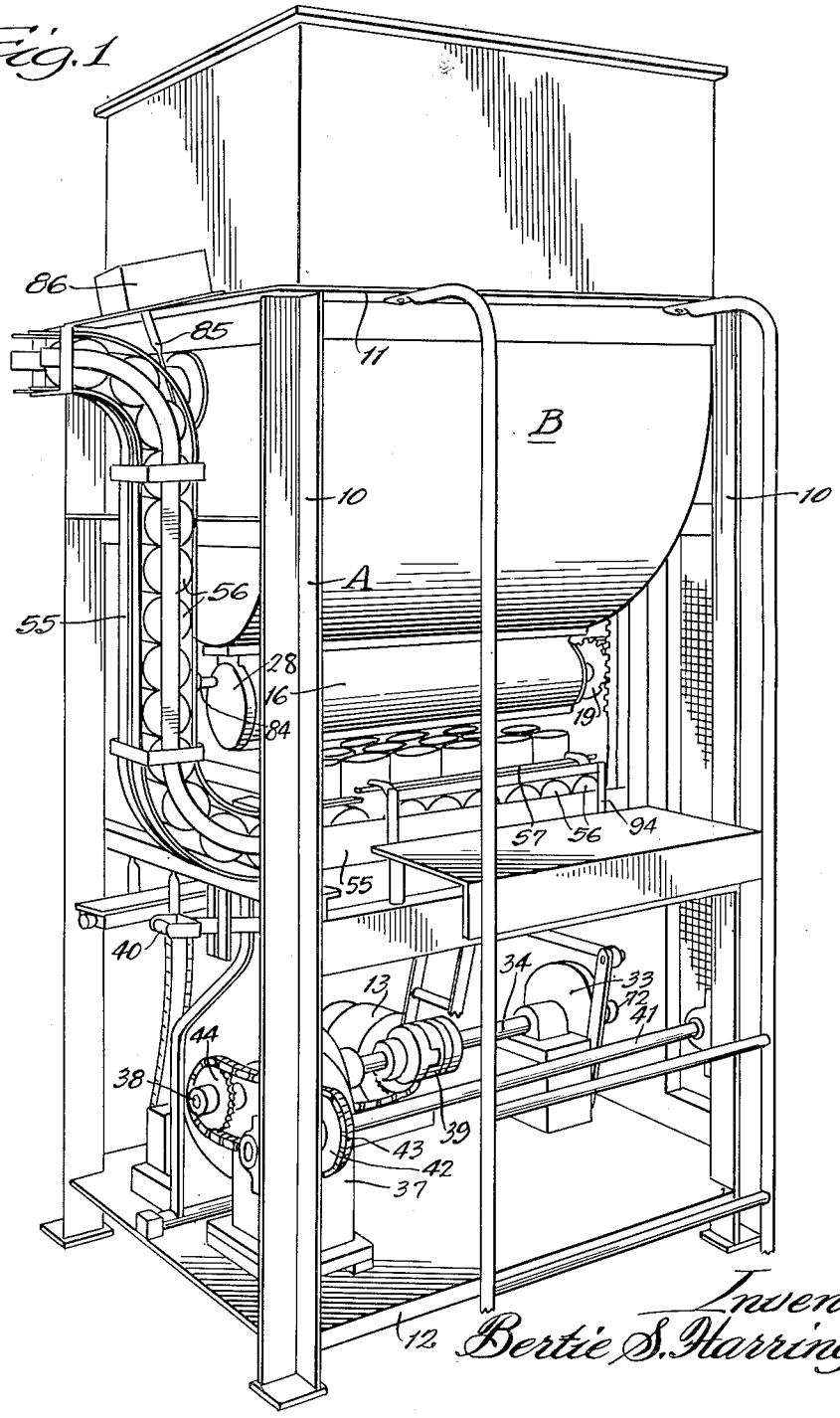
Aug. 11, 1953 B. S. HARRINGTON 2,648,477

FILLING APPARATUS

Filed March 17, 1948 5 Sheets-Sheet 1

Fig. 1



Inventor:
Bertie S. Harrington,

By Carl C. Batz
Attorney.

Aug. 11, 1953 B. S. HARRINGTON 2,648,477

FILLING APPARATUS

Filed March 17, 1948 5 Sheets-Sheet 2

Fig. 2

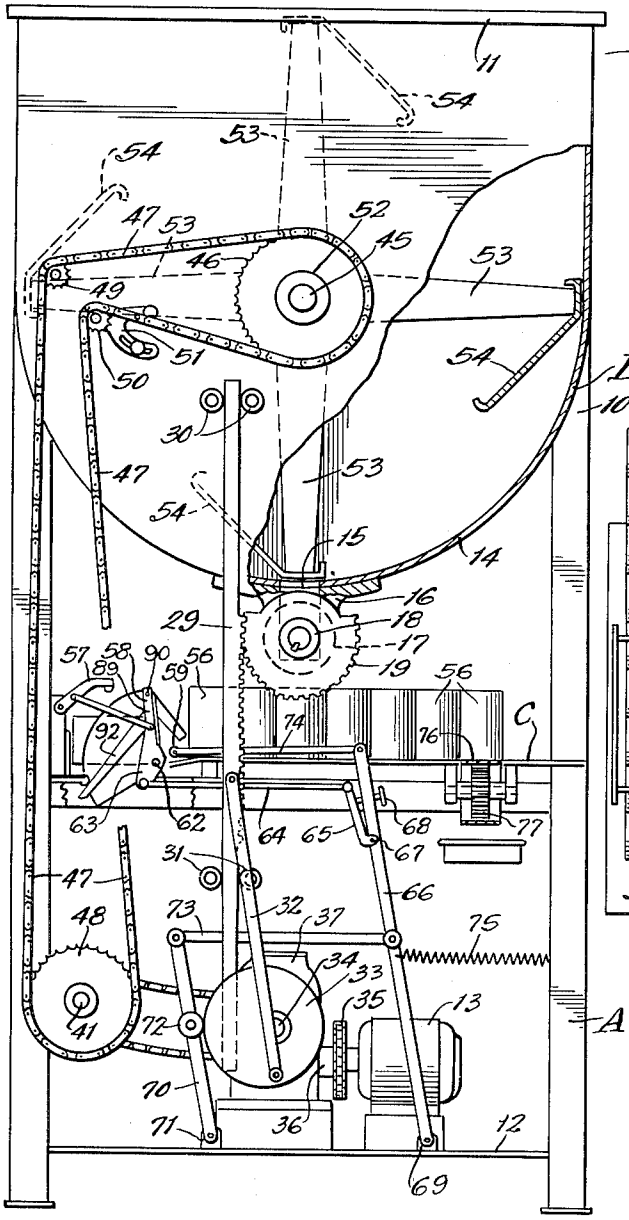
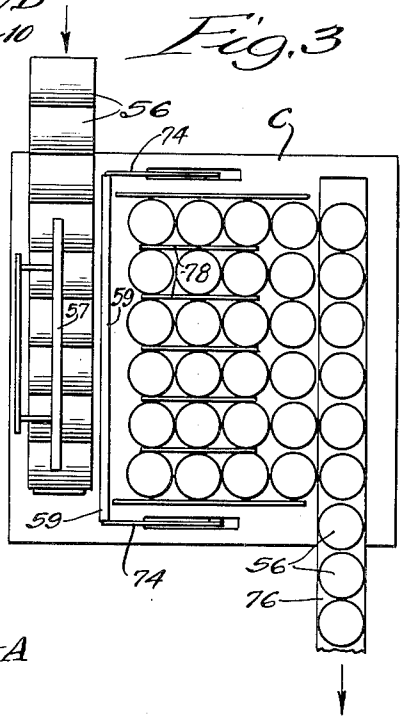


Fig. 3



Inventor:
Bertie S. Harrington,

By Carl C. Batz
Attorney.

Aug. 11, 1953 B. S. HARRINGTON 2,648,477

FILLING APPARATUS

Filed March 17, 1948 5 Sheets-Sheet 3

Fig. 4

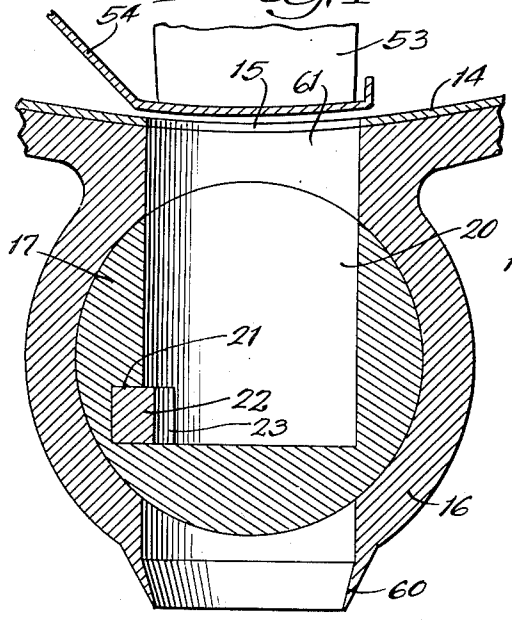


Fig. 5

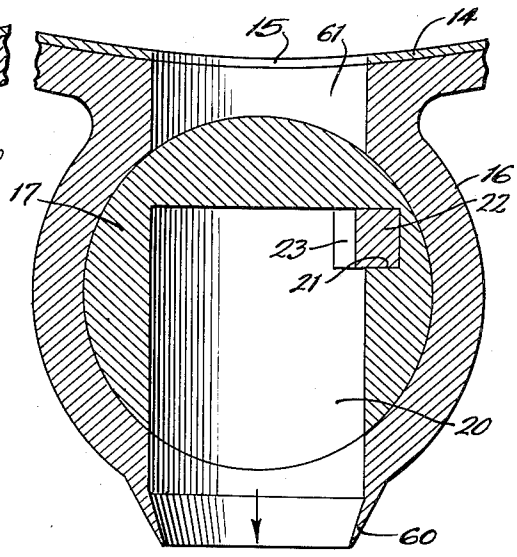


Fig. 6

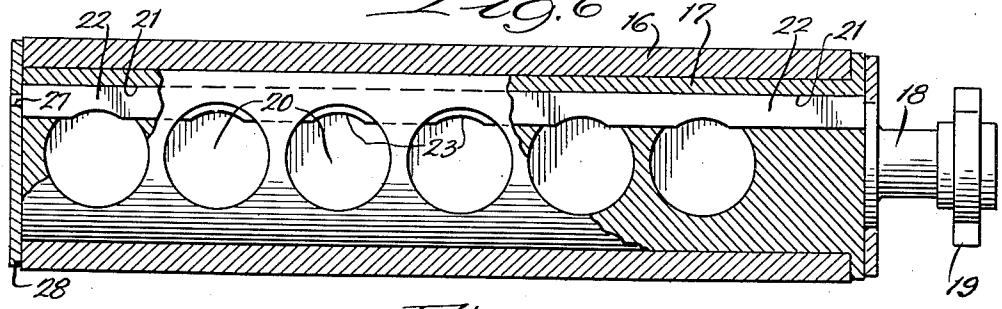


Fig. 7

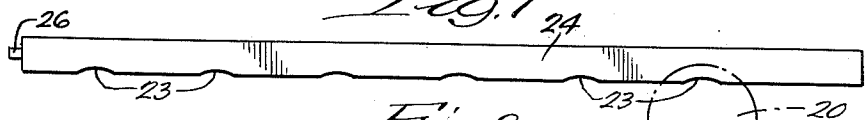
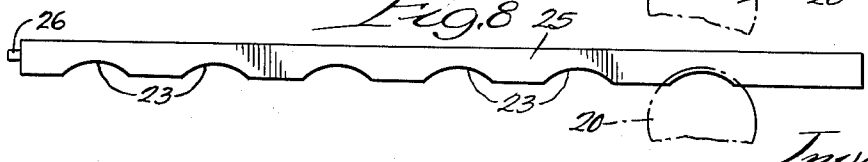


Fig. 8



Inventor:
Bertie S. Harrington,

By Carl C. Batz
Attorney.

Aug. 11, 1953 B. S. HARRINGTON 2,648,477

FILLING APPARATUS

Filed March 17, 1948 5 Sheets-Sheet 4

Fig. 9

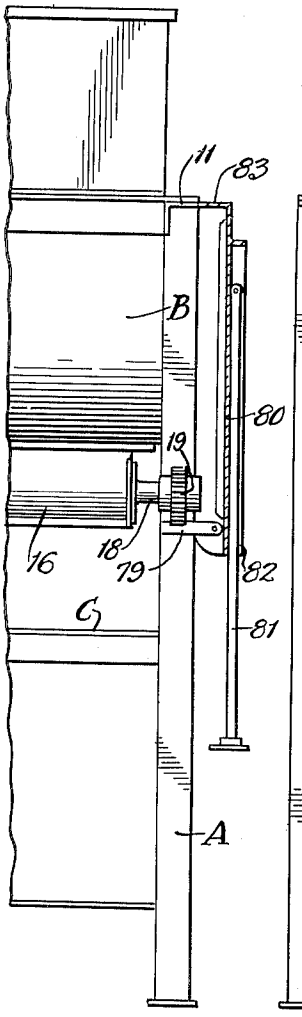
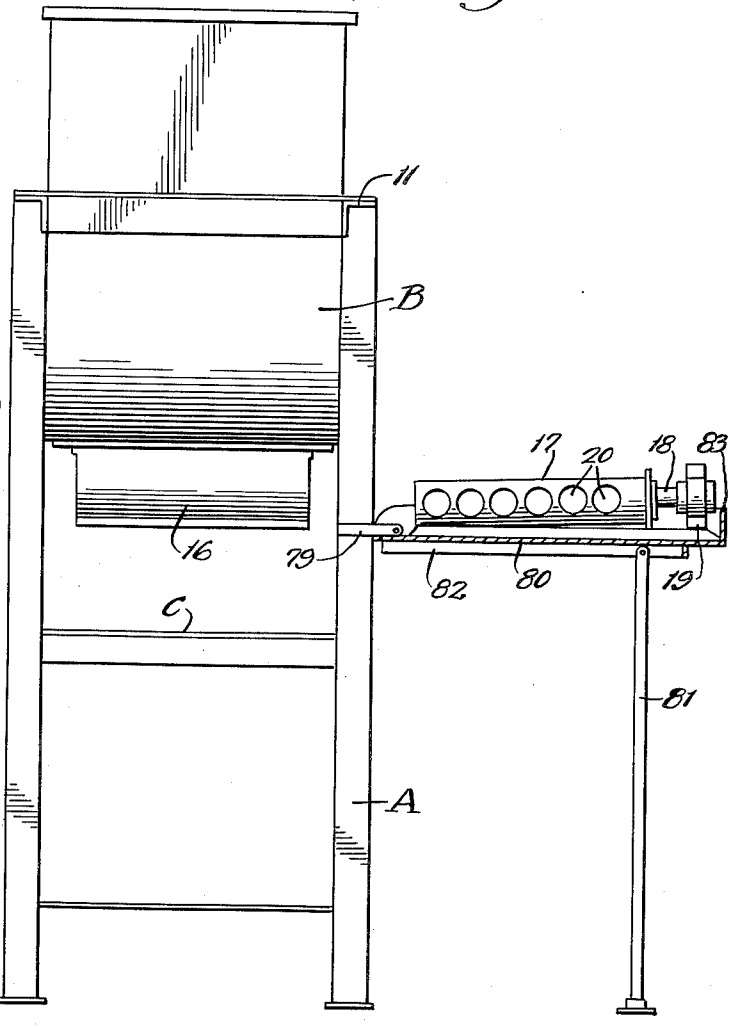


Fig. 10



Inventor:
Bertie S. Harrington,

By Carl C. Batz
Attorney.

Aug. 11, 1953 B. S. HARRINGTON 2,648,477

FILLING APPARATUS

Filed March 17, 1948 5 Sheets-Sheet 5

Fig. 11

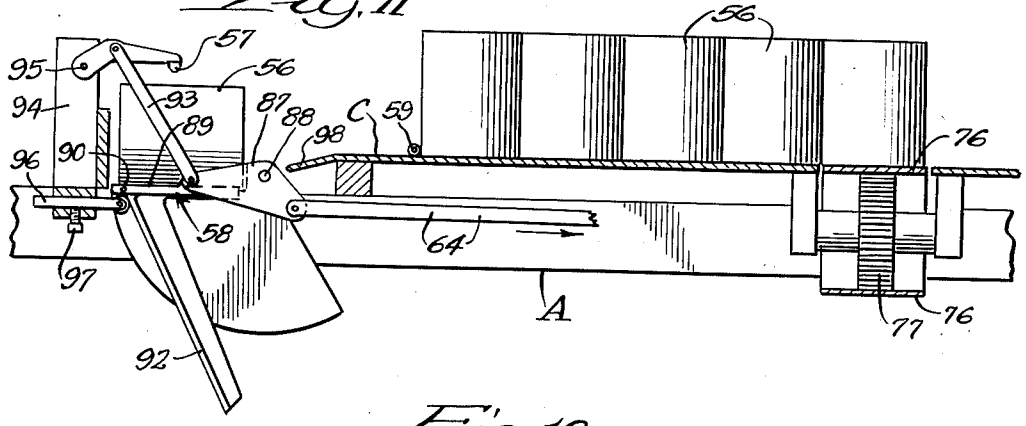


Fig. 12

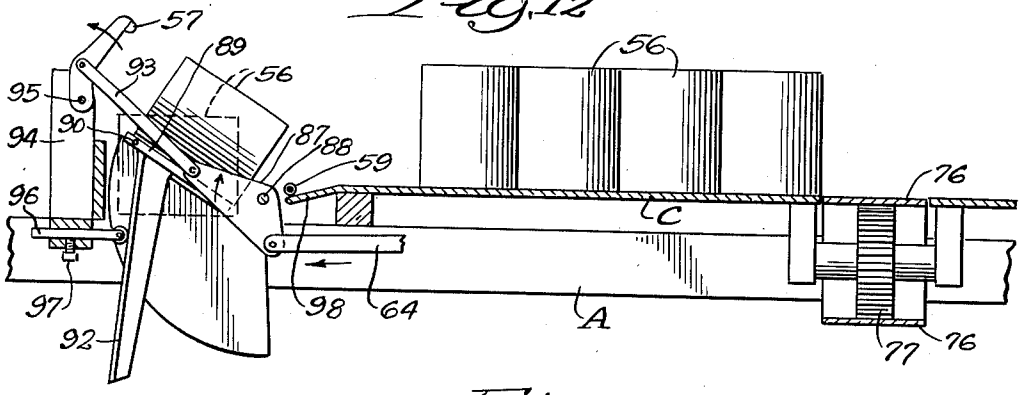


Fig. 13

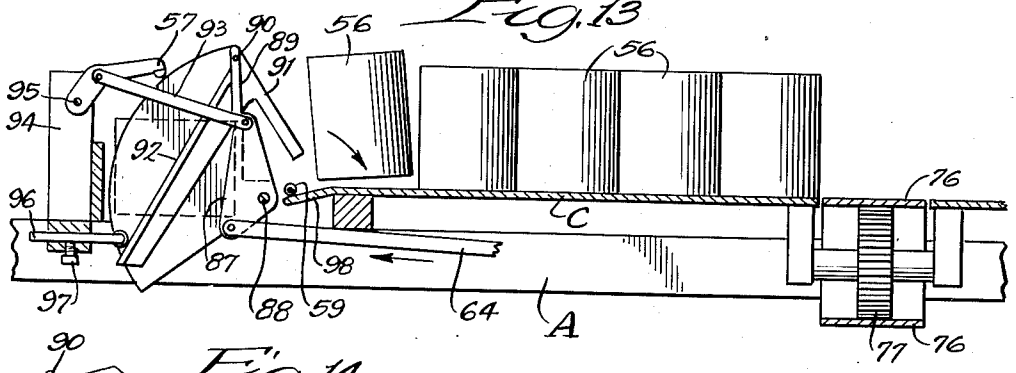
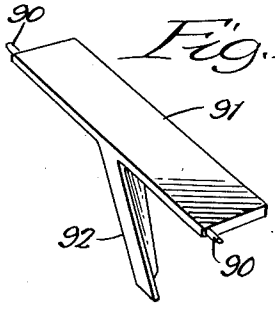


Fig. 14



Inventor:
Bertie S. Harrington,

By Carl C. Batz
Attorney.

Patented Aug. 11, 1953

2,648,477

UNITED STATES PATENT OFFICE

2,648,477

FILLING APPARATUS

Bertie S. Harrington, Chicago, Ill., assignor to Armour and Company, Chicago, Ill., a corporation of Illinois

Application March 17, 1948, Serial No. 15,370

6 Claims. (Cl. 226—94)

1

This invention relates to filling apparatus, and is particularly useful in the filling of cans or other receptacles with fluid or semi-fluid materials, such as, for example, chili, chop suey, chicken a la king, etc. It will be understood that the apparatus is applicable to all food or other materials soft enough to pour from a cup.

An object of the invention is to provide a receptacle-filling device or machine in which a number of receptacles are simultaneously filled or partially filled to a predetermined extent by operation of the machine, while at the same time providing simple and effective means for diminishing or increasing the capacity of the cups of the filling valve. A further object is to provide a structure in which the material being fed to a metering valve is kept in agitation and in which the material is wiped into each of the cups of the metering valve to insure the accurate filling thereof prior to the emptying of the cups. Yet another object is to provide filling apparatus in which cans are rocked from a position on their sides into a position in which their ends rest upon the feeding platform and in which the cans are advanced under filling apparatus and thence onwardly to a can-removal belt. A still further object is to provide filling apparatus in which a rotor valve equipped with cups is employed, the valve being removable for cleaning. A still further object is to provide a machine in which cans are advanced under a rotor valve provided with a plurality of cups, the cups being moved to a receiving position for filling and to a discharging position above said cans, and means being provided for insuring the filling of the cups to the desired degree, and means also being provided for varying the capacity of the individual cups. A further object is to provide novel means for feeding cans to filling apparatus and novel means for up-ending and elevating cans, while also providing means for stopping the apparatus if a desired number of cans are not received in the can-feeding portion of the apparatus. Other specific objects and advantages will appear as the specification proceeds.

The invention is illustrated, in a single embodiment, by the accompanying drawings, in which—

Figure 1 is a perspective view of apparatus embodying my invention; Fig. 2, an end view in elevation, a portion of the apparatus being shown in vertical section; Fig. 3, a top plan diagrammatic view of the can-supporting platform and conveyor apparatus employed therewith; Fig. 4, a broken enlarged sectional view showing the rotor valve with a cup thereof in filling position;

2

Fig. 5, a view similar to Fig. 4 but showing the rotor valve in discharging position; Fig. 6, a plan view of the rotor valve removed from the apparatus, a portion of the valve being shown in section; Fig. 7, a top plan view of a key which may be be employed to decrease the capacity of the cups in the rotor valve; Fig. 8, a similar view of another key which reduces to a lesser extent the capacity of the valve cups; Fig. 9, a broken front view in elevation of a portion of the rotor valve and the guard and holder for the valve core; Fig. 10, a view similar to Fig. 9 but showing the guard and holder extended to provide a support platform, and showing also the valve core withdrawn upon the platform for cleaning; Fig. 11, a longitudinal sectional view, on an enlarged scale, of the can-elevating and advancing mechanism, a can being shown resting upon its side preparatory to being up-ended; Fig. 12, a view similar to Fig. 11 but showing the can partly elevated; Fig. 13, a view similar to Fig. 12 but showing the can at the point of its discharge from the up-ending mechanism; and Fig. 14, a perspective view of the pivoted bottom wall of the cradle.

In the illustration given, A designates a frame which supports in the top portion thereof a hopper B and which supports below the hopper a table or platform C.

The frame consists of angle iron posts 10 which support a perimetric frame 11 carrying the hopper B. At its base, the frame A supports a plate 12 for supporting a motor 13 and drive apparatus which will be hereinafter described.

The hopper or receptacle B may be of any suitable type of construction. The hopper may be provided with a bottom of any desired shape or type. There are advantages, however, in providing the hopper with a semi-circular bottom portion 14, as illustrated, and with an outlet slot 15 extending longitudinally of the lowermost portion of the bottom 14. The semi-circular bottom cooperates with the agitator apparatus hereinafter described and with the rotor valve as will be described hereinafter.

A casing member 16 is secured to the bottom of the hopper B and provides a cylindrical chamber receiving a valve rotor 17. The valve rotor 17 is provided with a reduced shaft extension 18 equipped with an enlarged sector gear 19.

The rotor valve or valve core 17 is provided with a plurality of recesses or cups 20, as shown more clearly in Fig. 6. The cups 20 may be moved to filling and to discharging positions, as shown more clearly in Figs. 4 and 5.

The rotor valve core is provided with a longi-

tudinal slot 21 adapted to receive a key member 22, as shown in Fig. 6. It will be observed that the key member 22 has an arcuate portion 23 extending into each of the cups 20 and reducing the capacity of the cup. If it is desired to reduce the capacity of the cup still further, a key 24, as shown in Fig. 7, may be employed. If it is desired to increase the capacity of the cup above that shown in Fig. 6, a key 25, as illustrated in Fig. 8, may be employed. The keys 22, 24 and 25 are interchangeable and each varies from the other with respect to the area of the cutaway portion 23. The cutaway portion, shown in Fig. 8, with respect to key 25 is greater than that shown for keys 24 and 22, and therefore the amount of space taken up by the key in the separate cups will be less than that taken up by keys 22 and 24.

Each of the keys 22, 24 and 25 is preferably provided at one end with a short stem 26, and the stems are adapted to be received within an opening 27 upon a removable closure plate 28. Upon removal of the plate 28, the key 22 may be withdrawn and another key substituted therefor. It will be understood that there may be any number of keys employed and that these may have varying segments removed so as to vary the capacity of the cup to any desired degree.

Any suitable means for rotating the valve 17 between the filling and discharging positions may be employed. In the specific illustration given, a rack 29 meshes with the sector gear 19, as shown more clearly in Fig. 2. The upper portion of the rack 29 is guided between rollers 30 fixed to the hopper B, while the lower portion of the rack is guided between rollers 31 supported by the frame A. A link member 32 is pivotally connected at its upper end to the rack 29 and is pivotally connected at its lower end eccentrically to the cam member 33. The cam member 33 is mounted upon a transverse shaft 34 supported upon bearings, as illustrated best in Fig. 1. The motor 13 drives through a chain drive 35 a shaft 36 connected by worm gear connections with reduction gears enclosed within the casing 37. Since such gears are well known, it is believed unnecessary to describe them in detail. It is sufficient to state that the gear operates the shaft 38 which is connected through a clutch 39 with shaft 38. The clutch 39 may be operated by the lever structure 40 to disconnect shaft 38 from shaft 34. A second shaft 41 is also supported by the frame A, as shown more clearly in Fig. 1, and is driven by a sprocket 42 connected by a chain 43 to a sprocket gear 44 fixed to the shaft 38.

Shaft 41 is employed as a means for driving an agitator mounted in the hopper B. As shown more clearly in Fig. 2, a shaft 45 extends through the hopper casing B and is equipped at its end outside of the hopper B with a sprocket 46. A chain 47 connects sprocket 46 with sprocket 48 fixed to the shaft 41, as shown more clearly in Fig. 2. A small sprocket 49 is supported upon the hopper for engagement with chain 47, as shown more clearly in Fig. 2, while a second small sprocket 50 is supported upon an adjustable bracket 51 for engagement also with the chain 47, as shown in Fig. 2.

Any suitable agitator may be employed. In the illustration given, the shaft 45 is equipped with a hub 52 equipped with laterally-extending arms 53 and with wiper blades 54. The wiper blades 54 are so arranged as to sweep across the outlet opening 15 when the cups of the valve core 17 are in communication with the slot 15, thus insuring the rapid filling and accurate filling of each cup prior to the turning of the valve to discharge position.

Any suitable means for feeding cans into the apparatus and advancing them into filling position and then on to a discharge belt may be provided. In the illustration given, I provide a guideway 55 for receiving the cans 56, and the cans are allowed to roll on their sides onto the rear end of the platform C. A pivoted hold-down member 57 is provided for preventing the cans from leaving the platform C. A cradle 58 is provided for raising six of the cans, or any desired number of cans, at one time and placiug them on their ends behind a push bar 59. The push bar then advances the six cans upon their ends to a position below the discharge end 60 of the valve casing 17, the discharge end 60 of the casing being directly below the inlet opening 61 of the valve casing, as shown more clearly in Fig. 4.

Any suitable means for operating the cradle 58 and the push bar 59 may be employed. In the illustration given, the cradle 58 is pivoted at 62, and the angular extension 63 thereof is pivoted to a link 64, as shown more clearly in Fig. 2. The link 64 is connected to a member 65 pivoted to an operating link 66 at 67, and a regulating screw 68 is provided for adjusting the position of the member 65. Lever 66 is pivoted to the bracket 69 on the base plate 12. Another link 70 is pivoted upon a bracket 71 on plate 12 and is equipped with a roller 72 bearing against the cam 33. The upper end of the arm 70 is pivotally connected by a link 73 to the operating link 66. The upper end of the actuating lever 60 is connected by the link 74 to the push bar 59. Thus, by the action of the cam 33, the operating link 66 is moved rearwardly so as to bring the push bar behind the cans 56 while the cradle 58 is raised to deposit the cans ahead of the push bar. The spring 75 extending between the operating link 66 and the frame A next causes the push bar 59 to advance to operate a row of cans 56 into a position for filling or into any desired position relative to other cans which are being advanced under the filling mechanism.

Any suitable conveyor mechanism may be provided for removing the cans after the same have been filled. In the specific illustration given, I provide a belt conveyor 76 mounted on a pair of rollers 77 and the same are driven by suitable means (not shown) for advancing the filled or partially filled can to the next station.

In one embodiment of the invention, the can is filled partly with one product and is then advanced to another filling station where a completion of the filling is brought about by the adding of additional ingredient or ingredients. It is sufficient, however, for the purposes of the invention to describe the single machine as illustrated in the drawings.

To align the cans 56 properly upon the platform C, I prefer to place divider strips 78 between the cans, as shown more clearly in Fig. 3.

The valve core 17 is removable from the casing 16, and I provide apparatus which serves to support the core when the same is removed and which provides a guard for the operating rack when the valve core is in operative position. As shown more clearly in Figs. 9 and 10, the frame A is provided with fixed link members 79 pivotally secured to a holder 80. Supporting legs 81 are pivotally secured to the side walls 82 of the holder

80. Preferably, the holder 80 is provided with an outer stop flange 83.

When the valve core 17 is in operative position, the holder guard 80 is swung upwardly to the position illustrated in Fig. 9, in which position the outer flange 83 bears against the perimetric frame 11. In this position, the holder 80 serves as a guard for the rack 29. When it is desired to remove the core 17 for cleaning, the holder 80 is swung downwardly to the position shown in Fig. 11 in which the supporting structure 81 is moved to vertical position with its base resting upon the floor. The core 17 is then drawn outwardly to the position shown in Fig. 10, where it may be washed or otherwise treated. After washing, the core may be pressed back into position, bringing the teeth of the gear 19 into mesh with the teeth of rack 29. The closure plate 28, which receives the pin 26 of the key, may be locked in position by a screw member 84, as shown more clearly in Fig. 1.

In order to make sure that there will always be cans beneath the discharging rotor valve in the operation of the machine, I provide a contact arm 85 which controls a master switch within the case 86. Unless the lever 85 is held in the outer position indicated in Fig. 1 by means of a cam, the lever 85 will be urged by spring means within case 86 out of contact with such switch and will thus break the circuit controlling the operation of the hopper and valve mechanism. Thus, in the specific structure shown, it is necessary that there be sufficient cans in the feeding passage 55 to support a can in contact with the lever 85 to hold it in the switch-closing position illustrated in Fig. 1.

In the can-feeding structure shown, it will be observed that the cans are utilized in the feeding operation for pushing each other forwardly under the metering valve and beyond the valve to the conveyor. This arrangement is particularly useful in the filling operation shown, because the cans are close together and cover nearly all of the filling area so that should there by any small amount of drippage, the wastage would be thus minimized.

Referring more specifically to the can-upending and elevating mechanism illustrated in Figs. 2 and 11–14, the cradle 58 comprises a pair of members 87. Each of the members 87 is equipped with a fixed extension 89 apertured at its outer end to receive the pivot pins 90 integrally formed with a movable bottom 91 for the cradle. The bottom 91 is shown in detail in Fig. 14, and it is equipped with a downwardly-extending cam arm 92.

The hold-down member 57 is actuated by a link 93 connecting the member 57 to an end portion of one of the members 87, as shown more clearly in Figs. 11–13. Thus, the hold-down member 57 is effective, as shown in Fig. 11, for keeping the cans 56 in alignment and preventing them from jumping out of place. However, the hold-down member 57 is rendered ineffective during the elevating and up-ending operations, as illustrated in Figs. 12 and 13. As shown more clearly in Fig. 1, the hold-down member 57 consists of the pair of pivoted arms illustrated connected by a longitudinally-extending arm supported above the row of cams 56. The hold-down member 57 is pivotally supported upon the standard 94 at 95. Extending through an opening in the lower part of the standard 94 carried by frame A is an adjustable roller-equipped shaft 96 held within a selected position by the set screw 97, as shown more clearly in Figs. 11–13. The roller of the shaft 96

engages a flange of the cam member 92, and is effective for producing a pivoting of the bottom wall 91 of the cradle in a direction contra to the rotary movement of the main body of the cradle, as illustrated best in Fig. 13.

The action of the cradle and cradle bottom 91 is effective for depositing the can 56 over and beyond the pusher bar 59, as shown more clearly in Fig. 13. If desired to further facilitate the movement of the can 56 beyond the bar 59, the rear end portion of the bed C may be turned downwardly at 98, as shown more clearly in Figs. 11–13.

Operation

In the operation of the apparatus, the material to be introduced into the cans is fed into hopper B. Cans are supplied through the guide 55 and rolled upon their sides across the bottom wall 91 of the cradle. If a sufficient number of cans are fed to bring the topmost can into contact with the control arm 85, the master switch is closed, and the machine is ready for operation. The motor 13 drives the agitator by rotating shaft 38, sprocket 44, sprocket 42, shaft 41 (as shown more clearly in Fig. 1), and then sprocket 43, sprocket 46, and agitator shaft 45 (as shown more clearly in Fig. 2). If the clutch 39 is operated to connect the shaft 38 with shaft 34, the feed mechanism is also set into operation. It will be understood at the outset that cans are already in position under the discharge end of the rotor valve, as illustrated more clearly in Figs. 1 and 3.

As the cam 33 rotates, the sector 19 causes the rotor shaft to swing alternately in an upward and downward direction to bring the rotor valve 17 into receiving and discharging positions. In the receivng position, the cups 20 are aligned with the inlet openings 61 and with the hopper opening 15. The agitator is preferably brought past the cup to insure the filling of the cup prior to the turning of the valve, but it will be understood that the agitator may operate in any desired timed relation with respect to the operation of the valve. After the filling of the cup, the valve turns to the position shown in Fig. 5, in which the material within the cup discharges into the cans below.

In timed relation with the above operation, the can-feeding mechanism advances additional cans toward filling position. The operation of cam 33 moves the operating link 66 backward and forward, and this action causes the cans 56 to be swung from horizontal position to a vertical position behind the pusher bar 59. The pusher bar 59 then advances the cans to any selected position, depending upon the desired stroke of the link 66. If desired, the can may be advanced all the way to feeding position, or it may be advanced part way and into engagement with the can ahead of it so as to push the other can or cans into feeding position. As the cans are filled, or partially filled, they are advanced until the outer row of cans rests upon the conveyor 76, and they are then carried away by the conveyor. It will be observed that, in the preferred operation described, in which one can pushes another, nearly all of the space on the bed is taken up with cans, and if there should be some spillage from the hopper, the amount of wastage is reduced to a minimum.

In the can up-ending and advancing operation, the movement of rod 64 toward the cradle tilts the member 87 about the pivot 88 and lifts the cradle floor or bottom 91, as illustrated in

Fig. 12. Continued movement of the rod 24 in the same direction rotates the member 87 to the position shown in Fig. 13, but the engagement of cam 92 with the roller-equipped shaft 96 swings the bottom 91, toward the end of the movement of the cradle, in an upward direction and in a direction counter to the general direction of the cradle, as illustrated more clearly in Fig. 13. This upward swinging of the member 91 lifts the can 56 and places it over and beyond the pusher bar 59, as again illustrated in Fig. 13. When the actuating rod 64 moves in the opposite direction, the parts are restored to the position shown in Fig. 11, the cam member 92 swinging to the position illustrated.

It will be observed that the hold-down member 57, which is effective in the first operation illustrated in Fig. 11 in holding the cans in place, is elevated during the up-ending of the can so as not to interfere with such elevating and up-ending.

After the filling operation, the valve core 17 may be withdrawn for cleaning. In this operation, the holder 80 is swung to the position shown in Fig. 10, and the core 17 is drawn upon it. After cleaning, the core is pushed back into position and the teeth 19 of the sector gear brought into mesh with the teeth of the rack 23.

When it is desired to change the capacity of the cups 20 in the valve core 17, the closure plate 28 may be removed and the key 22 withdrawn by engaging the pin 26 with a gripping tool. Another key which will increase or diminish the capacity of the cups to the desired extent is then introduced into position and new closure plate 28 again locked in position by the screw member 84. The valve should be in the position with the cups opening downwardly so as to seal off the hopper outlet during such change of keys, if the hopper contains food material. Such position of the valve will prevent food material escaping through the cups and key opening during the changing of the keys.

It will be understood that the rotor valve may have a single cup, or any number of cups, and, further, that keys of widely differing contour may be used to change the capacity of the cup or cups.

While, in the foregoing specification, I have set forth a structure in great detail for the purpose of illustrating one embodiment of the invention, it will be understood that such details may be varied widely by those skilled in the art without departing from the spirit of my invention.

I claim:

1. In an apparatus for filling and metering a flowable material containing both liquid and solid portions, a hopper providing a chamber with at least one normally open discharge opening through a wall thereof, a casing member mounted on the outside of said hopper in alignment with said discharge opening and providing a cylindrical chamber communicating with said discharge opening and having a lower outlet opening, a rotor valve mounted in said cylindrical chamber and having at least one recess therein providing a metering cup, means for rotating said valve to bring said cup alternately into communication with said discharge opening and said lower outlet opening, an agitator mounted for rotary movement in said hopper chamber about an axis, said agitator having at least one arm extending radially from said axis, the outer end of said arm being equipped with a wiper member providing a surface positioned with respect to said axis of rotation to sweep directly over said discharge opening, said surface being of substantially as large dimensions as said discharge opening to provide a temporary closure for said opening for a short interval during each revolution of said agitator, and means for moving said surface across said discharge opening while the cup of said valve is in communication with said hopper, thereby assuring that said material is uniformly packed in said metering cup before being discharged therefrom.

2. In an apparatus for filling and metering a flowable material containing both liquid and solid portions, a casing providing a hopper chamber having a discharge opening and a cylindrical valve chamber communicating with said hopper chamber through said discharge opening, said valve chamber having a lower outlet opening, a rotor valve mounted in said chamber and having axially spaced aligned recesses therein providing a plurality of metering cups, means for rotating said valve to bring said cups alternately into communication with said discharge opening and said lower outlet opening, a shaft mounted in said casing and extending through said hopper chamber, an agitator carried by said shaft and providing a plurality of spaced radially extending arms, wiper blades carried by the outer ends of said arms, and means for rotating said shaft in unison with said means for rotating said valve to bring said wiper blades across said discharge opening when said cups are in position to communicate with said hopper chamber, each of said wiper blades providing a surface positioned with respect to said shaft to sweep directly over said discharge opening, said surface being dimensioned to substantially cover said discharge opening when said surface is directly opposite to said discharge opening, thereby assuring that said material is uniformly packed in said metering cups before being discharged therefrom.

3. In a filling apparatus, a casing providing a hopper chamber and a cylindrical valve chamber communicating with the hopper chamber through an inlet opening, said cylindrical chamber having also an outlet opening, a rotor valve consisting of a cylindrical member mounted in said valve chamber and having axially spaced aligned recesses therein providing metering cups opening on one side of said member, said cylindrical member being provided with a longitudinal slot extending from an end of said member and intersecting each of said cups in the same manner, a key slidably received in said longitudinal slot and projecting into each of said metering cups and occupying the same volume in each of said cups, means for releasably locking said key in said slot, whereby the exact capacity of said cups can be varied by substituting an interchangeable key in said rotor valve slot providing portions projecting into said cups and occupying a different volume therein than the projecting portions of said first-mentioned key, and means for rotating said valve to bring said cups alternately into communication with said inlet opening and said outlet opening.

4. In a filling apparatus, a casing providing a hopper chamber and a cylindrical valve chamber communicating with said hopper chamber through an inlet opening, said cylindrical valve chamber having also an outlet opening, a rotor valve consisting of a cylindrical member mounted in said valve chamber and having axially

spaced aligned recesses therein providing metering cups opening on one side of said member, said cylindrical member being provided with a longitudinal slot extending from an end of said member and intersecting the bottom edge portion of each of said cups in the same manner, a key slidably received within said slot and projecting into each of said cups to reduce the capacity of each of said cups at the bottom by the same amount, means for releasably locking said key in said slot, whereby the capacity of said cups can be varied by substituting an interchangeable key in said slot providing portions projecting into the bottom portions of said cup by a different amount than said first-mentioned key, and means for rotating said valve to bring said cups alternatively into communication with said inlet opening and said outlet opening.

5. In a filling apparatus, a casing providing a horizontally-extending cylindrical valve chamber, said cylindrical chamber being open at one end, a rotor valve slidably and rotatably received in said chamber, said valve having an end projecting outwardly when fully within said chamber and being insertable and removable through the open end of said chamber, a gear member carried by the projecting end of said rotor valve, gear means engaging said gear when the valve is in said cylindrical chamber for rotating said valve, said gear and gear means being disengageable to permit said valve to be drawn outwardly through the open end of said chamber, a vertically-extending guard member covering the gear-equipped projecting end of said rotor valve, said guard member being hingedly mounted at approximately the level of said rotor valve for swinging to a horizontal position just below the line of removal and insertion of said rotor valve, and means for securing said guard member in said horizontal position, whereby said guard member can provide a table for supporting said rotor valve when removed from said chamber and also during the insertion and removal of said valve.

6. In a filling apparatus, the combination comprising a horizontally-extending platform, a hopper supported above said platform having a discharge opening in the bottom thereof, a casing providing a horizontally-extending cylindrical valve chamber between said hopper and said platform, said valve chamber communicating with said discharge opening and having a lower outlet opening oriented toward said platform and positioned at a spaced distance therefrom, a cylindrical rotor valve mounted in said chamber and having aligned axially spaced recesses therein providing a plurality of metering cups, means for rotating said valve to bring said cups alternatively into communication with said discharge opening and said lower outlet opening, and means operated in timed relation with said rotor-operating means for moving an array of cans across said platform beneath said outlet opening and for positioning one can beneath each of said metering cups when said cups are brought into alignment with said outlet opening, said last mentioned means including guide means for directing a line of cans traveling on their sides to a position in front of said outlet opening with their open ends away from said outlet opening, a rockably mounted cradle beneath said position for uprighting a plurality of said cans and depositing them open end upwardly on said platform directly in front of said outlet opening with one can aligned with each metering cup, and a pusher member for advancing said cans across said platform.

BERTIE S. HARRINGTON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
111,726	Carman	Feb. 14, 1871
528,946	Knittel	Nov. 13, 1894
544,966	Davis	Aug. 20, 1895
603,309	Yeagley	May 3, 1898
648,538	Stickney	May 1, 1900
671,726	Gray	Apr. 9, 1901
1,066,285	Ketterer	July 1, 1913
1,243,566	Souder	Oct. 16, 1917
1,275,595	Pocock	Aug. 13, 1918
1,478,829	Liberman et al.	Dec. 25, 1923
1,649,073	McEwan	Nov. 15, 1927
1,709,771	Brady	Apr. 16, 1929
1,745,938	Lawder	Feb. 4, 1930
2,124,972	Engel	July 26, 1938
2,152,339	Anderson	Mar. 28, 1939
2,341,128	Titus et al.	Feb. 8, 1944