MACHINE FOR DISPENSING SHAPED AND PORTIONED CHARGES OF A FOOD PRODUCT

Inventor: Arnold Soodalter, 134 Tanglewood Dr., Longmeadow, Mass. 01106

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Primary Examiner—Stanley H. Tollberg
Attorney, Agent, or Firm—Ross, Ross & Flavin

ABSTRACT
Apparatus for the in seriatim dispensing of shaped and portioned charges of a moldable food product comprising a supply section including a hopper and an interconnecting charging chamber for the containment of the food preliminary to shaping and portioning, a pressure section for pressurizing the food within the chamber preparatory to and during the loading thereof into a metering section, the pressure section including primary and secondary pushers horizontally-reciprocable within the charging chamber toward and away from the metering section in compressing and relieving strokes respectively, the metering section including a charge-shaping drum rotatably confined within a housing and having a diametrically-disposed opening therethrough defining a pair of aligned radially-arranged pockets of alternately increasing and decreasing size according to the movement of a plug limitedly-reciprocable within the opening in the area intermediate the two pockets, the pockets of the drum each communicating through the housing in seriatim first as a receiving pocket with the charging chamber for shaping and measuring a charge of the food loaded thereinto from the charging chamber responsive to the motivation of the pushers and second as a dispensing pocket with atmosphere for dispensing the shaped and portioned charge from the metering section into a suitable receiving means, with the compressing stroke of the pushers maintaining a tension on the food during loading into the receiving pocket and therefore following during a momentary dwell period as rotation of the drum out of register with the charging chamber is initiated following which the pushers are retracted in relieving stroke as the food charged pocket is completely encapsulated by the cooperating drum and plug and housing is rotated into dispensing position as effected by the loading of the second-to-be-filled pocket and the resultant limited sliding movement of the plug within the drum opening.

9 Claims, 13 Drawing Figures
MACHINE FOR DISPENSING SHAPED AND PORTIONED CHARGES OF A FOOD PRODUCT

This application is a continuation-in-part of my co-pending application Ser. No. 222,559 filed Feb. 1, 1972.

There are any number of applications where it may be desired to deliver or deposit a moldable material in critically accurate amounts in a rapidly-timed sequence.

The principle may be applied to dispensing predetermined amounts of a food product and this exemplification is specifically made in the light thereof, although the invention has application in the metering of other moldable non-food materials.

The apparatus comprises first, a food product supply section including a hopper and an interconnecting charging chamber for the containment of the food product preliminary to the shaping and portioning operations, second a pressure section for pressurizing the food product within the chamber preparatory to and during the feeding thereof to a third or metering section. The pressure section includes primary and secondary pushers which are horizontally-reciprocable within the chamber toward and away from the metering section in compressing and relieving strokes respectively. The metering section includes a metering drum rotatable within a housing and having a diametrically-disposed opening therethrough defining a pair of radially-arranged pockets of alternately increasing and decreasing size according to the movement of a plug which is limitedly-reciprocable within the opening in the area intermediate the two pockets. The pockets of the drum each communicate in seriatim through the housing first in food-receiving position with the chamber for shaping and portioning a predetermined charge of the food product expressed from the chamber responsively to the motivation of the pushers and second in food dispensing position with atmosphere for dispensing the shaped and portioned charge from the metering section into a suitable receiving means under the control of a pittman arm for achieving both the compressing stroke of the pushers and maintaining a tension on the food product first as same is charged into the receiving pocket and a second during a momentary dwell time therefollowing as the drum commences rotation out of registry with the charging chamber.

A crank arrangement is incorporated into the apparatus which envisages a crank motion first with adjustment means for varying the velocity of the stroke and hence the velocity of the machine cycle and second with a motion involving a slight dwell at each end of a rectilinear stroke (i.e. at both points of reversal) so as to allow in one (forward) position the ushers to retain a tension on the product at the completion of the compressing stroke and for the moment therefollowing when the drum is rotated out of its load receiving position whereat the pocket receives its charge and the so charged pocket is rotated into and within the confines of the housing so as to preclude escape of any of the product from the pocket until it has rotated over to its discharging position.

The charges dispensed by the apparatus may be of any precise desired size and/or weight and means may be optionally incorporated for imparting such as a spherical or other special shape to the charges.

The food product does not suffer the usual effects of vibration as it is motivated through any of the portioning devices of the known art. Rather it enjoys the feature of not being exposed to any external pressures; the pressures herein are spring fed within the charging chamber, which pressures continue as feeding continues to the point where the empty pocket of the drum is fully charged with a predetermined quantity, at which moment and while the pressure remains constant the rotation of the drum is initiated. Once the charged pocket is out of registry with the charging chamber, the momentary dwell of the pressure means is terminated and the drum continues in its 180° rotation to a product-discharge position so as to place that charged pocket in position for dispensing and the next following empty pocket is in ready-to-be-charged position, there being one pocket in ready-to-be-charged position as the other pocket is in the ready-to-be-discharged position, with the charging of the one being coincident with and responsible for the discharging of the other.

In the drawings:
FIGS. 1 and 2 are front and rear side elevational respectively of the dispensing apparatus;
FIG. 3 is an enlarged top plan view thereof with certain parts omitted;
FIG. 4 is a forward end elevational view of the metering section;
FIG. 5 is a front elevational view of one of the wheels or half-parts constituting the drum of the metering section;
FIG. 6 is a side elevational view of one of the pushers of the pressure section;
FIG. 7 is an end elevational view of another feature of the pressure section;
FIG. 8 is a fragmentary rear side elevational view of a modified form of the apparatus;
FIG. 9 is an enlarged side elevational view of the feed assist means of the FIG. 8 apparatus;
FIG. 10 is an end elevational view of the FIG. 9 feed assist means in a raised position;
FIG. 11 is a top plan view of the FIG. 8 modified apparatus, with certain parts omitted for purposes of clarity, the feed assist means being shown in a lowered position;
FIG. 12 is a fragmentary rear side elevational view of another modified form of the apparatus; and
FIG. 13 is a top plan view of the FIG. 12 modified apparatus with certain parts omitted and others broken away for purposes of clarity.

Referring to the first form of FIGS. 1 – 7, the apparatus comprises generally a pressure section generally indicated by 10, a supply section generally indicated by 12, and a metering section generally indicated by 14.

Pressure and metering sections 10 and 14 respectively are each positioned upon a common base 15, with metering section 14 being disposed forwardly of pressure section 10, as viewed in FIG. 1.

Supply section 12 includes an arrangement of vertically-stacked plates 16 so configured as cooperatively to define an interior charging chamber 18 aligned vertically below and in communication with a hopper 20 adapted to contain a supply of a food product 21 and to hold same therein in a lightly pressurized condition as by a weight means 21 disposed thereabove, which weight means may or may not be spring loaded and serves to direct the food product downwardly from within the hopper to within the charging chamber ac-
cording to the capacity of the chamber as determined by the positioning of pushers operable therewith.

The salient point is that the arrangement is such that the chamber is more or less continuously being filled to its capacity from above while the contents therewithin are intermittently being pressured and hence reduced somewhat in volume and are also being intermittently discharged therefrom by loading into the metering section.

The pushers of the pressure section, subsequently to be described, are slidably receivable within chamber 18 and are motivated horizontally therewithin between an extreme rearward position (rearward being at the right as viewed in Fig. 1) and an extreme forward position (forward being at the left as viewed in FIG. 1) with a momentary dwell being allowed at the terminal end of each stroke of the stroking means.

The forward driving of the pressure devices toward metering section 14 effects a loading of food product P from within chamber 18 toward and into the product metering means. The rearward driving of the pressure devices away from the metering section effects a refilling of the food product into the charging cavity.

Linear reciprocation of pressure means 22 is achieved by a crank arrangement which includes a pair of spaced crank arms 24, organized for functioning unisonly by virtue of each being pivotally linked at its inboard end to a cross-head 26 extendable transversely of the pressure means and each being eccentrically connected at its outboard end to the side of a respective one of a pair of spaced annular drive plates 28 keyed upon a common shaft 30 rotated by such as a conventional worm and gear, not shown, operatively connected in known manner to a drive shaft 32 of a reversible drive motor 34.

The crank arms include turnbuckle arrangements whereby the arms may be adjusted relative to their respective drive plates for varying the velocity of the stroke and hence the velocity of the machine.

Each time the cross-head reaches an end to its stroke, it starts from a momentary stroke of rest or dwell at the dead center position and the velocity then increases during approximately one-half of its stroke and subsequently decreases until the cross-head again comes to a momentary state of rest or dwell at the opposite end of the stroke where dead-center is again passed.

A cam 36, on the periphery of one of the drive plates 28 imparts motion to a limit switch follower button movable in a plane coincident with the plane of motion of the cam wherefore the limit switch effects reversal of drive motor rotation for driving first in one and then in opposite direction.

Cross-head 26 is rideable in parallel slots 40 in plates 16, the slots being of dimension to accommodate to the stroke of the pressure means, which stroke may be varied by judicious adjustment of the turnbuckles on the crank arms, as aforesaid.

An extension 42 of one end of cross-head 26, best seen in FIG. 3, extends outwardly beyond it respective adjacent crank arm 24 and has a depending plate 44 fixed thereto and having a lower end integral with one end of a horizontally-disposed stationary rack 46 slidably mounted upon a slide 48 secured to base 15, with which rack a pinion 50 is operatively connected to product metering means 14. See FIG. 3.

The pressure means includes a pair of primary pushers 52 and a secondary pusher 54 sandwiched therebe-
Opening 102 is axially aligned and communicates with housing inlet opening 82. A plug 96 is slidably disposed in opening 102, the plug having a longitudinally-disposed slot 98 extending therethrough through which a pin 100 is freely passed, the pin being fixed relative to the drum as by a finger nut 101.

The pin and slot are so arranged that one end face of the plug is always flush with the drum periphery, the end faces being suitably curved to complement the contour of the drum periphery.

The plug is of such length as to allow for a pair of products chambers 102 defined by the opening 102 and the respective ends of the plug.

The length of the plug and the size of the opening and the limit of the plug stroke determine the size and hence capacity of the product chambers. As these dimensions are varied, the amount and weight of food product accommodated by the chambers 102 may be accordingly varied.

Drum 90 is adapted for rotation so that immediately following receipt by one of the product chambers 102 of a charge of the food product, the drum is rotated 180°, whereby the chamber is moved from a 3 o'clock to a 9 o'clock position as viewed in FIG. 1. In this way, the next charge of food product forced through inlet opening 82 drives plug 96 relative to opening 102 according to the preset limit of the plug stroke so as forcefully to expel the food product from the first so filled chamber 102 and exteriorly of the product metering means through an exit opening 104 in housing 80 to a suitable receiving receptacle.

Because plug 96 is slidably nested within opening 102 of drum 90, and because the drum is adapted for 180° degree rotation, the product chambers are each rotated intermittently and alternately between the 3 o'clock receiving position (wherein a charge of food product is received therein) and the 9 o'clock dispensing position (wherein the food product is discharged therefrom).

Drum rotation is effected by rack and gear 46 and 50 respectively, the gear being mounted on one end of a shaft 106 fixed at its opposite end to the drum.

A unidirectional clutch, not shown, disposed on shaft 106, limits drum rotation to only one direction of rotation.

A stop 108 fixed to rack 46 is engageable in cut-outs 110 provided in the periphery of a stop 112 fixed to shaft 106 whereby movement of the rack is stopped at the precise position essential to align bores 92 and chambers 102 of drum 90 in exact alignment with inlet opening 82 of housing 80.

Linear movements of the pushers of the pressure means are of course timed with the rotative movement of the drum.

By the arrangement, the pockets of the drum communicate in seriatim in food-receiving position with the chamber for receiving and portioning a predetermined charge of the food product expressed from the chamber responsively to the forward drive of the pushers.

The crank arrangement allows the compressing stroke of the pushers for compressing the food product into the pocket and maintaining a tension on the food product, first as same is charged into the receiving pocket, and second, during a momentary dwell time as the drum commences rotation out of registry with the charging chamber and the pushers commence the relieving stroke for opening the charging chamber for the recharging thereof.

Additionally, the drum may be provided with pockets of varying configurations by means of such as slugs or the like which may be inserted thereinto whereby shapes, such as spherical shapes, may be imparted to the charges.

**MODIFICATION I**

In a modified form of the apparatus shown in FIGS. 8 – 11, feed assist means generally indicated by 120 is operative in hopper 20 to direct the food product downwardly from within the hopper into chamber 18, the feed assist means operating in conjunction with pressure means 22 and being fixed to a shaft 122 which extends transversely therethrough and outwardly from the front and rear side faces thereof so as to be pivotally receivable in slots 124, (see FIG. 11), in the upper surface of the uppermost of plates 16, the shaft bridging the chamber 18.

Shaft 122 extends outwardly from one side of plate 16 and is journaled at one of its ends in an upright post 126 fixed to and extending outwardly from slide 48.

A pair of pivotally-connected drive links 128 and 130 extends in lengthwise machine direction outwardly of plates 16.

Drive link 130 is fixed at its forward end to shaft 122 and is pivoted at 132 at its opposite end to the forward end of drive link 128. Drive link 128 is pivoted at its opposite end to cross arm 26 inwardly of plate 44 and outwardly of carrier 56 and pressure means 22.

Thus, linear reciprocation of cross arm 26 by the crank arms 24 causes drive link 128 to rotate, setting up a concomitant rotation in link 130 whereby shaft 122 and feed assist means 120 are caused to rotate in timed relation to movement of carrier 56 and pressure means 22.

When the pressure means is retracted, as in FIGS. 8 and 11, the feed assist means is in a lowered position; when the pressure means is advanced, the feed assist means is raised, as in FIG. 10.

Feed assist means 120 includes a body portion 134 overlying product receiving chamber 18 and a plurality of fingers 136 fixed to the body portion and extending outwardly therefrom so as to be adapted to sweep the exit opening of hopper 20.

Fingers 136 are interconnected at their outer ends by a web 138 which assists in driving the food product downwardly as the feed assist means rotates.

The feed assist means rotates through an arc of approximately 90°, a recess 140 being provided in the forward wall of hopper 20 to permit nesting of body portion 134 on the upper stroke of the feed assist means.

Since movement of the feed assist means is coordinated with movement of the pressure means, the feed assist means aids in compacting the food product into chamber 18 as the pressure means is retracted and is raised ready for another purchase when the pressure means is advanced.

**MODIFICATION II**

The modified form of the invention of FIGS. 12 and 13 is similar to that of FIGS. 8 – 11 in that feed assist means is employed. Herein, however, while the outer fingers continue to pivot from a 9 o'clock pivot center, as viewed in FIGS. 11 and 13, a solid center portion pivots from a 3 o'clock pivot center as viewed in the
same Figures, the fingers and the center portion being driven by a pair of meshing gears operating in tandem. The feed assist means of FIGS. 12 and 13, generally indicated by 220, is disposed in hopper 20 to direct the food downwardly from within the hopper into the chamber 18.

Shaft 122 is driven by the links 128 and 130 as in the FIGS. 8 – 11 embodiment.

Pairs of fingers 236 interconnected by webs 238 are disposed on the shaft 122 adjacent the walls of chamber 18 so as to be pivotal with the shaft as it is rotated to sweep the hopper.

A solid central portion or arm 236' is fixed to a second shaft 222 disposed in spaced parallelism to shaft 122, the second shaft being rotated by a gear drive comprising a driven gear 223 on shaft 222 and a drive gear 224 on shaft 122.

As viewed in FIGS. 13, the fingers 236 operate from left to right through an arc of approximately 90°, and the solid central portion or arm operates from right to left, also through an arc of approximately 90°.

In this manner, the food product is moved steadily downwardly as the fingers wipe the walls, moving the food product toward the center of the hopper where it is forced downwardly by the solid member or arm, movement of the feed assist means being coordinated with movement of the pressure means, as explained with reference to FIGS. 8 – 11.

I claim:

1. Apparatus for the in seriatic dispensing of a plurality of like articles molded from a plastic material comprising:
   a supply section including a hopper and an interconnecting charging chamber for the containment of the material preliminary to shaping and portioning,
   a pressure section for pressurizing the material within the chamber preparatory to and during the loading thereof into a metering section,
   the pressure section including primary and secondary pushers horizontally-reciprocable within the charging chamber toward and away from the metering section in compressing and relieving strokes respectively,
   the metering section including a charge-shaping drum rotatably confined within a housing an having a diametrically-disposed opening therethrough defining a pair of aligned radially-arranged pockets of alternately increasing and decreasing size according to the movement of a plug limitedly-reciprocable within the opening in the area intermediate the two pockets,
   the pockets of the drum each communicating through the housing in seriatic first as a receiving pocket with the charging chamber for shaping, and measuring a charge of the material loaded thereinto from the charging chamber responsive to the motivation of the pushers and second as a dispensing pocket with atmosphere for dispensing the shaped and portioned charge from the metering section into a suitable receiving means, with the compensating stroke of the pushers maintaining a tension on the material during loading into the receiving pocket and therefollowing during a momentary dwell period as rotation of the drum out of register with the charging chamber is initiated following which the pushers are retracted in relieving stroke as the material charged pocket is completely encapsulated by the cooperant drum and plug and housing is rotated into dispensing position as effected by the loading of the second-to-be-filled pocket and the resultant limited sliding movement of the plug within the drum opening.

2. In apparatus for dispensing a moldable product, the combination of:
   a hopper, a primary product receiving chamber in communication with and vertically below the hopper, feed assist means disposed within the hopper for exerting intermittent vertical pressures on the product and urging same downwardly into the chamber, primary and secondary pressure means intermittently reciprocable horizontally within the chamber, product metering means communicating with the chamber and having a plurality of pockets alignable in seriatic with the primary and secondary pressure means for accepting measured increments of product as expressed from the chamber under the intermittent horizontal pressure of the primary and secondary pressure means, and means for ejecting the measured increments of product from certain pockets accordingly as other pockets are charged.

3. In apparatus for dispensing a moldable product according to claim 2, including means linking the primary and secondary pressure means and feed assist means for the timed relation operation of each to the other.

4. In apparatus for dispensing a moldable product according to claim 2, the feed assist means being mounted for pivotal movement relative to the hopper and including a pair of sets of product engaging fingers.

5. In apparatus for dispensing a moldable product according to claim 2, the feed assist means being mounted for pivotal movement relative to the hopper and including a pair of sets of product engaging fingers rotating in opposing arcs in timed relation with each other.

6. In apparatus for the in seriatic dispensing of charges of a moldable product comprising:
   a supply section including a hopper and an interconnecting charging chamber for the containment and charging of the product preliminary to the shaping and portioning thereof, feed assist means in the hopper reciprocable in repeating cycles in a path toward and away from the charging chamber for breaking up particles of the product preliminary to the feeding of the product from the hopper to the charging chamber, a pressure section for pressurizing the material within the charging chamber, a metering section for shaping and portioning the material following the loading thereof thereinto from the pressure section aligned therewith, the pressure section including primary and secondary pushers horizontally-reciprocable within the charging chamber toward and away from the metering section in compressing and relieving strokes respectively, the metering section including a charge-shaping drum rotatably mounted and provided with a diametrically-disposed through opening defining a pair of aligned radially-arranged pockets of alternately increasing and decreasing size according to the movement of a plug limitedly-reciprocable within the opening in the area intermediate the pockets of the pair thereof, each pocket serving in seriatic first as a
receiving pocket in communication with the charging chamber for shaping and portioning a charge of the product loaded thereinto from the charging chamber responsive to the compressing stroke of the pushers and second as a dispensing pocket for dispensing the so-shaped and portioned charge therefrom, with the compressing stroke of the pushers maintaining a tension on the product during charging into the first-to-be-filled receiving pocket and momentarily thereafter during a dwell period as rotation of the drum out of register with the charging chamber is initiated following which the pushers are retracted in relieving stroke as the product charged pocket is rotated into dispensing position as effected by the loading of the second-to-be-filled receiving pocket and the resultant limited sliding movement of the plug within the through opening.

7. In apparatus according to claim 6, including means linking the primary and secondary pushers and feed assist means for the operation of each in timed relation to the other.

8. In apparatus according to claim 6, the feed assist means being mounted for pivotal swinging relative to the hopper and including a plurality of fingers for urging the product from the hopper.

9. In apparatus according to claim 6, the feed assist means being mounted for pivotal swinging relative to the hopper and including a plurality of product engaging fingers rotating in one direction and a product engaging arm rotating in an opposite direction in timed relation with each other for urging the product from the hopper.