Sept. 30, 1941. M. M. RAYMER 2,257,347

MACHINE FOR FILLING FORMS WITH BISCUIT MATERIAL

Filed Sept. 16, 1939 6 Sheets-Sheet 1

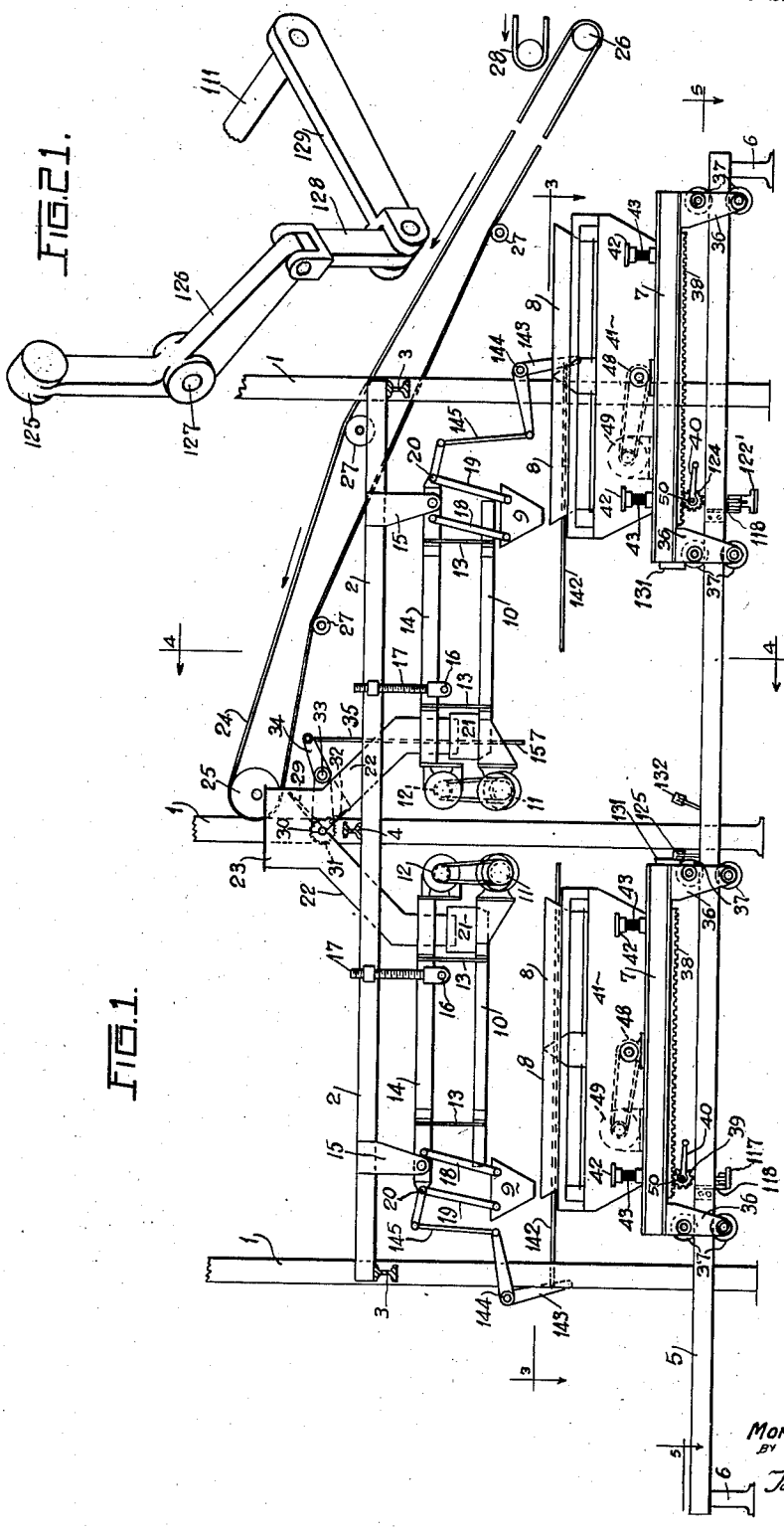


FIG. 1.

FIG. 21.

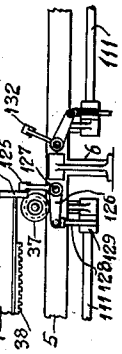


FIG. 17.

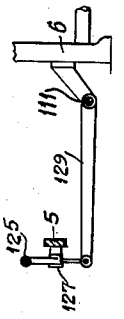


FIG. 16.

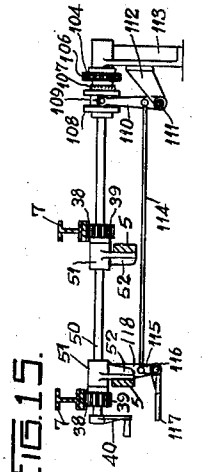


FIG. 15.

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Filed Sept. 16, 1939

6 Sheets-Sheet 2

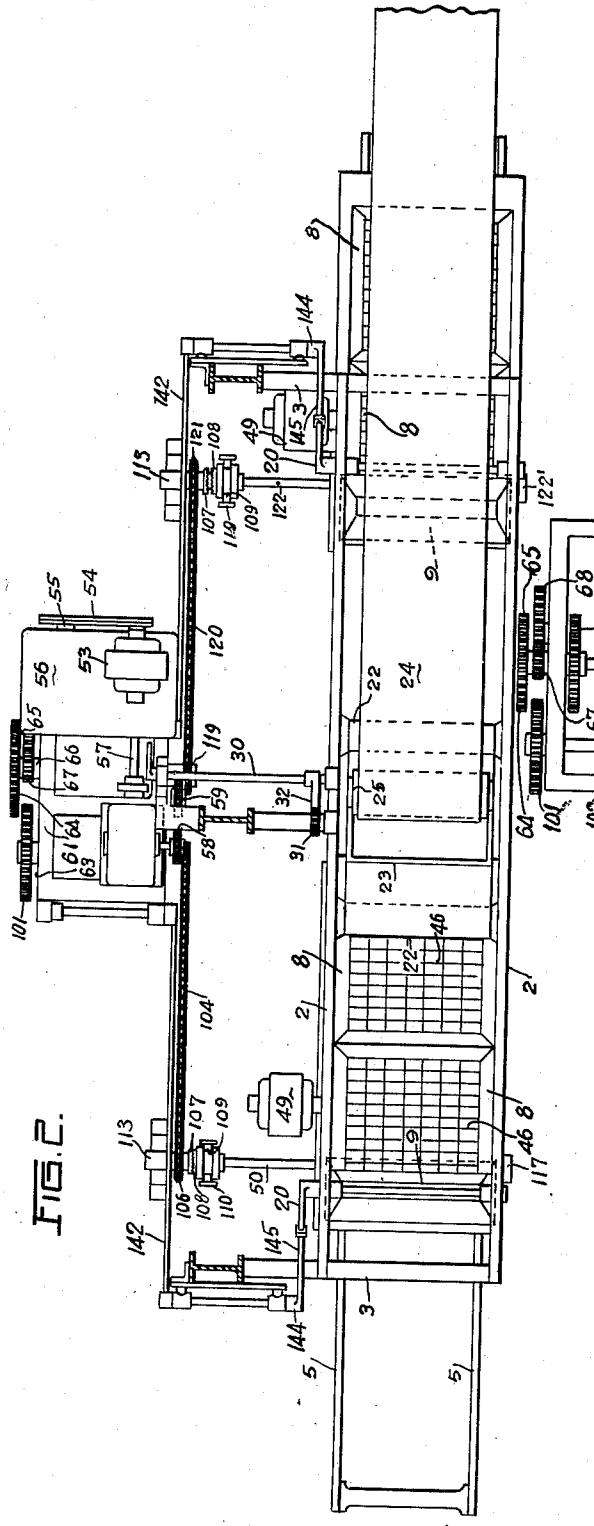


FIG. 2.

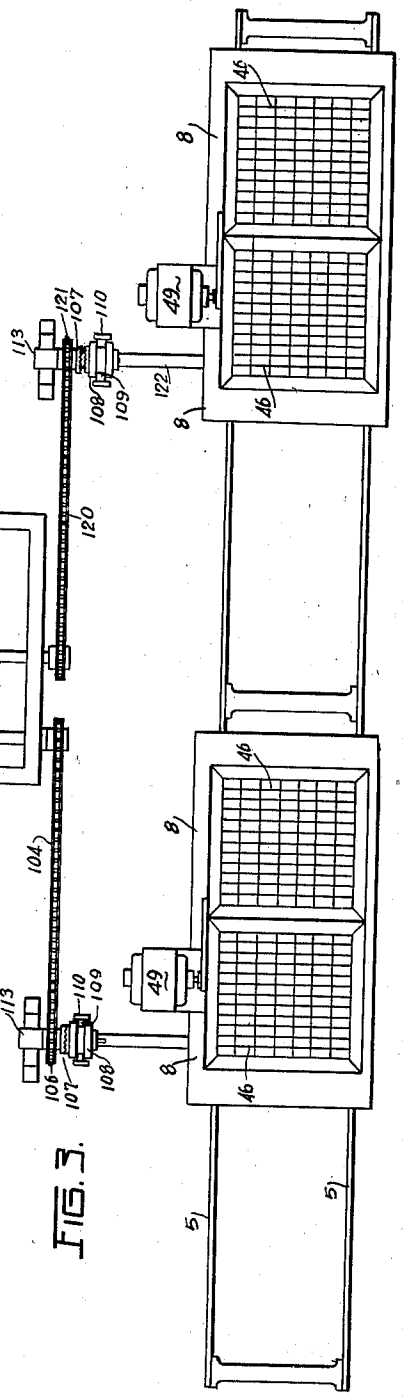


FIG. 3.

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MACHINE FOR FILLING FORMS WITH BISCUIT MATERIAL

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FIG. 4

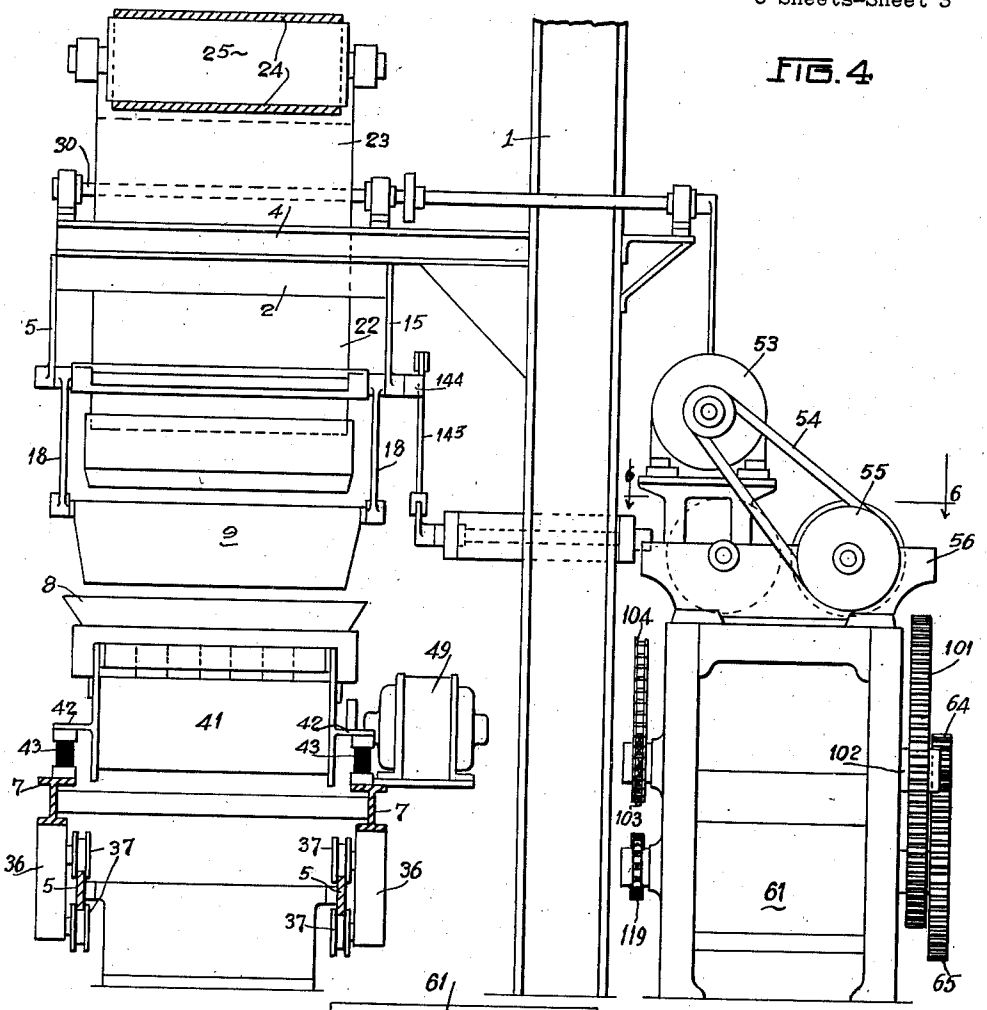
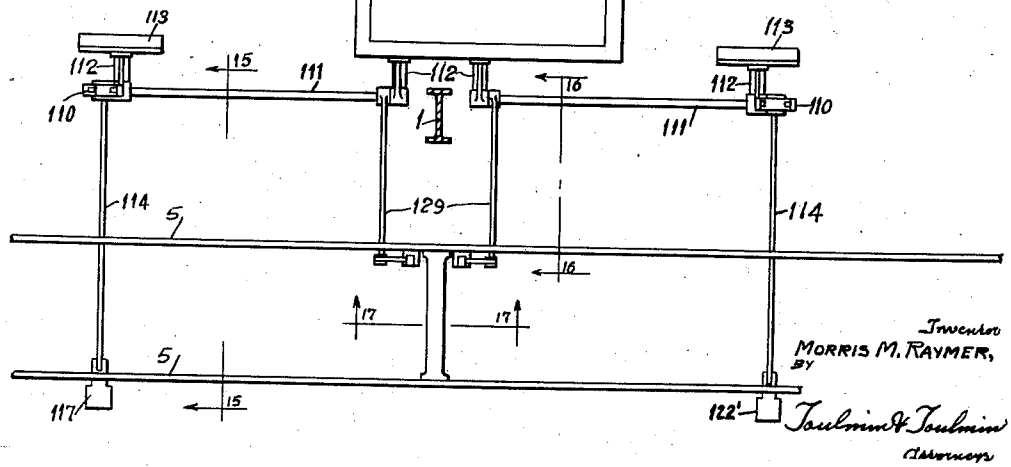


FIG. 5



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MACHINE FOR FILLING FORMS WITH BISCUIT MATERIAL

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FIG. 6.

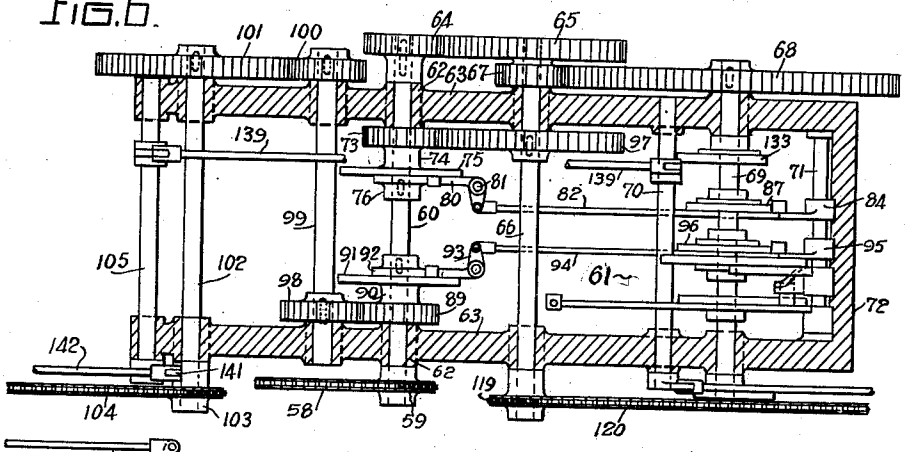


FIG. 7.

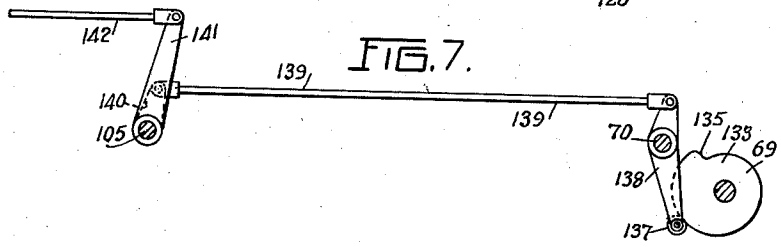


FIG. 8.

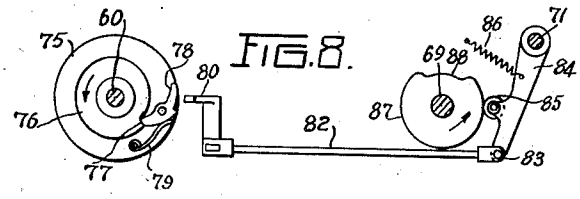


FIG. 9.

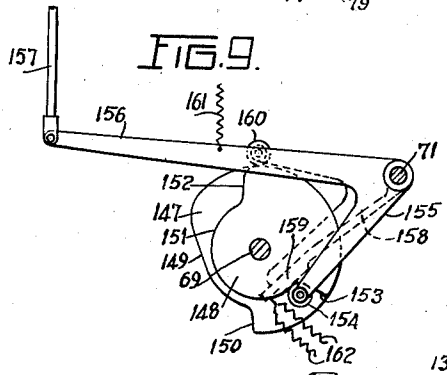


FIG. 10.

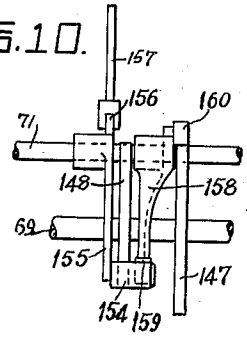
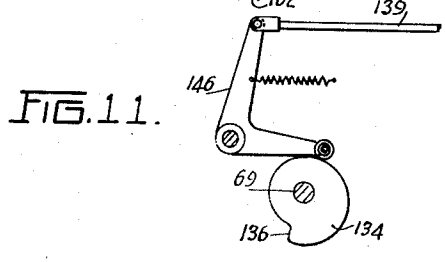


FIG. 11.



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MACHINE FOR FILLING FORMS WITH BISCUIT MATERIAL

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FIG. 12.

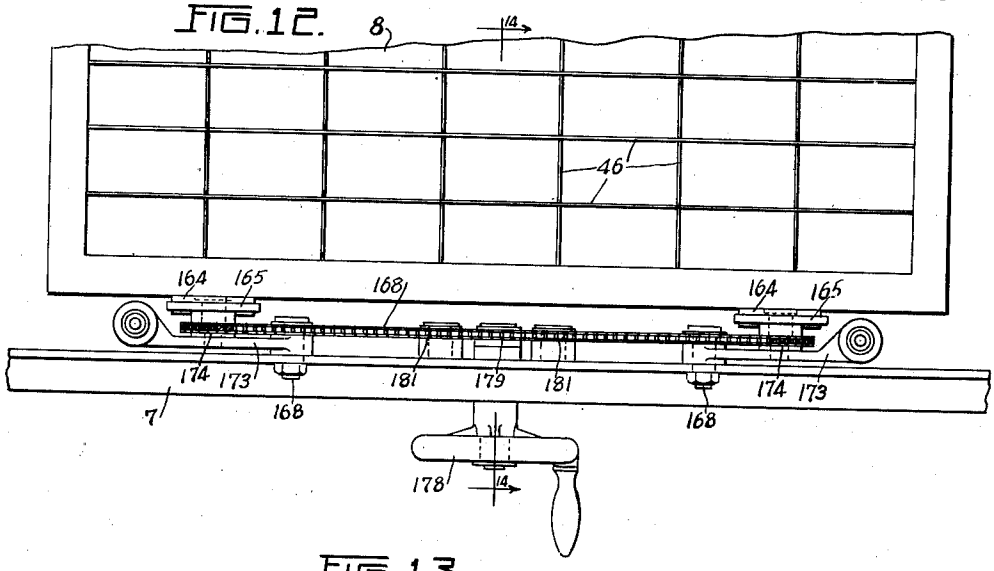


FIG. 13.

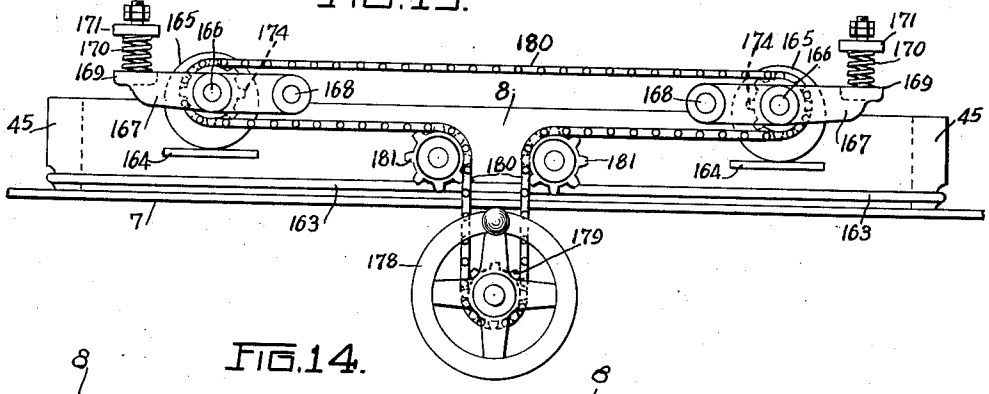
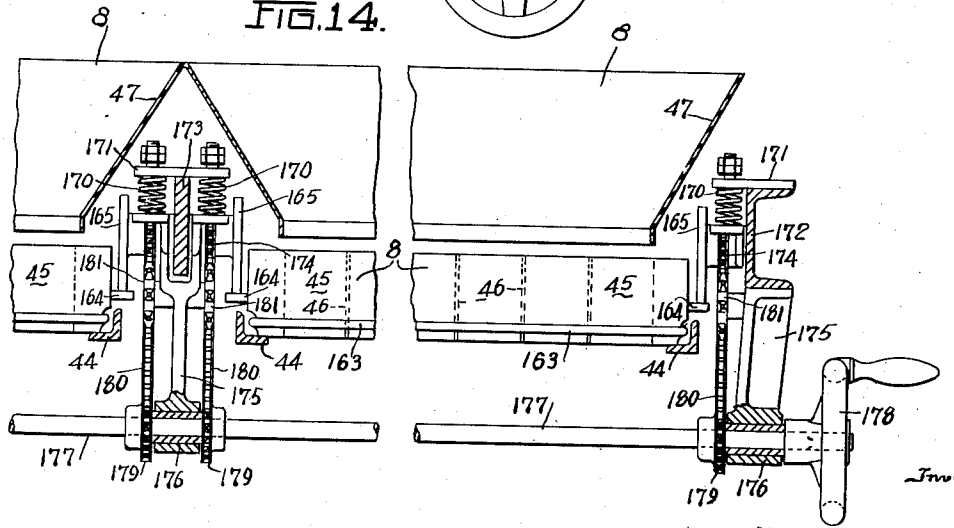


FIG. 14.



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MACHINE FOR FILLING FORMS WITH BISCUIT MATERIAL

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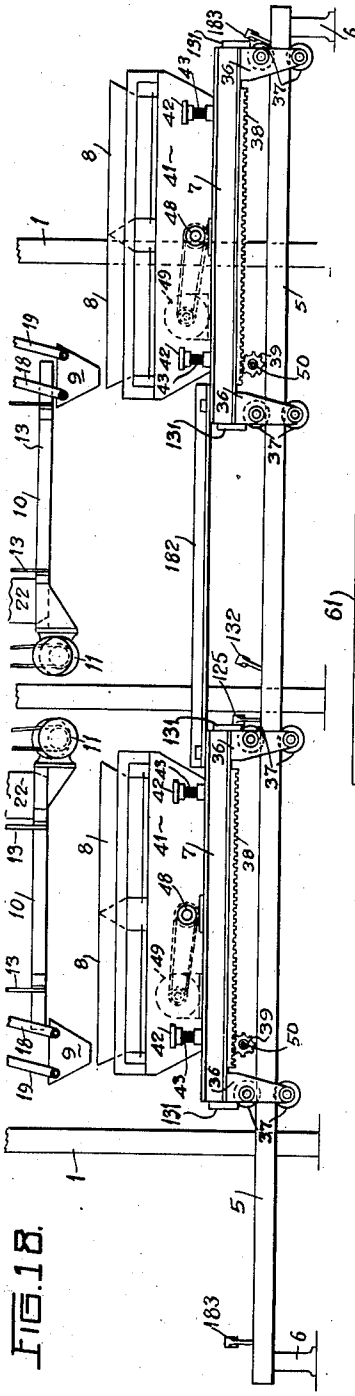


FIG. 18.

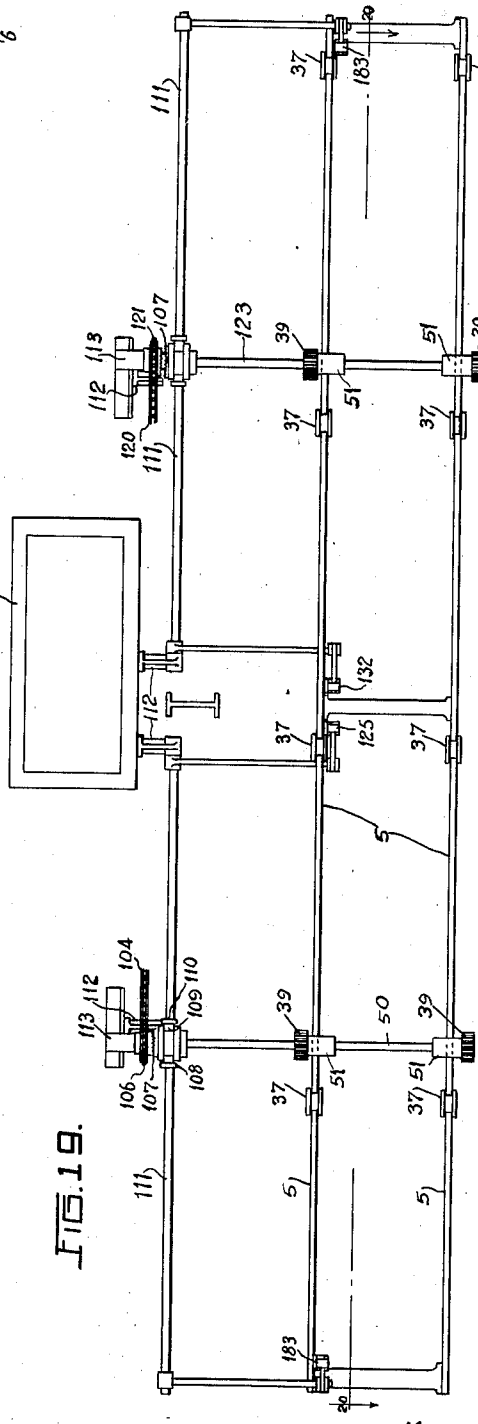


FIG. 19.

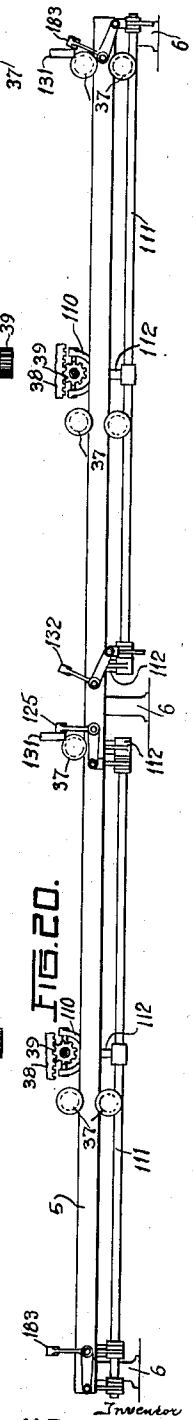


FIG. 20.

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Patented Sept. 30, 1941 2,257,347

UNITED STATES PATENT OFFICE

2,257,347

MACHINE FOR FILLING FORMS WITH BISCUIT MATERIAL

Morris M. Raymer, Augusta, Mich., assignor to Kellogg Company, Battle Creek, Mich., a corporation of Delaware

Application September 16, 1939, Serial No. 295,267

18 Claims. (Cl. 226—95)

The present invention relates to machines for filling forms or trays with fluid material such as cereals, sugar, salt, powdered soap, etc., and more particularly with flaked and pressed cereal which is thereafter baked into a biscuit.

In the past, when flaked material containing a high degree of moisture had been placed in forms or trays preparatory to baking, this operation was generally performed by hand. The determination as to whether the forms had received the proper amount of material was left entirely to the judgment of the operator or baker who usually made this determination solely by eye. Consequently, the uniformity with which the forms were filled and the content and weight of the baked product were dependent on the operator's experience and on occasion would vary quite widely.

Moreover, in the case of hand-filling of trays, the filling was slow and tedious, since the operator would have to fill each form separately.

In my application Serial No. 273,638, filed May 15, 1939, I have disclosed an improved tray or form-filling machine which employs pulley-and-belt structures adapted to move over a pair of trays and a two-way food-containing spout directly above the belts. Food is deposited on the belts during one-half cycle operation of the machine and dropped from the belts during the other half cycle of operation, and is thus evenly distributed throughout the trays. The present invention relates to a machine of this general character, but one which requires no pulley-and-belt structure, and the food is deposited directly from the spout into the trays by moving the trays with respect to the spout. Automatic and emergency devices are provided for determining the limits of travel of the trays or the carriages which support the trays, and for stopping the trays at any point in their travel.

Accordingly, the primary object of the present invention is to eliminate the manual filling referred to hereinbefore and substitute therefor a machine which not only serves to fill the trays on a quantity production basis, but also provides fillings of uniform content.

Another object is to provide a machine which eliminates the necessity for a pulley-and-belt arrangement for distributing the food over the trays, but instead causes the food to drop directly from the spouts into the trays by moving the trays past the spouts. The improved machine is, therefore, of a very simple construction, cheap to manufacture and easy to operate.

Other objects are to provide a machine which distributes a batch of cereal throughout a number of baking forms or trays in order to render uniform the content and weight of each baked unit; to provide a machine which handles flaked foodstuffs containing a high degree of moisture and eliminates the necessity for any manual handling whatsoever and, therefore, provides complete sanitary conditions; to provide manually and automatically operated mechanism for controlling the movement of the carriages which support the trays, either to determine the limits of travel of the carriages or to stop the carriages at a point in their travel; and to provide an improved mechanism for clamping each tray to its carriage.

The final object is to provide a machine for filling forms or trays with biscuit material in which one of the trays is being moved to a filling position, while the other tray is being filled and the mechanism for performing this function is so arranged and operated as to constitute a substantially constant load on the driving motor, regardless of the instantaneous positions of the trays.

The above objects are attained, in brief, by providing a double unit machine, each unit of which nominally constitutes a half section of the machine and derives its power from a common source and has mechanism which operates through a common cam shaft. Each machine section comprises a food-containing chute which delivers the food by a conveyor to a spout, and carriages are caused to move under the spout and the latter drops the food into the trays supported on the carriages and provides an even distribution of this food throughout the trays.

The invention will be better understood when reference is made to the following description and the accompanying drawings, in which—

Figure 1 is a diagrammatic view in side elevation of the improved filling machine, showing the filling of one group of trays, while the other group is returning to its filling position. In this figure, a portion of the frame has been removed for the sake of clearness.

Figure 2 is a plan view looking down on the entire machine, including the conveyor belts.

Figure 3 is a view taken along line 3—3 in Figure 1, looking in the direction of the arrows. This figure shows more particularly the carriage or tray drive.

Figure 4 is a vertical cross sectional view of the machine, looking along line 4—4 in Figure 1.

Figure 5 is a plan view taken at the track level showing more especially the foot pedal mechanism for disengaging the respective tray-carriage drives at any point in their travel and also at their limits of travel.

Figure 6 is a view, partly in cross section, but in exaggerated form to show more clearly the gearing, the cam shafts and the connecting rod drives for actuating the moving parts of the machine. This view is one which might be taken at line 6—6 in Figure 4, looking in the direction of the arrows, but exaggerated to the extent that

the box containing some of the gears and the cam shafts is shown in cross section.

Figure 7 is a detail view of the left-hand spout cam and drive.

Figure 8 is a detail view of the cam and clutch for controlling the power driven movement of one of the tray carriages.

Figures 9 and 10 are elevational and end views of the so-called "splitter" valve cam mechanism.

Figure 11 is a detail view of the right-hand spout cam and drive.

Figures 12 and 13 are plan and end views respectively of a tray together with a hand wheel mechanism for clamping the tray to a traveling carriage.

Figure 14 is a fragmentary enlarged view, partly in section, taken along line **14—14** in Figure 12 to show the operation of the tray-clamping mechanism.

Figures 15, 16 and 17 are views taken along lines **15—15**, **16—16** and **17—17** respectively in Figure 5. These views show details of the tray-carriage de-clutching and clutching mechanism, as operated either by the foot pedal or the travel-limit stops.

Figure 18 is a fragmentary elevational view of a fully automatic arrangement for moving the carriages, as distinguished from Figure 1 which shows a semi-automatic mechanism for presenting the trays to the food spout.

Figure 19 is a plan view taken at the track level, showing an automatic control of both tray carriages when moving in either direction.

Figure 20 is a view taken along line **20—20** in Figure 19 and looking in the direction of the arrows.

Figure 21 is an enlarged perspective view of the system of levers by which the travel limit stops serve to declutch and to clutch tray-carriage moving mechanism.

General description of the improved machine and its operation

In general, the improved machine comprises mechanism by which a chute or hopper is filled with biscuit-forming material such as cereal and the hopper is placed in communication with two chutes alternatively by the use of a so-called "splitter" valve, the arrangement being such that when one of the chutes is being filled from the hopper, the contents of the other of the chutes is being emptied into the trays. There is a suitable form of conveyor, preferably a vibratory pan or trough positioned under each chute, this pan serving to deliver the food from the chute into a spout.

The trays to be filled are mounted, usually in two-pair units, on a carriage which is adapted to move in such a way that every portion of each pair of trays is presented to the opening in the spout. Each tray comprises a pan having inclined sides and contains a large number of partitions to form rectangular compartments of biscuit size. In order to assure an even distribution from the first to the last row of these rectangular forms, and particularly in view of the tapered sides of the pan, the spout is given a transverse movement at the time that the abutting edges of the two trays on each carriage are moved past the spout.

In order to assure no movement of the trays with respect to their supporting carriages, the trays are flexibly but firmly clamped on the carriages. The latter are power driven during the time the trays are being filled in order to insure a constant velocity, but may be returned either manually by the operator to their ready-to-be-filled position, or this function may be performed automatically.

The arrangement of the mechanism is such that, while one set of trays is being filled from its spout, the other set is being returned to its ready-to-be-filled position. Thus, the prime mover which conveniently may be an electric motor, is subject to a constant mechanical load, i. e., during each half cycle of operation the motor is actually driving one set of trays under the filling spout. The "splitter" valve mechanism is operated in such a manner that the food is delivered from the chute to that spout, under which the trays are being moved for the filling operation. Thus, the "splitter" valve oscillates from one side to the other of the hopper to close off that chute which should not be delivering food to the moving trays.

In connection with the carriage-moving mechanism, there are provided manually and automatically operated devices for controlling the limit of travel of the carriages and also for stopping the carriages at any point in their travel. Thus, the tray-filling mechanism of each half of the machine operates during succeeding half cycles, the arrangement being such that, when one set of trays of one half of the machine is being filled, the set of trays of the other half of the machine is being returned to the ready-to-be-filled position for filling on the next half cycle.

Having summed up the general operation of the machine, a detailed description will now be given and, in the interests of clearness, the different operations and the structure by which they are accomplished will be described separately.

The parts which will be described hereinafter are all carried on a frame provided with a number of supports on platforms secured at different levels for carrying the actuating motor, the various cam shafts, connecting rods and the traveling carriages.

Referring more particularly to Figures 1, 2 and 3, this frame is constituted of a double row of three I-beam uprights **1** which are anchored to the floor in any suitable and well-known manner. These beams are spanned at the top by a beam **2** which is carried at each end on a transverse beam **3** and is suspended at the middle from a transverse beam **4**. Between the two rows of beams **1**, there is provided a pair of longitudinally extending iron tracks **5** which are mounted at each end on supports **6** and extend beyond both ends of the beam frame. These tracks are for the purpose of accommodating a pair of traveling carriages **7**, which will be described in detail hereinafter. These carriages are designated *a* and *b* in the claims. They support a pair of trays **8**, as seen more clearly in Figure 3, and are actuated by suitable mechanism to move these trays under a spout **9** which is supplied with food material from a pan or trough **10**. The latter is caused to vibrate by any suitable and well-known vibrator indicated at **11**, which is actuated by a motor **12**. For this purpose, the pan **10** is suspended by flat springs **13** from a pair of horizontal supporting bars **14** which are held at one end by pivoted brackets **15** and rest at the other end on a transversely extending rod **16** which is held in position by adjustable, threaded rods **17**. The latter and the brackets **15** are secured in any suitable manner

to one of the horizontal members 2 of the frame.

The spout 9 is of rectangular configuration, having inclined or tapered sides and of a length at least as large as the width of the trays 8. The inner edge of the spout is pivotally joined to the bar 14 by the link 18. The opposite edge of the spout is connected to the bar 14 through a bell crank lever 19 which is pivoted at 20 to the bar. Referring to the left-hand spout 9, it is apparent that, as the upper arm of the bell crank lever is pulled downwardly, the spout is adapted to move to the right and conversely as the lever 19 is pressed upwardly, the spout moves to the left. In the case of the right-hand spout 9, a downward pull on the upper arm of the bellcrank lever will cause the spout to move to the left and conversely, as the arm is pressed upwardly the spout moves to the right. The purpose of these movements and the manner in which they are obtained will be described presently.

The pan 10 is provided at the end nearer the center of the machine with a compartment 21 which receives the end of a downwardly and outwardly extending chute or conduit 22. The latter, together with the corresponding conduit of the other section of the machine, terminates at the upper end in a large hopper or main chute 23. The hopper and the connecting chutes may be supported from the frame 1. The opening in the hopper is directly below a traveling conveyor belt 24 which passes around the pulley 25 at the upper end and the pulley 26 at the lower end and is kept taut by the pulley idlers 27.

As shown in Figure 1, the belt 24 has an inclined position and the lower end is positioned directly under a horizontal belt conveyor 28, the arrangement being such that food, for example, cereal, delivered by the belt 28 will fall on to the belt 24 and will be carried by the latter upwardly and finally delivered into the hopper 23.

Within the hopper and positioned at the junction between the two conduits 22, there is a swinging gate or a so-called "splitter" valve 29 which is adapted to oscillate in an arcuate path so that, in one of its extreme positions, the left-hand conduit 22 is closed and, in its other extreme position, the right-hand conduit 22 is closed. The "splitter" valve is carried on a transversely extending shaft 30 (Figure 1), on which is mounted a pinion 31. The latter is positioned outside of the hopper. Meshing with the gear, there is a segmental gear 32 (Figure 1), which is pivoted at 33 and terminates in a lever 34. There is a vertically disposed connecting rod 35 secured to the upper end of the lever. It is apparent that, by pulling down on the rod 35, the segmental gear will be forced upwardly and will in turn rotate the pinion 31 counterclockwise, causing the "splitter" valve 29 to move from the righthand position, as shown, to its lefthand position. Under these conditions, the righthand conduit 22 will be placed in communication with the hopper 23, but the lefthand conduit 22 will be closed off from the hopper.

As illustrated in Figure 1, any cereal or other food delivered by the belts 28, 24 to the hopper 23 will move downwardly through the lefthand conduit 22 into the compartment 21. Due to the vibratory action of the element 11, this food will move to the left along the pan 10 in a series of small jumps until it falls off the lefthand end of the pan into the spout 9. As will be explained presently, the tray-carriage 7 is moved along the tracks 5 to the left so as to present the trays 8 to the bottom opening in the spout 9 and thus to receive the food contained in the spout.

Tray-carriage and moving mechanism

Referring more particularly to Figures 1, 3, 12 and 18 which show the details of the carriage and trays, the carriage frame is constituted of four I-beams secured together at their ends in a rectangular configuration and mounted at each corner on a downwardly extending bracket 36. On each bracket, there is rotatably mounted a pair of flanged wheels 37 which are spaced apart in the vertical direction such a distance as to embrace the upper and lower edges of a track member 5. One of the longitudinal I-beam frame members carries a rack 38, and meshing with this rack, there is a gear 39 which is carried on a shaft 50 (Figure 15) and journaled at 51 to a support member 52 which is secured to the track 5. A hand-operated lever 40 is secured to the gear 39. It is apparent that, by rotating the handle clockwise, the carriage 7 can be moved to the right.

The I-beam frame of the carriage supports a rectangular foundation member 41, the latter being provided with ledges or ears 42 which rest on corner support members 43 of rubber. The foundation member 41 is hollow and is provided at the top with four angle iron frame members 44, of which only the angle irons are shown in Fig. 14 for the sake of simplicity. On the inner edge of these irons there rests a rectangular pan 45 provided with a plurality of intersecting partitions 46 (Figure 12) which divide the pan into a number of rectangular forms of biscuit size. Directly above each multi-partitioned pan, there is a rectangular frame member 47 having sides or aprons which taper outwardly as the upper edge is approached. As seen more clearly in Figure 1, each foundation member 41 is of sufficient length to accommodate two pans 45 and the latter are so positioned that their outwardly extending aprons practically abut at the middle. These aprons are given an inclination or flare so as to minimize spillage at the spout. However, provision must be made, if the food is to be evenly distributed over all of the forms 46 to regulate the amount of material leaving the spout, while the flared portion of the aprons is directly under the spout.

It is obvious that, if the spout were to remain in one position and the trays 8 were to move at the same speed under the spout, considerably more material would be deposited in the first and last rows of partitions in each tray than in the intermediate rows because the aprons will tend to collect more than their share of the material. Consequently, it is necessary to delay the deliverance of material at the spout until after the lefthand apron has moved from under the spout and it is also essential to move the spout quickly from the first to the second tray at the time that the junction between the two trays has reached the spout position. The means including the cams, etc., for effecting this function will be described under a separate heading.

Assuming that the material has been dropped from the spout 9 so as to fill the forms in each tray evenly, it is desirable to settle this material in order that the pressed biscuit will have substantially the same thickness over its entire area. For this purpose there is provided a vibrator 48 actuated by a motor 49 positioned exterior to the foundation member 41 (Fig. 4). It has been pointed out that the latter is supported on the

rubber blocks 43 so that the vibrator will cause the foundation member and the trays supported thereon to vibrate or jiggle.

The mechanism for operating the main parts of the machine is shown more clearly in Figures 1, 2, 4, 6 and 8. The main motor drive is indicated at 53 (Figure 4), which rotates through a belt 54, a pulley 55 which is mechanically connected to a system of reduction gears (not shown) contained in a housing 56 (Figure 2). The rotative effort is communicated to a shaft 57 coming out of the housing. This shaft is provided with a sprocket (not shown), which drives a chain 58 (Figure 6) and a sprocket 59. The latter is carried on a shaft 60 which extends through the entire width of a housing 61 and is journaled at each end in bearings 62 formed in the sides 63 of the housing.

As illustrated in Figures 2 and 4, the housing 61 is positioned to the left and under the housing 56 which contains the reduction gears. At the end opposite from the sprocket 59, the shaft 60 has keyed thereto a gear 64 which meshes with a gear 65, both of which are positioned outside of the housing 61. The gear 65 idles on a shaft 66 which is journaled in the side 63 of the housing 61. A gear 67 is positioned between the gear 65 and nearer side wall 63, this gear being secured to the gear 65 and, therefore, running idle on the shaft 66. This gear 67 meshes with a large gear 68 carried on a main cam shaft 69 which is journaled in the sides of the housing. In addition to the shafts referred to hereinbefore, the housing 61 provides bearings at each side for a shaft 70 positioned between the shafts 66 and 69, also bearings for a shaft 71 positioned between the shaft 69 and the end wall 72 of the housing.

In addition to the gear 64 and the sprocket 59, the shaft 60 carries a gear 73 which is secured through a hub 74 to a clutch 75. The gear 73, hub 74 and the clutch 75 are loose on the shaft 60. Facing the clutch 75, there is a ratchet wheel 76 (Figure 8), having a tooth 77 and keyed to the shaft 60. The clutch 75 is provided with a pivoted pawl 78 which is spring-pressed, as indicated at 79, into the tooth 77. There is a push rod 80 forming one arm of a bell crank lever which is pivoted at 81. The lower arm of this lever is pivotally secured to a connecting rod 82 which carries at its opposite end a pivot 83. The latter forms a terminus of a lever 84 which is journaled on the shaft 71. The lever 84 is provided intermediate its length with a roller 85. The roller is spring-pressed, as indicated at 86, against the periphery of a cam 87 fixedly secured to the shaft 69.

As shown in Figure 8, the cam 87 is provided with a depression 88 which extends approximately ninety circular degrees. The purpose and operation of the clutch and cam arrangement will be explained after the remainder of the elements contained within the housing 61 is described.

In addition to the gear and clutch referred to in the immediately preceding paragraph, the shaft 60 carries a second gear-and-clutch arrangement similar to the above, the gear being indicated at 89, the hub at 90, the clutch at 91 and the toothed ratchet at 92. The latter is keyed to the shaft, as in the case of the ratchet 76. The bell crank lever is indicated at 93 and the connecting rod at 94 which is pivotally secured to a lever 95 journaled on the shaft 71. The cam for this organization of elements is indicated at 96.

The gear 73 on the shaft 60 meshes with a gear 97 keyed to the shaft 66. The gear 89 meshes with a gear 98 which is carried on a shaft 99 to which it is keyed, the shaft being journaled at each end in the side 63 of the housing. At the upper end of the shaft, as shown in Figure 6, there is a gear 100 keyed to the shaft, this gear meshing with a gear 101 which is keyed to a shaft 102. The latter is also journaled in the sides of the housing and is provided at the end opposite from the gear 101 with a sprocket 103 which carries a chain belt 104. There is a shaft 105 journaled at the lefthand end of the housing, the purpose of which will be explained hereinafter.

The chain 104 passes over a sprocket 106 (Figure 15) which idles on the shaft 50. This sprocket forms part of a jaw clutch, the teeth 107 of which are adapted to mesh with the teeth of a flanged element 108 which is slidably mounted on the shaft 50, but is otherwise keyed thereto. There is a roller 109 positioned between the flanges of the element 108, this roller being carried at the upper end of a bifurcated yoke 110 pivoted at 111 in a bracket 112 which is secured to an upright 113. The latter may provide a bearing for the shaft 50. Pivoted at a position between the roller 109 and the pivot 111, there is a connecting rod 114 which is pivotally secured to a bell crank lever 115 pivoted at 116 and terminating in a foot pedal 117. The pivot 116 may be carried on a bracket 118 secured to the track and at the same position as the bearing 51. It is apparent that by depressing the pedal, the slidable portion 108 of the jaw clutch is caused to become disengaged at the teeth 107, in which case the rotative effort available at the sprocket 106 is not communicated to the shaft 50.

Referring again to Figure 6, the shaft 66 carries at the end opposite from the gear 65, a sprocket 119, keyed thereto and which is provided with a chain belt 120. As in the case of the chain 104, the chain 120 passes over a sprocket 121 positioned at the opposite side of the machine from the sprocket 106, and the purpose of this sprocket is to communicate power to the shaft 122 (Figure 3) when the foot pedal 122' (Figure 1) is left in an un-depressed position. The manner in which this is accomplished is similar to that described immediately above in connection with the clutch 107 and the shaft 50.

Assuming that the sprocket 59 is given a counterclockwise rotation (as looking toward the front face of the sprocket in Figure 6) by the chain 58 leading to the main drive, the ratchet wheel 92 is rotated counterclockwise. Now supposing that the cam 96 is in such a position that the roller is contacting with the unslotted portion, as illustrated in Figure 8, in that event the push rod is removed from the tail of the clutch pawl so that the latter is spring-pressed against the tooth of the ratchet wheel 92. Thus, the clutch 91 is caused to rotate in a counterclockwise direction, carrying the gear 89 which causes the gear 98 to rotate clockwise. The gear 101 is rotated counterclockwise through the gear 100 which causes the sprocket 103 to rotate counterclockwise and the upper length of the chain 104 to move to the left, as seen in Figure 6. This rotative effort is communicated to the gear 39 which causes the rack 38 of the tray carriage to move to the left along the tracks 5. This movement is continued just so long as the roller on the lever 95 is swung outwardly due to the unslotted portion of the cam 96. However, in practice the carriage will not be permitted to

travel to the left for this length of time, but when it has reached a predetermined position, as explained below, the operator will depress the pedal 117 which disengages the teeth 107 and causes the carriage to come to rest. As the cam 96 continues to rotate due to the rotation of the shaft 69, the roller on the lever 95 falls into the depression on the cam and this serves to force the pawl out of the tooth in the ratchet.

Now assuming that the spout 9 is filled with food such as a cereal in a manner explained hereinbefore, and further assume that the carriage 7 supports a pair of trays partitioned into biscuit forms, as the carriage moves to the left, the food will drop from the spout into the trays as even layers due to the uniform speed of the moving carriage and, as the righthand end of the last tray leaves the filling position, the operator will stop the carriage by depressing the pedal 117. The latter is so constructed that, after being depressed, it remains in this position until the operator restores it to its undepressed position.

The lefthand set of trays, as seen in Figure 1, is, therefore, filled with food material and is now at its farthest lefthand position and the carriage is stopped by the operator. The latter will then remove the filled trays from the carriage, of which the preferred manner will be described hereinafter and will then place a pair of empty trays on the carriage. Inasmuch as the jaw teeth 107 are disengaged, the carriage can now be pushed to the right to its ready-to-be-filled position. However, if desired, the gear 39 may be rotated by the hand wheel 40 which causes the carriage to be conveniently retracted. The position of the cam 96 on the shaft 69 is such that the roller on the lever 95 falls into the depression on the cam during the time that the carriage is being retracted.

When the carriage has reached its fully retracted or initial position, as seen in Figure 1, it makes contact with a pivoted stop 125, the purpose of which is to restore the foot pedal 117 to its upper position and, in which case, the clutch 108 is engaged with the sprocket 106. The mechanism by which the stop 125 serves this purpose will be explained in connection with Figure 21 hereinafter. However, rotative power will not be communicated to the shaft 50 through the jaw clutch until the forward edge of the depression in the cam 96 will have forced the lever 95 to withdraw the push rod away from the tail of the pawl on the clutch 91.

Thus, the operator can determine by the use of the foot pedal 117 exactly when the carriage is to stop at the lefthand end of its travel, but the position of the cam 96 determines when the carriage will be moved from right to left during the power-driven portion of the cycle. In determining when the carriage shall stop during its power-driven movement, the operator will observe the food leaving the spout 9 and will usually stop the carriage when the food is no longer being deposited due to the fact that the "splitter" valve 29 has been automatically moved, as will be explained hereinafter, so as to close the lefthand chute 22 and to open the righthand chute.

It will be understood that, as the carriage 7 is moving from the right to left and the trays are being filled with food material, the vibrator 48 is being operated which serves to settle the material evenly throughout all of the partitioned forms contained in each tray. The operation of the set of trays shown to the right in Figure 1 is just opposite to that of the lefthand set of trays. This will be clear from a study of Figure 6. Still assuming that the shaft 60 is being rotated counterclockwise, the ratchet wheel 76 rotates counterclockwise, and when the roller 85 contacts the outer periphery of the cam 87, the pawl is permitted to engage the tooth of the ratchet wheel, causing the clutch 75 to rotate counterclockwise. The gear 73 secured thereto causes the gear 97 to rotate clockwise which, in turn, communicates a clockwise rotative effort to the sprocket 119. Thus, the gear 124 is rotated clockwise through the chain 120.

Assuming that the righthand carriage (Figure 1) has been moved to its lefthand or ready-to-be-filled position by the operator having depressed the foot pedal 122' and pushing the carriage, the carriage will be power-driven in the righthand direction by the clockwise rotation of the gear 124 meshing with its rack 38.

It is apparent that the general arrangement, including the relative positions of the cams 87 and 96, also the relative positions of the ratchet wheels 76 and 92 in their cooperative clutches is such that, during the time that one carriage is being power driven by the shaft 60, the other carriage is disengaged by one of the foot pedals from its power drive and is being returned to its initial or ready-to-be-filled position. The mechanism can be readily designed and adjusted so as to start the power driven movement of the carriages in an alternate manner and at equal recurring instants of time.

Consequently, if the operator does not depress the carriage pedal until the other carriage is ready to start, the prime mover 53 will be subjected to a constant load, since at all times it will be serving to move one or the other carriage. This is extremely desirable from the power-saving standpoint. However, as stated hereinbefore, in practice, the operator will determine when to press the pedal from the amount of food that is being dropped by the spout. It will be noted that, even if the operator were to fail to depress the pedal, the depression in the cams 87 and 96 will disengage the carriage-moving mechanism from the prime mover for a predetermined length of time determined by the length of the depression during which time the carriage may be manually moved toward the center of the machine.

However, as can be seen from Figure 8, this depression extends for only approximately one-fourth of the periphery of the cam so that, unless the operator does depress the pedal, each carriage will be power-driven for more than half a revolution of the shaft 69. This provides flexibility of operation by which the operator determines when the carriage will stop.

It has been pointed out that the stop 125 serves to engage the jaw clutch 108 to the sprocket 106, ready to be rotated at a time determined by the position of the cam 96. Thus, the start of the power-driven operation is precisely determined. The operation of the stop 125 is shown more clearly in Figures 15, 16 and 21. The stop forms the upper arm of a bell crank lever 126 which is pivoted at 127 to a bracket supported by one of the tracks 5. The lower arm of the lever is pivotally connected to a link 128 which is pivoted in a bifurcated connecting rod 129. The end of the rod 129, opposite from the bifurcation, is rigidly secured to a rod which constitutes the pivot 111 (Figure 15) referred to hereinbefore.

It will be readily seen from Figure 21 that, as

the stop 125 is moved so as to rotate the lower arm of the bell crank 126, the shaft 130 is also caused to rotate. It is apparent that the rod 130 is connected to the foot pedal 117 through the rod 114 so that a depression of the foot pedal would cause the stop 125 to move to the left from the vertical, as seen in Figure 1, in order to disengage the jaw clutch. However, as the carriage 7 is manually moved to the right, the bar 131 on the carriage contacts the stop and brings it to the vertical position, causing the shaft 111 to rotate and to engage the teeth 107. A similar stop 132 is also provided to be engaged by the righthand carriage so as to determine the beginning of the power-driven operation of this carriage.

Spout swinging mechanism

It has been pointed out that each tray is provided with a plurality of intersecting partitions which constitute biscuit forms. The outwardly inclined or flared aprons 47 are provided to prevent spillage of material. It will be apparent from Figure 1 that, due to this flared apron, particularly at the position where the two trays abut and assuming the spout 9 to be stationary, there would be a tendency for the last row of the first tray and the first row of the second tray to receive more than its proportionate share of the material, because each of these rows would normally receive that additional portion which is dropped onto the flared aprons.

In order to maintain a uniform thickness of the biscuits in the trays, I have provided a mechanism by which the spout 9 is shifted from a position to the left of the vertical plane to the right, as the abutting aprons are passing under the spout. Thus, these apron portions are prevented from receiving any biscuit material which would normally slide into the last and first rows respectively of the two trays.

This spout-swinging mechanism is shown more clearly in Figures 6, 7 and 11. On the shaft 69, there are provided two cams: cam 133 (Figure 7) serving to shift the spout 9 of the lefthand section of the machine, and cam 134 (Figure 11) serving to shift the spout at the righthand section of the machine. These cams have a depressed peripheral portion which terminates in a tooth 135, 136. A roller 137 bears against the outer periphery of the cam 133 and is carried on an arm 138 which forms part of a bell crank lever which is rotatably mounted on the shaft 70 (Figure 6). The upper end of the arm 138 has pivotally connected thereto a rod 139 which is secured to a lever 140 rigidly mounted on the shaft 105 (Figure 6). The other end of the shaft 105 has keyed thereto a lever 141 which pivotally carries at its upper end a rod 142. This rod is connected, as shown at the left in Figure 1, to the lower arm of a bell crank lever 143 pivoted at 144. The other arm of the lever 143 is connected through a rod 145 to the upper arm of the bell crank lever 19 referred to hereinbefore.

It is apparent that, as the cam 133 is rotated counterclockwise, the roller 137 will drop into the tooth 135, causing the rods 139, 142 to move to the left and the upper arm of the bell crank lever 19 to move downwardly and thus swinging the spout to the right. The cam 133 is so designed that the spout will swing only as the abutting aprons of the two trays pass under the spout. Thus, the spout is moved rapidly from a position directly over the last row of the first tray to the first row of the second tray. The front apron of the first tray produces no excessive accumulation of food material in the first row of the first tray, because the spout will not deliver material until it is directly above this first row. This is due to the fact that it takes time for the material to drop from the chute 23 through the conduit 22, which is delivered by the vibrating pan 10 into the spout.

As for the apron adjacent the last row of the second tray, it has already been pointed out that the deposition of material can be accurately controlled by the operator pushing down on the foot pedal 117. The other cam 134 (Figure 11) operates in precisely the same manner as the cam 133 through the bell crank lever 146 to shift the righthand spout 9 quickly to the left, as the edges of the abutting aprons of the righthand trays pass under the spout. It will be understood that, inasmuch as the righthand carriage 7 is being power-driven to the right during a different part of the operating cycle from the power-driven movement of the lefthand carriage to the left, so will the swinging movement of the righthand spout take place at a different time from that of the corresponding movement of the lefthand spout. The time relation of these movements can be determined by the position of the cams 133 and 134 on the shaft 69.

"Splitter" valve shifting mechanism

It has been pointed out that the "splitter" valve 29 shifts from its righthand position, as shown in Figure 1, to a corresponding lefthand position as the righthand carriage 7 is moving to the right under its power-driven stroke. The mechanism for accomplishing this is shown in Figures 9 and 10. The shaft 69 is provided with two cams 147 and 148, the lower one of which, as seen in Figure 9, has a depressed portion 149 which terminates in a tooth 150. The upper cam 148 has a smaller peripheral portion indicated at 151, which terminates at one end in the tooth 152 and at the other end in the tooth 153.

A roller 154 bears against the periphery of the cam 148 and is carried on the end of a bell crank lever 155 which is pivoted at the shaft 71. The other arm 156 of the lever 155 is pivotally connected to a vertically disposed rod 157 which is secured to the lever 34 of the "splitter" valve-operating mechanism. The shaft 71 carries another bell crank lever 158 indicated by the dotted lines in Figure 9, the lower arm of which terminates in a contact plate 159 and positioned so as to strike the roller 154. The other arm of the lever 158 terminates in a roller 160 which bears against the periphery of the cam 147.

Assuming that the main drive shaft 60 still turns in a counterclockwise direction, the shaft 69 will be found to be turning also in the counterclockwise direction through the gears 64, 65, 67 and 68 (Figure 6). Assume further that the roller 154 is at the moment in the position shown in Figure 9. The roller then moves about the smaller diameter portion of the cam 148 until the tooth 152 is presented to the roller. During this time the arm 156 will be in its uppermost position, also the rod 157, causing the splitter valve 29 to be at its right-hand position, as shown in Figure 1. The cams 147 and 148 are secured together so that during this time the roller 160 will have contacted the remainder of the larger diameter portion of cam 147, until the roller is urged into the depression formed by the tooth 150 by the springs 162. This movement takes place just prior to the time that the roller 154 reaches the tooth 152, and

its effect is to cause the lever 158 to move counterclockwise. The plate 159 is therefore given a downward push, causing the roller 154 to mount the tooth 152, moving the lever 156 in a counterclockwise direction to give the rod 157 a downward pull. This pull causes the splitter valve to be moved to the left. As the cams continue to rotate, the roller 154 will move over the large diameter portion of the cam 148 until the tooth 153 is reached, at which time the roller is urged by the spring 161 to move inwardly to contact the cam surface 151. The lever 156 is thereby caused to move clockwise, pushing up on the rod 157 and moving the splitter valve to the right, as is shown in Figures 1 and 9. In the meantime, the surface 149 of the cam 147 has a configuration such as to cause the lever 158 to move clockwise, thus preventing any interference between the plate 159 and the roller 154.

It is apparent that the positions of the cams 147 and 148 with respect to the cams 87 and 96 are such that the splitter valve 29 takes the position shown in Figure 1, i. e., to the right at the precise moment that the lefthand carriage 7 is being power-driven to the left. The "splitter" valve is automatically shifted to the left at the moment that the righthand carriage 7 is being power driven to the right.

Tray clamping mechanism

Figures 12, 13 and 14 show an improved method of clamping the trays to the moving carriage. The framework of the body of the carriage 7 is indicated in Figure 14 by the angle irons 44, on which the trays 45 rest. These trays may be bound around their exterior by a strap 163, as shown in Figure 13, and just above the partitioned tray interior, there are the inclined aprons 47 referred to hereinbefore. Each rectangular pan 45 carries on two sides a pair of horizontally-extending ears 164. Directly above these ears, there is an eccentric cam 165 pivoted at 166, the latter being contained in a lever 167 which is pivoted at 168 to the carriage. The lever 167 terminates at the end opposite from the pivot 168 in a platform 169 against which a compression spring 170 is urged. The latter is fixedly secured to a support 171, also suitably mounted on the carriage, for example, by a longitudinally extending U-beam 172, or a plain bar 173.

The pivot 166 constitutes a shaft on which is mounted a sprocket 174. There are four sets of structures, as described, each positioned at opposite ends of each rectangular pan or tray and on each side thereof, as shown in Figure 14. From the beam 172 or bar 173, there is a depending structure 175 which terminates in a bearing 176. It will be understood that there is a bearing 176 provided at each end of the double-tray structure, also a bearing intermediate the two trays, as is clearly indicated in Figure 14. These bearings receive a shaft 177 which, in case it is desired to clamp two trays or pans to the carriage, extends the length of both trays, as indicated in Figure 14. The shaft 177 is provided with a hand wheel 178 at one end and a plurality of sprockets 179 at intermediate positions. Chains 180 are passed around each sprocket and carried on a pair of idler sprockets 181 and finally engaging a pair of sprockets 174 of each clamping mechanism.

It is evident that, by rotating the hand wheel 178 clockwise (as seen in Figure 13), the clamping sprockets are also rotated clockwise, causing the eccentric cams 165 to be rotated and to bear downwardly against the ears 164 to force the trays 45 downwardly against the top of the carriage. The pivoted levers 167 which are flexibly mounted by the springs 170 are provided to prevent an excessive compressing force being exerted at the hand wheel on the ears 164 by the eccentric cams 165.

Consequently, as each carriage arrives at the end of its power-driven movement, as determined by the clutch-disengaging effect of the foot pedal, the operator simply rotates the hand wheel counterclockwise which removes the pressure from the ears 164 and permits the filled trays to be slid from under the eccentric cams 165. Empty trays can then be placed in position by the operator and the hand wheel rotated clockwise, after which the carriage is pushed or manually actuated by the lever 40 to its original position. It will be noted that, by providing clamping mechanisms at all four corners of each tray and by extending the shaft 177 throughout the length of a plurality of trays, all of the trays are clamped simultaneously and rigidly at both ends to the carriage.

It has been pointed out hereinbefore that the carriages are power driven only in one direction, i. e., when the trays are receiving food from the spout, they are returned to their original position manually. However, if desired and, as a further modification, I may return the carriages by power. While various ways will occur to those skilled in the art, I have shown as an exemplary embodiment in Figure 18, the feature of providing a tie-bar 182 connecting the two carriages together. Thus, the carriage which, for the moment, is being power driven and in which the trays are being filled from the spout, draws the other carriage from the end-of-its-travel position to its ready-to-be-filled position.

Inasmuch as the operation of the carriages now becomes fully automatic, it is necessary to provide a limit stop at the outermost end of each carriage travel so as to disengage the teeth 107 of the driving carriage to permit this carriage to be pulled by the other carriage which now becomes the power-driven unit. These limit stops are indicated at 183 in Figures 18, 19 and 20. Their construction can be similar to the limit stop 125 which was shown and described in connection with Figures 16 and 21. The connection between the limit stops 183 and the teeth 107 forming part of the jaw clutch may be provided by an extension of the rod 111 referred to hereinbefore.

In addition to the limit stops 183, there may be provided inner limit stops 125 and 132, the operation of which was described in connection with Figure 1. As shown in Figure 20, the lefthand limit stop 183 and the inner limit stop 125 have just been moved from a position inclined to the left to the vertical position due to the contact between the carriage 7 and the inner limit stop 125. This operation serves to connect the lefthand carriage to the prime mover through the jaw clutch and all the various gears. At the time the lefthand carriage is moving the inner limit stop 125 to the right, the right-hand carriage is similarly moving the righthand outer limit stop 183 to the right to disengage the jaw clutch of its carriage from the prime mover.

From the foregoing, it is apparent that, in Figures 1 to 17, I have disclosed a machine which operates during half a cycle to fill a pair of trays evenly with biscuit material, and during the other half cycle to fill a second pair of trays evenly

with the same material. Two separate spouts are used for this purpose, the material being fed to the spouts from a common hopper which is caused to communicate first with one spout and then with the other, depending upon the position of the carriages. The empty trays are returned to their initial position by hand. However, in Figures 18 to 20, I have disclosed a system which is fully automatic in that the empty trays are returned by the carriages during a power-driven half cycle of operation and protective stops are provided simultaneously to disengage one carriage from the prime mover at the time that the other carriage is engaged.

It has been found that, regardless of the manner in which the empty trays are returned to their initial position, the load on the prime mover is practically constant throughout the entire cycle of operation. It has further been found that, by providing the vibratory pan **10** which prevents a massing of the material, particularly when the latter is cereal in a moist condition, and further by providing spout **9** which offsets the material-accumulating effects of the flared aprons, the partitioned trays are filled uniformly with the biscuit material. The filling is quite fast, in fact much faster than manual filling and has the added advantage that there is no manual handling whatsoever of the biscuit material after it reaches the first conveyor belt **28** until it is placed in the pans or trays ready for baking.

It will be understood that I desire to comprehend within my invention such modifications as come within the scope of the claims and the invention.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A food-dispensing machine comprising a movable carriage, a food conveyor positioned over a tray supported on said carriage, means for moving the carriage under the conveyor at a uniform rate of speed whereby the tray is evenly filled with food, means for stopping the movement of the carriage at any predetermined position with respect to the conveyor, and means for manually returning the carriage to the position in which the tray is ready to be filled.

2. A machine for uniformly distributing food over a plurality of trays, said machine comprising a chute containing the food, said chute terminating in two spouts, a pair of carriages on which the trays are mounted, means for simultaneously moving the carriages respectively under the spouts, first in one direction and then in the opposite direction, and means for furnishing food to the spouts alternately during the excursions of the carriages whereby one spout serves to fill the tray passing that spout in one direction and another spout serves to fill the tray passing the last-mentioned spout in the opposite direction.

3. A machine for uniformly distributing food over a tray, said machine comprising a chute containing the food, a vibratory trough, a spout communicating with said chute through said vibratory trough, a movable carriage on which the tray is supported, and means for moving the carriage and the supported tray under the spout whereby food is conveyed from the chute and trough to the spout and dropped evenly into the tray.

4. A machine for uniformly distributing food over a plurality of trays, said machine comprising a chute containing the food, a pair of conveyors positioned to receive food from the chute, said conveyors terminating in a pair of spouts to which food is alternately supplied, a pair of movable carriages on which trays are supported, means for moving the carriages and trays, first under one spout which contains food and then under the other spout which alternately contains food, and means for vibrating said conveyors to move the food evenly from the chute to the spouts whereby food is dropped evenly into the trays.

5. In a food-dispensing machine, means for distributing food evenly throughout a plurality of trays arranged in abutting relation including those portions of the trays which abut one another, said means including a food-containing spout positioned over the trays, means for moving the trays past the spout, and means for moving the spout in a direction opposite to the direction in which the trays are moving during the time the abutting portions of the trays are moving past the spout, whereby the food is distributed evenly over the entire area of all the trays.

6. A machine for uniformly distributing food over a plurality of abutting trays with inclined sides at the abutting position, said machine comprising a chute containing the food and terminating in a spout, a movable carriage on which all of the trays are mounted, means for moving the carriage under the spout whereby the trays travel past the spout in succession, and means for moving the spout quickly over the abutting inclined sides of the trays, as the trays pass under the spout whereby the trays are filled uniformly with food from the spout notwithstanding the inclined sides of the trays.

7. A machine for uniformly distributing food over two groups each containing a plurality of abutting trays with inclined sides at the abutting position, said machine comprising a chute containing the food and terminating in a pair of spouts, a pair of movable carriages on which two groups of trays are mounted, means for simultaneously moving the carriages respectively under the spouts, first in one direction and then in the opposite direction, whereby the trays of each group move past the respective spouts in succession, and means for moving the spouts quickly over the abutting sides of the trays as each tray group passes under its spout, whereby the trays are filled uniformly with food from the spouts notwithstanding the inclined sides of the trays.

8. In a food-dispensing machine, a movable carriage, a conveyor containing food and positioned over a plurality of trays mounted on said carriage, means for power driving the carriage at a uniform rate in one direction under the conveyor, and means for causing the conveyor to drop food into the trays during the movement of the carriage whereby the trays are filled evenly with food, and means for manually moving the carriage in the opposite direction, whereby the trays are moved to their ready-to-be-filled position.

9. A machine for uniformly distributing food over a plurality of trays, said machine comprising a chute containing the food, said chute terminating in two spouts, a pair of movable carriages on which the trays are supported, power driven means for moving each of the carriages from its initial position to positions under the spout in which the trays supported on the carriage receive a uniform filling of food from the

spout, a hand-operated means for returning each of the carriages to its initial position.

10. A machine for uniformly distributing food over a plurality of trays, said machine comprising a chute containing the food, said chute terminating in two spouts, a pair of movable carriages on which the trays are supported, power driven means for moving each of the carriages from its initial position to positions under the spout in which the trays supported on the carriage receive a uniform filling of food from the spout, a hand-operated means for returning each of the carriages to its initial position, said power driven means operating on each carriage through a half cycle of operation whereby the load on the power driven means is continuous.

11. A machine for uniformly distributing food over a plurality of trays, said machine comprising a chute containing the food, said chute terminating in two spouts, a pair of carriages on which the trays are supported, a common means for simultaneously moving the carriages respectively under the spouts, first in one direction during a half operating cycle of the common moving means and then in the opposite direction during the other half operating cycle of the common moving means, whereby the last-mentioned means is subjected to a continuous load, and means for withholding food from each spout as the opposite carriage reaches the opposite spout whereby said opposite spout serves to fill the trays on the carriage passing beneath the filled spout during succeeding half cycles of the operating cycle.

12. A machine for uniformly distributing food over a plurality of trays, said machine comprising a chute containing the food, said chute terminating in two spouts, a splitter valve for connecting said chute to each spout alternately, a pair of carriages on which the trays are mounted, means operating during one half an operating cycle for moving one of the carriages from an initial position to positions in which the supported tray receives food from one of the spouts, means operating during the other half of the operating cycle for moving the other of the carriages from an initial position to positions in which the tray supported thereon receives food from the other of said spouts, and means for moving the splitter valve from one spout to the other whereby food is maintained only in that spout which is normally filling a tray.

13. A tray carriage unit for a food-dispensing machine including a carriage, eccentrically mounted cams secured to the carriage and adapted to bear against lugs formed on a tray, and manually operative means for rotating the cams to clamp the tray to the carriage.

14. A tray carriage unit for a food-dispensing machine including a carriage, arms pivotally and resiliently mounted on the carriage above lugs formed on a tray, eccentric cams rotatably mounted on said arms, and manually operative means for rotating the cams to bear against said lugs whereby the tray is resiliently pressed against the carriage.

15. A tray carriage unit for a food-dispensing machine including a carriage, arms pivotally mounted at one end of the carriage above a tray, and springs between the other end of the arms and the carriage, eccentric cams rotatably mounted on the arms, and means for rotating the cams on the arms to bear against the tray and to cause the arms to rotate on their pivots against the action of said springs whereby the tray is resiliently secured to the carriage.

16. A food-dispensing machine comprising movable carriages *a*, *b*, said carriages being mechanically connected together, a food-containing chute terminating in a pair of spouts which are alternately in communication with the chute, said spouts being positioned over a plurality of trays resting on said carriages, means for moving the carriage *a* at a uniform rate of speed in one direction past the spout momentarily filled with food, whereby the tray carried by the carriage *a* is evenly filled with food from the filled spout and whereby the carriage *b* and the tray supported thereon are moved into a ready-to-be-filled position under the second spout which momentarily contains no food, and means for moving the carriage *b* at a uniform rate of speed in the opposite direction past the second spout which is now momentarily filled with food whereby the tray carried by the carriage *b* is evenly filled with food from the filled spout and whereby the carriage *a* and the tray supported thereon are moved into a ready-to-be-filled position under the other spout which momentarily contains no food.

17. A food-dispensing machine comprising movable carriages *a*, *b*, said carriages being mechanically connected together, a food-containing chute terminating in a pair of spouts which are alternately in communication with the chute, said spouts being positioned over a plurality of trays resting on said carriages, means for moving the carriage *a* at a uniform rate of speed in one direction past the spout momentarily filled with food, whereby the tray carried by the carriage *a* is evenly filled with food from the filled spout and whereby the carriage *b* and the tray supported thereon are moved into a ready-to-be-filled position under the other spout which is now momentarily empty of food, and means for stopping the movement of the carriages *a* and *b* when they reach the limit of their travel in either direction.

18. A food-dispensing machine comprising movable carriages *a*, *b*, said carriages being mechanically connected together, a food-containing chute terminating in a pair of spouts which are alternately in communication with the chute, said spouts being positioned over a plurality of trays resting on said carriages, means for moving the carriage *a* at a uniform rate of speed in one direction past the spout momentarily filled with food, whereby the tray carried by the carriage *a* is evenly filled with food from the filled spout and whereby the carriage *b* and the tray supported thereon are moved into a ready-to-be-filled position under the second spout which momentarily contains no food, means for moving the carriage *b* at a uniform rate of speed in the opposite direction past the second spout which now momentarily contains food whereby the tray carried by the carriage *b* is evenly filled with food from the filled spout and whereby the carriage *a* and the tray supported thereon are moved into a ready-to-be-filled position under the other spout which momentarily contains no food, and means for stopping the movement of the carriages *a*, *b* when they reach any predetermined position including intermediate positions and the limit of their travel in either direction.

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