July 9, 1963 J. M. MILLER ET AL 3,096,540

CONTROL APPARATUS FOR FORMING MECHANISM

Filed July 10, 1961 2 Sheets-Sheet 1

Fig. 1.

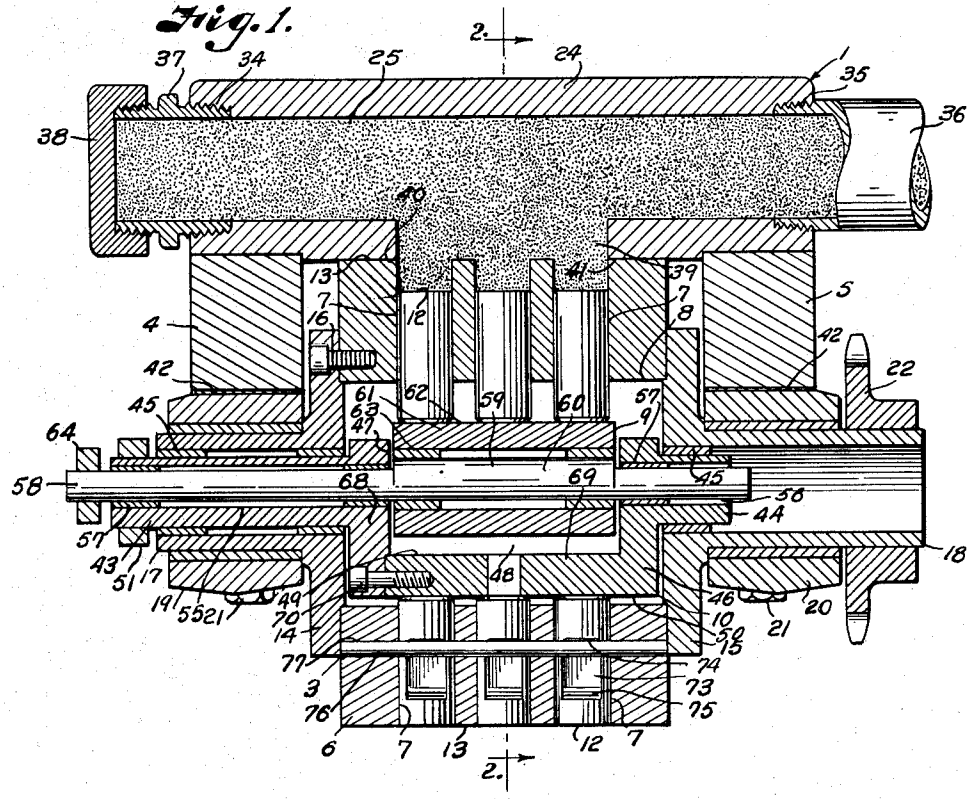


Fig. 3.

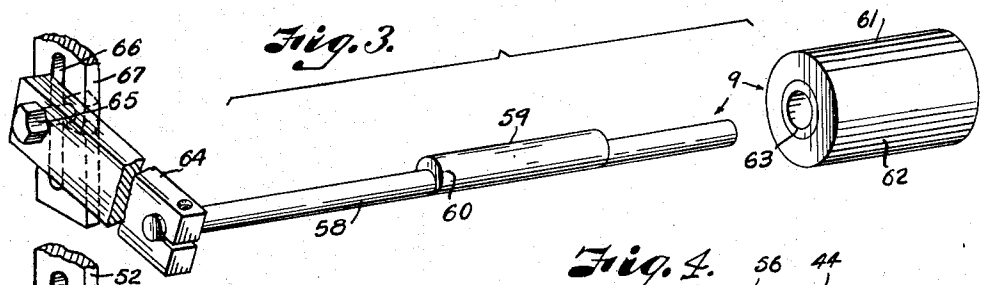
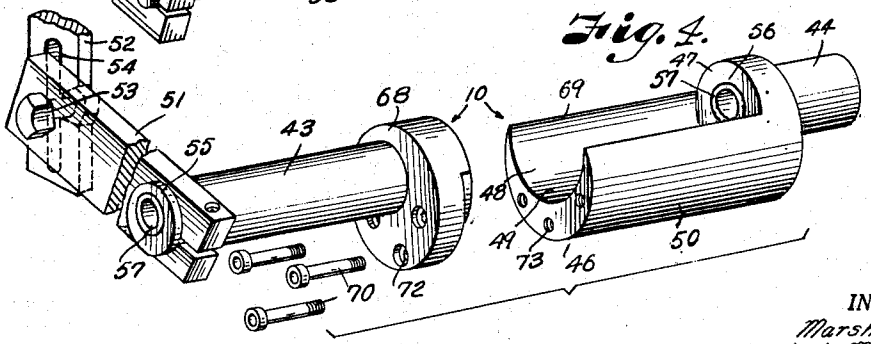


Fig. 4.



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Fig. 2.

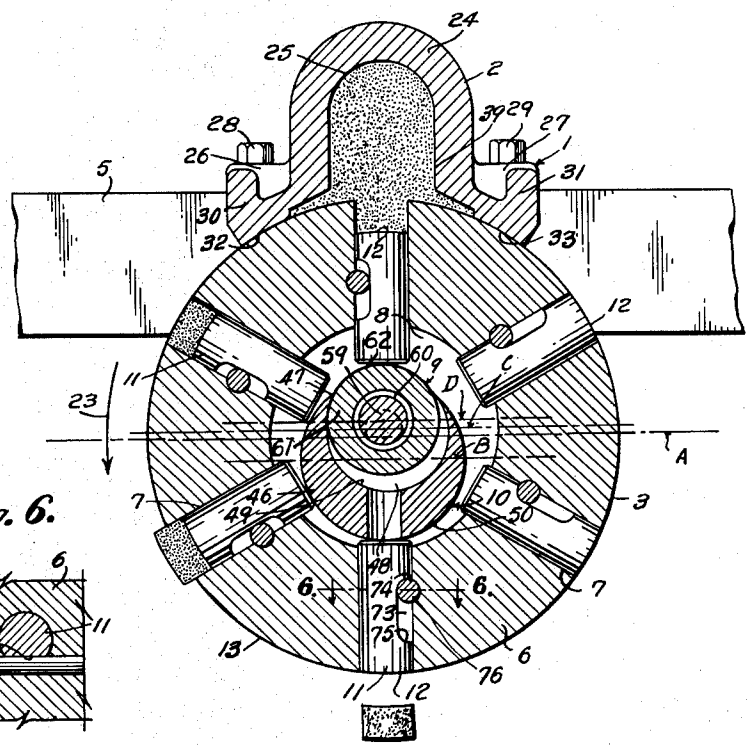
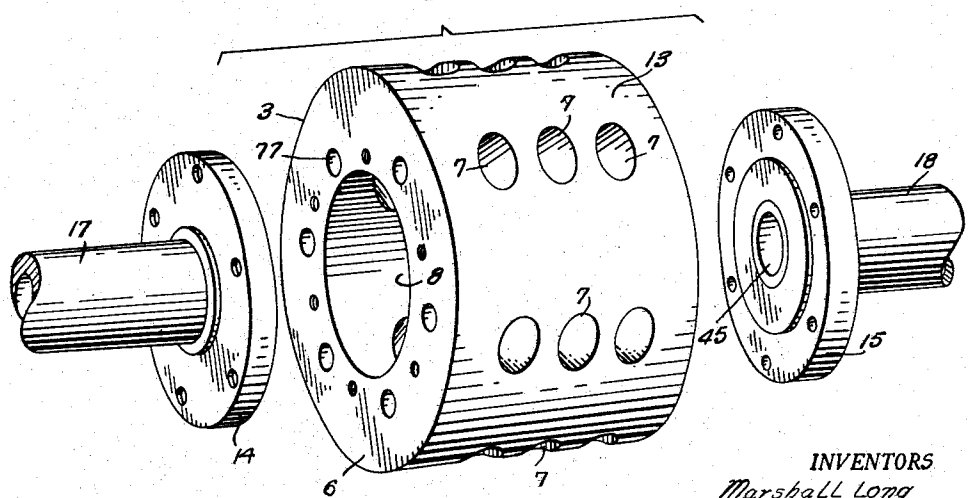


Fig. 6.

Fig. 5.



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CONTROL APPARATUS FOR FORMING MECHANISM

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5 Claims. (Cl. 17—32)

This invention relates to a machine for forming or pressing minced material into cohesive masses of like shape and size, such as in the forming of meatballs, meat patties, and the like, and is an improvement on the structure disclosed in the Long, et al., Patent No. 2,708,287. The machine of this patent includes a rotor having one or more radial bores into which the minced material is pressed against the head of a piston that is slidable in the bore under pressure of the material in one position of the rotor, and which piston acts in another position of the rotor to eject the material in a definite shape.

The principal object of the present invention is to provide an improved and more rugged mechanism for controlling the piston or pistons so that an exact amount of material is pressed into each bore to form the desired size of ball or patty and to eject the ball or patty in the rotation of the rotor.

A further object of the invention is to facilitate adjustment of the control mechanism that effects ejection, so that the balls or patties may be discharged at different points in the rotation of the rotor.

A further object of the invention is to facilitate and make more accurate adjustment of the inward movement of the piston or pistons for making the balls or patties of different thickness.

Further objects of the invention are to provide an improved means for retaining the pistons in the rotor; to provide supports for the control elements, so that they may be easily adjusted exteriorly and while the rotor is in motion; and to provide means for retaining the adjusted position of the control elements independently of each other.

In accomplishing these and other objects of the invention as hereinafter pointed out, we have provided improved construction, the preferred form of which is illustrated in the accompanying drawings, wherein:

FIG. 1 is a vertical longitudinal section of a ball or patty forming mechanism embodying the features of the present invention.

FIG. 2 is a cross section on the line 2—2 of FIG. 1.

FIG. 3 is a perspective view of the cam or eccentric elements which control the thickness of the balls or patties, the parts being shown in spaced relation.

FIG. 4 is a perspective view of the parts composing the stationary cam or eccentric element that determines the ejection point of the meatballs or patties, the parts being shown in spaced relation.

FIG. 5 is a perspective view of the parts of the rotor, shown in disassembled, spaced relation.

FIG. 6 is a fragmentary section on the line 6—6 of FIG. 2, particularly showing the retention of the pistons.

Referring more in detail to the drawings:

1 designates the ball or patty former, for example, of a machine for making meatballs and placing a fixed number of the meatballs into a can, as when canning meatballs and spaghetti. Since the present invention pertains only to the meatball former, other parts of the machine have been omitted from the drawings for the sake of clarity. It is also to be understood that while the invention is illustrated and described for forming meatballs, the same mechanism, with slight modification as to size, may be used for making meat patties or the like.

The portion 1 of the machine includes a manifold 2 and a rotor 3, which are retained in cooperative relation on laterally spaced transverse supports 4 and 5 of the frame of the machine. The rotor 3 comprises a cylindrical body 6 having a plurality of radial bores 7 opening through the periphery thereof, as best shown in FIG. 5. There may be a plurality of the bores 7 arranged in rows along the length of the rotor, depending upon the output capacity that may be desired. The body of the rotor has an axial bore 8 to accommodate therein piston control elements 9 and 10, that are best illustrated in FIGS. 3 and 4, respectively, and which will be hereinafter described. The radial bores 7 extend through to the axial bore 8 and are of a shape corresponding to the transverse shape of the balls or patties that are to be formed in the outer ends of the bores, as later described. Slidably mounted in each of the bores 7 is a plunger or piston 11, closely fitting the walls of the bores and having a length slightly more than the radial depth of the bores 7 when the outer end faces 12 of the pistons register with the outer cylindrical face 13 of the rotor.

Fixed to the ends of the cylindrical body 6, for closing the ends of the axial bore 8, are disk-shaped plates 14 and 15, which are secured thereto by fastening devices such as cap screws 16 (FIG. 1). Extending outwardly from the plates are tubular trunnions or shafts 17 and 18 having a common axis "A" aligning with the axis of the cylindrical body of the rotor. The tubular trunnions or shafts 17 and 18 are mounted in bearing blocks 19 and 20 that are fixed to the under side of the transverse supports 4 and 5 by fastening devices such as bolts 21 (FIG. 1). The tubular trunnion or shaft 17 terminates substantially at the outer face of the bearing block 19, but the tubular trunnion or shaft 18 projects from the bearing block 20 to accommodate a driving member thereon, such as a sprocket 22, for driving the rotor in a continuous anticlockwise direction, as shown by the arrow 23 in FIG. 2.

The manifold 2 extends longitudinally, preferably, at the top side of the rotor and comprises a generally tubular body 24 having a through longitudinal bore 25. The ends of the tubular body have laterally extending ears 26 and 27 (see FIG. 2) extending from opposite sides thereof for attachment to the transverse members 4 and 5 by fastening devices such as cap screws 28 and 29, as shown in FIG. 2. The tubular body 24 also has lateral flanges 30 and 31 extending along the respective sides thereof between the ears 26 and 27. The lateral flanges 30 and 31 have arcuate underfaces 32 and 33 in contact with the cylindrical face 13, as shown in FIG. 2. The bore 25 through the tubular body 24 has counterbored ends provided with internal threads 34 and 35 for respectively connecting a supply duct 36 for conveying the material under pressure to the manifold, and a nipple 37 which carries a cap 38 for closing that end of the tubular bore. The tubular bore provides a common connection with the rows of radial bores 7 through an elongated port 39, as shown in FIG. 1, to pass the minced material, under pressure as later described.

The arcuate faces 32 and 33 join with corresponding arcuate faces 40 and 41 to bear upon the cylindrical surface 13 of the rotor at opposite ends of the rows of cylindrical bores 7, as best shown in FIG. 1. The arcuate faces thus completely surround each row of radial bores 7 as the bores are carried consecutively under the manifold to seal and prevent leakage of the minced material therebetween. In order to provide the desired sliding seal between the arcuate faces 32—33—40—41 and the cylindrical face 13 of the rotor, shims 42 may be provided

between the ears 26 and 27 and the transverse supports 4 and 5, or between the bearing blocks 19 and 20 and the undersurfaces of the transverse supports 4 and 5.

The piston control element 10 includes coaxially aligned shafts 43 and 44 that are rotatably mounted in bushings 45 carried within the tubular trunnions 17 and 18, as shown in FIG. 1. Interconnected with the inner ends of the shafts and located within the axial bore 8 is a generally cylindrical body 46, having an axis "B" offset downwardly of the axis of rotation "A" (FIG. 2). The opposite diametrical side is cut away as indicated at 47, to provide a recess 48.

The recess 48 has an arcuate face 49 with an axis slightly offset from the axis "A" of the shafts 43 and 44 and terminates at the sides somewhat above the eccentric axis "B" of the generally cylindrical body 46, as best shown in FIG. 2. The body 46 is, therefore, of generally crescent shaped cross section along the length of the recess (FIGS. 2 and 4). The outer face of the generally cylindrical body provides a cam surface 50 that is concentric with the axis "B" and eccentric with respect to the axis "A" of the shafts 43 and 44 and in position to cam the plungers or pistons 11 outwardly as the rotor carries them from a substantially horizontal position to a vertical position at the bottom of rotation, to effect discharge of the shaped masses of the material, as shown in FIG. 2.

The shaft 43 has an arm 51 attached to an end thereof that projects from the outer end of the tubular trunnion 17. The arm 51 is adjustably secured to a fixed part 52 by a fastening device, such as a bolt 53, extending through the arm and an arcuate slot 54 in the fixed part 52 (FIG. 4) to adjustably retain the cam surface 50 of the piston control member 10 in a desired position.

In order to mount the piston control element, the shafts 43 and 44 have eccentric longitudinal bores 55 and 56 on an axis "C" offset from the rotational axis "A" of the rotor on the diametrical side opposite the axis "B" (FIG. 2). Located in the bores 55 and 56 are bushings 57 for carrying the shaft 58 of the piston control element 9 on the axis "C." Fixed to or formed as a part of the shaft 58 within the recess 48 is an eccentric journal 59 having a cylindrical surface 60 on an axis "D" that is offset from the axis "C." Rotatably mounted on the eccentric journal 59 is a roller 61 having a cylindrical surface 62 and rotatable on bushings 63 about the axis "D," to provide an inner stop for the plungers or pistons 11 in one position of the rotor. The roller 61 and its support 59 are retained in a fixed position by an arm 64 fixed to an outer end of the shaft 58 and having a clamping bolt 65 extending through a slot 66 in a fixed part 67.

In order to facilitate assembly of the piston control element 9 within the piston control element 10, the generally cylindrical body portion 46 of the control element 10 is preferably formed of two sections 68 and 69, extending through one end of the crescent portion thereof, and which parts are secured together by fastening devices 70 extending through holes 71 in the section 68 and into threaded sockets 72 in the section 69 (FIGS. 1 and 4).

In order to retain the pistons 11 in the radial bores 7, each piston is provided with a notch 73 in a side thereof, so that the ends 74 and 75 of the notches provide stops for engaging key pins 76 that extend transversely of each of the rows of radial bores 7 and which have support in the cylindrical body of the rotor in longitudinal bores 77. The key pins may be retained in position by the ends thereof abutting the plates 14 and 15 that close the open ends of the axial bore 8.

In using the apparatus constructed and assembled as described, the minced material forming the product is moved through the supply duct 36 under pressure into the manifold 2, to be held therein, since the cylindrical face of the rotor 3 closes the outlet port 39 and makes sealing contact with the faces 32—33 and 40—41 of the manifold. With the rotor in operation, the rows of radial bores 7 are carried consecutively into registry with

the outlet port of the manifold. When a row of pistons is in registry with the port, the material under pressure acts against the end faces 12 of those pistons to force them inwardly until the opposite ends of the pistons engage the roller 61. This movement of the pistons opens up cavities in the outer ends of the bores, with the bottoms of the cavities formed by the end faces 12 of the pistons. The cavities fill under pressure immediately with movement of the pistons. The pressure is maintained on the pistons 11 during the entire time the bores are in connection with the outlet of the manifold, but since the inner ends of the pistons are in contact with the roller 61, the roller 61 will turn with turning of the rotor 3. As the rotor continues to turn in the direction of the arrow 23, the pressed material in the cavities is leveled off upon passing under the face 32 of the manifold. The material is retained in the cavities as they emerge from under the sealing face 32, because the pressure results in packing of the minced material sufficiently tightly to form cohesive masses. By this time movement of the rotor carries the pistons off the roller 61 and onto the stationary cylindrical surface 50 of the control element 10 however, the pressure has been released and the pistons slide freely on the cam. As soon as the pistons make contact with the surface 50, they are gradually forced outwardly until the shaped masses are ejected from the open ends of the bores 7, as shown in FIG. 2 of the drawings. When the pistons reach the high point of the camming surface 50, the end faces 12 of the pistons register smoothly with the cylindrical face 13 of the rotor, at which time the stops 74 engage the key pin 76 for that row of pistons. The pistons continue to hold this position while they are being carried under the sealing face 33 of the manifold.

Adjustments may now be made while the rotor is in continuous operation, to provide the desired point of ejection, and also to provide the proper depth of the cavities for producing shaped cohesive masses of a required thickness. The first adjustment is effected by loosening the fastening device 53 and swinging the arm 51 in proper direction to bring the highest point of the camming surface 50 into radial alignment with the desired point of ejection. During this adjustment, the shafts 43 and 44 turn within the tubular trunnions 17 and 18 of the rotor and the cylindrical body 46 swings about the axis "A." After the proper point of ejection has been determined, the parts of the piston control element 10 are locked in stationary position by retightening the fastening device 53.

Adjustment is now made to provide the desired thickness of the shaped masses, also while the rotor is in operation. This is made easy because the rollers 61 can turn when the pistons are under pressure. The fastening device 65 for holding the shaft 58 is loosened, and the arm 64 is actuated to turn the shaft 58 in the bores 55 and 56, thereby turning the eccentric 59 to raise or lower the roller in the recess 48 to stop the pistons when the depth of cavities is attained as evidenced by the weight of the shaped masses that are ejected. When the position of the roller is attained, the fastening device 65 is retightened to hold the shaft 58 stationary and retain the roller 61 in the adjusted position. Usually when the proper ejection point is obtained the adjustment of the control element remains the same. However, the position of the roller 61 must be adjusted every time the weight of the product is changed.

From the foregoing, it is obvious that we have provided an improved mechanism for controlling the piston or pistons of the rotor so that an exact amount of material is pressed into the cavity provided by each bore to form the desired size and shape of the cohesive masses. It is also apparent that the control mechanism is readily adjusted from the exterior of the rotor so that the rotor may be in operation while adjustments are being made.

The structure also provides for rolling support of the pistons when pressure of the product is on the pistons, thereby allowing smoother operation of the mechanism. The present invention also permits easier adjustment when the mechanism is in operation.

We claim and desire to secure by Letters Patent:

1. In a machine for forming a material into cohesive masses of like shape and size, a rotor having a radial bore conforming in cross section to the masses to be formed and having an axial bore intersecting the radial bore, a manifold in contact with the periphery of the rotor and having an outlet to discharge the material under pressure, means for turning the rotor to bring the radial bore into and out of connection with the outlet of the manifold during each revolution of the rotor, and a piston slidable inwardly within the radial bore under pressure of the material within said manifold as the radial bore moves across the manifold, the improvement comprising a roller in said axial bore in radial alignment with the manifold for limiting inward movement of the piston and for providing a rolling support for the piston during the time that the piston is subjected to the charging pressure, and means within said axial bore for contact with the inner end of the piston as the piston is carried off the roller and away from said manifold to move the piston outwardly in said bore for ejecting the charge of material.

2. In a machine for forming a material into cohesive masses of like shape and size, a rotor having a radial bore conforming in cross section to the masses to be formed and having an axial bore intersecting the radial bore, a manifold contacting the periphery of the rotor and having an outlet to discharge the material under pressure, means for supporting the rotor for turning movement about an axis of rotation fixed relatively to the manifold to bring the radial bore into and out of connection with the outlet of the manifold during each revolution of the rotor, and a piston slidable inwardly within the radial bore under pressure of the material within said manifold to charge the radial bore with material as the radial bore is carried across the outlet of the manifold, the improvement comprising a cam member having support within the axial bore of the rotor, and a roller carried by the cam member on the side of the axis of rotation nearest the manifold for limiting inward movement of the piston to limit the size of the charge and for providing rolling support for the piston during the time that the piston is subjected to the charging pressure within the manifold, said cam member having a cam surface extending from said roller for contact by the inner end of the piston as the piston is carried off the roller and away from said manifold, and said cam surface increasing in radius to move the piston outwardly in said bore for ejecting the charge of material.

3. In a machine for forming a material into cohesive masses of like shape and size, a rotor having a radial bore conforming in cross section to the masses to be formed and having an axial bore intersecting the radial bore, a manifold contacting the periphery of the rotor to supply the material under pressure, means for supporting the rotor for rotation about an axis of rotation fixed relatively to the manifold to bring the radial bore into and out of connection with the manifold during each revolution of the rotor, and a piston slidable inwardly within the radial bore under pressure of the material within said manifold to charge the material into the bore as the radial bore is carried across the manifold, the improvement consisting of a cam member having stationary support within the axial bore of the rotor and provided with a recess in the side thereof nearest the manifold, a shaft journaled in the rotor supporting means and extending transversely of the recess in parallel with the axis of rotaion, a journal on the shaft and located in said recess and having its axis radially spaced from the axis of the shaft, a roller freely rotatable on the journal for limiting inward movement of the piston and for providing rolling support of the piston during the time that the piston is subjected to the charging pressure within the manifold, an arm fixed to the shaft for turning the shaft to position the journal for adjusting the roller relatively to the periphery of the rotor to adjust size of the charge, and means for securing the arm in fixed position for retaining said adjustment, said cam member having a cam surface for contact by the inner end of the piston as the piston is carried off the roller and away from said manifold to move the piston outwardly in said bore for ejecting the charge of material.

4. In a machine for forming a material into cohesive masses of like shape and size, a rotor having a radial bore conforming in cross section to the masses to be formed and having an axial bore intersecting the radial bore, means for closing the ends of the axial bore and having tubular trunnions projecting therefrom in the axis of the rotor, a manifold having an outlet contacting the periphery of the rotor through which the material is supplied under pressure, bearings mounting said trunnions for supporting the rotor for rotation relatively to the manifold to bring the radial bore into and out of connection with the manifold during each revolution of the rotor, and a piston slidable inwardly within the radial bore under pressure of the material within said manifold to charge the material into the bore as the radial bore is carried across the manifold, the improvement comprising a cam member within the axial bore of the rotor and provided with a recess in the side thereof nearest the manifold, tubular shafts projecting from opposite ends of the cam member and mounted in the tubular trunnions to support said cam member, a shaft having eccentric support in the tubular shafts in the direction of the manifold and extending across the recess, a journal fixed to the shaft within said recess with its axis offset radially from the axis of the shaft, a roller rotatable on the journal for limiting inward movement of the piston and for providing rolling support of the piston during the time that the piston is subjected to the charging pressure within the manifold, an arm fixed to the shaft for turning the shaft to position the stopping point of the piston by said roller to vary size of the charge, means for securing the arm in fixed position for retaining said adjustment, said cam member having a camming surface for contact by the inner end of the piston as the piston is carried off the roller for ejecting the charge of material from said bore, an arm on one of the tubular shafts for turning the cam member to the desired ejecting point for the charge, and means for securing said arm in fixed position to maintain the point of ejection.

5. In a machine for forming a material into cohesive masses of like shape and size, a rotor having a radial bore conforming in cross section to the masses to be formed and having an axial bore intersecting the radial bore, means for closing the ends of the axial bore and having tubular trunnions projecting therefrom in the axis of the rotor, a manifold having an outlet contacting the periphery of the rotor through which the material is discharged under pressure, bearings mounting said trunnions for supporting the rotor for rotation to bring the radial bore into and out of connection with the outlet of the manifold during each revolution of the rotor, a piston slidable inwardly within the radial bore under pressure of the material within said manifold to charge the bore with material as the radial bore is carried across the outlet of the manifold, a cylindrical member within the axial bore of the rotor and provided with a recess in the side thereof nearest the manifold, tubular shafts projecting eccentrically from ends of the cylindrical member and mounted in the tubular trunnions to support said cylindrical member in the portion of the axial bore opposite the manifold, a shaft extending through the tubular shafts and across the recess with the axis of said shaft offset on the side of the axis of rotation nearest the manifold, a journal on the shaft and located in said recess with its

axis offset radially from the axis of the shaft on the side nearest the manifold, a roller freely rotatable on the journal for limiting inward movement of the piston and for providing rolling support of the piston during the time that the piston is subjected to the charging pressure within the manifold, an arm fixed to the shaft for turning the shaft for adjusting the position of the roller to adjust the stopping point of the piston for varying size of the charge, means for securing the arm in fixed position for retaining said adjustment, a similar arm on one of the tubular shafts for turning the cylindrical member to the desired ejecting point for the charge, and

means for securing said last named arm in fixed position to maintain the point of ejection.

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