June 24, 1958 E. H. CARRUTHERS **2,840,121**

MACHINE FOR PACKING A PREDETERMINED WEIGHT OF BULK PRODUCTS

Filed Nov. 12, 1953 5 Sheets-Sheet 1

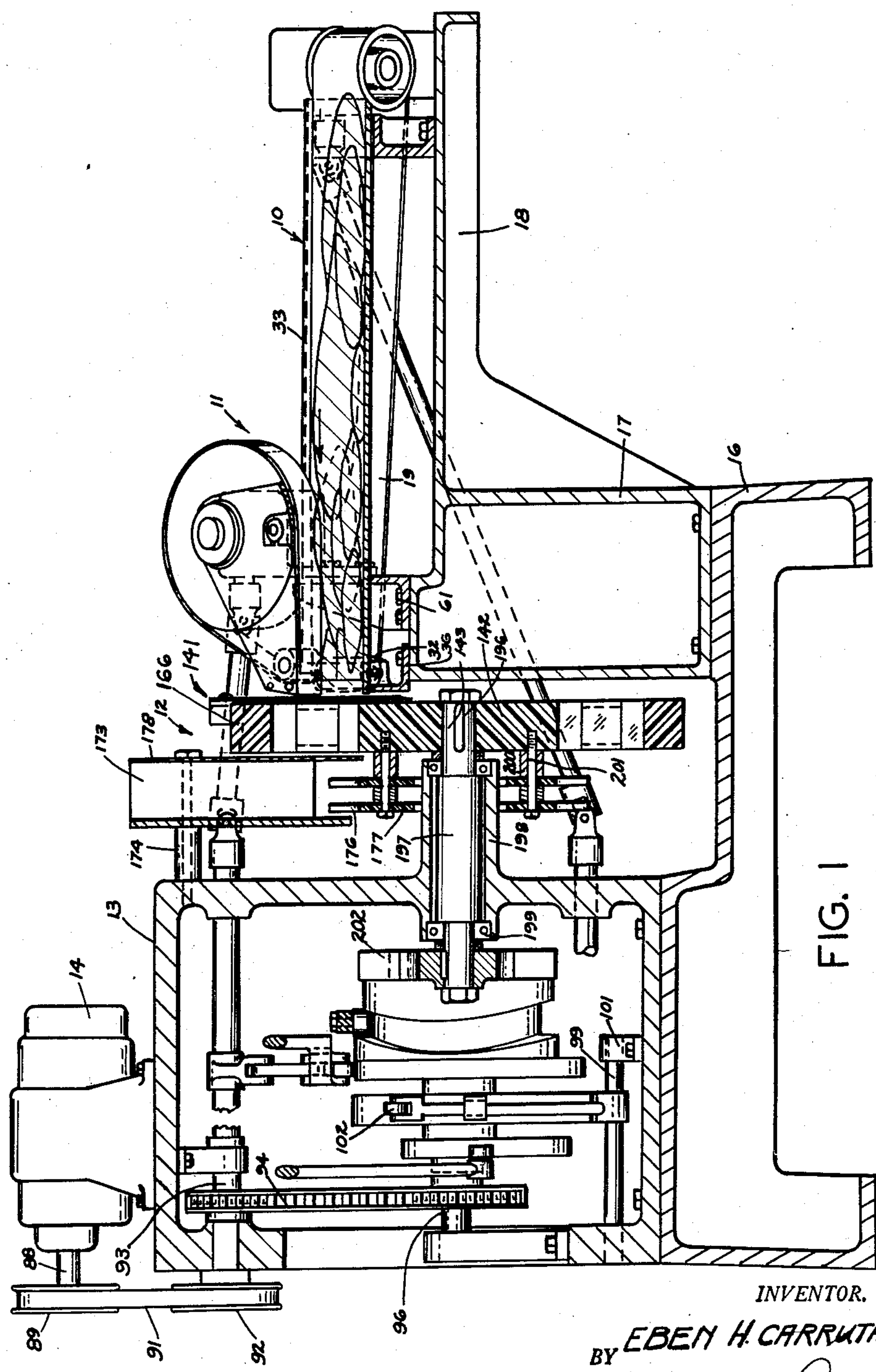

FIG. 1

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MACHINE FOR PACKING A PREDETERMINED
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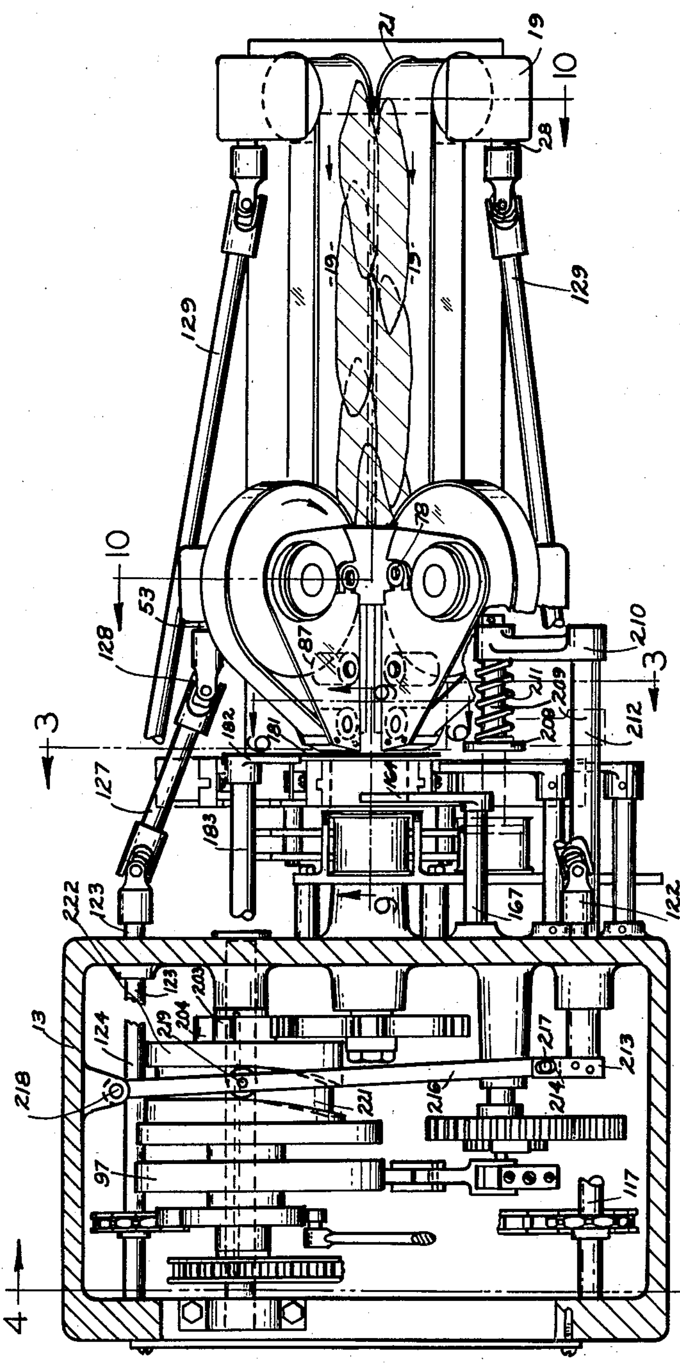

FIG. 2

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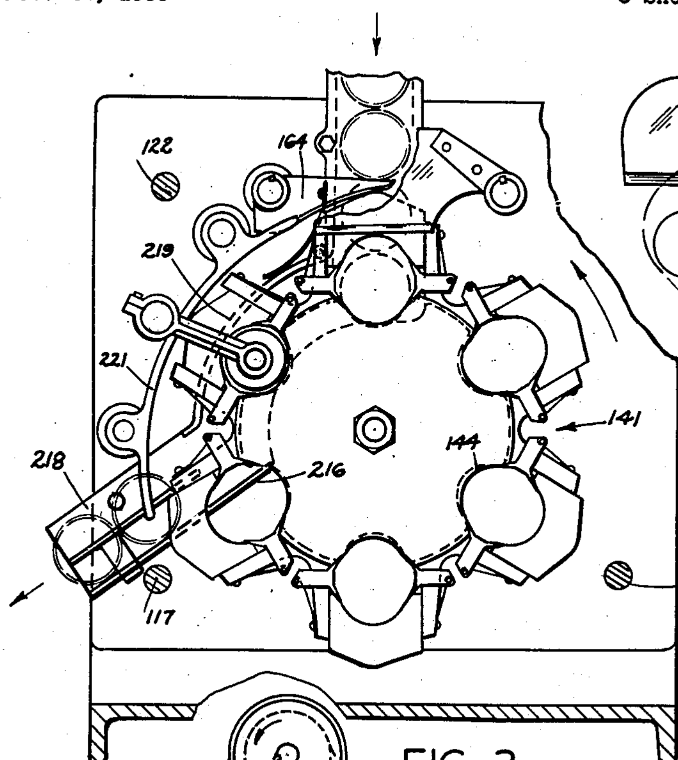

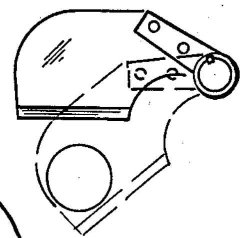

FIG. 5

FIG. 3

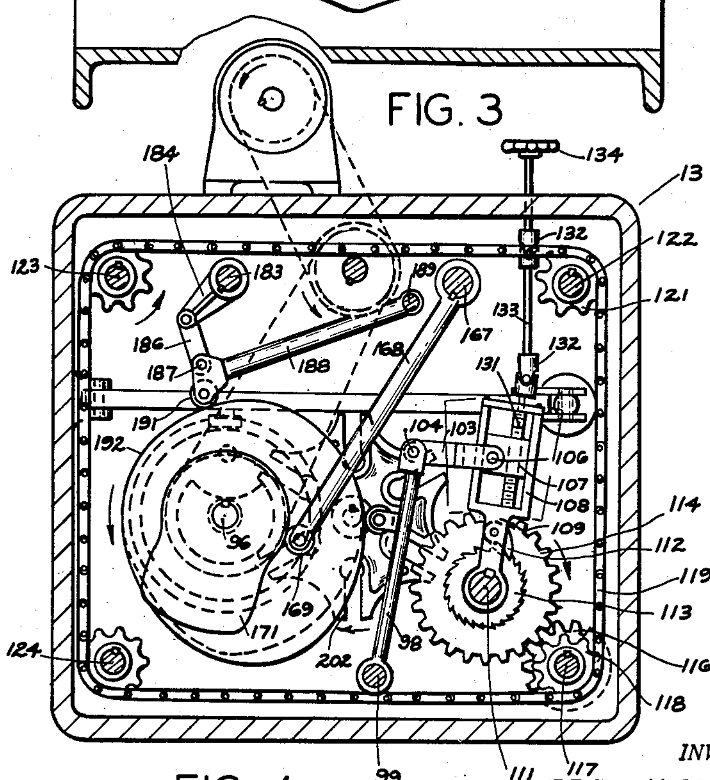

FIG. 4

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MACHINE FOR PACKING A PREDETERMINED WEIGHT OF BULK PRODUCTS

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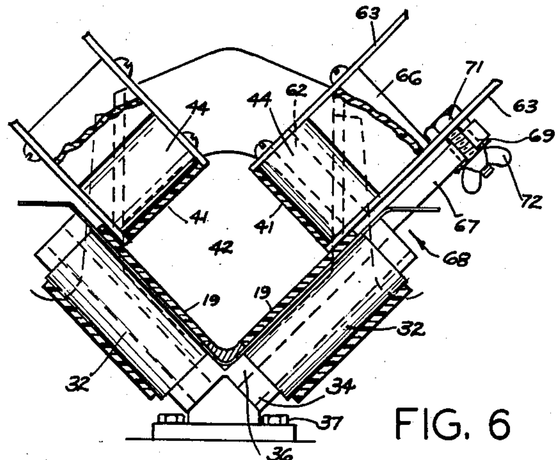

FIG. 6

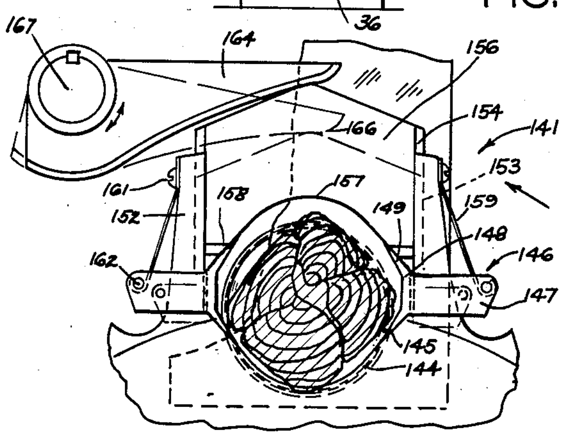

FIG. 7

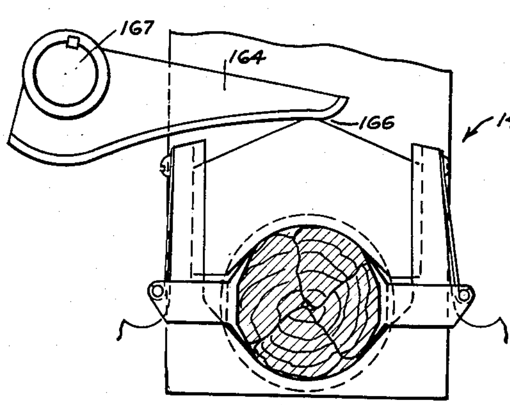

FIG. 8

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MACHINE FOR PACKING A PREDETERMINED WEIGHT OF BULK PRODUCTS

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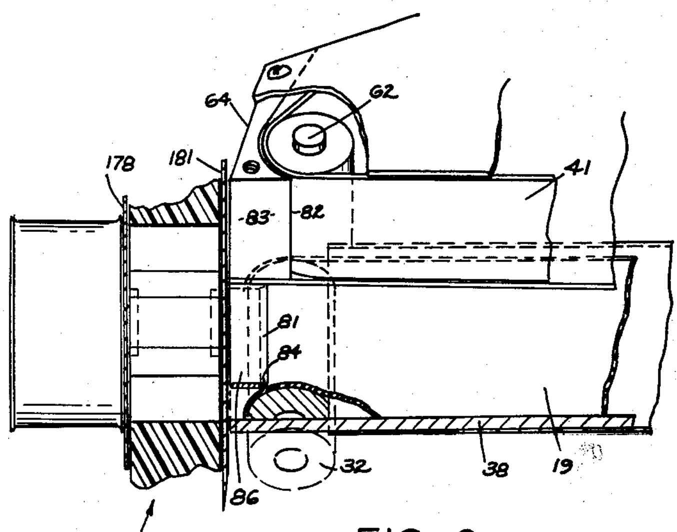

FIG. 9

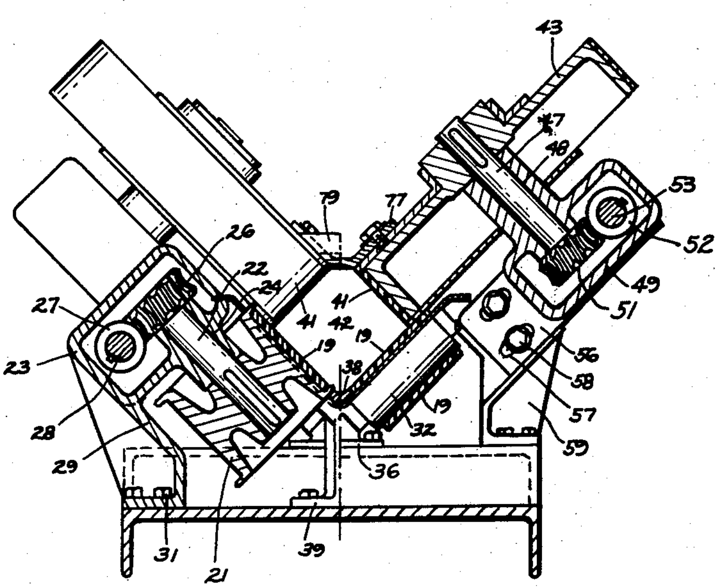

FIG. 10

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United States Patent Office

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Patented June 24, 1958

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2,840,121

MACHINE FOR PACKING A PREDETERMINED WEIGHT OF BULK PRODUCTS

Eben H. Carruthers, Warrenton, Oreg.

Application November 12, 1953, Serial No. 391,528

17 Claims. (Cl. 141—164)

My invention relates to a machine for packing a predetermined weight of bulk products. Reference is made to my issued Patent No. 2,601,093, issued June 17, 1952, entitled "Method and Machine for Packing a Predetermined Weight of Bulk Products," and to my co-pending application Serial No. 121,172 filed October 13, 1949, entitled "Machine for Packing a Predetermined Weight of Bulk Products."

While the machine of my invention has been particularly designed for the packing of tuna, it has other uses. It may, for example, be employed in the packing of other species of fish and may be adaptable to the packing of other food products, for example, sauerkraut or spinach. It further may be adapted to the packing of meat products which are packed in bulk or it may have uses in the packing of non-food products which are of a pliable or deformable character. The invention of the present application discloses improvements in the method and machine shown in the above mentioned patent and application.

An object of my invention is to provide an improved machine for packing a predetermined weight of tuna or other bulk product in a container to the end of accomplishing increased production and a saving in labor costs.

Another object of my invention is to provide improved means for holding the tuna or other product while it is being cut off to container size and weight to enable a cleaner and more well defined cutting of the product to be packed.

Another object of my invention is to provide improved mechanism for adjusting the length of cut and hence weight of tuna cut off for deposit into a container to thereby secure more accurate control of weight.

Still another object of my invention is to provide a machine which exerts a more gentle forming action on the tuna than the machines of the above mentioned patent and application to the end that a pack of tuna of improved appearance may be obtained when the tuna being packed is relatively soft or is fresh caught and packed without having been previously frozen as in the case of tuna caught within a relatively short distance of the major tuna packing centers of the west coast.

A further object of my invention is to provide a machine for forming whole loins of tuna into a roll of tuna by a relatively gentle forming action and improved means for cutting off the tuna while it is held on both sides of the cutting position to the end that an improved pack of tuna is obtained, particularly on relatively soft or fresh fish.

My invention further contemplates a machine for packing tuna by forming whole loins of tuna into an elongated continuous roll approximately rectangular in shape; then forming a section of the roll of tuna to be cut off into a cylinder of the size and weight to be placed in the container; then cutting off said formed section of tuna while the section is rigidly held; and then depositing the cut off section in a container to be filled.

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Other objects and advantages of my invention will be particularly set forth in the claims and will be apparent from the following description, when taken in connection with the accompanying drawings, in which:

Fig. 1 is a vertical longitudinal sectional view taken through the packing machine of my invention;

Fig. 2 is a plan view of the machine with the gear housing being shown in horizontal section to show the parts mounted therein;

Fig. 3 is a view taken substantially on the line 3—3 of Fig. 2 in the direction indicated by the arrows;

Fig. 4 is a sectional view taken substantially on the line 4—4 of Fig. 2 in the direction indicated by the arrows;

Fig. 5 s a detailed view showing the cut off knife;

Fig. 6 is a sectional view taken substantially on the line 6—6 of Fig. 2 in the direction indicated by the arrows;

Fig. 7 is a view showing the forming chuck in an open position and showing the chuck closing cam;

Fig. 8 is a view similar to Fig. 7 with the forming chuck closed;

Fig. 9 is a sectional view taken substantially on the line 9—9 of Fig. 2 in the direction indicated by the arrows; and

Fig. 10 is a sectional view taken substantially on the line 10—10 of Fig. 2 in the direction indicated by the arrows.

The machine of my invention has been particularly designed for the packing of a predetermined weight of tuna in each of successive cans or other containers. However, the machine of my invention may be adapted to the packing of other materials in bulk such as various kinds of fish, meat and certain types of vegetables, for example, sauerkraut and spinach. Moreover, the principles of the machine of my invention may be adapted to the packing of non-food products, particularly those which are of a bulky, pliable character.

The machines of the above mentioned patent and application have met with outstanding commercial success and have revolutionized that portion of the tuna industry which is concerned with the packing of the tuna into cans or other containers after the tuna has been cleaned. Substantially the entire industry has been changed over in the matter of a few years from hand packing to machine packing of tuna. While the method and machine of the above mentioned patent and application have met with outstanding commercial success, some difficulty has been encountered in the packing of soft or fresh fish.

A large proportion of the tuna brought to the tuna packing centers of the west coast is caught at a long distance from the packing centers. Tuna clippers range thousands of miles from their home ports and may be away at sea for many weeks at a time. Under such conditions the clippers must be provided with refrigeration equipment to freeze the fish as they are caught. A considerable volume of tuna is also imported into this country in a frozen condition, notably from Japan. The flesh of such tuna when canned after thawing and cleaning, is usually relatively firm and the tuna loins are capable of withstanding an appreciable forming force exerted upon them. The machines and method of the above mentioned patent and application are admirably suited to the packing of such relatively firm fish. However, large quantities of tuna, particularly albacore, are caught within a few hundred miles of the major tuna packing ports on the west coast. This fish is usually not frozen and is brought to port in a fresh state. Such fish is usually relatively soft and tends to break up if the forming forces employed in packing the tuna into cans is too harsh. The primary purpose of this invention is therefore to provide a method and machine which, while suitable for packing tuna the flesh of which is relatively firm, has been primarily designed for the packing of relatively soft or fresh fish.

The machine of my invention comprises a loading and conveyor section **10**, a roll forming section generally indicated by the numeral **11**, a chucking, cutting and transfer section generally indicated by the numeral **12**, a gear housing **13** containing the mechanism for driving the elements of the sections **10**, **11** and **12** and an electric motor **14** for driving the mechanism within the gear housing **13**. The motor **14** may be either of the variable speed or constant speed type.

The machine is mounted upon a base or bedplate **16**. The machine mounting includes a pedestal **17** carried by the bedplate and an apron **18** preferably integral with the pedestal **17**. The gear housing **13** is also supported on the bedplate **16**.

The loading and conveyor section (Figs. 1, 2 and 10) comprises two belts **19** which, as shown in Fig. 10, are arranged in the shape of a **V** to provide a trough open at the top into which the tuna loins may be loaded or packed. Upon reference to Fig. 2 it will be observed that this trough is relatively long, at least sufficient in length to enable at least one person to stand adjacent the machine and load the trough formed by the belts **19** with the loins of tuna extending lengthwise of the trough in overlapping relation (see Fig. 2). It is desirable that the trough be substantially uniformly loaded with tuna loins so that the weight of tuna per unit of length of the loading and conveyor section is substantially a constant. This aids in securing more uniform weight of the slices of tuna cut off in the manner presently to appear. With some practice, an operator becomes quite proficient in securing approximately uniform loading, the depth of the trough and its cross sectional area serving to some extent as a visual measuring chamber to guide the operator.

The belts **19** are driven by a pair of flanged driving rolls **21** (Fig. 2) each of which is keyed to a shaft **22** (Fig. 10). The shaft **22** projects into a housing **23** and is suitably journaled as indicated at **24**. A worm wheel **26** is located within the housing **23** is rigidly secured to the shaft **22**. The worm wheel is driven by a worm **27** keyed to a shaft **28**. The two shafts **28** (Fig. 2) extend through bores formed in the housings **23** and are driven in a manner which will presently appear. The housings **23** are supported by brackets **29** integral therewith and mounted on the apron **18** as shown at **31** (Fig. 10).

The belts extend rearwardly of the machine beyond the end of the roll forming section **11** substantially to the chucking, cutting and transfer section **12** (Fig. 1). The belts **19** pass around idler rolls **32** where they form part of the end of the roll forming section **11**. Shields or thin support plates **33** having side flanges lie beneath each of the belts **19**. These support plates **33** at the forward end of the machine are substantially tangent to the driving rolls **21** and at their rearward ends extend substantially tangent to the idler rolls **32**. These support plates **33** prevent the belts from sagging when loaded with tuna and also function to form part of a tunnel for forming the loins of tuna into a roll of tuna as will presently appear. The idler rolls **32** are freely rotatable on stub shafts **34** which are supported by a casting **36** (Fig. 6) rigidly secured as shown at **37** on the pedestal **17** (Fig. 1).

A filler piece **38** essentially **V**-shaped in cross section (Fig. 10) closes the longitudinal space between the lower edges of the belts **19**. This filler piece extends from the forward end of the machine adjacent the driving rolls **21** to a position beyond the idler rolls **32**. The filler piece prevents small pieces of tuna which may break off from the loins from dropping out of the trough. The filler piece is supported at the forward end of the machine by backets **39** (Fig. 10) mounted on the apron **18** and adjacent the end of the roll forming section from the brackets **36**.

The roll forming section **11** comprises the belts **19** and their associated parts, together with belts **41** which form a molding space or tunnel **42** which, as viewed in Fig. 10, is essentially rectangular in cross section. The function of the roll forming or molding section of the machine is to mold the loins of tuna into a substantially homogeneous mass or roll of tuna which is of substantially constant weight per unit of length. It will be particularly noted that the forces exerted by the belts **19** and **41** are in a direction transverse to the length of loins as they appear in Fig. 2. The forming forces are entirely transverse to the lengthwise extent of the loins and parallel to the natural flake or layer structure of the tuna. Heavy molding forces are avoided because the entire tunnel is moving and only slight slippage of loins occurs with respect to the belts. Extensive rubbing of the sides of the loins by contact with the belts is thus maintained at a minimum.

The belts **41** pass over and are driven by large pulleys **43** (Fig. 10) and small idler pulleys **44** (Figs. 2 and 6). Each of the large pulleys **43** is keyed (Fig. 10) to a shaft **47**. The shaft **47** is suitably journaled as shown at **48** and extends into a housing **49**. A worm wheel **51** is mounted on the end of the shaft within the housing and is driven by a worm **52** keyed to a shaft **53**. As shown most clearly in Fig. 2, the shafts extend through the housing **49** and are driven in a manner which will presently appear.

The casting of which the housing **49** is a part, has an extension **56** which is provided with a pair of slots **57**. The slots are elongated in a direction such as to enable a shifting of the housing **49**, together with the pulley **43**, angularly 45° with respect to the horizontal so as to increase or decrease the molding space provided by the tunnel **42**. The extension **56** through the slots **57** is bolted, as shown at **58**, to a bracket **59** carried by the pedestal **17** as shown at **61** (Fig. 1).

The idler rollers **44** (Fig. 6) freely rotate on shafts **62** (see also Fig. 9) the ends thereof being carried in openings formed in guide plates **63** and **64**. The guide plates **63** are supported from a casting **66** (Fig. 9). The assembly formed by the rollers **44**, guide plates **63** and **64** and casting **66** is carried by a bracket **67** which is an extension of the bracket **36**. The bracket **67** has an enlarged bore **69** for the reception of a bolt **71** which is threaded to receive a bearing washer and wing nut **72**. The enlarged bore **69** enables the idler rollers to be shifted in a direction 45° with respect to the horizontal to shift the idler rollers toward and from the central axis and thereby increase or decrease the molding space defined by the tunnel **42**. The enlarged bore **69** also enables shifting of the idler roller forward and rearward of the machine.

Upon an examination of Fig. 1 and particularly Fig. 6, it will be observed that the sets of idler rollers **32** and **44** lie substantially at the discharge end of the tunnel. Thus the smallest cross-sectional area of the tunnel is determined by the relationship of these idler rollers and the cross-sectional area of the tunnel at this point determines the cross-sectional area of the roll to which the tuna is molded. It will further be particularly noted from an examination of Fig. 6 that the belts **41** overlie the belts **19**. The position of the idler rollers **32** is fixed. However, as described above, the position of the idler rollers **44** is adjustable.

From the above it will be clear that a number of adjustments of the forming tunnel or molding space **42** is possible. Upon loosening the wing nuts **72**, the bolts may be shifted in their enlarged bores **69** to shift the belts **41** (Fig. 6) inwardly or outwardly with respect to the axis of the tunnel **42** so as to decrease or increase the cross-sectional area to which the roll is molded. It is also possible as will be clear from the above and an examination of the structure that the idler rollers **44** may be shifted around the axis of the large pulleys 43. Moreover, as previously mentioned, the pulleys 43 are adjustably positioned by reason of the slots 57 (Fig. 10). In addition, both the large pulleys and the small idler rollers may be adjusted simultaneously to vary the cross-sectional area of the tunnel 42 at various points along its length.

The above enumerated adjustments are important because of the variable conditions encountered in packing tuna. The tuna will vary in moisture content, density and degree of firmness depending upon whether it is fresh caught or has been frozen and only recently thawed. These conditions may vary from hour to hour and by the means described, the tunnel may be adjusted by the operator with little or no interruption in production. The tunnel may be made constant in cross-sectional area throughout its length; made to decrease in cross-sectional area toward the discharge end; or may be increased or decreased in cross-sectional area as a whole to increase or decrease the pressure applied on the loins.

The tunnel 42 at its entrance end is provided with what may be termed a funnel 76 (Figs. 2 and 10). The funnel has angularly shaped portions 77 which are at right angles to each other to conform to the angular relationship of the large pulleys 43. The funnel 76 is secured to the guide plates 63 by adjustable means which includes U-shaped slots 78 and screws. The forward end of the funnel is curved upwardly and rounded as shown at 79 (Fig. 10) to form an enlarged entrance for the reception of the loins of tuna. The curvature of the forward end of the funnel is such that it conforms substantially to the circular shape of the large rolls and is tangent to these rolls at a point spaced inwardly from the entrance end.

At the discharge end of the tunnel the machine is provided with what may be termed a "discharge throat." This discharge throat is made up of the two castings 64 (Fig. 9) and two plates 81, one of which is shown in Fig. 9. As will be observed, the castings 64 have a portion which is curved around the idler pulley and terminates in an edge 82 and a surface 83 which lies tangent to the belts 41. The discharge throat plates 81 are also curved, as shown at 84, and have a surface 86 which lies tangent to the belts 19. As will presently appear the discharge throat formed as set forth above, receives the end of the roll of tuna and serves to hold it rigidly in position during cut-off.

As previously mentioned, support plates 33 extend substantially the full length of the belts 19. The belts 41 are also supported by bars 87 (Fig. 2) to avoid any extensive deflection of the belts 41. Thus the tunnel 42, while essentially fixed in cross-section when once adjusted can yield to some extent by reason of the fact that the upper belts 41 are not supported throughout their length as is the case with the lower belts 19.

The mechanism thus far described forms the whole loins of tuna laid into the V-shaped trough into a roll of tuna essentially square in cross-section conforming to the shape of the tunnel 42 (Fig. 10). Thereafter, briefly stated, mechanism is provided for intermittently feeding the roll of tuna forward to a cut-off position in which position the portion of the roll to be cut off is enclosed within a chuck; chuck closing mechanism is operated to close the chuck and form the roll of tuna into a cylinder of tuna somewhat smaller than the diameter of the container into which the tuna is to be packed; then a knife sweeps across the face of the chuck to cut off the formed section of tuna; the chuck filled with a slug or cake of tuna, together with a can in alignment therewith, is indexed out of the cut-off position to a container filling position; and then discharge mechanism is operated to force the formed cylinder or slug of tuna out of the chuck into the container. All of the above operations are in timed relation with each other and the mechanisms for carrying them out are driven from the motor 14. The various mechanisms will be described in the order above set forth.

The motor 14 has a drive shaft 88 which has a pulley 89 rigidly secured thereto. The pulley 89 drives a belt 91 which extends over a driven pulley 92. The driven pulley 92 is mounted on the end of a shaft 93 which extends through the wall of the housing 13. A sprocket rigidly secured to the shaft 93 drives a chain 94 which drives a sprocket rigidly secured to a main shaft 96. All of the mechanisms set forth above in outline form are driven from the main shaft 96.

The mechanism for intermittently advancing the feeding and form belts 19 and 41 to move a section of the tuna into the forming and cut-off position comprises a feeding cam 97 rigidly secured to the main shaft 96 (Fig. 2). This cam has a single lobe and actuates a belt drive arm 98. For this purpose the belt drive arm is pivoted on a pivot rod 99 rigid with respect to the housing 13 as shown at 101 (Fig. 1). The belt drive arm 98 carries a roller 102 which rides on the belt feeding cam 97. A spring (not shown) normally urges the belt drive arm 98 in a counterclockwise direction as viewed in Fig. 4 so that the roller is always maintained in engagement with the belt feeding cam 97. Thus as the feeding cam is rotated the belt drive arm 98 is oscillated about the pivot 99 completing an oscillation each time the feeding cam 97 makes a complete rotation. A link 103 is pivoted at 104 to the upper end of the belt drive arm 98. The other end of the link is pivoted at 106 to a slide block 107. The slide block 107 is movable in ways 108 in a manner which will presently appear. The ways 108 are formed integral with an oscillating member 109 mounted on a shaft 111.

The intermittent feed for the feeding belts and the means for adjusting the amount of feed have been shown somewhat diagrammatically, the mechanism actually employed being known as a form sprag the relatively complicated details of which need not be shown. In the drawings, I have shown a pivoted pawl 112 carried by the oscillating member 109 which is pressed by a spring (not shown) into engagement with a ratchet wheel 113. The ratchet wheel, also for purposes of illustration, is integral with a gear 114 which drives a pinion 116 rigidly secured to a shaft 117. A sprocket 118 rigid with the shaft 117 drives a chain 119 which passes over three additional gears 121 each of which is secured to a shaft numbered respectively 122, 123 and 124.

The four shafts 117, 122, 123 and 124 project forwardly through the housing, three of these shafts being shown in section in Fig. 3. In Fig. 2 I have shown one of the upper shafts, the shaft 123 projecting through the forward wall of the housing 13. The shaft 123 is connected through a universal joint assembly 126 to a short drive rod 127 which is connected by a universal joint assembly 128 to the shaft 53 which drives the large pulley 43 shown at the right of Fig. 10. The shaft 122 similarly projects through the housing and is connected by universal joint assemblies and a drive rod similar to the corresponding parts above described and drives the other large pulley 43. The lower shafts 117 and 124 similarly project through the housing 13 and are connected by universal joint assemblies and long drive rods 129 to the shafts 28.

As previously described, the shafts 28 and 53 drive the feeding and forming belts 19 and 41. The shafts 117, 122, 123, and 124 are intermittently rotated as previously described so that one forward step of the feeding and forming belts 19 and 41 is taken each time the belt feeding cam 97 is rotated.

As previously mentioned, the condition of the tuna and its specific gravity as it is packed varies to a wide extent. For this reason means are provided for adjusting the amount of feed of the feeding and forming belts 19 and 41. Such means (Fig. 4) comprises a feed screw 131 which extends through the slide block 107. This feed screw 131 is connected by universal joint assemblies 132 and a rod 133 to a hand wheel 134 extending above the top of the housing 13. By means of the hand wheel 134 the feed screw 131 may be rotated to shift the slide block 107 in the ways 108 formed in the oscillating member 109. Downward adjustment of the slide block 107 increases the amplitude of movement of the oscillating arm 109 and hence the amount of feed of the feeding and forming belts 19 and 41 for each rotation of the belt feeding cam 97.

As previously mentioned the adjustment mechanism has been shown only diagrammatically, the actual mechanism employed being known as a form sprag mechanism. It is sufficient to state that a form sprag mechanism is equivalent to a pawl and ratchet wheel construction in which the ratchet wheel has an infinite number of teeth. Thus by adjustment of the hand wheel 134 a small increment or decrement in the amount of feed of the feeding and forming belts 19 and 41 may be made. As will presently be shown, the operation of all other mechanism is maintained at a constant, considering the motor to be driven at constant speed so that an adjustment of the amount of movement of the feeding and forming belts 19 and 41 will vary the thickness of the slice or slug of tuna cut from the roll as will presently appear. It is important that this adjustment be extremely fine and that the machine be capable of adjustment without interrupting its operation as the latter means a loss of production. Inaccurate weights of tuna is extremely serious to the canner, not only because of Government weight standards but also because tuna is an expensive fish and overweight cans of tuna must be avoided if the canner is to make a profit.

By the means above described, the roll or elongated mass of tuna is intermittently fed forward to a rotatable chuck assembly generally indicated by the numeral 141 (see Figs. 3, 7 and 8). The chuck assembly comprises a rotatable disc 142 keyed to a shaft 143 (Fig. 1). The chuck disc 142 has a plurality of cavities or semi-cylindrical openings 144 formed peripherally thereof, the partial cylinders being somewhat smaller in diameter than the diameter of the container into which the tuna is to be packed. These semi-cylindrical openings 144 adjacent the periphery of the chuck disc have flat parts 145 adapted to slidably receive movable chuck parts generally indicated by the numeral 146.

Each of the movable chuck parts 146 includes an extension 147 and a pair of angularly extending forming parts 148. The inner side of these angularly extending forming parts 148 together with the inner end of the extension 147 provides a forming surface, indicated by the numeral 149, which as presently will appear engages the sides of the roll of tuna to form it into the shape desired. The forming section 148—149 may be a section of a cylinder or may be shaped as shown which closely approximates the contour of a cylinder. The rearward sides of the angularly extending forming parts 148 are flat and adapted to slide upon the flattened peripheral ends of the semi-cylindrical openings 144 formed in the chuck disc 142.

The chuck disc has a series of peripheral guides 152 which extend parallel to radii and which are provided with ways 153 for the reception of slide elements 154 formed on the sides of a movable chuck part 156. Each of the movable chuck parts 156 is cut out to form a section 157 which is a partial cylinder. The partial cylinder 157 terminates in portions 158 constituting a slide for the angularly extending forming parts 148 of the movable chuck parts 146.

The guides 152 serve as a support for springs 159 as shown at 161. The other ends of the spring are wrapped around pins 162 carried by the extensions 147. The function of the springs 159 is to move the forming surfaces 148, 149 to the movable chuck parts 146 away from each other and at the same time exert pressure on the movable chuck part 156 and urge it in an upward direction as viewed in Fig. 7.

It will now be understood that the roll or elongated mass of tuna is formed by the tunnel into essentially a square roll (Fig. 6) and the end of this roll is fed toward and inserted in the chuck when in the open condition shown in Fig. 7. With the chuck in the open position the chuck opening is substantially larger than the cross-sectional area of the section of tuna inserted therein. By mechanism presently described, the chuck is closed by moving the movable chuck part 156 downward from the position shown in Fig. 7 to the position shown in Fig. 8. Downward movement of the movable chuck part 156 exerts pressure on the outer sides of the angularly extending forming parts 148 and this pressure causes the movable chuck parts 146 to move from the position shown in Fig. 7 to that shown in Fig. 8. The closing of the chuck changes the cross-sectional shape of the tuna within the cavity formed by the chuck to form an essentially cylindrical section or slug of tuna slightly smaller than the cross-sectional area of the can or other container in which the tuna is to be packed.

The means for closing the chuck to form the cake or slug of tuna prior to cut off comprises a chuck-closing cam 164 (Figs. 2 and 7) adapted to engage the movable chuck part 156 as shown at 166. The chuck-closing cam 164 is keyed to a shaft 167 (see also Fig. 2).

As shown most clearly in Fig. 4, the chuck-closing shaft 167 extends into the housing 13 and is rigid with an arm 168. The other end of the arm 168 has a roller 169 mounted thereon which rides on a cam 171. The cam 171 is mounted on the main shaft 96 and has a single lobe adapted to actuate the arm 168 and hence close the chuck once during each rotation of the main shaft. A spring (not shown) maintains the arm 168 in a position such that the roller 169 rides on the cam 171.

Cans enter the machine from a can loft through a can chute 173 (Figs. 1 and 3). The can chute 173 is rigidly secured to and spaced from the housing 13 by bolt and spacing sleeve assemblies 174. The cans drop into the pockets 176 of a can turret 177. The forward wall 178 of the can chute lies closely adjacent the discharge side of the chucks as shown in Fig. 1. It serves as an abutment against which the end of the roll of tuna is fed in the manner described above. Thus, when the chuck closes, the slug or cake of tuna is confined by the abutment plate 178 and the chuck. That portion of the roll not within the confines of the chuck is rigidly held by the discharge throat plates 81 and 83 (Fig. 9).

While held in the manner above described and during the interval when forward motion of the roll of tuna is interrupted, the slug or cake of tuna within the confines of the chuck is cut off by a guillotine knife 181 (Fig. 5). From an examination of Fig. 9, it will be clear that only sufficient space exists between the entrance face of the chuck and the outer ends of the plates 81 and 83 forming the tunnel discharge throat for the knife to descend and move downward through the roll of tuna to make the cut. Since the roll of tuna while it is cut is confined and held rigidly on both of the sides of the cut, the exposed surfaces are cut cleanly.

As previously mentioned, means have been provided for varying the thickness of the slice or slug of tuna from the roll. It will be understood that the plate 178 forms an abutment against which the roll of tuna is fed. If it is desired to increase the weight of the slug or cake of tuna cut off, the amount of movement of the forming tunnel is increased by a small increment which serves to compress the tuna slightly against the wall 178, thus increasing the amount of fill. Since the size of the chucks and the cross-sectional area of the forming space is substantially that required to accommodate the proper weight of tuna, only slight changes in the cross-sectional area of the tunnel or the amount of feed is required to adjust the weight for a proper fill of the containers.

The guillotine knife 181 is mounted on an arm 182 which is rigidly secured to a shaft 183 (Figs. 2 and 5).

The knife shaft **183** projects into the housing **13** and an arm **184** is rigidly secured thereto. The other end of the arm is pivoted to a link **186**, the other end of the link being pivoted, as shown at **187**, on the end of an arm **188**. The arm **188** pivots on a rod **189** rigid with the housing **13** and has a roller **191** mounted on the other end thereof which rides on a knife cam **192**. A spring (not shown) maintains the arm **188** in the down position shown in Fig. 4 with the roller **191** riding on the knife cam **192**. The cam **192** is rigid with the main shaft **96** and actuates the knife **181** to provide a cutting stroke and a return stroke of the knife once during each rotation of the main shaft **96**.

After the chucks have been filled and closed and the slug or cake of tuna to be placed in the container has been cut off as described above, the chuck assembly **141** together with the container or can turret **177** is rotated. As will be observed from an examination of Fig. 3, six chucks are provided so that upon each rotation, the assembly of chucks and can turret rotates through 60 degrees. For this purpose the chuck assembly is keyed as shown at **196** to the shaft **143**. The shaft projects through an elongated bored boss **198** formed in the housing **13**, suitable bearings **199** being provided to support the shaft.

The can turret **177** comprises two circular plates or discs in which the can pockets **176** (six in number) are located. The can pockets **176** are in alignment with the chuck opening when the chuck is in the closed position shown in Fig. 8. The discs forming the can turret **177** have central openings, the margins of which extend in encircling relation to the boss **198** and are tied to the chuck disc **142** by means of bolts **201**. Suitable spacing sleeves **200** separate the discs forming the can turret and separate the can turret from the chuck disc **142**.

The shaft **143** projects into the housing **13** and a Geneva motion gear **202** is keyed to the end of the shaft. Referring to Fig. 4, the Geneva motion gear **202** has six stations or pockets, for the reception of an actuating element **203** formed on a Geneva motion member **204**. Since the Geneva motions are well understood in the art, it will not be further described, it being sufficient to state that the Geneva motion member **204** is keyed to the main shaft **96** and for each complete rotation of the main shaft the Geneva motion gear **202** is moved through one station or 60°. This rotation of the can turret **177** and the chuck assembly **141** rotates these parts counterclockwise as viewed in Fig. 3 to a position where mechanism is provided to transfer the cake or slug of tuna from the chuck into the can or other container to be filled.

At the can filling station, a combined plunger and tamper **208** is provided (Fig. 2). This plunger is slightly smaller than the diameter of the can and the chuck when closed. It is adapted when actuated to push the slug or cake of tuna out of the closed chuck and transfer the slug of tuna to the can. The plunger enters the can slightly and pushes the slug of tuna to the bottom thereof, exerting a slight pressure on the face of the slug when bottomed in the can to smooth the surface. The cake is deposited below the rim of the can a distance sufficient to provide proper head space in the can.

The plunger **208** is secured to a plunger rod **209** which is slidably supported in a connecting arm **210**. A spring **211** is interposed between the plunger **208** and the connecting arm **210**. A suitable stop **215** is provided to retain the plunger rod **209** in the bore provided in the connecting arm **210**. Thus the pressure applied on the plunger or tamper **208** is a yielding one, the spring yielding and limiting the force applied on the slug of tuna when deposited in the container.

The connecting arm **210** is rigidly secured to a tamper rod **212** which projects through a bore provided in the housing **13** within which bore the tamper rod **212** is slidable. A pair of flat bars **213** are rigidly fixed to the rod **212** to form a yoke slotted as shown at **214** to receive the pivot pin **217** of the bar lever **216**. The other end of the lever **216** is pivoted, as shown at **218**, on a boss rigid with the interior wall of the housing **13**. Intermediate the end of the arm **216**, a roller **219** is secured which rides in a cam groove **221**. The cam groove is formed in a cam **222** which is keyed to the main shaft **96**. It will now be understood that for each rotation of the main shaft **96**, the plunger **208** is moved from the solid line position to the dotted line position shown in Fig. 2 and restored to the solid line position shown in that view.

Upon the next rotation of the can turret, the can just filled is rotated through 60° and a filled new chuck and can presented to the tamper or plunger **208**. The filled can is intercepted by the end **216** of a can chute **218** for discharge of the filled cans from the machine. During their passage from a position of alignment with the plunger to the discharge can chute **218**, the cans are confined by a can guard **219** which encircles the path of movement of the cans.

Upon an examination of Fig. 3, it will be noted that the chuck closing cam **164** is formed on the arc of a circle. This arc is substantially coincident with the curvature of a chuck retaining guard **221** which encircles the axis of rotation of the chuck. When the movable chuck part **156** rides from beneath the chuck closing cam **164**, it rides beneath the chuck guard **221** which retains the chuck in the closed position during discharge of the slug of tuna from the chuck until the chuck reaches a position adjacent the discharge chute **218**.

It is believed that from the foregoing the construction and operation of the machine of my invention will be understood. However, briefly the operations occur in this sequence. The loins of tuna are manually deposited on the belt **19** and moved into the forming tunnel which forms the tuna into an elongated roll essentially rectangular in cross-sectional area. This tunnel may be adjusted in the manner described above. The end of the roll is inserted in an open chuck as the roll is intermittently fed forward. Thereafter the chuck is closed and the slug or cake of tuna within the chuck is cut off while the material is rigidly held on both sides of the cut. Thereafter the chuck and cans are indexed to the can filling position, in which position the cans are filled and tamped. Thereafter the chuck assembly is again indexed and the filled cans discharged from the machine as above described.

While I have shown and described the preferred form of my invention, it will be apparent that various changes and modifications may be made therein, particularly in the form and relation of parts, without departing from the spirit of my invention as set forth in the appended claims.

I claim:

1. A machine for packing materials into a container of substantially constant cross-section comprising, in combination, a moulding tunnel at least part of the walls of which are movable for moulding the material into an elongated roll of substantially constant weight per unit of length, said weight per unit of length being substantially that to be placed in the container, a moulding chuck movable from an open to a closed position and into which the end of said roll of material is fed by said movable tunnel, means for opening and closing the chuck to mold the material within the chuck into a section of material of container size and shape, means for cutting off said section from said roll, and means for moving the movable walls of said tunnel.

2. A machine in accordance with claim 1 in which part of the moulding tunnel is elongated in a direction forwardly of the machine to form a loading station in which loins of tuna may be placed in overlapping relation.

3. A machine in accordance with claim 1 in which the moulding chuck after the section has been cut off is indexed to a container filling station and means are provided for transferring the section to a container at said station.

4. A machine in accordance with claim 1 in which the moulding tunnel is formed by at least four movable members placed angularly with respect to each other.

5. A machine in accordance with claim 1 in which the moulding tunnel is moved intermittently to move the roll toward the chuck.

6. A machine in accordance with claim 1 in which the tunnel is moved intermittently in steps to move the roll toward the chuck and means are provided for varying the amount of movement of the tunnel at each step to vary the weight of material fed into the chuck.

7. A machine in accordance with claim 1 in which the cross-sectional area of the tunnel may be varied.

8. A machine in accordance with claim 1 in which a series of chucks are mounted in a rotatable turret and means are provided for indexing the turret to move a chuck into alignment with the end of the roll of material and move the filled chuck from said position of alignment to a transfer station.

9. A machine in accordance with claim 1 in which a turret is provided in which a series of chucks are mounted and into which containers to be filled are deposited with their open ends facing and in alignment with the chucks, means are provided for indexing the turret to move a chuck into alignment with the end of the roll of material and move the filled chuck from said position of alignment to a transfer station, and means are provided for transferring the section of material to a container.

10. A machine for packing materials in a container comprising, in combination, means for moulding the material into an elongated roll, a chuck movable from an open to a closed position, means for opening and closing the chuck, means for moving the end of said roll into said chuck when open, and means for cutting off the section of said roll within the chuck after the chuck has been closed.

11. A machine in accordance with claim 10 in which means are provided adjacent the end of the moulding means for enclosing and holding the roll, a cut-off knife, said enclosing and holding means being spaced from the face of the chuck a distance substantially only sufficient to enable the cut-off knife to pass down between the enclosing and holding means and the face of the chuck.

12. A machine for packing materials in a container comprising, in combination, a pair of lower belts and a pair of upper belts arranged to form a substantially rectangular moulding tunnel, the lower belts extending forwardly beyond the upper belts and arranged in a relationship to each other such as to form a trough for the reception of the materials to be packed.

13. A machine in accordance with claim 12 in which at least some of the belts may be adjusted with respect to each other to vary the cross-sectional area of the moulding tunnel.

14. A machine in accordance with claim 12 in which the belts are mounted on rollers the axes of rotation of which may be adjusted to vary the cross-sectional area of the tunnel at any transverse plane along its length.

15. A machine in accordance with claim 12 in which the moulding tunnel has a funnel-shaped entrance.

16. A machine in accordance with claim 12 in which four plates are provided at the discharge end of a tunnel with the plates having planar surfaces which extend tangent to the ends of the belts to form a discharge throat.

17. A machine for packing materials in a container comprising, in combination, means for moulding the material into an elongated roll of substantially rectangular shape of a desired cross-sectional area, means for moulding the end of the roll into a slug of material of circular cross section, means for cutting-off the end of the roll which has been moulded into a slug of circular cross section and means for rigidly holding the material on both sides of the cut during the cutting operation.

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