June 21, 1955 M. S. GRAY 2,711,278

BAG TYING MACHINE

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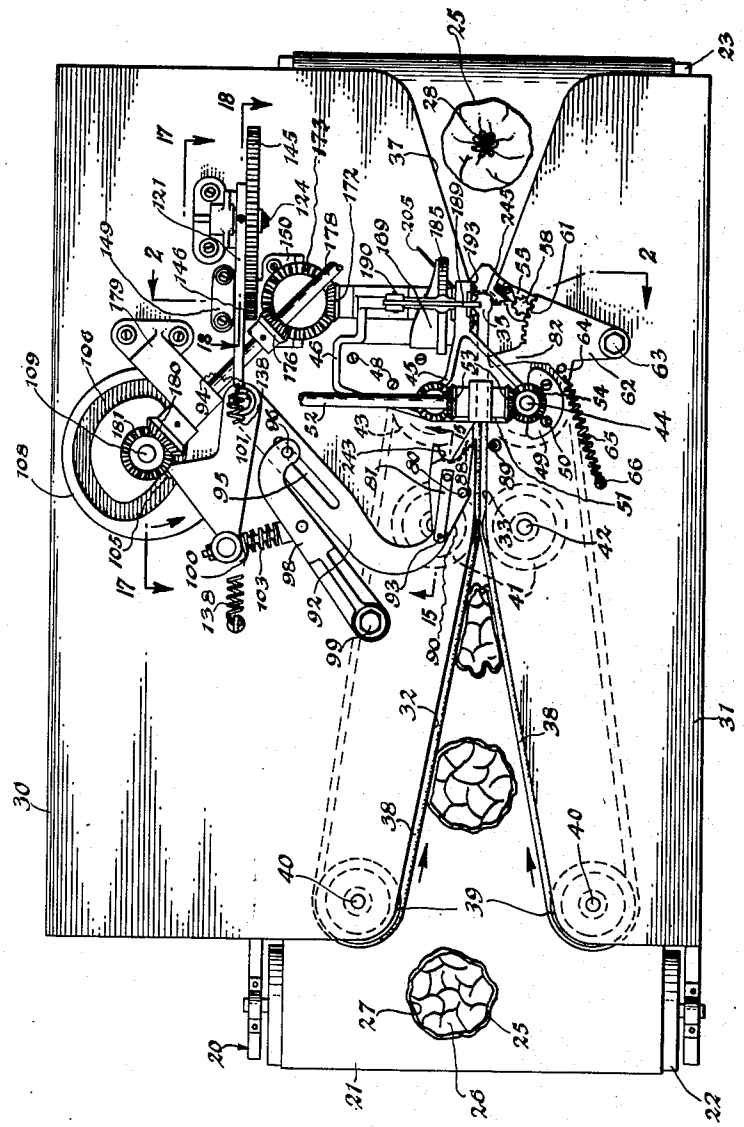


Fig. 1.

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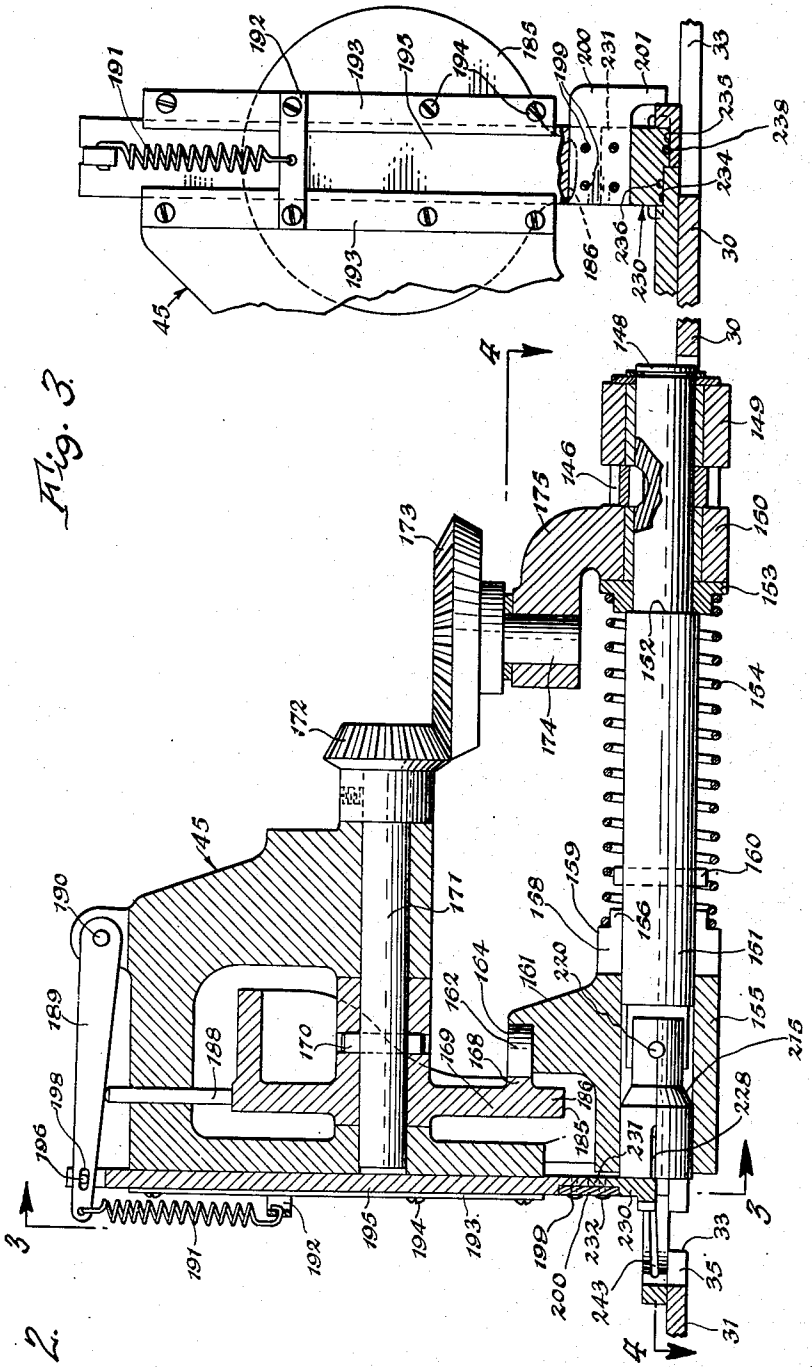


Fig. 3.

Fig. 2.

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BAG TYING MACHINE

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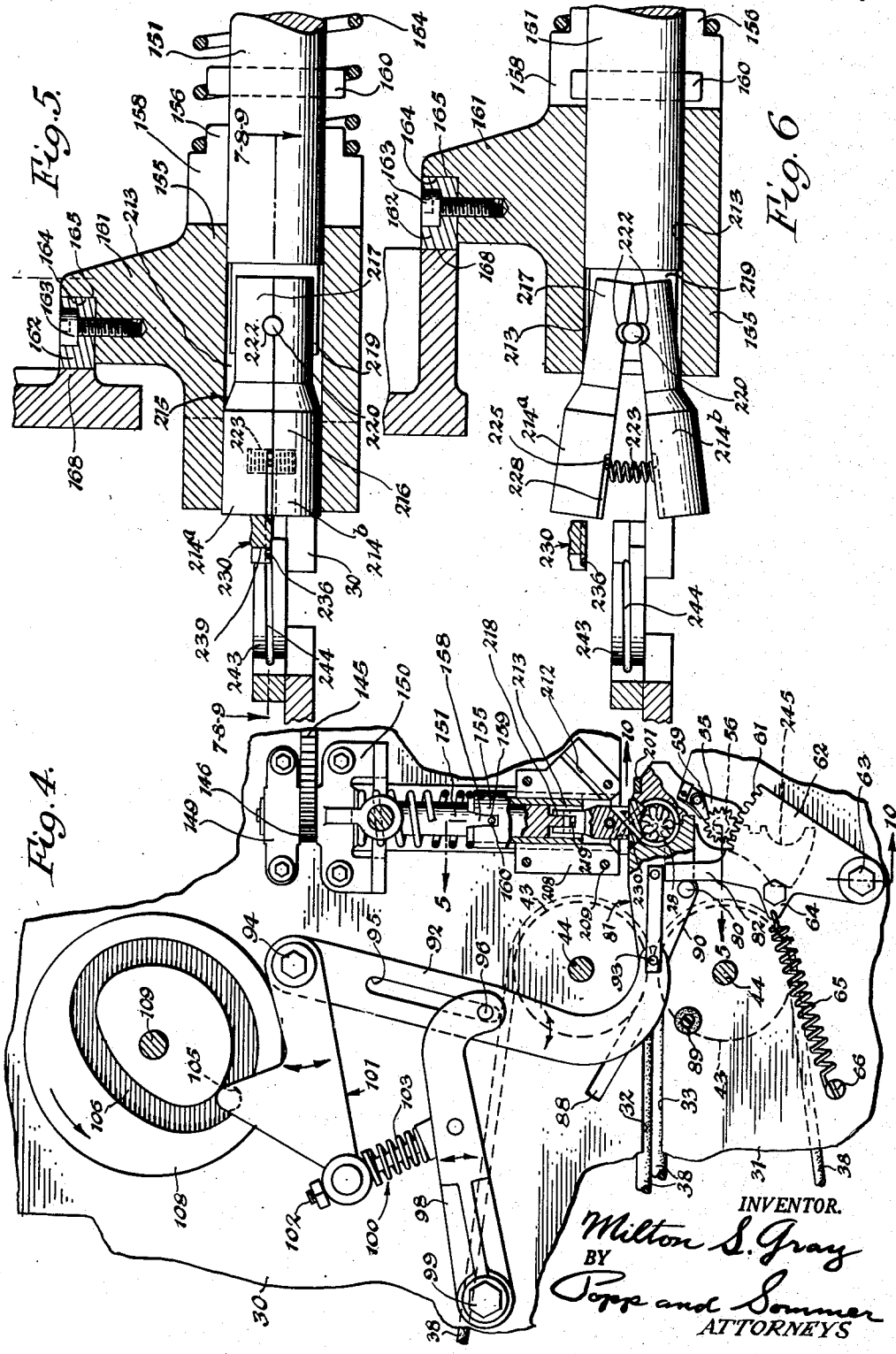


Fig. 4.

Fig. 5.

Fig. 6

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BAG TYING MACHINE

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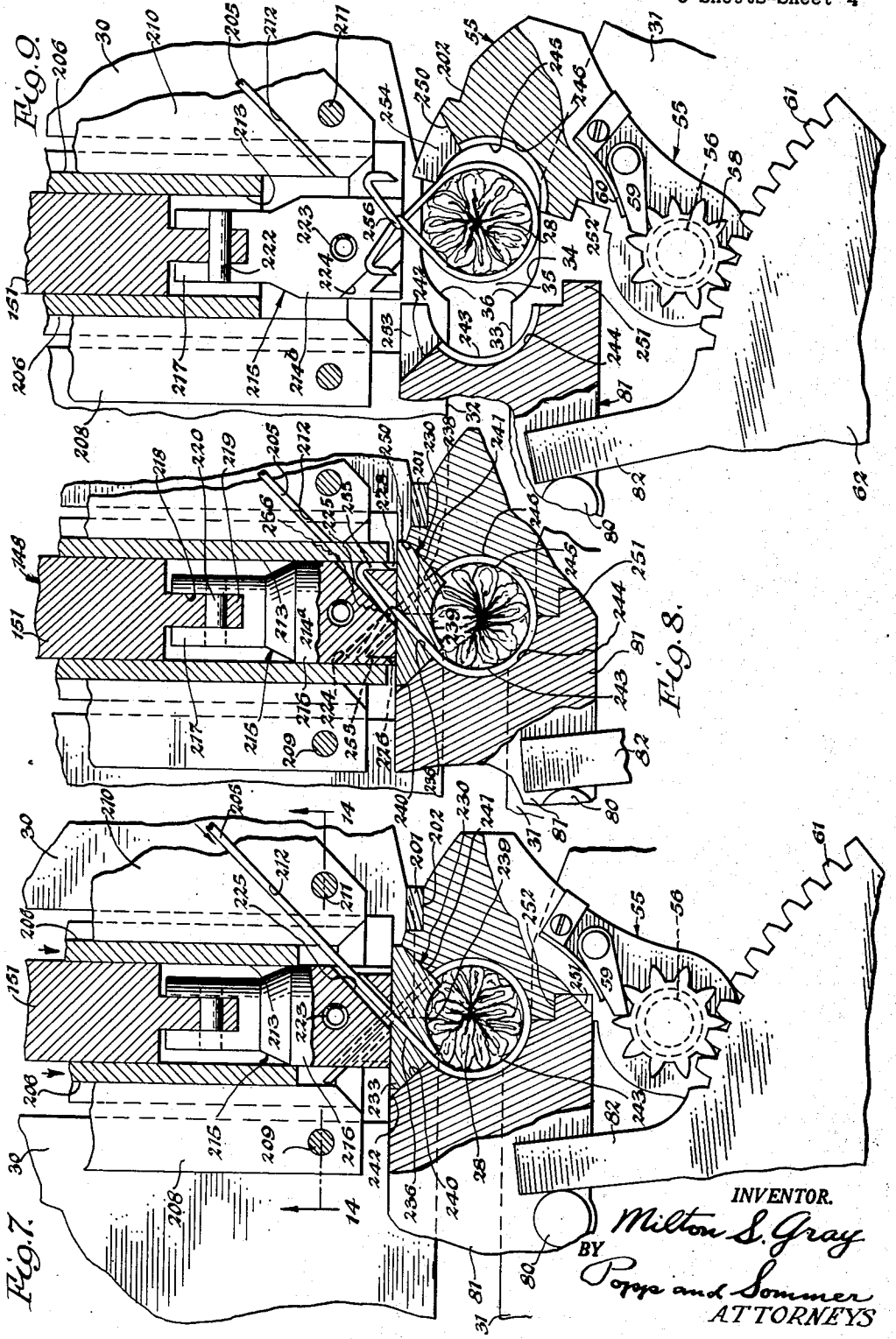


Fig. 9.

Fig. 8.

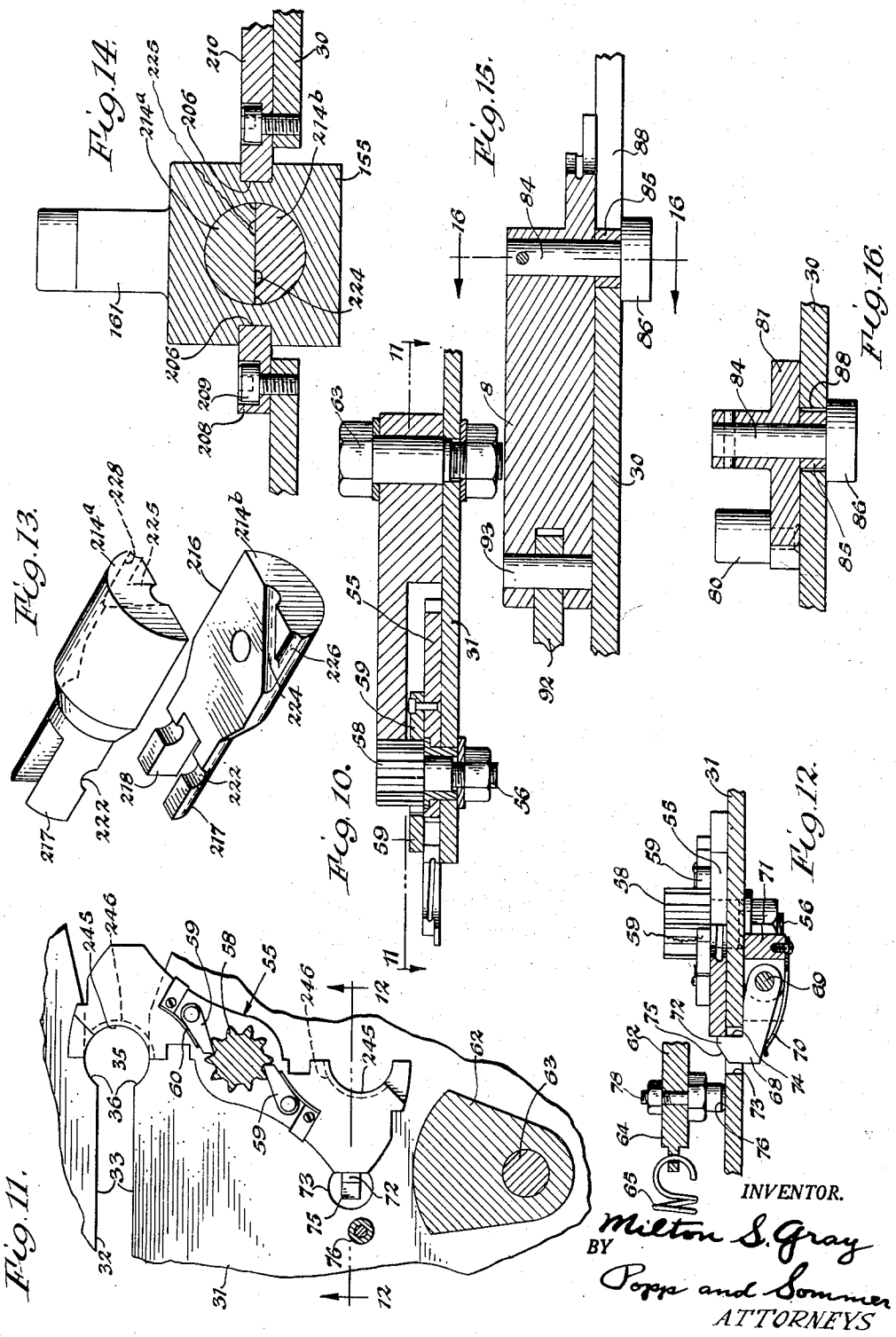
Fig. 7.

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BAG TYING MACHINE

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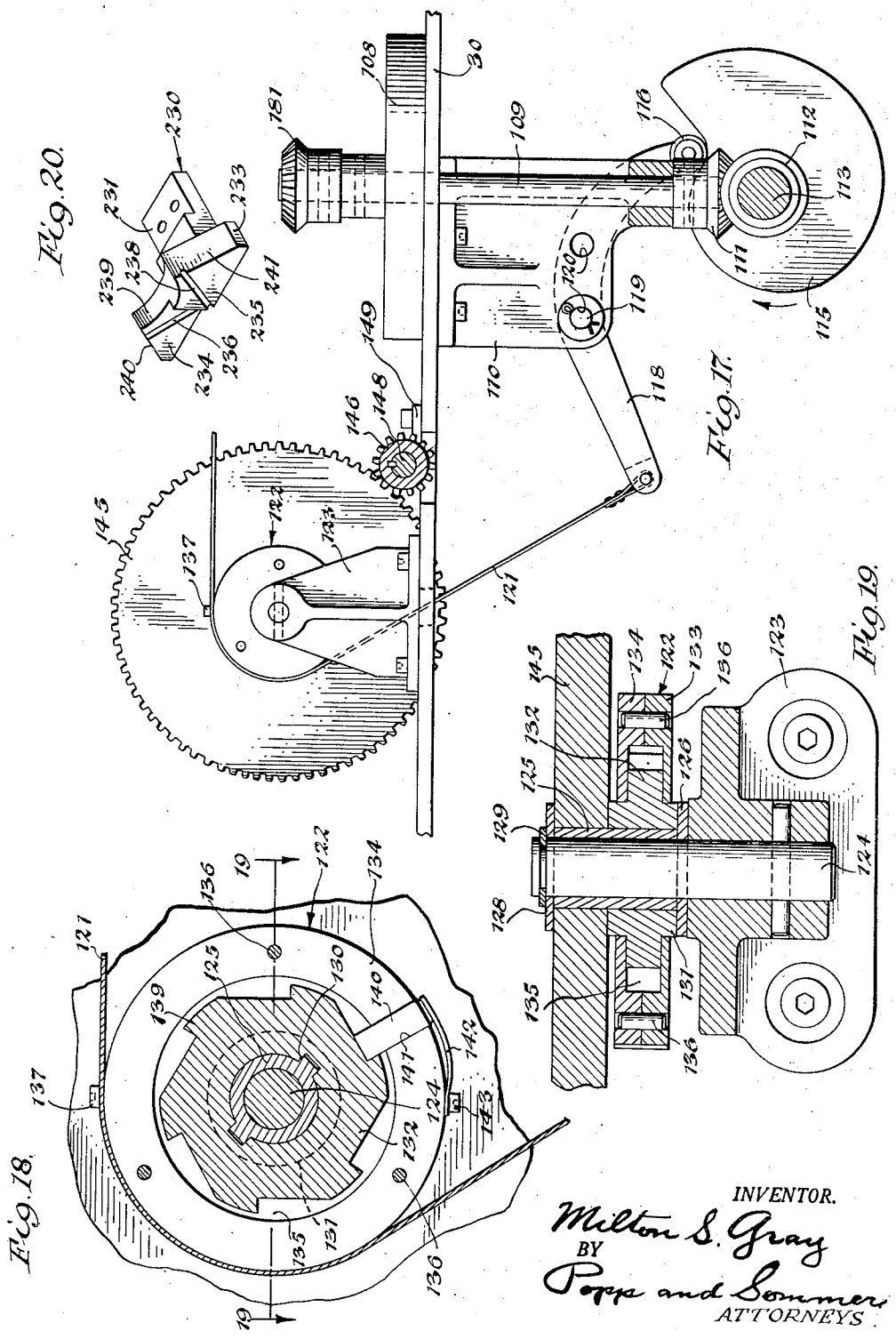


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2,711,278

BAG TYING MACHINE

Milton S. Gray, Wethersfield, Conn.

Application April 30, 1953, Serial No. 352,260

18 Claims. (Cl. 226—57)

This invention relates to a bag tying machine and more particularly to such a machine used in connection with a succession of partly filled bags to gather the mouth of each successive bag into generally cylindrical form; to pass a loop of wire around the gathered neck; to cut off the loop so formed; to form reversely bent hooks on the ends of the cut loops; and to twist these ends together so as to form a closed loop around the neck of the bag and securely hold it closed.

In general the machine comprises an endless horizontal conveyor upon which the partly filled bags are successively placed. As each bag travels along, the sides of its neck are brought together in flat face-to-face relation. The neck is then gathered together by movable forming members which gather the neck into generally cylindrical form. These members are provided with grooves which, when brought together into operative relation provide a continuous passage for the end of the tie wire which is caused by these grooves to encircle the gathered neck of the bag. Means are then provided for cutting the looped wire to the desired length and forming hooks at the ends thereof. These means include a two-part wire forming head rotatably mounted and the tie wire is fed to the forming members through grooves provided in the mating faces of this head. When this two-part head is turned about its axis it twists the ends of the loop any desired number of turns to form a closed loop around the neck of the bag. The parts of this two-part head then separate to release the twisted loop on the neck of the bag.

One of the principal objects of the invention is to provide a machine of this character for applying a twisted loop to the neck of a bag which securely applies the twisted loop to each bag of a succession so that there is no danger of loss of the contents of the bag.

Another object of the invention is to provide such a machine which also provides a hook at each end of the loop so that these ends can radially be untwisted in opening the bag.

Another object of the invention is to provide such a machine which is simple in construction, considering the function which it performs, and is composed of rugged parts which are not likely to get out of order or fail in their function of reliably tying the neck of each passing bag.

Another object is to provide such a machine which is low in cost, considering the function which it performs.

Another object is to provide such a machine which is readily adjustable to provide different numbers of twists in the wire, as may be desired.

Other objects and advantages will appear from the following description and drawings in which:

Fig. 1 is a diminutive top elevational view of a bag tying machine embodying the present invention.

Fig. 2 is a fragmentary enlarged vertical section taken generally on line 2—2, Fig. 1.

Fig. 3 is a fragmentary vertical sectional view taken generally on line 3—3, Fig. 2.

Fig. 4 is a fragmentary horizontal section taken generally on line 4—4, Fig. 2.

Fig. 5 is a vertical section taken generally on line 5—5, Fig. 4, and showing the position of the parts preparatory to the insertion of the tie wire to form a loop around the mouth of the bag.

Fig. 6 is a view similar to Fig. 5 and showing the position of the parts when the wire loop is released.

Figs. 7, 8 and 9 are horizontal sections taken on line 7—7, Fig. 5 and showing successive positions of the parts, Fig. 7 showing the position of the parts immediately after the end of the tie wire has been inserted and a loop formed; Fig. 8 showing the loop severed from the length of the wire and showing hooked ends formed on the severed loop and showing the ends of the loop twisted to form a closed loop around the neck of the bag; and Fig. 9 showing the neck embracing and wire forming parts separated from the neck of the bag and the twisted loop thereon to permit the tied bag to be discharged from the machine.

Fig. 10 is a transverse vertical section taken generally on line 10—10, Fig. 4.

Fig. 11 is a fragmentary horizontal section taken generally on line 11—11, Fig. 10.

Fig. 12 is a longitudinal vertical section taken generally on line 12—12, Fig. 11.

Fig. 13 is an exploded perspective view of the parts of the two part wire forming head used in the machine.

Fig. 14 is a longitudinal vertical section taken generally on line 14—14, Fig. 7.

Fig. 15 is an enlarged longitudinal vertical section taken on line 15—15, Fig. 1.

Fig. 16 is a vertical transverse section taken generally on line 16—16, Fig. 15.

Figs. 17 and 18 are longitudinal vertical sections taken on the correspondingly numbered line of Fig. 1.

Fig. 19 is a horizontal section taken on line 19—19, Fig. 18.

Fig. 20 is a perspective view of a wire forming block or head used in the machine.

The tying machine embodying the present invention is shown as having a supporting frame 20 for an endless horizontal conveyer belt 21, this conveyer belt being shown as mounted on rollers 22, 23 suitably journalled on the supporting frame 20 and one of which rollers is power driven to move the upper stretch of the belt 21 to the right as viewed in Fig. 1. The filled bags 25 to be tied are manually or automatically placed on the left hand end (Fig. 1) of the upper stretch of the conveyer belt 21 and are carried by this belt through the tying mechanism embodying the present invention. The bags 25 are shown as being in the form of heavy paper bags and are filled with the normal quantity of articles, such as potatoes 26, so that the open mouths 27 of the bags project above the contents. In the operation of the tying mechanism of the present invention, the mouths 27 of the bags 25 are brought together and gathered into a neck 28; the end of a length of wire is looped around this neck; this end is thereafter cut off to the required length and at the same time has its opposite ends bent to form hook-like ends; the ends of the cut piece of wire are thereafter twisted together to form a closed loop around the neck of the bag; and the ends of the wire are then released to complete the tying cycle, the tied bag continuing with the belt or conveyer 21 to the discharge end thereof and another bag being presented for tying.

The above bag tying mechanism is mounted on a pair of main horizontal stationary plates 30, 31 which are mounted above the upper stretch of the endless belt 21 in any suitable manner and at such an elevation that the mouths 27 of the filled bags 25 on this upper stretch pass between the opposing edges of these plates. At their

left hand end (Fig. 1) these opposing edges converge to the right, to form a V-shaped throat 32. To the right of this throat 32 the opposing edges of the plates 30, 31 are parallel, as indicated at 33, and in closely spaced relation to each other. At the right hand end (Figs. 1 and 9), the opposing edges of the plates 30, 31 diverge as indicated at 34, to provide jointly a space 35 in which the mouth 27 of each bag is gathered into a neck 28 and in which the tying operation is performed, the left hand end of this space being preferably semicircular, as indicated at 36, to facilitate gathering of the mouth 27 into a round neck 28. Beyond the space 35, the opposing edges of the two horizontal plates 30, 31 diverge to the right as viewed in Figs. 1 and 9 and as indicated at 37 to permit free travel of the tied bags to the discharge end of the machine.

As the bags 25 on the upper stretch of the conveyer belt 21 enter the V-shaped throat 32, their necks are engaged by the converging stretches of a pair of endless side belts 38 which are preferably round in cross section as illustrated in Fig. 4. Each of these belts travels around on the grooved periphery of an idler pulley 39 suitably mounted on the underside of the corresponding plate 30, 31, as indicated at 40, to rotate about a vertical axis. The peripheries of these idler pulleys project into the throat 32 near the inlet end of this throat. Similarly projecting into the throat 32 near the constricted end thereof are the peripheries of a second pair of idler pulleys 41. These idler pulleys 41 are also suitably journalled on the undersides of the plates 30, 31, as indicated at 42, to rotate about a vertical axis and also have their peripheries grooved to support the belts 38.

The adjacent stretches of these belts 38 so supported by the grooved peripheries of the idler pulleys 39, 41 travel along the edges of the throat 32 in position to engage the mouths 27 of the filled bags 25 on the conveyer belt 21. For this purpose each belt 38 also passes around a driving pulley 43 fast to a vertical shaft 44 journalled in a casting 45 which bridges the closely spaced edges 33 of the plates 30, 31. This casting has a base 46 at one end which is suitably secured, as by screws 48, to the upper face of the stationary plate 30 and has a base 49 at its opposite end which is suitably secured, as by screws 50, to the upper face of the stationary plate 31. Between these end bases the casting 45 bridges upwardly, as indicated at 51, to permit the passage of the mouths of the bags.

In this upwardly bridged central part 51 of the casting 45 is journalled a drive shaft 52, this drive shaft having fast thereto a pair of bevel gears 53 each of which meshes with a bevel gear 54 fast to the vertical shaft 44 of the corresponding one of the driving pulleys 43 for the belt 38. It will be seen that turning the drive shaft 52, through the bevel gears 53, 54 and vertical shaft 44, turns the driving pulleys 43 to drive the belt 38. This drive is such that the adjacent stretches of these belts move toward the constricted end of the throat 32 as indicated by the arrows in Fig. 1.

As the mouth of each bag traveling along the throat 32 is engaged by the adjacent stretches of the belts 38, the sides of this mouth are brought together into generally flat, face-to-face closed form, which form is maintained as the mouth of the bag travels along the closely spaced parallel edges 33 of the stationary plates 30, 31. On entering the space 35 at the leaving ends of the closely spaced parallel edges 33, the flattened mouth 27 of each bag engages one end of a double-ended stop arm 55 so that the flattened mouth is gathered or compressed into a generally circular closed neck 28.

This arm is journalled for rotation about a vertical axis on a pin 56 which is fixed to and rises from the stationary plate 31. This pin also carries a loose toothed wheel 58 which is arranged above the double-ended stop arm 55. This double-ended stop arm carries a pair of spring loaded detents 59 each of which is pivoted on the corresponding end of the double-ended stop arm 55 and has an end in engagement with the teeth of the toothed wheel 58. The spring loading for each detent 59 is in the form of a leaf spring 60 anchored on the double-ended stop arm 55 and urging the detent into engagement with these teeth. The arrangement of the detents is such that, looking downwardly, when the toothed wheel 58 is rotated clockwise, the double ended arm 55 is compelled to rotate with this toothed wheel, but on counterclockwise rotation of the toothed wheel 58, the detents travel idly over the teeth of the toothed wheel 58. Accordingly this toothed wheel forms the driving member of a one-way clutch for rotating the double-ended stop arm 55.

The toothed wheel 58 is turned by a gear segment 61 at the end of an arm 62 and which arm is pivoted concentric with the teeth 61 on the stem of a screw 63 fast to the stationary plate 31. This arm 62 is provided on one side with an apertured ear 64 to which one end of a helical tension spring 65 is secured. The opposite end of this helical tension spring 65 is anchored on a screw 66 also fast to the stationary plate 31. This spring 65 biases the arm 62 carrying the gear segment 61 in that direction which urges the toothed wheel 58 toward its clockwise direction of rotation.

A feature of the invention resides in a releasable latch mechanism between the arm 62 carrying the gear segment 61 and the double-end stop arm 55. This latch mechanism, as best shown in Figs. 11 and 12, includes a latch arm 68 on a horizontal pivot pin 69 arranged below and supported by the stationary plate 31. The free end of this latch arm is biased upwardly by the free end of a flat leaf spring 70 the other end of which is secured to a U-shaped stationary block 71 depending from the stationary plate 31, this block also supporting the opposite ends of the pin 69. The free end of the latch arm 68 has an upward extension 72 which extends through a hole 73 in the stationary plate 31 and which is arranged in the path of travel of the arm 62 carrying the gear segment 61. One side of this upward extension 72 is formed to provide an abrupt shoulder 74 while the opposite side is formed to provide an inclined cam surface 75. The abrupt shoulder 74 is arranged to engage the side of the double-ended stop arm 55. The inclined cam surface 75 is arranged to engage the beveled head 76 at the lower end of a pin 78 fast to the arm 62 carrying the gear segment 61. When this head 76 engages and depresses the upward extension 72 of the latch arm 68, the double-ended stop arm 55 is released from the abrupt shoulder 74 of this latch arm.

The arm 62 carrying the gear segment 61 is oscillated about its pivot 63 by a pin 80 mounted on a horizontally sliding neck-forming head or slide indicated generally at 81 and which successively cooperates with each end of the double-ended stop arm 55 in forming the mouth 27 of each bag into generally cylindrical form. The pin 80 is in the path of a generally radial extension 82 of the arm 62 carrying the gear segment 61 so that when the neck-forming slide 81 is slid toward the corresponding companion end of the double end stop arm 55 the pin 80 engages the extension 82 and swings the arm 62 carrying the gear segment 61 clockwise as viewed from above.

The neck-forming slide 81 slides on the upper surfaces of the stationary plates 30 and 31, bridging the space between their closely spaced parallel edges 33. This neck-forming slide is guided to travel along the slot or space between these edges 33 and for this purpose is provided with a pin 84 depending from the neck-forming slide and carrying a roller 85 arranged to travel in this groove. This roller is retained in position and the neck-forming slide retained in contact with the upper surfaces of the plates 30, 31 by an enlarged head 86 at the lower end of the pin 84.

In its retracted position it is necessary that the neck-forming slide 81 be withdrawn from the groove or slot formed by the opposite closely spaced parallel edges 33

of the plates 30 and 31 in order that the mouth 27 of the bag 25 can travel along this slot or groove preparatory to being gathered into cylindrical form and tied. For this purpose a lateral branch groove or slot 88 is provided in the stationary plate 30, this branch groove joining the groove or slot between the parallel edges 33 and forming an angularly extending branch of this last slot or groove. The roller 85 enters this branch groove 88 when the neck-forming slide is retracted and to insure that the roller 85 enters this branch groove 88, a bumper 89 of any suitable form is mounted on the stationary plate 31 in the path of an inclined cam surface 90 on one side of the neck-forming slide 81, the form of this cam surface 90 being such that the leading end of the retracting neck-forming slide is turned to slide upon the stationary plate 30 and its roller 85 to enter the branch groove 88 thereby to withdraw the neck-forming slide from the path of movement of the mouths of the bags to be gathered together and tied.

The sliding movement of the neck-forming slide 81 is effected by a horizontally swinging arm 92 the free end of which is pivotally connected to the neck-forming slide 81 by a vertical pivot pin 93, this pivot pin 93 being at the end of the neck-forming slide remote from its roller 85. The other end of this horizontally swinging arm 92 is pivoted, as indicated at 94, to the stationary plate 30. This horizontally swinging arm is provided with a longitudinal slot 95 in which a pin 96 rides. This pin is at the free laterally extending end of another horizontally swinging arm 98 which is pivotally mounted at its opposite end on the stationary plate 30 as indicated at 99. This horizontally swinging arm is connected at its center by a link, indicated generally at 100, to a bellcrank lever 101. Preferably this link 100 is in the form of a rod 102 which prevents separation of the arm 98 from the bell crank lever 101 and which is surrounded by a helical compression spring 103 to yieldingly hold the arm 98 away from the bellcrank lever 101 the distance determined by the effective length of the rod 102.

The bell crank lever 101 pivots around the pivot pin 94 for the horizontally swinging arm 92 and also carries on its underside a roller 105 riding in the cam groove 106 of a face cam 108.

This face cam 108 is fast to a vertical shaft 109 suitably journalled in the stationary plate 30 and the lower end of which is journalled in a bracket 110 as best shown in Fig. 16. A bevel gear 111 is fast to the lower end of this shaft 109 and meshes with a bevel gear 112 fast to a horizontal drive shaft 113.

This drive shaft carries a cam 115 which is engaged by a roller 116 on one end of a bellcrank lever 118 and which bellcrank lever is pivoted at its center to the bracket 110, as indicated at 119, to swing about a horizontal axis. This pivot pin 119 can also be located in a hole 120 in the bracket so as to adjust the effective throw of the bellcrank lever. In one position of the pin 119 the tie wire is given one twist around the closed neck 28 of the bag and in its other position the tie wire is given two twists.

One end of a draw strap 121 is fast to the other arm of the bellcrank lever 118 and passes through an opening in the stationary plate 30 and around the periphery of a circular housing arranged above this plate and indicated generally at 122. As best shown in Figs. 17, 18 and 19, this circular housing is supported by a bracket 123 mounted on the stationary plate 30 and carrying a horizontal pin 124 which is fast to this bracket and concentric with the circular housing 122. This pin carries a bearing sleeve 125 which is retained between thrust washers 126, 128 and a split washer 129 at the outboard end of the pin 124. To this bearing sleeve 125 is keyed, as indicated at 130, the hub 131 of a ratchet wheel 132. The circular housing 122 is made in the form of two circular counterpart halves 133, 134 jointly forming a cylindrical chamber 135 in which the ratchet wheel 132 is snugly fitted. Each of these housing parts 133, 134 is journalled on the corresponding end of the hub 131 of the ratchet wheel 132 and the two halves 133, 134 are held against rotation with reference to each other by a series of alining pins 136 extending therethrough parallel with the axis of the housing. The draw strap 121 can be secured to the periphery of the two part housing 122 by a pair of screws 137 and has a free end extending beyond these screws and connected with a helical tension spring 138 which is anchored on the stationary plate 30 as shown in Fig. 1.

The ratchet wheel 132 is provided with a series of ratchet teeth 139 which are individually engageable with a detent 140. This detent is in the form of a square bar which is slidingly mounted in counterpart radial grooves 141 provided in the halves 133, 134 of the circular housing 122. This bar is urged toward the teeth 139 by a leaf spring 142 which is secured at one end, as by a screw 143, to the periphery of the circular housing 122.

Also keyed to the bearing bushing 125 by the keys 130 is a gear wheel 145. This gear wheel 145 meshes with a pinion 146 fast to a horizontal shaft 148 journalled in bearings 149 in a bracket or casting 150 secured to the stationary plate 30. As best shown in Fig. 2, this horizontal shaft is in axial alinement with the space 35 in the way between the opposing edges of the stationary plates 30, 31 and has an extension 151 of enlarged diameter projecting toward this space The enlarged end 151 of this shaft 148 forms an annular shoulder 152 which bears against a thrust collar 153, this thrust collar also forming a seat for one end of a helical compression spring 154 which surrounds the enlarged part 151 of this shaft.

The opposite end of the helical compression spring 154 bear against a collar 155 slidingly mounted on the enlarged part 151 of the shaft 148 and surrounds an extension 156 of reduced diameter of this collar This reduced extension 156 is provided with a pair of diametrically opposite notches 158 extending axially from the end thereof to provide a pair of jaws 159 arranged to releasably embrace the projecting ends of a cross pin 160 through the shaft 148. The larger part of the collar 155 is preferably square in cross section as shown in Fig. 14 and is provided with an upwardly extending boss 161 to which a cam block 162 is secured, as by a screw 163. This cam block is fitted in a rectangular notch 164 in the upper end of the boss 161 and is preferably of cylindrical form, as shown in Fig. 2, with a flat 165 engaging the vertical side of the notch 164.

This cam block 162 engages the track 168 of a face cam 169 which, as best shown in Fig. 2, is pinned, as indicated at 170, to a horizontal shaft 171. This horizontal shaft is journalled in the bracket 45. A bevel pinion 172 is fast to this shaft 171 and meshes with a bevel gear 173 having a vertical stem 174 journalled in an upward extension 175 of the bracket 150. This bevel gear in turn meshes with a bevel pinion 176 fast to a horizontal shaft 178 journalled in a bracket 179 mounted on the stationary plate 30, as best shown in Fig. 1. A pinion 180 is fast to the opposite end of this horizontal shaft 178 and meshes with a bevel pinion 181 fast to the upper end of the vertical shaft 109.

The end of the horizontal shaft 178 is preferably connected with a step-by-step wire feeding mechanism (not shown).

The face 169 also has a peripheral cam track 185 with an abrupt salient 186 at one side as shown in Fig. 3. This abrupt radial salient actuates a vertical pin 188 slidingly mounted in the bracket 45 as best shown in Fig. 2. The upper end of this pin contacts a vertically swinging lever 189 one end of which is pivoted, as shown at 190, to the bracket 45. This lever is biased downwardly to urge the pin 188 into contact with this peripheral cam track 185 by a helical tension spring 191.

The lower anchored end of this helical tension spring

191 is secured to a cross piece 192 which, as best shown in Figs. 2 and 3, is secured at its ends to a pair of vertical slideway guides 193. These slideway guides are removably secured, as by screws 194, to the bracket 45 in vertical alinement with the space 35 in the way between the opposing edges of the stationary plates 30 and 31. These slideway guides are spaced to provide a vertical slideway for a vertical slide 195 the upper end of which is connected by a pivot pin 196 with a longitudinal slot 198 provided in the lever 189.

To the lower end of the vertical slide 195 is secured, as by screws 199, to a vertical plate 200, the plate being preferably recessed into the slide. This plate, as best shown in Fig. 3, projects beyond one edge of the vertical slide and is provided with a downwardly projecting stop finger 201 at its outboard end. This stop finger is preferably rectangular in horizontal section, as shown in Figs. 7 and 8, and enters a vertical notch 202 provided in each end of the double ended stop arm 55. The purpose of the stop finger 201 is to lock the double-ended stop arm 55 is operative position and to insure the proper register of each end of this double-ended stop arm 55 in guiding the wire to form a loop around the neck of the bag gathered against this double-ended stop arm.

The guide for so forming the end of the length of wire, indicated at 205, to form a loop around the gathered neck of each bag is constructed as follows:

The enlarged square part of the collar 155 is provided in each of its opposite vertical sides with a horizontal guideway or groove 206 as best shown in Fig. 14. In one of these guideways is fitted one side of a guide block 208 which is shown as removably secured to the upper face of the stationary plate 30 by screws 209, as best shown in Figs. 7, 8, 9 and 14. In the other of these guideways 206 is fitted one side of a guideblock 210 which is also shown as removably secured to the upper face of the stationary plate 30 by screws 211. This last guide block is provided with a horizontal wire bore 212 into the outer end of which the end of the tie wire 205 is fed. This bore is angularly disposed with reference to the line of movement of the collar 155 along the guide blocks 208, 210 and is directed toward the space 35 in the way between the opposing edges of the stationary plates 30, 31 and opens into the horizontal bore 213 through the sleeve 155 and in which bore one end of the shaft 148 is fitted.

Also fitted in this bore are the two halves 214*a* and 214*b* of a wire forming head indicated generally at 215. This two-part head has an enlarged cylindrical end 216 fitting the bore 213 and a smaller cylindrical end 217, this smaller end being arranged adjacent the end of the shaft 148. This head is divided into its two halves 214*a*, 214*b* along a horizontal medial plane and the smaller end 217 is bifurcated, transversely of this plane as indicated at 218, so that the two halves jointly provide jaws at the extremity of the smaller end of the two-part head 215 arranged to embrace a tongue 219 projecting from the end of the shaft 148.

This tongue carries a cross pin 220 having opposite projecting ends and arranged to fit in transverse mating grooves 222 provided in the mating faces of the halves 214 of the head 215 at the smaller end 217 thereof. This cross pin 220 also forms the pivot about which the two halves 214 separate, these two halves being yieldingly urged apart by a helical compression spring 223 therebetween. These generally planar mating faces are also provided with non-mating diagonal face grooves 224 and 225 which extend from opposite sides of the periphery of the larger end 216 of the two-part wire forming head to the end face of this larger end at the axial center thereof. The diagonal groove 224, at the periphery of the two-part wire forming head 215, is continued by an axially extending groove 226 which extends to the end face of the enlarged part 216 of the two-part wire forming head. Similarly the diagonal groove 225, at the periphery of the two-part wire forming head 215, is continued by an axially extending groove 228 which also extends to the end face of the enlarged part 216 of the two-part wire forming head.

The diagonal groove 225, in the retracted position of the sleeve 155, forms a straight continuation of the bore 212 through which the tie wire 205 is fed to the mechanism.

The tie wire is guided in its movement out of this diagonal groove 225 and back into the diagonal groove 224 by a guide head 230 at the lower end of the slide 195. This guide head is in the form of a block having an upper extension 231 secured to the back face of the vertical plate 200 by screws 232, this plate 200 being secured to the lower end of the slide 195. As best shown in Fig. 20, the enlarged bottom 233 of this guide head or block is stepped, the bottom face 234 at one side being higher than the bottom face 235 at the opposite side. The higher bottom face 235 is provided with a diagonal groove 236 which, in the operative position of the wire forming elements, forms a straight continuation of the groove 225 in the half 214*a* of the wire forming head 215. The lower bottom face 235 is provided with a diagonal groove 238 which, in the operative position of the wire forming elements, forms a straight continuation of the groove 224 in the half 214*b* of the wire forming head 215.

The lower enlarged part 233 of the guide head or block 230 has, on its side opposite the two-part wire forming head 215, a vertical semicylindrical recess 239 from the opposite vertical edges of which vertical flat faces 240, 241 diverge toward the stationary plate 30.

The face 240 mates with a vertical flat face 242 provided on the corresponding end of the horizontal slide 81. This slide is also provided with a semicylindrical face 243 which is concentric with the semicylindrical face 239 of the guide head or block 230 but is spaced further from their common vertical axis. This face 243 is provided with a helically disposed face groove 244 which forms a continuation of the groove 236 in the guide head or block 230 and which inclines downward from this groove 236. Each end of the double ended stop arm 55 has a semicylindrical face 245 which is concentric with the semicylindrical faces 239 and 243 of the guide head 230 and horizontal slide 81, respectively, and which forms a continuation of the semicylindrical face 243 of the horizontal slide 81. This semicylindrical face is provided with a helically disposed face groove 246 which connects the helically disposed face groove 244 of the horizontal slide 81 with the groove 238 in the lower bottom face 235 of the wire forming block 230.

The semicylindrical face 245 at each end of the double-ended stop arm 55 terminates in a vertical face 250 which, in the operative position of the wire forming elements, mates with the vertical face 241 of the wire forming block or head 230.

Each end of the double-ended stop arm 55 is aligned with the horizontal slide 81, in the operative position of the wire forming elements, by a vertical tongue 251 on the slide 81 which enters a vertical groove 252 in each end of the double-ended stop arm 55.

The upper bottom 234 of the wire forming head or block 230, in the operative position of the wire forming elements, seats in a recess 253 in the horizontal slide 81. The lower bottom face 235 of the wire forming head or block 230, in the operative position of the wire forming elements, seats in a recess 254 at each end of the double-ended stop arm 55.

Operation

In general, the bags 25 partly filled with a normal quantity of the material being packaged, say potatoes, are placed one by one on the left hand end of the endless conveyor belt 21, as viewed in Fig. 1, and are carried along by the upper stretch of this conveyor belt until the open mouth 27 of each bag engages the converging stretches of

the side belts 38 which travel along the opposing converging edges 32 of the stationary plates 30 and 31. These converging stretches of the side belts 38 are traveling in the same direction as the main endless conveyor belt 21 and at approximately the same speed. Accordingly the mouth of each bag is progressively closed by the side conveyor belts 38 and when each bag passes between the parallel closely spaced stretches of these belts (between the drive pulleys 43 and the idler pulleys 41) the mouth of each bag has its opposite sides arranged in flat face-to-face relation and is elongated in the direction of travel of the bag.

As each bag approaches the space 35 in the way between the opposing edges of the stationary plates 30, 31, the double-ended stop arm 55 has been turned about its vertical axis 180° following release of a preceding bag, as hereinafter described, and is in the position shown in Figs. 1 and 11 in which one of its semicircular faces 245 is in the path of the approaching bag. This double ended stop arm is releasably latched in this position by the abrupt shoulder 74 (Fig. 12) of the spring loaded latch member 68 which shoulder is at this time in engagement with the side of the double-ended stop arm as shown in Figs. 11 and 12 to prevent movement of this double-ended stop arm under the pressure of the mouth of the bags moving toward the semicylindrical face 245 at its operative end.

When the advance edge of the flattened mouth of the bag reaches the space 35 in the way between the opposing edges of the stationary plates 30, 31, the horizontal slide 81 is moved to the right as viewed in Fig. 1 to compress the flattened mouth of the bag into the space 35 and into generally cylindrical form against the semicylindrical operative face 245 of the double-ended stop arm 55. This movement of this horizontal slide 81 is effected as follows:

The horizontal shaft 113, after the flattened mouth 27 of the bag 25 enters the space 35 in the way between the opposing edges of the stationary plates 30, 31, is rotated clockwise as viewed in Fig. 17 thereby to rotate, through the pinions 112 and 111, the vertical shaft 109 in a corresponding direction, this being counterclockwise as viewed in Figs. 1 and 4. This rotates the cam 108 fast to this vertical shaft 109 and, through the roller 105 in its cam groove 106, swings the bellcrank lever 101 counterclockwise as viewed in Figs. 1 and 4 about the axis of its pivot pin or bolt 94. This movement is transmitted through the spring 103 of the link 100 to the arm 98 so as to swing this arm clockwise as viewed in Figs. 1 and 4, about the axis of its pivot pin or bolt 99. This, through the pin 96 and slot 95, swings the arm 92 counterclockwise, as viewed in Figs. 1 and 4 and, through the pivot 93 at the free end of this arm 92, moves the horizontal slide 81 to the right as viewed in Figs. 1 and 4. This slide, through its guide roller 85 on its underside, travels along the branch slot 88 in the stationary plate 30 and after the mouth of the bag has passed beyond this branch groove, this guide roller enters the slot formed by the closely spaced opposing edges 33 of the stationary plates 30, 31 and travels along this last slot thereby to cause the horizontal slide 81 to follow the mouth of the bag to be tied. As the semicircular face 243 at the advance end of the horizontal slide 81 approaches the space 35, it compresses the flattened mouth 27 of the bag against the operative semicircular face 245 of the double-ended stop arm 55 thereby to form this mouth into the generally cylindrical or contracted neck 28.

During the last part of the movement of the horizontal slide 81 toward its operative position, its pin 80 (Figs. 1 and 4) engages and moves the arm or extension 82 of the gear segment 62, but no positive result is achieved by such movement. Thus this moves the gear segment 62 clockwise about its pivot axis 63 as viewed in Figs. 1, 4 and 7, but this merely rotates the pinion 58 meshing therewith counterclockwise as viewed in these figures and Fig. 11, this merely causing the teeth of this last pinion 58 to click by the spring loaded detents 59. However, this movement sets up the gear segment 62 for effective operation following the tying of the bag and when it is necessary to rotate the operative end of the double-ended stop arm 55 out of the way of the tied neck of the bag which is to be discharged from the apparatus.

As the horizontal slide 81 is so moving toward its operative position, the vertical slide 195 is being lowered to position its wire forming head or block 230 into operative relation with the horizontal slide 81 and also the operative end of the double-ended stop arm 55. This lowering of this vertical slide is effected as follows:

The clockwise rotation (Fig. 17) of the horizontal shaft 113, which, as above described, advanced the horizontal slide 81 to its operative position, also, through the bevel pinions 112, 111, turns the vertical shaft 109 and its bevel pinion 181, counterclockwise as viewed in Fig. 1. Through the bevel gear 180, its horizontal shaft 178 and bevel gears 176, 173, 172 (Figs. 1 and 2) the horizontal shaft 171 is turned to rotate the cam 169. This cam is rotated so as to move its peripheral abrupt salient 186 (Fig. 3) out of engagement with the vertical slide pin 188. This permits downward movement of this pin and the vertically swinging arm 189 which it supports, this downward movement being insured by the spring 191 connected with the free end of the arm 189. This moves the vertical slide 195 downwardly thereby to move downwardly the wire forming block or head 230 mounted on the lower end of this slide. This wire forming block or head seats on the seats or shoulders 253 and 254 of the horizontal slide 81 and the double-ended stop arm 55, respectively. As this wire forming block or head 230 is so moving downwardly to its seated position on these seats 253 and 254, the plate 200 which connects this wire forming head or block 230 with the vertical slide 195 is also moved downwardly to bring its depending stop finger 201 (Fig. 3) into operative engagement with the vertical notch 202 (Figs. 7 and 8) at the operative end of the double-ended stop arm 55. This latches the stop arm against movement under pressure of the bag mouth 27 being gathered into the cylindrical neck 28.

In these operative positions of the double-ended stop arm 55, horizontal slide 81 and wire forming head 230, the semicylindrical surfaces 245 and 243 of the double-ended stop arm and horizontal slide 81, respectively, form a continuous surface, and the semicylindrical face 239 of the wire forming head 230 is concentric with these surfaces but offset inwardly therefrom as shown in Figs. 7 and 8. Since the neck 28 of the bag is compressed between these surfaces, it will be seen that the neck of the bag is compressed into generally cylindrical form.

Also in these operative positions of the double-ended stop arm 55, horizontal slide 81 and wire forming head 230, the under groove 236 of the wire forming head 230 (Figs. 3, 7 and 8) is in line with the helically disposed groove 244 in the semicylindrical face 243 of the horizontal slide 81; this last helically disposed groove 244 is in line with the helically disposed groove 246 in the semicylindrical face 245 of the double-ended stop arm 55; and this last helically disposed groove 246 is in line with the other under groove 238 of the wire forming head 230. It will therefore be seen that when the length of tie wire 205 is pushed endwise through these grooves, a loop of wire with crossed ends is formed around the gathered neck 28 of the bag 25.

At this time, the two halves 214*a* and 214*b* of the wire forming head 215 (Figs. 7, 13 and 14) are held together in the bore 213 of the sleeve 155 and the grooves 224 and 225 in the mating faces of these halves are in a horizontal plane with the groove 225 in line with the wire feeding bore 212 in the stationary guide plate 210 and also with the bottom groove 236 in the wire forming head or block 230 at the lower end of the vertical slide 195. Also, in this position of the parts the groove 224

of the two-part wire forming head 215 is in line with the bottom groove 238 in the wire forming head 230 at the lower end of the vertical slide 195. With these parts so alined, the end of the feed wire 205 is advanced by a step-by-step feed mechanism (not shown) from the wire feeding bore 212 in the stationary guide plate 210 progressively through the groove 225 in the two-part wire forming head 215; bottom groove 236 in the wire forming block or head 230; helically disposed groove 244 in the semicircular face 243 of the horizontal slide 81; helically disposed groove 246 in the semicircular face 245 of the double-ended stop arm 55; bottom groove 238 of the wire forming block or head 230; and groove 224 in the two-part wire forming head 215, the end of this tie wire projecting into the space between the two-part wire forming head 215 and the stationary guide plate 208.

The length of tie wire 205 so encircling the gathered neck 28 of the bag is then cut; the ends of the cut off length are formed into hooks and these hooked ends are rotated so as to twist the ends of the cut length of wire around each other and to form a closed loop of wire around the neck 28 of the bag to complete the tying thereof. This is accomplished as follows:

The rotation of the cam 169 in lowering the vertical slide 195 (through its peripheral cam track 185) also moves the salient part of the face cam track 168 out of register with the rounded block 162 on the sleeve 155 (Fig. 2). This permits the helical spring 154 to move this sleeve 155 toward the space 35 in the way between the opposing edges of the stationary plates 30, 31. In so moving, the leading outer corner of this sleeve contacts (Figs. 7 and 8) the length of wire 205 and cuts or shears this wire along the face of the guide plate 210.

The continued movement of the sleeve 155 then causes its leading end face to engage the projecting ends of the severed loop of wire and to bend these ends toward the space 35 and to force these ends into the grooves 226 and 228 along the sides of the two-part wire forming head 215. In so being forced into these grooves 226 and 228 these ends are bent into the form of hooks 255 at the ends of the severed loop of wire.

The continued movement of the sleeve 155 then causes the jaws 159 at the trailing end of this sleeve to move free from the cross pin 160 in the shaft 148. Accordingly this shaft 148 is now free to turn for the purpose of twisting the crossed ends of the wire loop.

This turning of the shaft 148 for this purpose is as follows:

While the horizontal shaft 113 was rotating clockwise (Fig. 17) as above described to advance the horizontal slide 81; to lower the vertical slide 195; and to move the sleeve 155 axially for the purpose of cutting the wire and forming the hooks 255 in the severed loop; the roller 116 was riding up on the salient part of the cam 115 (Fig. 17). During this period, this movement of the roller 116 was ineffective, the only effect having been to rotate the two-part cylindrical casing 122 counterclockwise as viewed in Fig. 18 in which movement the spring loaded detent 140 merely rode idly over the ratchet teeth 139. When, however, the roller 116 passes beyond the peak of the cam 115 (Fig. 17) it is permitted to return directly to the low part of this cam. This return is insured by the helical tension spring 138 (Fig. 1) which draws on the free end of the strap 121 thereby to swing the bellcrank lever 118 clockwise as viewed in Fig. 17 to move the roller 116 from the peak to the low part of the cam 115.

This longitudinal movement of the strap 121 under the influence of its spring 138 causes a clockwise rotation of the two part cylindrical housing 122 (Fig. 18). In this movement the spring loaded detent 140 in this casing 122 engages the abrupt faces of the ratchet teeth 139 of the wheel 132 and hence rotates this ratchet wheel and its bearing sleeve 125 clockwise as viewed in Fig. 18. This rotation of this bearing sleeve 125 (Fig. 18) rotates the gear 145 also keyed to this bearing sleeve, this gear in turn rotating the pinion 146 fast to the shaft 148.

Referring to Fig. 2, the rotation of the shaft 148, through its cross pin 220, rotates the two-part wire forming head 215 about its axis. This winds the hooked ends 255 of the wire loop around each other to produce the twist 256 as illustrated in Fig. 8. One or two twists can be provided. Thus, by using the hole 120 (Fig. 17) to carry the pivot 119 for the bellcrank lever 118 as shown, a single twist 256 is provided. By shifting the pivot pin 119 to the unoccupied hole 120 shown in Fig. 17 two twists are put in the wire loop. When the roller 116 (Fig. 17) strikes the lower part of the snail cam 115 the turning of the shaft 148 in providing the twist 256, of course ceases and this shaft comes to rest.

With the loop around the neck 28 of the bag and with its ends twisted together and provided with the hook shaped ends 255 to facilitate the manual untwisting of the ends when it is desired to open the bag, the next operation of the machine is to release the neck 28 of the bag with the wire loop twisted thereon.

To permit such release, the continued rotation of the cam 169 (Fig. 2) moves the rounded block 162 further up the salient of its face cam track 168 and hence moves the sleeve 155 axially further away from the space 35 in the way formed by the opposing edges of the stationary plates 30, 31. When the mouth of this sleeve 155 passes beyond the enlarged part 216 of the two-part wire forming head 215, as shown in Figs. 6 and 9, the two halves 214*a* and 214*b* of this two part head open up in the manner of alligator jaws under the influence of the helical compression spring 223 interposed between these halves. These two halves are limited in their degree of opening movement by engagement of their ends 217 of smaller diameter with the bore 213 of the sleeve 155 as shown in Fig. 6 and these halves are retained in the bore 213 by the cross pin 220 which remains housed by the opposing transverse grooves 222 in the mating faces of the two halves 214*a* and 214*b* as also shown in Fig. 6. At this time the cross pin 160 through the shaft 148 is fully engaged in the notches 158 between the pair of jaws 159 of the sleece 155 so that the two-part wire forming head 215 is prevented from turning while its parts 214*a* and 214*b* are separating and so that these parts separate vertically as shown in Fig. 6.

While the two halves 214*a* and 214*b* of the two-part wire forming head 215 are so separating, the cam 108 (Figs. 1 and 4) has turned so as to bring the roller 105 into the receding part of its cam track 106. This causes the lever 101 to rotate clockwise about its pivot axis 94 thereby to pull on the rod 102 of the link 100 and to swing the arm 98 counterclockwise about its pivot axis 99. Through the pin and slot connection 96, 95 between this arm 98 and the arm 92, this swings the slotted arm 92 clockwise thereby to retract the horizontal slide 81 pivotally connected to the free end of this slotted lever. Thus the slotted arm 92, through its pivot 93, moves the horizontal slide 81 to the left as viewed in Figs. 1 and 4 and since the roller 85 (Figs. 15 and 16) is in the slot formed by the closely spaced parallel edges 33 of the way between the opposing edges of the stationary plates 30, 31, this horizontal slide is drawn along this slot toward the branch slot 88 (Fig. 4). When the horizontal slide 81 reaches this branch slot 88, its inclined cam edge 90 engages the bumper 89 on the stationary plate 31 and the end of this horizontal slide 81 carrying the roller 85, is deflected laterally toward the stationary plate 30 so that this roller is moved into the branch slot 88 and constrained to follow this branch. The pivoted end of the horizontal slide 81 is swung over the stationary plate 30 by reason of its pivotal connection 93 with the slotted arm 92, the free end of which is swinging over the stationary plate 30. The opposite end of the horizontal slide 81 is moved over the stationary plate 30 by reason of the roller 85 (Figs. 15 and 16) being so forced into the

branch slot 88 by the bumper 84. Accordingly during the return movement of the horizontal slide 81, it is moved bodily over the top of the stationary plate 30 and completely away from the way between the opposing edges of the stationary plates 30, 31 so that the neck 28 of the bag is free to travel along this way as above described.

During the initial part of the retracting movement of the horizontal slide 81, its pin 80 (Figs. 1, 4 and 7–9) releases the extension 82 of the gear segment 62. This withdrawal of this pin 80 permits the helical tension spring 65 (Fig. 1) to swing this gear segment 62 counterclockwise about its axis 63. This causes the beveled head 76 of the pin 78 on this gear segment 62 (Fig. 12) to engage the inclined part 75 of the detent or latch 68 and to depress this detent or latch 68, against the resistance of its spring 70, into the hole 73 of the stationary plate 31. The free end 72 of this latch or detent 68 is thereby moved out of the path of the double-ended stop arm 55 so that this double-ended stop arm is free to swing clockwise as viewed in Figs. 1, 4 and 7–9.

Such clockwise movement is then effected by the gear segment 62. Thus the counterclockwise swinging of the gear segment 62 under the influence of its helical tension spring 65 (Fig. 1) rotates the pinion 58 clockwise as viewed in Figs. 1, 4 and 7–9 and causes its teeth to clutch or effectively engage the pair of spring loaded detents 59 on the double-ended stop arm 55. Accordingly this double-ended stop arm is swung clockwise about the axis of the pinion 58 so as to move its formerly operative end out of the space 35 in the way between the opposing edges of the stationary plates 30, 31. This removes the formerly operative end of the double-ended stop arm from the path of the neck 28 of the bag just tied and hence permits the tied bag to continue on its way on the moving upper stretch of the conveyer belt 21 to be discharged from the right hand end of this belt as viewed in Fig. 1.

The gear segment 62 imparts a 180° rotation to the double-ended stop arm 55, this bringing its formerly inoperative end into the space 35 in the way between the opposing edges of the stationary plates 30, 31 and hence into operative position to cooperate in gathering the neck 28 of the next succeeding bag 25. When this 180° rotation of the double-ended stop arm 55 is completed, the leading edge of its now inoperative end engages and is stopped by the abrupt shoulder 74 of the now operative latch or detent 68 (Fig. 12).

The continued rotation of the cam 169 (Fig. 2) causes the rounded block 162 engaging the face cam track 168 to ride down the salient part of this cam track, thereby to permit movement of the sleeve 155 to the left as viewed in this figure or toward the space 35 in the way between the opposing edges of the stationary plates 30, 31. This sleeve is so moved by the helical compression spring 154. During the first part of the movement of this sleeve 155 (Fig. 6), the mouth of the bore 213 in the sleeve 155 is pushed over the spread enlarged part 216 of the two-part wire forming head 215 thereby to force the two parts 214*a*, 214*b* together against the resistance of their spreading spring 223. The continued movement of the sleeve 155 to the left causes the sleeve to slide over the closed parts 214*a*, 214*b* of the two-part wire forming head 215 and to house these parts as shown in Fig. 5. At the end of this movement of the sleeve 155, its jaws 159 are withdrawn from the cross pin 160 through the shaft 148 and hence this shaft is free to be turned to provide the twist 256 in the next loop of wire.

The final part of the rotation of the cam 169 (Fig. 2) brings its abrupt salient 186 (Fig. 3) into engagement with the pin 188 so as to raise this pin. This raises the arm 189 thereby to raise the vertical slide 195. This raises the wire forming head or block 230.

The parts are now in the position which they occupied at the start of the description and the above cycle of operation is repeated with each succeeding bag to be tied.

It will be understood that a trip device (not shown) can be provided for starting the above cycle when a bag placed on the conveyer 21 reaches a predetermined position and that other additions can be made. The invention is therefore not to be construed as limited to the apparatus as above described but is to be accorded the full range of equivalents comprehended by the following claims.

I claim:

1. In a machine for tying the mouths of bags partly filled with material, a plurality of forming members mounted for movement with reference to each other into and out of embracing relation with a neck formed at the mouth of said bag, said members being jointly formed to provide a continuous channel open at its ends and embracing said bag neck, and arranged to form a tie wire inserted into one end thereof into a loop embracing said neck, and means for twisting the ends of said loop together, comprising a two-part wire forming head having its parts arranged in face-to-face relation and with its mating faces provided with a pair of grooves each registering at one end with a corresponding end of said channel, means arranged to feed said tie wire into the opposite end of one of said grooves to pass endwise through said channel and through the other of said grooves, means for revolving said two part head to twist the ends of said loop together, and means for separating said parts of said two part head to release said ends.

2. In a machine for tying the mouths of bags partly filled with material, a plurality of forming members mounted for movement with reference to each other into and out of embracing relation with a neck formed at the mouth of said bag, said members being jointly formed to provide a continuous channel open at its ends and embracing said bag neck and forming a tie wire inserted into one end thereof into a loop embracing said neck, and means for severing said loop and twisting its ends together, comprising a sleeve movable axially toward and from the open ends of said channel and having a cylindrical bore, a two-part cylindrical wire forming head fitted in said bore and rotatable about its axis, the parts of said two-part head having generally planar axially extending mating faces each provided with a face groove registering at one end with a corresponding end of said channel, means arranged to feed said tie wire into the opposite end of one of said grooves to pass endwise through said channel and through the opposite end of the other of said grooves, means arranged to move said sleeve axially toward said forming members, means coacting with said sleeve during such axial movement to sever said loop, and means arranged to thereafter revolve said two-part head to twist the ends of said loop together.

3. A machine as set forth in claim 2 wherein said sleeve is non-rotatably mounted in a guideway provided with a wire bore through which said tie wire is fed to said opposite end of said one of said grooves and wherein said sleeve traverses the mouth of said wire bore to shear said loop from the tie wire in said wire bore.

4. A machine as set forth in claim 2 wherein said sleeve is non-rotatable.

5. A machine as set forth in claim 2 wherein the periphery of said two-part head is provided with face grooves extending axially from said opposite ends of said first grooves toward said forming members whereby said movement of said sleeve bends the ends of the loop along said axially extending grooves to form hooks in said ends.

6. A machine as set forth in claim 2 wherein the parts of said two-part head are biased apart whereby said parts open to release the twisted loop on retraction of said sleeve.

7. In a machine for tying the mouths of bags partly filled with material, a horizontal conveyer on which the open bags are placed, neck flattening members arranged at the elevation of the mouth of a bag on said conveyer on opposite sides of the line of travel thereof and in con-

verging relation to each other in the direction of travel of said bag and engaging the sides of the mouth of said bag to bring the sides of the mouth of said bag into generally flat, face-to-face relation, a double-ended stop arm mounted to rotate about a vertical axis with each end thereof movable into the line of travel of said flattened mouth of said bag, a horizontally movable neck forming member movable along said line of travel in rear of said flattened mouth, means for moving said neck forming member along said line of travel toward the operative end of double-ended stop arm to compress said flattened mouth against said operative end of said double-ended stop arm into a contracted neck, means arranged to tie said neck in said contracted condition, and means arranged to rotate said double-ended stop arm to successively bring each end thereof into operative position with its operative end moving in the direction of travel of said bag after having formed a neck thereon.

8. A machine as set forth in claim 7 wherein a latch is provided for latching said double-ended stop arm in each of its operative positions.

9. A machine as set forth in claim 7 wherein said mechanism for rotating said double-ended stop arm comprises a one-way rotary clutch having a driving pinion concentric with said double-ended stop arm and a driven member connected with said double-ended stop arm and wherein said clutch drives said double-ended arm in that direction in which its operative end is moved in the direction of movement of the bag after forming the neck thereof, a gear segment meshing with the teeth of said pinion, and means for oscillating said gear segment through motion derived from said neck forming member during the final part of its advancing movement and the initial part of its retracting movement.

10. A structure as set forth in claim 9 additionally including a releasable latch for latching said double-ended arm in each of its operative positions, wherein a spring urges said gear segment in that direction to operate said clutch to rotate said double-ended arm and wherein said neck forming member engages and releases said latch and is arranged in the path of said gear segment to control its swinging movement.

11. In a machine for tying the mouths of bags partly filled with material, a horizontal conveyer on which the open bags are placed, neck flattening members arranged at the elevation of the mouth of a bag on said conveyer on opposite sides of the line of travel thereof and in converging relation to each other in the direction of travel of said bag and engaging the sides of the mouth of said bag to bring the sides of the mouth of said bag into generally flat, face-to-face relation, a stop removably arranged in the path of said flattened mouth of said bag, a neck forming slide guided along a horizontal track one end of which track is coincident with the line of travel of the said flattened mouth of said bag and the other end of which track is divergent from said line of travel and is arranged toward the feeding end of said conveyor, vertically projecting guide member on said slide and riding in said track and about which said slide can pivot horizontally, a horizontally swinging lever arm having its free end connected with said slide to effect movement of said slide along said track toward said movable stop to compress said flattened mouth against said movable stop into a contracted neck, means arranged to tie said neck in said contracted condition, and means arranged to remove said movable stop from said line of travel to permit said conveyor to remove the tied bag.

12. A machine as set forth in claim 11 and additionally including a stationary bumper engageable with said slide during its retracting movement and constraining movement of said slide to cause its guide member to enter said other end of said track during retracting movement of said slide.

13. In a machine for tying the mouths of bags partly filled with material, a horizontal conveyor on which the open bags are placed, neck flattening members arranged at the elevation of the mouth of a bag on said conveyor on opposite sides of the line of travel thereof and in converging relation to each other in the direction of travel of said bag and engaging the sides of the mouth of said bag to bring the sides of the mouth of said bag into generally flat, face-to-face relation, a stop removably arranged in the path of said flattened mouth of said bag, a neck forming slide guided along a horizontal track one end of which track is coincident with the line of travel of the said flattened mouth of said bag and the other end of which track is divergent from said line of travel and is arranged toward the feeding end of said conveyor, a vertically projecting guide member on that end of said slide which engages said flattened mouth and ridings in said track and about which said slide can pivot horizontally, a horizontally swinging lever arm having its free end connected with said slide to effect movement of said slide along said track toward said movable stop to compress said flattened mouth against said movable stop into a contracted neck, means arranged to tie said neck in said contracted condition, and means arranged to remove said movable stop from said line of travel to permit said conveyor to remove the tied bag.

14. In a machine for tying the mouths of bags filled partly with material, a plurality of forming members mounted for movement with reference to each other into and out of embracing relation with a neck formed at the mouth of said bag, said members being severally grooved along their faces contacting said neck to provide a continuous face groove embracing said neck, means arranged to project a tie wire endwise along said continuous face groove to provide a loop of said tie wire around said neck, means for guiding the end of said wire to project beyond said continuous face groove, means for cutting said wire at a distance from the wire inlet end of said continuous face groove, and means for twisting together the ends of the wire loop projecting from the opposite ends of said continuous face groove.

15. A machine as set forth in claim 14 and additionally including means for forming hooks at said projecting ends of said wire loop.

16. A machine as set forth in claim 14 wherein said continuous face groove is of helical form.

17. In a machine for tying the mouths of bags partly filled with material, three forming members each movable toward and from the other two forming members into and out of embracing relation with a neck formed at the mouth of said bag, the first and second of said movable forming members having recessed faces forming a continuation of each other and against which said bag neck is compressed and said recessed faces being severally grooved to provide a continuous face groove embracing said bag neck, said third forming member being movable lengthwise of said bag neck and having a pair of end grooves severally movable into register with the opposite ends of said continuous face groove, means arranged to project a length of tie wire lengthwise into one of said end grooves to follow said continuous face groove into the other of said end grooves thereby to provide a loop of wire around said bag neck having projecting ends, and means arranged externally of said third forming member and arranged to cut said wire to sever said loop, said first and second of said forming members being mounted for movement in a horizontal direction and said third of said forming members being mounted for movement in a vertical direction and seating against upwardly facing seats to enclose said end grooves.

18. In a machine for tying the mouths of bags partly filled with material, three forming members each movable toward and from the other two forming members into and out of embracing relation with a neck formed at the mouth of said bag, the first and second of said movable forming members having recessed faces forming a continuation of each other and against which said bag

neck is compressed and said recessed faces being severally grooved to provide a continuous face groove embracing said bag neck, said third forming member being movable lengthwise of said bag neck and having a pair of end grooves severally movable into register with the opposite ends of said continuous face groove, means arranged to project a length of tie wire lengthwise into one of said end grooves to follow said continuous face groove into the other of said end grooves thereby to provide a loop of wire around said bag neck having projecting ends, and means arranged externally of said third forming members and arranged to cut said wire to sever said loop, said first forming member being pivoted for swinging movement

about a vertical axis, said second forming member being mounted for sliding translational movement in a horizontal direction and said third of said forming members being mounted for movement in a vertical direction and seating against upwardly facing seats provided on said first and second forming members to enclose said end grooves.

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