

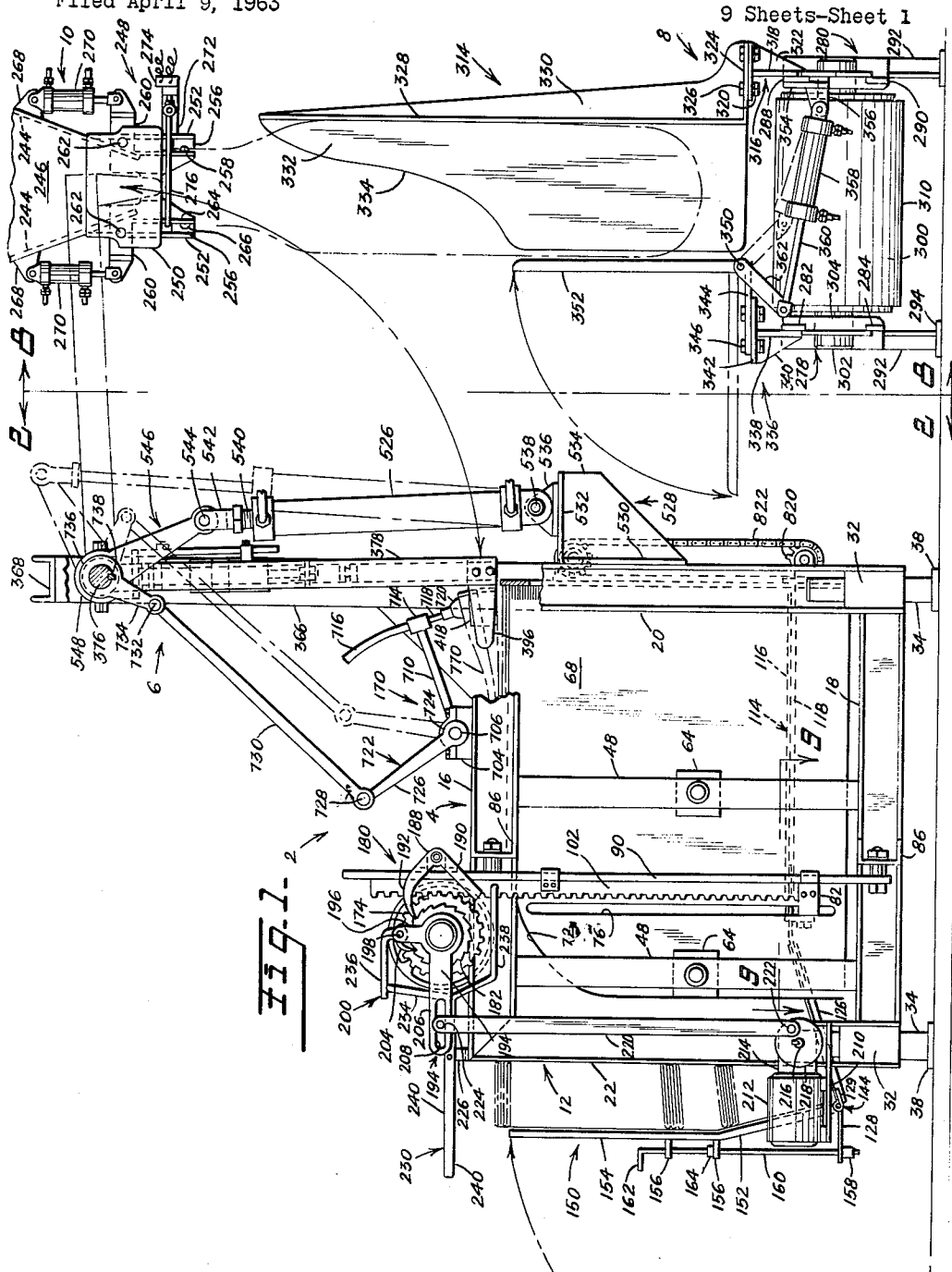
Dec. 28, 1965

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3,225,515

AUTOMATIC BAG HANGER

Filed April 9, 1963



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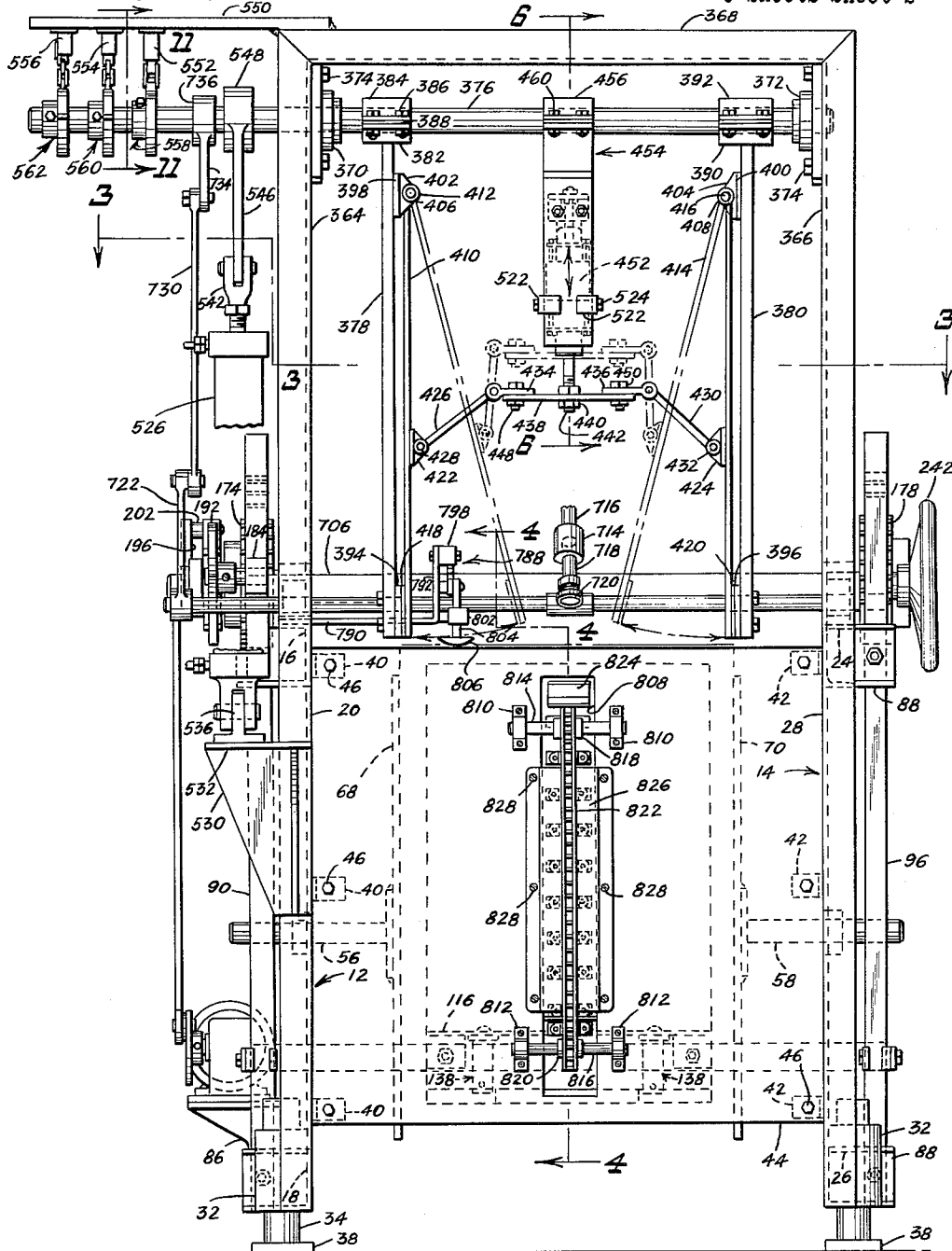


Fig. 2.

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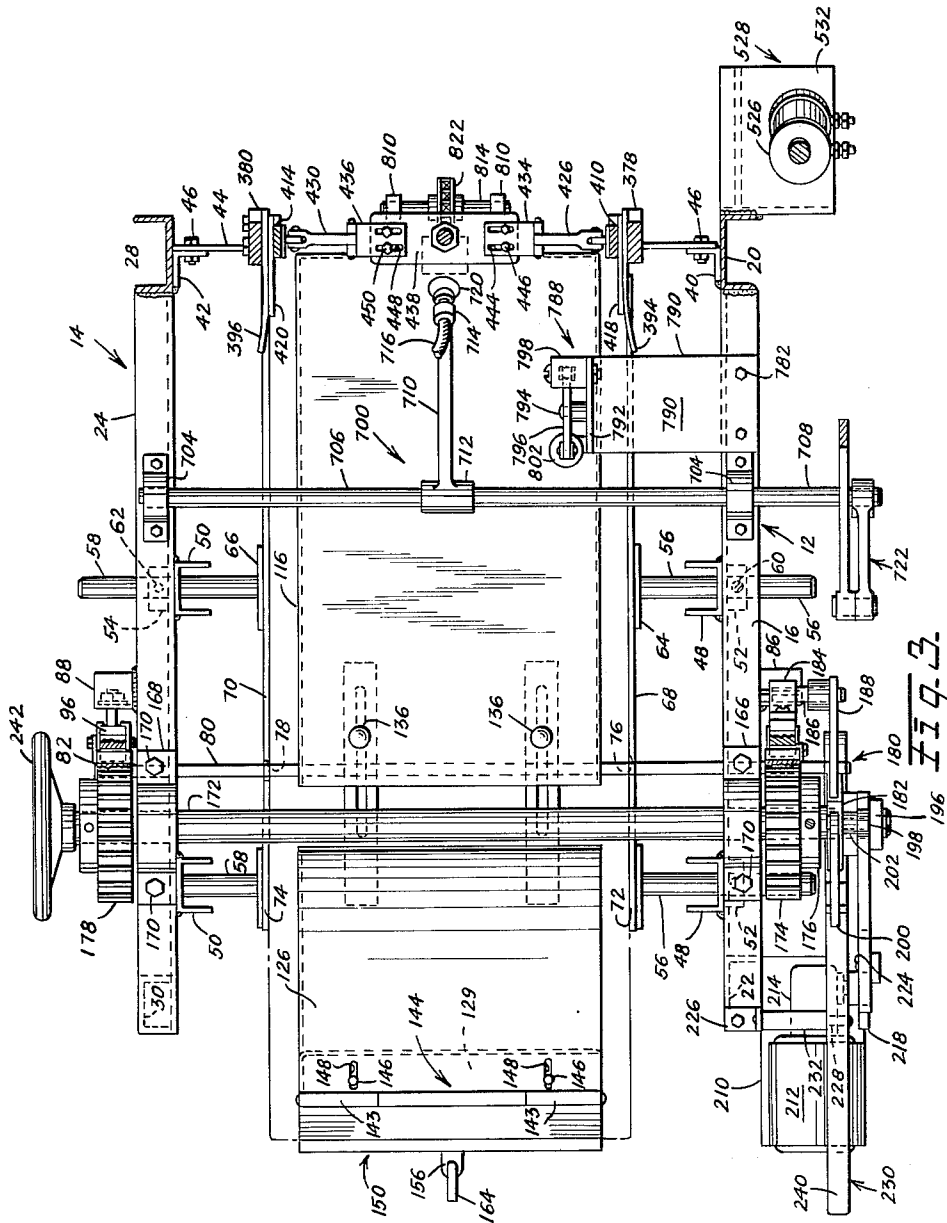
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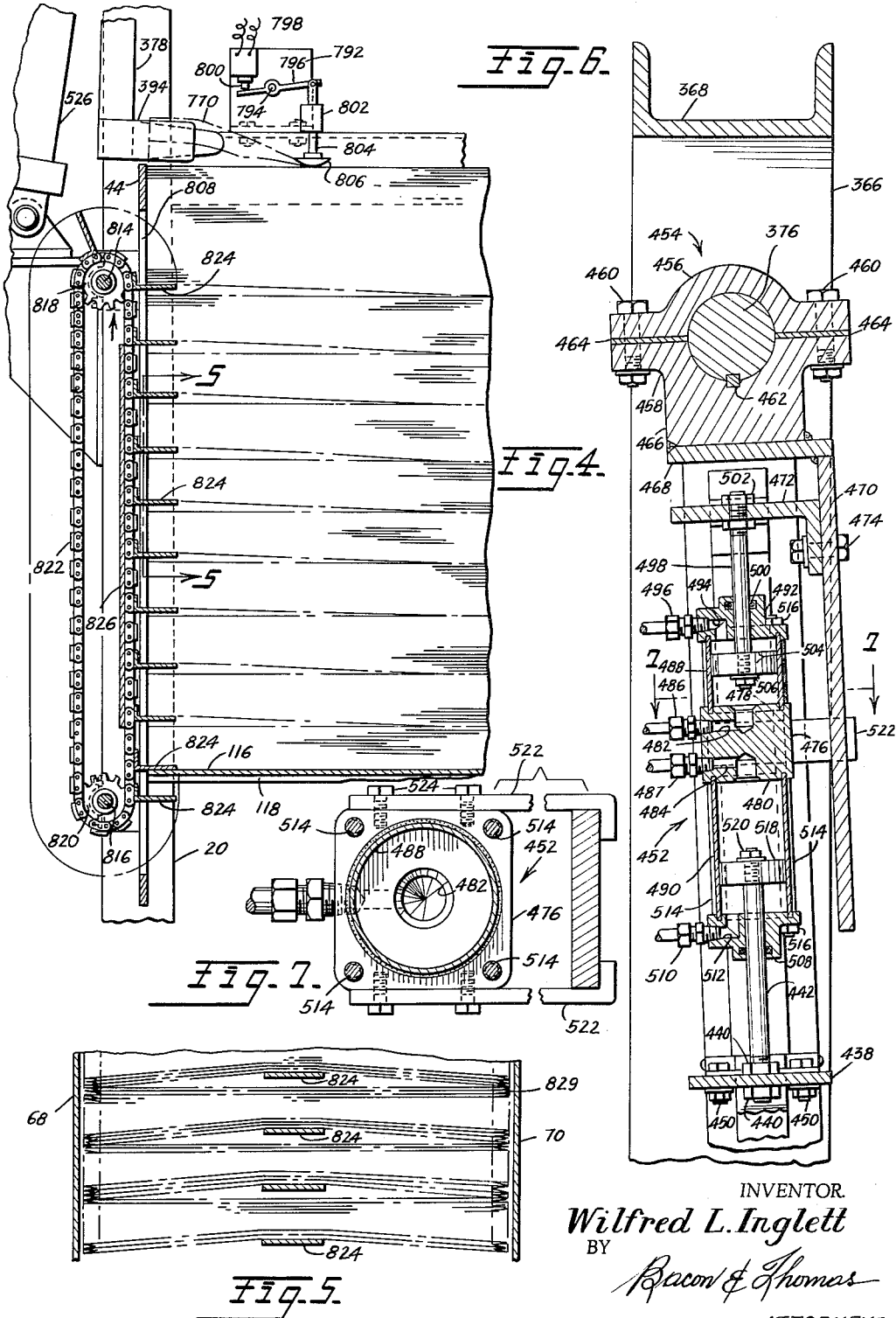
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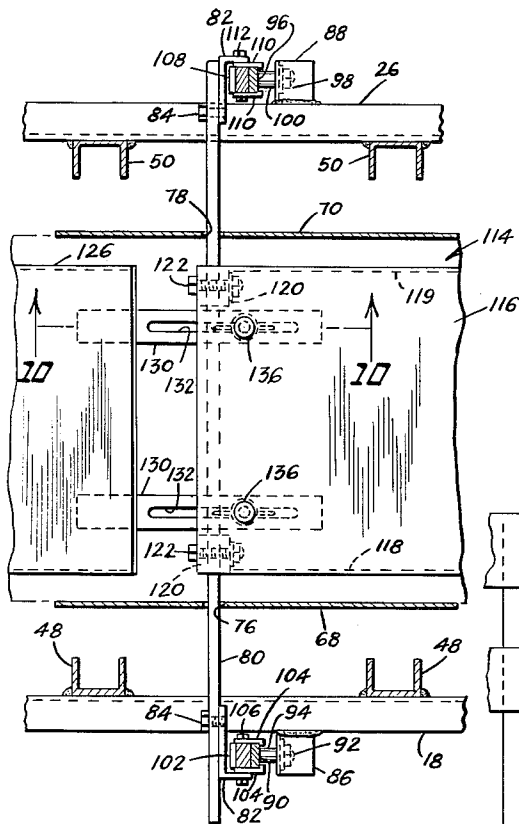


Fig. 9.

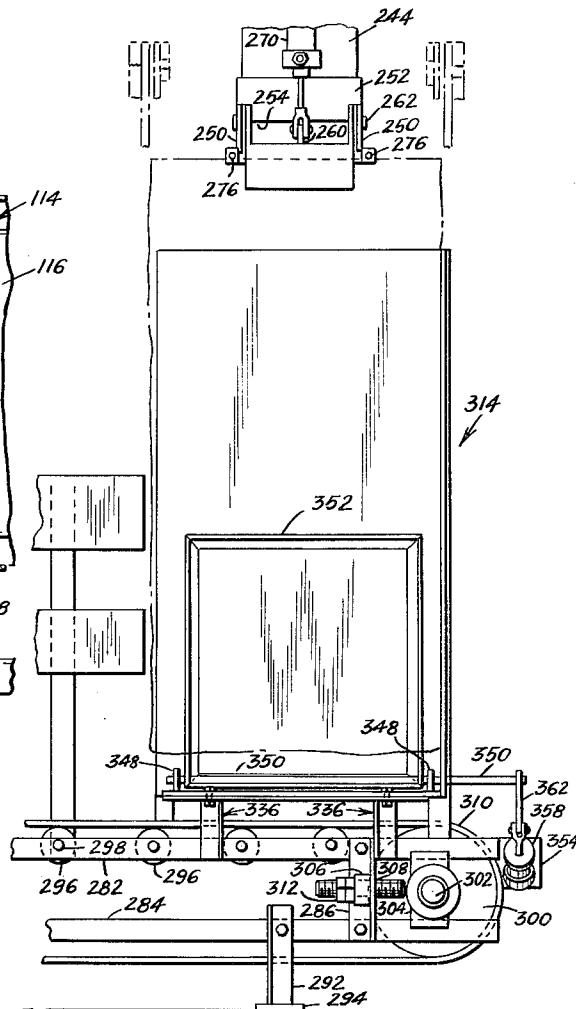


Fig. 8.

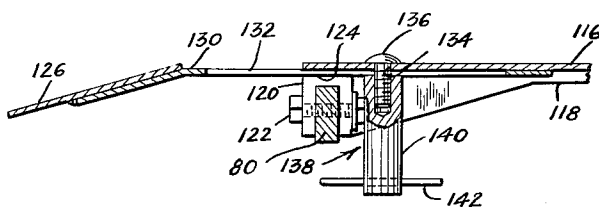


Fig. 10.

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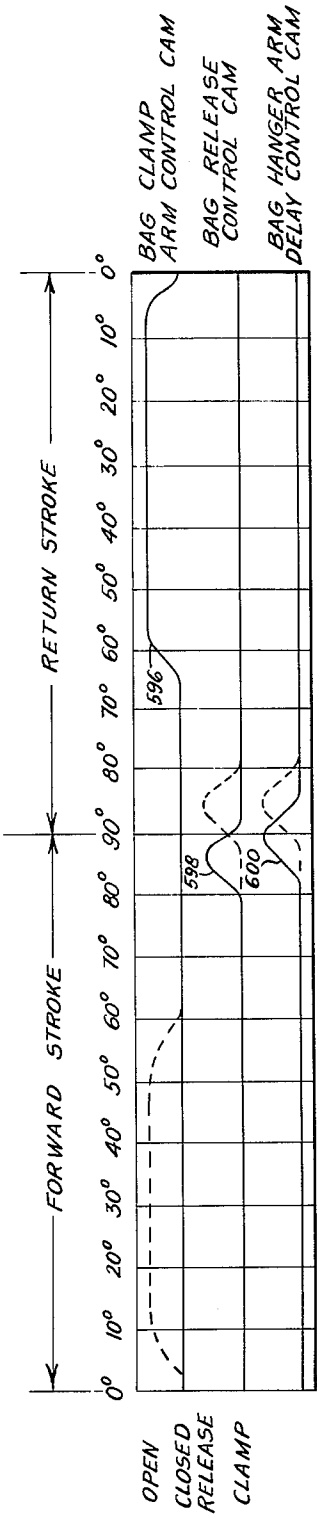
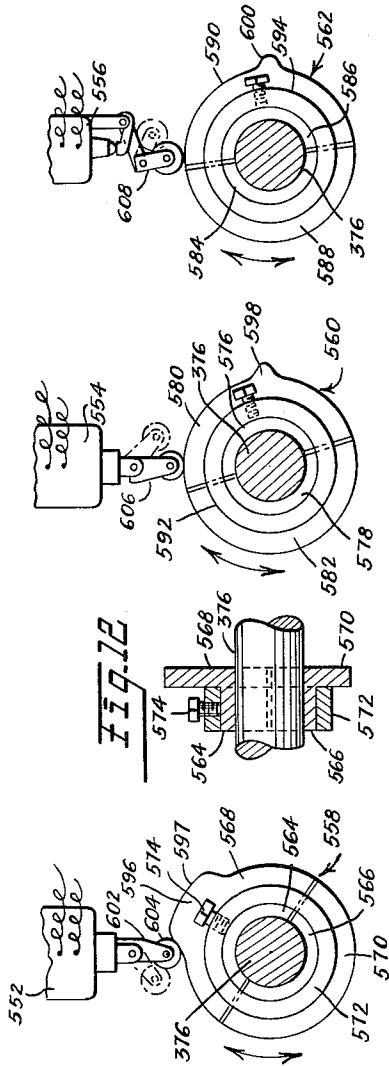


FIG. 15.

FIG. 11.

FIG. 13.

FIG. 14.



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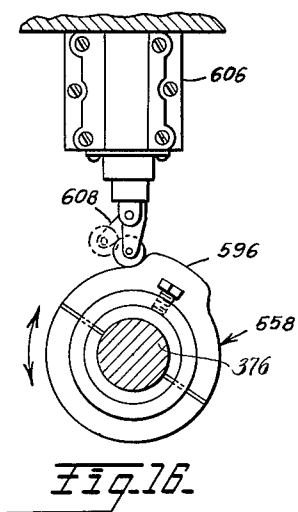
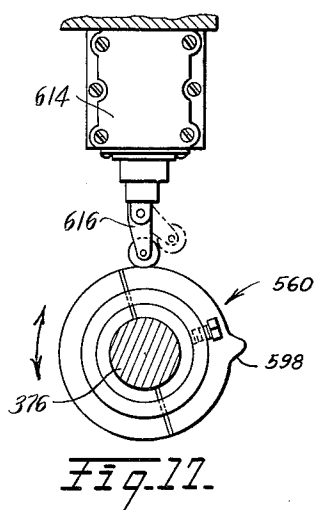
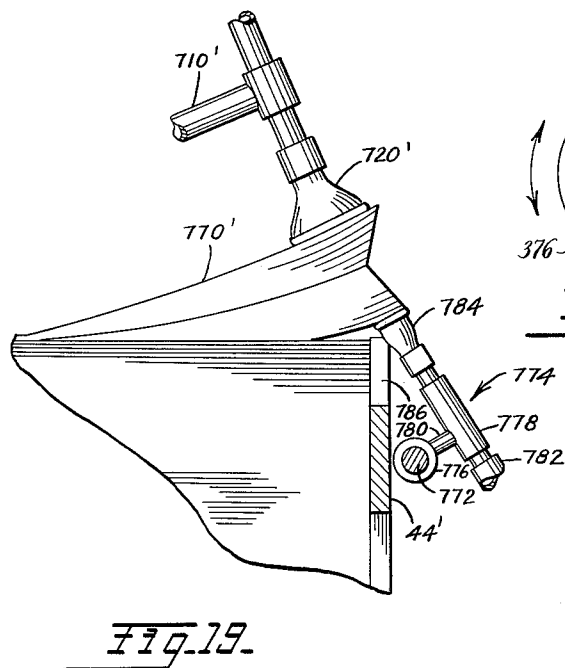
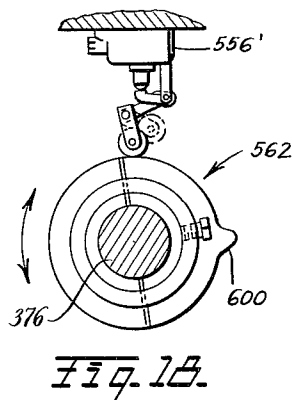
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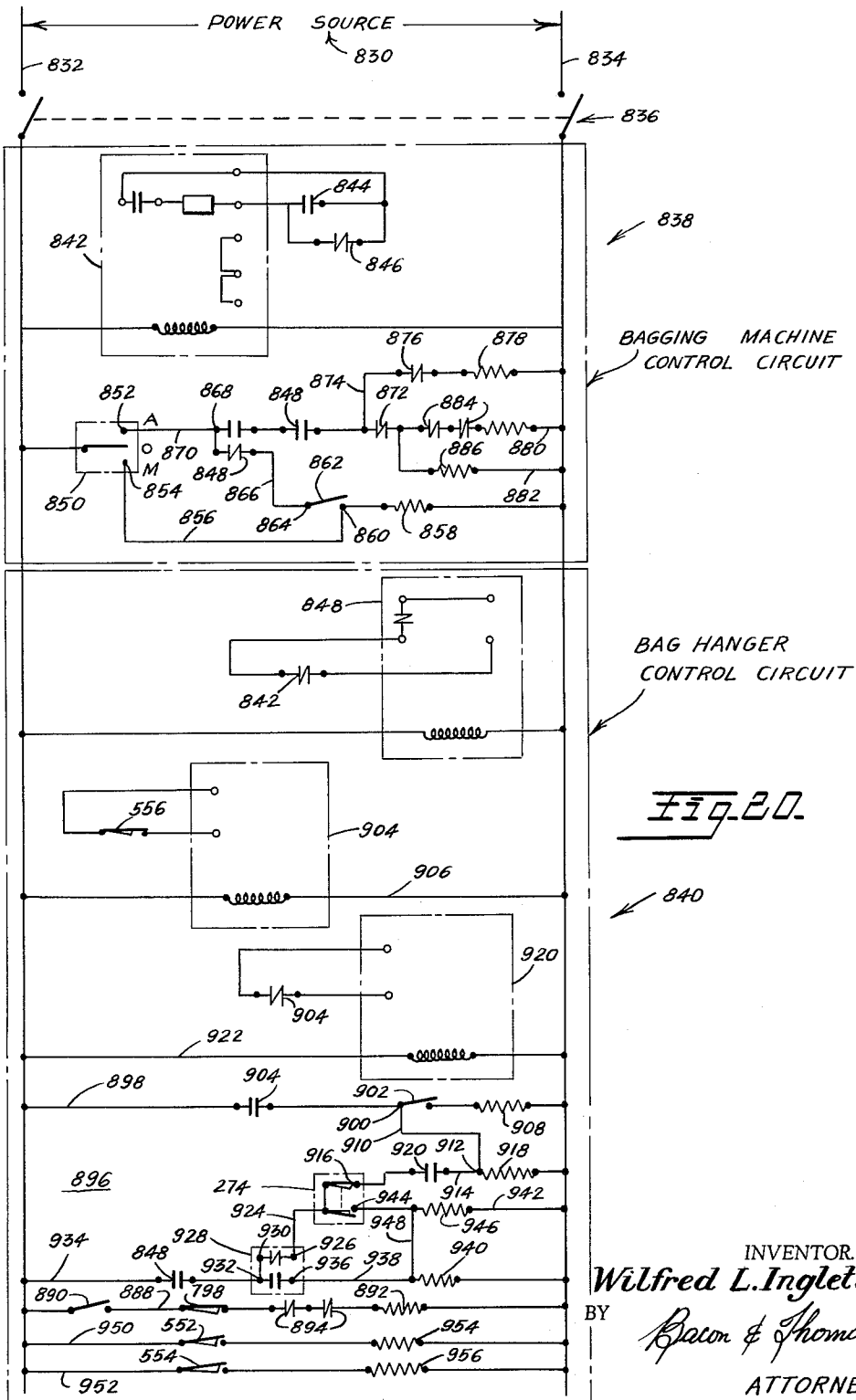
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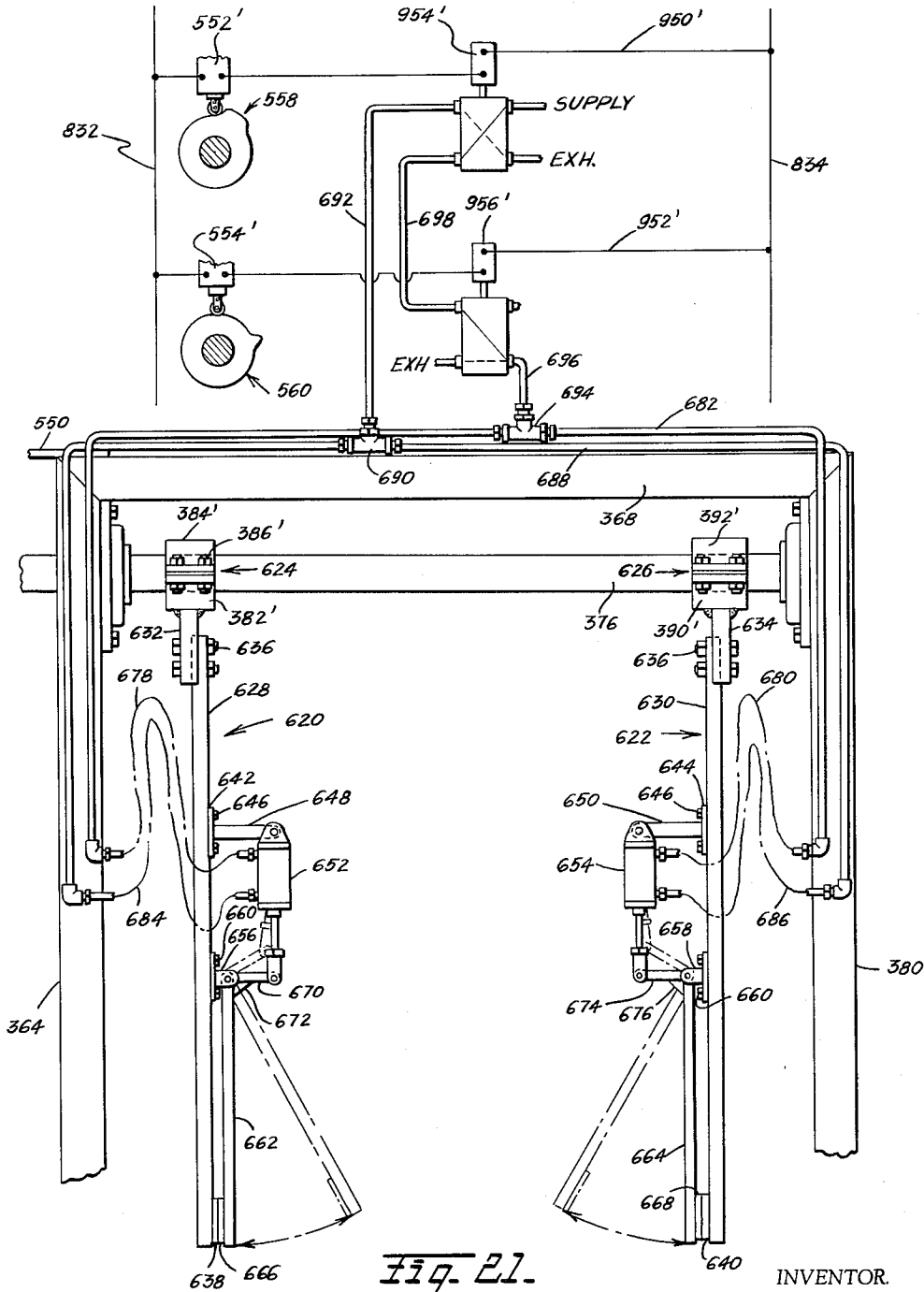


Fig. 21.

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AUTOMATIC BAG HANGER

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23 Claims. (Cl. 53-190)

This invention relates generally to machines for filling bags with bulk material, and more particularly to an improved automatic machine for hanging empty bags upon a bag filling machine in proper position and without causing damage thereto.

Many bulk materials, such as cement, grain, chemical compounds, livestock feed mixtures, and the like, are commonly placed in bags for commercial handling. Several machines have been devised for automatically filling bags with bulk material, the majority of such machines including a hopper in which the bulk material is placed. The empty bags, which may be of paper, cloth, a synthetic material, or any combination of these, is then placed below a filling spout on the hopper, and the spout is opened to permit the desired quantity of material to enter the bag. The present invention is directed to an automatic machine for removing an empty bag from a stack and properly placing it under the filling spout of such a bagging machine, and to associated bag handling apparatus.

The bag hanging machine of the invention is constructed to store a supply of collapsed, empty bags in a horizontal stack, it having been a common practice in the past to stack such empty bags vertically. The transfer arms of the invention are arranged to pick the top bag from the horizontally disposed stack, and to hang it vertically below the filling spout of the bagging machine. The horizontal disposition for the empty, collapsed bags enables the transfer arms to hang a bag in a very short period of time, and it has proved to be easier to stack the empty bags to lie horizontally than to stack them vertically.

Further, the transfer arms of the present invention are constructed to operate in a manner which greatly lessens the possibility of causing damage to the bags which are being hung. The control circuitry of the present invention is arranged to operate in relation to the position of the transfer arms, and is constructed to release a bag from the grip of said arms simultaneously with the gripping of said bag by clamping structure on the filling spout. Thus, there is substantially no possibility of a bag being simultaneously gripped from two different directions and being torn thereby.

It is an object of this invention to provide an automatic bag hanging machine constructed to remove an empty bag from a stack, and to position it upon a bag clamping mechanism disposed below the filling spout of a bulk material bagging machine.

Another object of the present invention is to provide a bag hanging machine which will open a bag and transfer it from a magazine to a filling spout, without causing damage thereto.

It is also an object of the subject invention to provide a bag opening mechanism constructed to automatically open a bag contained in a magazine for reception of a pair of clamping arms.

A further object of this invention is to provide a transfer arm mechanism for a bag hanging machine, constructed to remove a bag from a horizontal magazine stack and place it to hang vertically below a hopper spout.

It is also an object of this invention to provide a transfer arm mechanism capable of handling bags constructed from tearable material without causing damage thereto.

Still another object of the subject invention is to provide a bag magazine mechanism constructed to store a plu-

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ality of empty bags in a horizontal position, and that will automatically elevate the bags toward a bag opening mechanism.

Another object of the present invention is to provide a bag magazine for a bag hanging machine, so constructed as to be easily loaded and to properly feed bags of various thicknesses to a bag opening mechanism.

It is also an object of this invention to provide a conveyor arranged to cooperate with a bag hanging machine, and incorporating structure to properly shape a bag as it is being filled.

A further object of the present invention is to provide a novel control circuit for a bag hanging machine, constructed to automatically control the complete cycle of operation of said machine.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a side elevational view of the automatic bag hanger of the invention, with a conveyor and the hopper spout of a bagging machine being shown in partial end elevational views in front thereof;

FIG. 2 is an enlarged front elevational view of the bag hanging machine, taken on the line 2-2 of FIG. 1;

FIG. 3 is a horizontal sectional view, taken on the line 3-3 of FIG. 2;

FIG. 4 is an enlarged fragmentary, vertical sectional view, taken on the line 4-4 of FIG. 2;

FIG. 5 is an enlarged fragmentary, vertical view, taken on the line 5-5 of FIG. 4;

FIG. 6 is an enlarged fragmentary, vertical sectional view, taken on the line 6-6 of FIG. 2;

FIG. 7 is an enlarged horizontal sectional view, taken on line 7-7 of FIG. 6;

FIG. 8 is an enlarged fragmentary, vertical side elevational view of the conveyor and the filling spout, taken on the line 8-8 of FIG. 1;

FIG. 9 is an enlarged fragmentary, horizontal sectional view, taken on the line 9-9 of FIG. 1;

FIG. 10 is an enlarged fragmentary, vertical sectional view, taken on the line 10-10 of FIG. 9;

FIG. 11 is an enlarged vertical sectional view of the control cam for the bag clamping arms, taken on the line 11-11 of FIG. 2;

FIG. 12 is a fragmentary vertical sectional view, taken on the line 12-12 of FIG. 11, showing the manner in which the cam is mounted on its shaft;

FIG. 13 is a vertical sectional view similar to FIG. 11 of the bag release control cam of FIG. 2;

FIG. 14 is a vertical sectional view similar to FIG. 11 of the bag transfer arm delay control cam of FIG. 2;

FIG. 15 is a developed view of the cams of FIGS. 11-14;

FIGS. 16 through 18 are modified forms of the cams similar to FIGS. 11-14, illustrating an arrangement for directly actuating valves;

FIG. 19 is an enlarged fragmentary vertical sectional view, illustrating a modification for opening the bags;

FIG. 20 is a control circuit diagram for the bag hanging machine of the present invention in combination with a control circuit for a bagging machine, and

FIG. 21 is a vertical elevational view of a modified clamping arm structure for the present invention, with the control circuitry thereof being shown schematically.

The bag hanging machine of the present invention is intended for use with automatic bagging machines of the type which dispense a specified amount of bulk material from a hopper into a bag suspended therebelow. Several such bagging machines are known to the art, and hence they will not be described in detail herein except insofar

as the structure or circuitry thereof relates to the bag hanger of the present invention.

The subject bag hanger incorporates a magazine for storing a large plurality of empty bags in a horizontal position. The magazine incorporates a platform which is raised by a ratchet and pawl mechanism that cooperates with a pair of vertical racks. The bags are elevated toward a bag opening device, and suitable control circuitry is utilized to control the elevating movement of the magazine so that only one bag at a time is brought into pick-up position.

Mounted on the bag magazine is a transfer arm mechanism, said mechanism incorporating a pair of transfer arms having fingers on the lower ends thereof and a pair of clamping arms having clamping plates disposed thereon to cooperate with said fingers, said clamping plates being arranged to enter into and clamp a bag positioned in pick-up position on the magazine. The transfer arms are interconnected by a suitable lever arrangement with the bag opening device, whereby the bag positioned at pick-up position will be automatically opened to receive the clamping plates. The clamping arms clamp the awaiting bag between the clamping plates and the fingers in response to the actuation of an air cylinder arrangement, and when the bag has been clamped the transfer arms are swung by an air cylinder and crank arm arrangement toward the filling spout of the bulk material bagging machine.

As the ends of the transfer arms carrying the empty bag approach the filling spout, a limit switch is tripped which, in turn, actuates a bag clamping mechanism on the filling spout. The bag is then transferred from the transfer arms to the filling spout, and after a brief time delay the arms return to pick up another bag from the magazine. The air chamber arrangement that operates the clamping arms is actuated by a cam-operated switch to release the bag just prior to, or simultaneously with, grasping of the bag by the clamping mechanism on the filling hopper. Tearing of a bag caused by simultaneous clamping by two separate devices is thus avoided.

Positioned below the filling spout and in front of the bag hanger is a conveyor belt arrangement for conveying a filled bag away from the vicinity of the bagging machine. The conveyor is provided with a novel arrangement of vertical forming plates, which partially enclose a bag while it is being filled. The front panel of this supporting plate structure is pivoted to swing downwardly for permitting the empty bag to be placed within the structure, after which it is returned to its vertical position.

Control circuitry is provided for interrelating the operation of the magazine, the transfer arms, the clamping mechanism on the filling hopper, and the pivoted panel of the supporting structure on the conveyor. Said circuitry includes a plurality of switches mounted on the frame of the bagging machine and operated by a unique cam arrangement in response to movement of the transfer arms. Thus, by relating the control circuitry directly to the movement of the transfer arms, the possibility of causing damage to tearable bags is minimized.

Referring now to the drawings, the bag hanging machine of the invention is indicated generally at 2 in FIG. 1, and includes a bag magazine 4 and a transfer arm mechanism 6. Positioned in front of the bag hanger 2 is a conveyor 8, and vertically thereabove is disposed the filling spout 10 of the hopper (not shown) of a bulk material automatic bagging machine. The automatic bagging machine, of which the spout 10 is a part, is of the type which will dispense a predetermined weighed quantity of material through the spout 10 upon actuation thereof.

The bagging machine 2 includes a pair of side supporting frames 12 and 14. The frame 12 includes upper and lower outwardly facing channels 16 and 18, respectively, which are welded at their forward edges to a vertical, outwardly facing channel 20. The rear edges of the channels 16 and 18 are welded to an outwardly facing

channel 22, the mating corners of the channels 16 and 22 being mitered. The side frame 14 similarly includes upper and lower channels 24 and 26, a vertical channel 28, and a rear channel 30, said channels being welded together.

The lower ends of the rear channels 22 and 30 and of the front channels 20 and 28 have cylindrical collars 32 welded to the outside thereof, and a cylindrical post 34 is received within each of said collars and is secured in position by a bolt (not shown), received within a threaded bore in said collars. The cylindrical posts each have a plate 38 welded to the bottom thereof, which plates define feet upon which the frame of the bagging machine rests.

Disposed between the two side frames 12 and 14 is the bag magazine of the apparatus. Referring to FIG. 3, the front channels 20 and 28 have spaced angle irons 40 and 42, respectively, welded to the inner faces thereof. A rectangular front magazine plate 44 is secured to said angle irons 40 and 42 by bolts 46.

A pair of vertically extending, inwardly facing channels 48 are welded to the inner faces of the upper and lower channels 16 and 18 of the frame 12, said channels being spaced from the angle irons 40 and from each other. Similarly, a pair of inwardly facing channels 50 are welded to the upper and lower channels 24 and 26 in position to confront the channels 48. Midway of their lengths each of the channels 48 and 50 has a bore therethrough, around which bores are welded cylindrical collars 52 and 54, respectively. A cylindrical shaft 56 extends through each of the collars 52, and a similar shaft 58 extends through each of the collars 54; set screws 60 and 62, respectively, are provided in the collars 52 and 54 to secure said shafts in position. The inner ends of the shafts 56 and 58 have plates 64 and 66, respectively, welded thereto, which plates are in turn welded to vertical side plates 68 and 70 of the bag magazine.

The plates 68 and 70 are adjustable toward and away from each other by manipulation of the shafts 56 and 58, whereby bags of various widths may be readily accommodated within the magazine. The top rear corners 72 and 74 of the plates 68 and 70, respectively, are rounded to permit the relatively wide bottoms common to some folded, or collapsed, bags to extend therebeyond. The side plates 68 and 70 have confronting, vertical slots 76 and 78, respectively, therein, said slots extending nearly the full height of said plates and being positioned between the shafts 56 and 58.

A rectangular bar 80 extends through the vertical slots 76 and 78, and the ends thereof extend outwardly beyond the side frames 12 and 14. As is best shown in FIG. 9, an L-shaped bar 82 is secured by bolts 84 at each end of the bar 80, the projecting legs of said L-shaped bars extending towards the front of the bag hanging machine. Referring to FIGS. 1 and 9, a pair of vertically aligned channel iron stubs 86 are welded to the outside of the upper and lower channels 16 and 18 to extend therefrom, said stubs being positioned a short distance in front of the vertical slot 76. A similar pair of stubs 88 are welded to the upper and lower channels 24 and 26. A vertical guide bar 90 is attached to the rear face of the stubs 86 by suitable bolts 92, said guide bar being spaced from said stubs by cylindrical collars 94 disposed upon said bolts. Similarly, a guide bar 96 is attached to the stubs 88 by bolts 98 and collars 100.

A vertical rack 102 is disposed to slide on the rear face of the guide bar 90, said rack having opposed pairs of L-shaped brackets 104 attached thereto by bolts 106, the confronting legs of said brackets engaging over the guide bar 90 for securing said rack thereto. The outer one of the lower set of brackets 104 is disposed between the rack and the projecting leg of the L-shaped bar 82, the bolts securing said bracket portion also securing said L-shaped bar to said rack; thus, one end of the bar 80 is attached to the rack 102 to move therewith. An identical rack 108 is secured to the guide bar 96 by brackets

110 and bolts 112, the projecting leg of the L-shaped bar 82 at the adjacent end of bar 80 being also secured to said rack. Thus, the bar 80 and the racks 102 and 108 can move together vertically along the vertical guide bars 90 and 96.

Disposed upon the bar 80 is the bottom plate 114 of the bag magazine, said bottom plate including a front flat portion 116 having reinforcing ribs 118 welded to the bottom lateral edges thereof. As is best shown in FIGS. 9 and 10, a pair of downwardly facing U-shaped members 120 are welded to the outside corners of the undersurface of said bottom plate 114 and are receivable over the bar 80. The U-shaped members are secured to said bar 80 by bolts 122, and the bases of the members 120 provide a space 124 between the bar 80 and the surface of the plate 116.

The bottom plate 114 also includes a downwardly inclined middle plate 126, which at its rear end has a horizontal plate 128 attached thereto. A pair of parallel, spaced angular bars 130 are welded to the undersurface of the middle plate 126 at the front edge thereof, and project through the space 124 to lie under the front plate 116. The bars 130 have longitudinally extending slots 132 therein, and the front plate 116 has bores 134 therein to lie over said slots. A bolt 136 is passed through each of the bores 134 and through the slot 132 lying therebeneath. A nut member 138, comprising a cylindrical bar 140 having a threaded bore in one end thereof, is threaded on each bolt 136 and functions to clamp its associated angle bar 130 to the front plate 116; a pin 142 is passed diametrically through a bore in the lower end of each nut member, and functions as a handle to facilitate manipulation thereof. The cylindrical bars 140 extend downwardly a distance sufficient to permit ready manipulation thereof. It is thus seen that by manipulation of the bolts 136 and the nuts 140, the length of the bottom plate 114 may be varied over the length of the slots 132 whereby to accommodate bags of various lengths.

The rear plate 128 has the aligned collars 143 of one-half of a hinge 144 secured thereto, the other half of said hinge being secured to a back closure plate 150. The forward edge 129 of the plate 128 is inclined upwardly and is received under the rear edge of the middle plate 126, the latter having a pair of elongated slots 148 therein disposed to lie over bores in the rear plate. Bolts 146 pass through said slots 148 and their aligned bores (not shown), and permit longitudinal adjustment of the two plates. The closure plate 150 includes an outwardly inclined lower portion 152 and a vertical upper portion 154, the vertical portion 154 having a pair of vertically aligned tabs 156 welded to the exterior thereof. The tabs 156 have aligned bores therein, which in turn are vertically aligned with a bore in the plates 128; a cylindrical collar 158 is welded to the undersurface of plate 128 about the latter bore. A shaft 160, having an outwardly bent handle 162 at the top thereof, is passed through said three aligned bores, and has a collar 164 welded thereto in position to lie upon the lower one of the tabs 156 when said shaft is engaged within the collar 158. Thus, by raising the shaft 160, the closure plate 150 can be readily pivoted downwardly to permit the insertion into the magazine of a plurality of empty bags. When the bags have been placed within the magazine, the closure plate is pivoted to its vertical position, and shaft 160 is engaged within the collar 158 to secure said plate in position.

The bag magazine of the invention incorporates means for elevating the bottom plate 114 to raise the top bag of those disposed within the magazine to the desired level. Referring in particular to FIGS. 1 and 3, the elevating mechanism includes a pair of pillow block bearings 166 and 168, which are secured in confronting relationship to the channels 16 and 24, respectively, by bolts 170. A cylindrical shaft 172 extends through said pillow blocks

and projects beyond the side frames 12 and 14. A gear 174 is mounted on the shaft 172 in position to engage with vertical rack 102, said gear 174 including a hub 176 having a set screw therein to secure said gear against motion relative to said shaft. A similar gear 178 is mounted on the other end of the shaft 172 to engage the vertical rack 108.

A ratchet assembly 180 is mounted on the side frame 12, and includes a ratchet gear 182 secured to the end of the shaft 172 outwardly of gear 174. A bracket 184 is bolted to the front face of the vertical guide bar 90 in a vertical position slightly above the longitudinal axis of the shaft 172, and supports an outwardly projecting shaft 186. An L-shaped arm 188 is supported medially thereof on said shaft 186, and includes a lower leg 190 and a curved upper pawl leg 192 positioned so that the forward tip thereof engages with the ratchet gear 182.

A generally L-shaped yoke 194 is secured by a set screw to the shaft 172 outwardly of the ratchet gear 182, and includes a vertical arm 196 having an inwardly projecting shaft 198 at the top thereof. A generally U-shaped member 200 is supported on the shaft 198 near the bottom of said U-shape, and is maintained in spaced relationship from the yoke 194 by a collar 202. The lower leg of the member 200 defines a downwardly curved pawl 204 that engages with the ratchet gear 182. The rearwardly extending arm 206 of the yoke 194 has a longitudinally extending slot 208 therein.

Secured to the rear channel 22 near the lower end thereof is a supporting bracket 210, upon which rests an electric motor 212 having a gear reduction box 214 mounted thereon. An output shaft 216 of the gear box 214 projects outwardly normally from the side frame 12 and has a disk 218 mounted thereon, keyed against relative rotation. A connecting rod 220 is secured at one end thereof to a pin 222 mounted off center on said disk 218, and the other end of said connecting rod has a pin 224 thereon which is received within the slot 208 in the yoke 194. Thus, when the disk 218 is rotated by the motor 212 the yoke 194 will reciprocate, whereby the pawl 192 will rapidly and repeatedly engage and advance the ratchet gear 182, the pawl 192 functioning to retain the ratchet gear against rearward motion during each cycle of the yoke 194; as the ratchet gear 182 revolves it causes the shaft 172 to rotate, which in turn rotates the gears 174 and 178 to drive the two racks vertically upward to thereby raise the bottom plate 114 of the bag magazine.

The upper channel 16 has an angle iron 226 bolted thereto at the rear end thereof, the upwardly projecting leg of said angle iron having a shaft 228 extending outwardly normally therefrom. Mounted upon the shaft 228 is a pawl release arm 230, said release arm being maintained in spaced relationship with the angle iron 226 by a cylindrical collar 232 disposed on the shaft 228. The release arm 230 has an upwardly projecting arm 234 thereon, positioned to engage the upper arm 236 of the U-shaped member 200. A generally L-shaped arm 238 extends forwardly from the body arm 240 of the release arm 230, and is arranged to engage the lower leg 190 of the arm 188. When it is desired to release the ratchet mechanism the body arm 240 of the release arm 230 is pivoted downwardly, whereby the two pawls 192 and 204 are lifted from the ratchet gear; the shaft 172 is then free to rotate in a direction to permit the vertical racks to move downwardly, whereby the bottom plate of the magazine is returned to its lower position. A handwheel 242 is secured to the end of the shaft 172 opposite to the ratchet assembly, and provides a means for manually operating the bag magazine elevating mechanism.

The bag hanger machine of the invention is constructed to transfer a horizontally disposed bag from the bag magazine 4 to the filling spout 10 of the bulk material bagging machine with which this invention is utilized. Referring to FIGS. 1 and 8, the bagging machine (not shown) includes a hopper in which the bulk material to be dis-

pensed is contained, said hopper terminating at its lower end in the filling spout 10. The filling spout 10 includes a pair of inwardly inclined side plates 244 and a pair of end plates 246. A bag holding mechanism 248 is attached to the plates 244 and 246, and includes a pair of end plates 250 welded to the end plates 246. A pair of vertically disposed side plates 252 are welded between the end plates 250, one on each side of the filling spout. The side plates 252 have longitudinally extending cutout portions 254 therein, and have longitudinally extending, confronting clamping bars 256 secured to the lower inner edges thereof; each clamping bar 256 has a longitudinally extending groove 258 therein.

Extending through each of the cutouts 254 is one of a pair of L-shaped clamping arms 260, the lower edges of the side plates 244 having notches (not shown) therein to permit passage of said L-shaped arms therethrough. Each of the L-shaped arms is pivotally supported upon a shaft 262 extending between the end plates 250, whereby when the outer ends of the arms are moved downwardly the lower ends thereof will move away from the clamping bars 256. The lower ends of said arms 260 have longitudinally extending clamping plates 264 welded thereto, each of said plates having a longitudinally extending protrusion 266 thereon positioned to confront one of the grooves 258.

A pair of ears 268 are welded to the side plates 244, one on each side of the filling spout. The upper end of an air cylinder 270 is pivotally connected to each of said ears 268, said air cylinder being of the double-acting type and including air connections at each end thereof. The piston shaft of each air cylinder is pivotally connected at its lower end to the outer end of one of the L-shaped arms 260, so that when the piston of the air cylinder is moved said arm will pivot about its associated shaft 262. Thus, by actuating the air cylinders 270 the arms 260 may be moved to alternately grasp and hold, or release, the top edges of a bag positioned below the filling spout 10 and between elements 258 and 266.

A supporting bar 272 is welded to the front side plate 252 to project outwardly therefrom, and has a double-pole limit switch 274 mounted thereon, one side of said switch being normally open and the other side normally closed. A pair of actuating arms 276 project outwardly from said switch to lie parallel to and spaced from the lower edges of the end plates 250, and are arranged to operate said switch 274 in response to upward pivoting motion thereof; said arms are pivoted upwardly when engaged by a bag being placed on the filling spout by the transfer arm mechanism. The purpose for and construction of the switch 274 will be more fully described hereinafter.

Disposed vertically below the filling spout 10 is one end of the conveyor 8. Referring again to FIGS. 1 and 8, said conveyor includes two side frames 278 and 280. The side frame 278 comprises an upper rail 282 and a lower rail 284, said rails being interconnected at spaced intervals therealong by vertical angle irons 286. Similarly, the side frame 280 includes upper and lower rails 288 and 290. The two side frames 278 and 280 have vertical angle irons 292 extending downwardly therefrom, which angle irons terminate in footpads 294 welded to the lower ends thereof. The angle irons 292 thus form supporting legs for the conveyor.

The upper rails 284 and 288 have a plurality of rollers 296 supported therebetween on shafts 298, and a cylindrical drum 300 is supported between said frames at the end thereof upon an axle 302. The opposite ends of the axle 302 pass through pillow block bearings 304, which bearings have notches in their top and bottom edges to receive the upper and lower rails of their associated side frames. The vertical angle irons 286 positioned immediately behind said axle 302 both have a bore therethrough, around which is welded an internally threaded collar 306. A bolt 308 extends through each said collar 306 and en-

gages the rear face of the pillow block associated therewith, whereby the position of said axle 302 may be varied to tighten or loosen a conveyor belt 310 which is disposed upon the rollers 296 and about the drum 300. A pair of lock nuts 312 are threaded on the end of the bolt 308, and function to secure the bolt in position.

Supported upon the end of the conveyor 8 is a bag supporting and guiding mechanism 314, one purpose for which is to provide a means for exact placement of bags on the conveyor belt when the bags have been filled and released by the bag grasping mechanism. Further, the mechanism prevents a bag from tipping over to one side until it has moved a distance along the conveyor, and functions to partially shape a bag as it is being filled.

Referring to the drawings, the bag supporting mechanism 314 includes a pair of spaced brackets 316 secured to the rail 288, said brackets each including a vertical support plate 318 welded to a horizontal base plate 320, a gusset plate 322 being welded between said plates 318 and 320. The vertical plate 318 is welded to said rail 288, and the base plate 320 has bolt receiving bores therethrough. Disposed upon the base plates 320 is a base plate 324, said plate 324 having slots therein extending perpendicular to the rail 288; bolts 326 pass through the slots in the base plate 324 and the bores in the base plate 320 to secure said members together. A vertical support plate 328 is welded to the base plate 324, and a gusset plate 330 is welded between said plates 328 and 324 to maintain said plate 328 in a vertical position; a support plate 332 is welded to project normally from the front edge of the plate 328, the upper edge 334 of said plate 332 having a generally S-shape.

The rail 282 has a pair of spaced brackets 336 welded thereto, each comprising a vertical support plate 338 and a gusset plate 340. The brackets 336 are welded at their top end to a longitudinally extending base plate 342 having bolt receiving bores therethrough. Disposed to lie upon the base plate 342 is a base plate 344, said plate 344 having slotted bores therein to permit adjustment thereof toward and away from the conveyor belt; bolts 346 secure the two base plates 342 and 344 together.

The base plate 344 has a pair of aligned lugs 348 projecting upwardly therefrom, said lugs having aligned bores therethrough for receiving a shaft 350. A front panel 352 is welded along its lower edge to the shaft 350 between the lugs 348, whereby upon revolving the shaft said panel will move between a vertical and a horizontal position.

The rail 288 has welded thereto a supporting base 354, said base having an ear 356 projecting therefrom. The cylinder end of an air cylinder 358 is pivotally secured to said ear 356, said air cylinder being of the double-acting type. The piston rod 360 of the air cylinder is pivotally connected to the projecting end of a crank arm 362, the other end of said crank arm being welded to the projecting end of the shaft 350. The air cylinder 358 and the crank arm 362 are so arranged that when the piston rod is extended the panel 352 will be pivoted to its vertical position; similarly, when the piston rod 360 is received within the housing of the pneumatic cylinder 358 said panel will assume a horizontal position.

The panel 352 is hinged downwardly to its horizontal position during the time when a bag is being transferred from the bag magazine 4 to the filling spout 10. When the bag has been grasped by the mechanism on the filling spout, the air cylinder 358 is automatically actuated through the control circuitry of the invention to raise the pivoted panel 352 to its vertical position. Thus, a means is provided for partially confining a bag during filling thereof, and to guide a filled bag downwardly to a correct position on the conveyor 8.

The bag hanging machine of the invention utilizes a transfer arm mechanism for removing a bag from the magazine 4 and positioning it below the hopper 10 for grasping by the grasping mechanism 248. Referring now

to FIGS. 1 to 3, the transfer arm mechanism 6 is supported upon upwardly extending portions 364 and 366 of the channel members 20 and 23, respectively. The upper ends of the channel portions 364 and 366 are bridged by a welded-in-place, upwardly facing channel member 368, the mating corners of said channels being mitered. The two channels 364 and 366 have aligned bores therethrough a short distance below the bridging member 368, and a pair of pillow block bearings 370 and 372 are secured about said openings by bolts 374. A cylindrical shaft 376 extends through said bearings 370 and 372, and projects outwardly a substantial distance beyond the side frame 12. Supported upon the shaft 376 are a pair of transfer arms 378 and 380, the transfer arms being adjustable toward and away from each other for use with bags of various widths.

The transfer arm 378 has a flanged, semi-cylindrical collar 382 welded to the top end thereof, the longitudinal axis of said collar extending perpendicularly to said arm. A mating semi-cylindrical flanged collar 384 is engaged over the shaft 376, and is secured to the semi-cylindrical collar 382 by bolts 386; suitable shims 388 are interposed between the confronting flanges on the two collars 382 and 384, and said collars are keyed (not shown) to the shaft 376 to prevent rotation of the transfer arm 378 relative thereto. The transfer arm 380 has a pair of semi-cylindrical collars 390 and 392 mounted thereon, which are identical to the collars 382 and 384 and which function to secure the arm 380 to said shaft 376.

The lower ends of the transfer arms 378 and 380 have rearwardly projecting, rounded fingers 394 and 396, respectively, bolted thereto, said fingers projecting substantially normally from the transfer arms and being inclined outwardly at their tips (FIG. 3). A base plate 398 is secured to the transfer arm 378 a short distance below the collar 382, and a similar plate 400 is secured to the transfer arm 380 opposite said plate 398. The plates 398 and 400 have spaced, generally triangular gusset plates 402 and 404, respectively, projecting therefrom, to which are welded transversely-extending collar sections 406 and 408. A clamping arm 410 is pivotally connected to the collars 406 by a pin 412, said clamping arm having a cylindrical collar welded to the upper end thereof adapted to be aligned with said collars 406. Similarly, a clamping arm 414 is pivotally connected to the collars 408 by a pin 416.

The lower ends of the clamping arms 410 and 414 have clamping plates 418 and 420, respectively, welded thereto, said clamping plates projecting generally parallel to the fingers 394 and 396 and functioning to clamp the sides of a bag to said fingers when the clamping arms are pivoted to lie immediately adjacent their respective transfer arms. About midway of their lengths the clamping arms 410 and 414 have brackets 422 and 424 thereon, respectively; a push rod 426 is pivotally connected at one end thereof by a pin 428 to the bracket 422, and a similar push rod 430 is pivotally connected by a pin 432 to the bracket 424. The other ends of the two push rods 426 and 430 are pivotally connected to hinge plates 434 and 436, respectively, mounted on the ends of a cross bar 438 that is secured medially thereof by nuts 440 to the threaded end of a piston rod 442.

As is best shown in FIG. 3, the hinge plate 434 has longitudinally extending slots 444 therein through which bolts 446 are passed to secure said hinge plate to the cross bar 438; the elongated slots 444 permit adjustment of the push rod 426 to compensate for different distances between the two transfer arms, which distance is varied according to the width of the bags which are to be suspended. The hinge plate 436 has similar slots 448 therein, and is secured by bolts 450.

The piston rod 442 is received within a two-chamber air cylinder 452, which cylinder is supported from the shaft 376 by a supporting bracket 454. Referring to FIGS. 2 and 6, the supporting bracket 454 includes an upper, semi-

cylindrical collar 456 and a lower, semi-cylindrical collar 458, said collars having confronting lateral flanges thereon through which bolts 460 are passed to secure them in position upon the shaft 376. A rectangular key 462 is received within confronting grooves in the shaft 376 and the interior of the lower collar 458 for securing said collars against rotation relative to said shaft. Shims 464 are interposed between the opposed flanges on the collars to insure tight gripping of the shaft 376.

The lower collar 458 has a boss 466 extending therefrom, terminating in a face lying perpendicular to the axes of the transfer arms. A plate 468 is welded to said face, and projects a short distance rearwardly from the rear face of said boss. A plate 470 is welded to the rear edge of plate 468, and extends downwardly normally therefrom. An L-shaped support bracket 472 is bolted to the inner face of the plate 470 by bolts 474 a short distance below the plate 468, and functions to support the air cylinder 452.

The air cylinder 452 includes a central body 476, said body including an upper face 478 and a lower face 480. The body 476 has a pair of L-shaped bores 482 and 484 therein, which bores open in the center of the faces 476 and 480, respectively, and are threaded at their outer ends for reception of air conduit fittings 486 and 487, respectively. The upper face 478 has an annular groove therein with which is received the lower end of an upper cylinder 488. Similarly, the lower face 480 has an annular groove therein for reception of the upper end of a lower cylinder 490.

An upper end cap 492 having an annular groove in its lower face is mounted on the upper end of the cylinder 488, and has an L-shaped, off-center bore 494 therein opening into said cylinder and threaded at its outer end for reception of a conduit fitting 496. The end cap 492 has a central bore therethrough, through which a piston rod 498 passes; an O-ring seal 500 is contained within an annular groove in said central bore for sealing said piston rod. The upper end of the piston rod 498 is threaded, and passes through a bore in the L-shaped bracket 472, in which position it is secured by nuts 502. The lower end of the piston rod 498 is threaded and is reduced in diameter for reception of a piston 504, which piston is retained in position by a nut 506.

The lower end of the lower cylinder 490 is closed by an end cap 508 substantially identical in construction to the end cap 492, and has an air fitting 510 threaded within the outer end of an L-shaped bore 512 therein. The two end caps 492 and 508, and the other elements of the pneumatic cylinder, are held in assembled position by four longitudinally extending tie rods 514 (see FIG. 7), the outer ends of which pass through bores in said end caps and have nuts 516 threaded thereon; the central portion of said rods 514 pass through the body 476. The piston rod 442 projects into the lower cylinder 490 and has a piston 518 attached thereto by a nut 520. As is best shown in FIG. 7, a pair of L-shaped brackets 522 are secured by bolts 524 to the sides of the body 476 and are engaged over the vertical plate 470, whereby the air cylinder is guided for generally vertical sliding movements.

The two-chamber air cylinder 452 functions to operate the clamping arms 410 and 414. It should be noted that the piston 504 within the upper cylinder 488 has a total stroke which is only about one-third that of the piston 518 within the lower cylinder. When the transfer arms are in their down, or bag-entering position, the piston 518 is actuated by a solenoid valve and the control circuitry of the invention to fully telescope its associated piston rod within the cylinder 490; thus, the clamping plates on the lower ends of the clamping arms are separated and can easily enter into the bag to be picked up. The piston rod 498 is preferably fully extended while the transfer arms are in their down position. After the transfer arms are positioned to pick up the waiting bag, the piston 518 is driven to fully extend its piston rod, whereby the la-

teral edges of an awaiting bag are securely clamped between the clamping plates on the clamping arms and the fingers on the transfer arms. The transfer arms are thereafter caused to swing upwardly toward the filling hopper 10.

As the bag enters into the clamping mechanism 248 on the filling hopper, the L-shaped clamping arms 260 are actuated upon tripping of switch 274 to clamp the two opposed top edges of the open bag. Simultaneously with this movement, the upper piston 504 is actuated by a cam-operated switch and solenoid valve arrangement to telescope its piston rod 498 with cylinder 488, whereby the clamping ends of the clamping arms are moved inwardly a distance sufficient to release the bag, but not so great as to bring the clamping arms into engagement with the end plates on the bag gripping mechanism 248. After the bag has been gripped by the mechanism 248, the transfer arms continue upwardly until the fingers and the clamping plates have been withdrawn completely from the bag. The piston 504 is then actuated to extend the piston rod 498, whereby on the downward swing thereof the transfer arms and the clamping arms will all pass laterally outwardly of the bag now suspended from the filling hopper 10. Once the transfer arms are a sufficient distance below the hopper 10, say about one-third the arc distance toward the bag magazine, the piston is again actuated by a cam-operated switch to open the clamping arms for reception into the next awaiting bag.

The transfer arms 378 and 380 are swung through their substantially 90-degree arc by an air cylinder 526. Referring to FIGS. 1 and 2, a supporting bracket 528 is welded to the vertical channel 20, and includes a vertical plate 530, a horizontal plate 532, and a gusset plate 534. An ear 538 is welded in position upon the plate 532, and the lower bifurcated end of the air cylinder 526 is pivotally secured thereto by a pin 538. The piston rod 540 of the air cylinder 526 has a bifurcated end 542 thereon, which is pivotally secured by a pin 544 to one end of a crank arm 546. The other end of the crank arm 546 is integral with a cylindrical collar 548, which collar is keyed to the shaft 376. The air cylinder 528 is of the double-acting type, and functions to move the transfer arms between the positions indicated by full and phantom lines in FIG. 1.

The top channel member 368 has a bar 550 welded thereto in position to extend over the extending portion of the cylindrical shaft 376, and said bar has three axially spaced limit switches 552, 554 and 556 thereon; said switches are aligned with cams 558, 560 and 562, respectively, fixed to the shaft 376. The switch 552 and its associated cam 558 function, through a solenoid control valve, to control the operation of the lower piston 518 of the two-chamber air cylinder 452, and thus partially controls the positions of the clamping arms. The switch 554 and its associated cam 560 function through a solenoid valve to operate piston 504, whereby to initiate release of the bag when the lower ends of the transfer arms are positioned adjacent the grasping mechanisms 248. The third switch 556 and its associated cam 562 function to initiate a time delay when the lower ends of the transfer arms are at their extreme upper position, adjacent the filling spout 10.

Referring now to FIGS. 11-14, the construction and arrangement of the cams 558, 560 and 562 and their associated switches is shown in greater detail. All the cams of the invention are constructed and mounted on the shaft 376 in an analogous manner, and hence only the cam 558 will be described in detail. As is shown in FIGS. 11 and 12, the cam 558 comprises a pair of semi-cylindrical collars 564 and 566 having arcuate radial flanges 568 and 570, respectively, projecting from one end thereof. The two collars 564 and 566 are constructed to fit about the shaft 376 with a slight gap therebetween. A continuous cylindrical collar 572 encircles the two semi-cylindrical collars 564 and 566, and functions to fasten the cam to the

shaft 376, a bolt 574 is engaged within a threaded bore in the collar 572, and functions to secure said collar in position.

The cam 560 includes a pair of semi-cylindrical collars 576 and 578, which have flanges 580 and 582 thereon, respectively. Similarly, the cam 562 includes a pair of semi-cylindrical collars 584 and 586, having flanges 588 and 590, respectively thereon. The cams 560 and 562 are secured in position by continuous collars 592 and 596, respectively.

The cam 558 has an arcuate lobe 596 formed on the flange 568 thereof, which lobe has an outer dwell portion 597 and which extends through about 60 degrees; the lobe is positioned to actuate the switch 552. Similarly, the flanges 580 and 590 of the cams 560 and 562 have arcuate lobes 598 and 600 thereon, respectively, positioned to actuate the switches 554 and 556. The two lobes 598 and 600 each extend through a total of about 10 degrees, with an effective switch-actuating length of about 5 degrees.

The switches 552, 554 and 556 are each of a type which will be activated when their associated cams are rotated in one direction, and which will ride over the cam lobes when said cams are rotated in the opposite direction. The switch 552 is provided with a pivoted activating arm 602 having a roller 604 at its tip that rolls on the cam 558; the activating arm 602 is constructed to ride over the lobe 596 when the shaft 376 in FIG. 11 is rotated counterclockwise, and to activate the switch 552 when the shaft rotates clockwise to bring the lobe 596 into engagement therewith.

The switches 554 and 556 are provided with operating lever arms 606 and 608, respectively, both of which are constructed and arranged to actuate their associated switches when the shaft 376 is rotated counterclockwise, and to override their associated cam lobes when the shaft 376 rotates clockwise. The shaft 376 rotates clockwise in FIGS. 11-14 when the transfer arms travel from the hopper to the magazine, and counterclockwise when said arms swing in the opposite direction.

The switch 552 in the embodiment of FIG. 1 is connected with a four-way solenoid valve, which valve is actuated upon energization of the switch by its associated cam lobe to drive the piston 518 upwardly in its chamber, whereby the clamping arms are drawn toward each other into their retracted position. When the switch 552 is de-energized, the four-way solenoid valve controlled thereby drives piston 518 in the opposite direction to cause the clamping arms to move outwardly into engagement with the transfer arms.

The switch 554 is connected to a solenoid valve that controls the position of the upper, shorter stroke section of cylinder 452. When the switch 554 is energized by its associated cam (which occurs as the transfer arms near the hopper 10), the upper section of the cylinder 452 is activated to move the clamping arms inwardly; when the switch 554 is in its de-energized state, the solenoid valve associated therewith drives the upper section of the air cylinder 452 to cause the clamping arms to move outwardly.

The switch 556 is connected across a time delay, as is described hereinafter, and when energized by its associated cam 562 initiates a time delay that causes the transfer arms to pause in their movement. The switch 556 is actuated when the transfer arms are in their fully raised position adjacent the hopper 10, and the time delay initiated thereby allows time for the bag to be fully gripped by the mechanism 248.

The relative positions for the cams 558, 560 and 562 when the transfer arms are in their down, or bag entering, position are as shown in FIGS. 11, 13 and 14, and the developed lobes 596, 598 and 600, respectively, of said cams during the 90-degree forward stroke (from the magazine toward the hopper) and the reverse 90-degree return stroke (from the hopper toward the magazine) are

shown in the graph of FIG. 15. When the transfer arms are in their down position, the lobe 596 is positioned clockwise of and about 5 degrees removed from the roller 604, and the lobe 598 is disposed about 85-degrees clockwise from switch 554. The time delay control cam lobe 600 is positioned to activate switch 556 after the transfer arms have moved counterclockwise through 90 degrees.

Referring to FIG. 15, the switch actuating positions for the lobes 596, 598 and 600 are indicated in full lines, and the switch over-ride position in broken lines. As the transfer arms travel upwardly on their forward stroke, the roller 604 rides over the cam lobe 596, whereas the bag release switch 554 is energized after about 85 degrees of movement by the lobe 598. The cam lobe 600 energizes the time delay switch 556 after 90 degrees travel upwardly, and the transfer arms then pause for the duration of the time delay.

After conclusion of the time delay, the air cylinder 526 is activated by the control circuitry and a solenoid valve to cause the transfer arms to begin their return, or downward, stroke. The switches 554 and 556 override the lobes 598 and 600 on such return stroke.

After the transfer arms have travelled about 30 degrees in their return stroke, lobe 596 activates switch 552, causing the clamping arms to move together for entering the awaiting bag. When about 85 degrees of the return stroke has been completed, the switch 552 is released by the lobe 596, and the clamping arms move toward the transfer arms to grasp the awaiting bag.

It is thus seen that the cam and switch arrangement of this invention provides for sure, automatic operation of the transfer arm mechanism. The mounting collar structure for the cams facilitates proper positioning thereof relative to their associated switches to obtain the desired operating sequence.

In some instances it may be desirable to eliminate the switches 552 and 554, and to actuate the air cylinder control valves directly. Such an arrangement is shown in FIGS. 16-18, wherein the cams 558, 560 and 562 are identical to the like-numbered elements of FIGS. 11-14, and the switch 556' is substantially identical to the switch 556.

In FIG. 16, a four-way valve 606 equipped with a one-direction overriding actuating lever 608 is illustrated positioned over the cam 558, the valve 606 being connected to supply air to the top end of the lower chamber of the cylinder 452 when activated by the cam lobe 596. The valve 606 thus functions when operated by cam lobe 596 during the return stroke of the transfer arms to move the clamping arms inwardly.

Positioned above the cam 500 is a valve 614 having an override-type actuating lever 616, and which is connected to the upper chamber of the cylinder 452. The valve 614 functions when actuated during the forward stroke of the transfer arms to release a bag from the grip of the clamping arms. The switch 556' operates in exactly the same manner as the switch 556 to produce a time delay at the end of the transfer arm's forward stroke.

If the transfer arms are to properly pick up a bag from the magazine 4, it is necessary that said bag be opened to receive the clamping plates on the clamping arms. The bag hanging machine of the present invention incorporates a bag opening apparatus 700 to accomplish this function, which apparatus is arranged to be automatically operated in response to the position of the transfer arms.

Referring to FIGS. 1-3, a pair of pillow block bearings 702 and 704 are secured in confronting relationship to the upper channels 16 and 24 about midway between the front channels and the vertical racks. A shaft 706 extends through said bearings, one end 708 thereof projecting beyond the side frame 12. A suction arm 710 is mounted on the shaft 706, said arm 710 having a collar 712 welded to one end thereof in position to extend perpendicularly thereto; the collar 712 is disposed on

the shaft 706 and is keyed thereto (not shown) to prevent relative rotation therebetween.

The opposite end of the suction arm 710 has a generally vertically disposed collar 714 welded thereto, to the upper end of which is attached a suction hose 716. A nipple 718 is attached to project from the lower end of the collar 714, and terminates in a funnel-shaped suction head 720.

The outer end of the shaft 706 has a crank arm 722 keyed thereto, said crank arm including a cylindrical collar 724 receivable about said shaft and a projecting arm 726. The end of the arm 726 is pivotally connected by a pin 728 to one end of a connecting rod 730, the opposite end of said connecting rod being pivotally connected by a pin 732 to the end of a crank arm 734. The crank arm 734 includes a hub 736 keyed to the shaft 376 by a key 738. The crank arms 722 and 734 and rod 730 are proportioned and arranged so that when the transfer arms move upwardly, thereby revolving shaft 376, the suction head 720 will move downwardly toward the top bag 770 contained in the magazine 4, ultimately coming into engagement with said bag when the transfer arms are in their fully elevated position. The suction effect on the head 720 causes it to grasp the top side wall of the bag. As the transfer arms swing downwardly, the crank arms and connecting rod will cause the shaft 706 to revolve in the opposite direction, whereby the suction arm 710 is pivoted upwardly. This action results in the top end of the bag 770 being opened sufficiently to permit entry therinto of the clamping plates on the clamping arms.

The suction head 720 usually is sufficient to open a bag for entry of the clamping arm structure. However, for some bag materials there may be a tendency for the two side walls of the bag to stick together; this is especially true of polyethylene-lined bags, and the like. To open such a bag for entry of the clamping arms, an additional suction device may be employed, such being illustrated in FIG. 19.

Referring to FIG. 19, a suction head 720' is shown mounted on a suction arm 710' in position to hold a bag 770' partially open. The front plate 44' of the bag magazine has a cylindrical shaft 772 supported in spaced relationship thereto a short distance below its top edge, and a suction device 774 is supported upon said shaft. The device 774 includes a pair of cylindrical collars 776 and 778 disposed at right angles to each other, and interconnected by a post 780. The collar 776 is mounted on the shaft 772, and is secured thereto by a set screw (not shown). The collar 778 has a suction hose 782 connected to the lower end thereof, and a funnel-shaped suction head 784 connected to its top end; the front plate 44' has a notch 786 cut therein positioned to receive the suction head 784.

The operation of the device of FIG. 19 is as follows. The suction head 720' is brought into engagement with the top bag 770' by movement of the transfer arms in the manner described hereinabove for the head 720. As the arm 710' starts to move upwardly, the bag 770' is carried upwardly and slightly forwardly by the suction head 720' until the lower face thereof is presented to the suction head 784. The slight forward movement referred to is caused by the fact that the suction head 720' is a substantial distance below the axis of the shaft 706 when it first engages a bag. The suction head 784 then grasps the lower face of the bag, while the upper face of the bag is being moved upwardly by the head 720'. The two suction heads thus cooperate to open the bag sufficiently to permit entry therinto of the clamping plates on the clamping arms, whereby the bag 770' may be readily grasped by said arms.

The top bag 770 in the bag magazine 4 must be correctly positioned in elevation if the suction head 720 is to properly perform its function, and if the bag is to be positioned for entry of the clamping arms therinto.

As was described hereinabove, the bottom plate 114 of the bag magazine is elevated by an electric motor through the vertical racks and the ratchet and pawl mechanism of the invention. Such elevation will bring the top bag of the horizontal stack to the correct height for proper operation of the bag hanging machine; however, a means should be provided to automatically terminate elevation of the bags when the top bag of the stack has attained its desired height. The present invention includes such a means.

Referring to FIGS. 2, 3 and 4, a bag elevation limiting switch device is indicated generally at 788, and includes a horizontal plate 780 secured to the top channel member 16 by bolts 782, said plate being positioned between the front channel and the pillow block 704. The plate 780 extends inwardly across the top of the side plate 68 to a position over the bottom plate of the magazine, and has a vertical plate 792 welded thereto. The vertical plate 792 has a cylindrical shaft 794 extending therefrom (FIG. 4), upon which is mounted a lever arm 796, said lever arm being pivotally mounted near the middle thereof.

Secured to the plate 792 over one end of the lever arm 796 is a normally closed limit switch 798, said switch including a pushbutton 800. The switch 798 is connected into the circuit of the ratchet-driving motor 212, and causes said motor to operate when the pushbutton 800 is depressed. A cylindrical collar 802 is secured to the plate 792 with the axis thereof positioned in alignment with the other end of the lever 796. A cylindrical shaft 804 passes through the collar 802, and is pivotally connected at its upper end to said lever arm. The lower end of the shaft 804 has a rounded, weighted foot 806 secured thereto, which normally rests upon the bags contained in the bag magazine.

The operation of the device 788 is as follows. Initially, the bags are placed in the bag magazine, and the motor 212 is switched on. The ratchet arrangement then elevates the bottom plate of the magazine until the top bag of the stack engages the foot 806. As the foot 806 is raised, the pushbutton 800 is permitted to extend until the circuit to the drive motor is broken. Elevation of the bags then ceases. By properly adjusting the switch 798, it is possible to precisely position the top bag for pickup by the transfer arms. As soon as the first, or top, bag has been removed by the transfer arms from the bag stack, the weighted foot 806 drops to engage the next successive bag; this causes the lever arm 796 to pivot, closing the switch 798 and starting the bag elevating mechanism in operation.

The bag magazine 4 of the invention is intended to hold a large plurality of empty, collapsed bags. When a bag, particularly a paper bag incorporating gussets in the sides and bottom thereof, is folded flat, the bottom thereof will normally have a substantially greater thickness than the top. Thus, if a large plurality of bags are horizontally stacked in their folded position, the stack will have a considerably greater height at the bottom ends of said bags than at the top ends thereof. The angled bottom plate 114 of the bag magazine compensates partially for this increased thickness at the bottom ends of the bags. However, this angled plate structure may be insufficient to maintain the top bag of the stack substantially level throughout its length if a great number of bags are disposed in the magazine, or if bags having a relatively great thickness when folded are employed.

For the transfer arms and the bag opening apparatus to properly function, the top bag of the stack should normally lie substantially flat throughout its length; in any case, the difference in height between the top and the bottom of the top bag should not be so great as to interfere with its removal from the bag stack by the transfer arms. The bag hanging machine of the invention incorporates a bag leveling mechanism to compen-

sate for the difference in thickness of a bag stack at the front and rear edges thereof.

Referring to FIGS. 1-5, the front plate 44 of the bag magazine has a vertical, rectangular opening 808 centrally thereof, said opening extending nearly the entire height of said plate. A pair of opposed pillow block bearings 810 are secured to the plate 44 a short distance below the top of the opening 808, and a similar pair of pillow block bearings 812 are secured to said plate a distance above the bottom of said opening. A shaft 814 extends through the bearings 810, and a similar shaft 816 extends through the bearings 812.

The shafts 814 and 816 have sprocket gears 818 and 820 mounted thereon, respectively, said gears being positioned to confront the center of the opening 808. A continuous roller chain 822 is mounted over the sprocket gears 818 and 820 to extend therebetween, the teeth on said gears engaging between the rollers on said chain. The roller chain 822 has a plurality of L-shaped cleats 824 secured thereto to extend through the opening 808. The forward edge of the plate 116 is received between the two bottommost cleats 824, whereby when the elevation of said plate 116 is substantially changed it will cause the roller chain 822 to move about the sprocket gears 818 and 820.

A flanged, substantially U-shaped cover plate 826, having a length substantially less than the distance between the shafts 814 and 816, is secured by screws 828 to the front plate 44. The cover plate 826, as is best shown in FIG. 4, has a height sufficiently great to just clear the rear face of the cleat-bearing portion of the roller chain 822, and thus functions as a backup plate for said chain portion.

In use, bags (indicated in FIGS. 4 and 5 by phantom lines) are stacked into the bag magazine several at a time, said bags each incorporating gussets 829 in the sides thereof. When the relatively thick bottoms of the bags, which are disposed adjacent the plate 154, build up sufficiently to cause a substantial difference in height between the top and bottom of the top bag of the stack, the tops of the next group of bags are placed on the next higher one of the cleats 824 rather than being allowed to rest on the bags immediately therebelow. This process is continued until the magazine is filled with bags to the desired level. The result is that the bottom, relatively thick bag ends will be in contact throughout the height of the stack, whereas the top, relatively thin ends of the bags will be separated periodically by the cleats 824 (best shown in FIGS. 4 and 5). This results in the top bag of the stack being nearly flat throughout its length.

As the platform 114 is raised during operation of the filling machine, the cleats 824 will also be raised because of the fact that the plate 116 is engaged beneath one thereof. The roller chain will progress around its sprocket gears, carrying the cleats 824 through the portion of the opening 808 that extends above the shaft 814; it is thus obvious that the shaft 814 must be spaced a sufficient distance below the top of the opening 808 so that cleat may pass through said opening (indicated by phantom lines in FIG. 4).

The bag magazine, the transfer arms and the grasping mechanism on the filling spout are all interconnected by a circuit which includes the cam-operated switches 552, 554 and 556, and the switches 274 and 798, whereby the operation of the machine is entirely automatic. The control circuitry of the bag hanging machine is also interconnected with the control circuitry of the bagging machine, whereby the operation of the two machines is interrelated and automatic. The control circuitry of the invention is illustrated schematically in FIG. 20, wherein the control circuit for a typical bagging machine is also shown.

Referring to FIG. 20, a power supply is indicated at 830 having a pair of leads 832 and 834 connected there-

to, a double-pole switch 836 being connected in said leads. The leads 832 and 834 furnish power to the control circuitry of a typical bag filling, or bagging, machine, indicated generally at 838, and to the control circuitry of the bag hanging machine of the invention, indicated generally at 840.

The bagging machine control circuit 838 includes a timing relay 842 connected between the leads 832 and 834, which relay determines the overall operating cycle of said machine. Connected in parallel across the timing relay 842 to be controlled thereby are a starter 844 and a control relay 846, the starter 844 being part of the circuit of an electric motor (not shown) utilized to periodically feed the material to be bagged into the hopper of the bagging machine.

The circuitry for controlling the bag hanging machine circuit includes a timing relay 848 connected between the leads 843 and 834, which functions to automatically control recycling of the bag hanging machine. The timing relay 842 of the bagging machine is suitably connected with the relay 848, to properly correlate the operating cycles of the two machines.

Returning to the bagging machine circuit 838, a three-position selective switch 850 is connected to the lead 832, and includes two terminals 852 and 854; in its center position the switch 850 is off, and in its other two positions it connects the lead 832 with the terminals 852 or 854, which terminals are in turn respectively connected to automatic and manual circuitry for operating the material dumping apparatus of the bag filling machine.

The manual terminal 854 of switch 850 is connected by a lead 856 through a solenoid control valve 858 to the lead 834, the control valve 858 being operable by the switch 850 to dump material from the hopper of the filling machine. One terminal 860 of a switch 862 is connected to lead 856 between terminal 854 and valve 858, and the other terminal 864 of said switch 862 is connected to a lead 866 connected at point 868 to a lead 870 emanating from terminal 852.

A beam switch 872 is connected into the lead 870, and a lead 874 is connected to the lead 870 just before said beam switch and extends to lead 834; the lead 874 has a second beam switch 876 therein disposed before a solenoid valve 878. The beam switch 876 is actuated as a bag being filled by the machine nears its desired weight, and functions to activate valve 878, which valve then partially closes the hopper to cut the flow of material into the bag to a dribble.

The beam switch 872 has a pair of leads 880 and 882 extending between it and lead 834, the former having a pair of overloads 884 therein, and being connected across the starter 844 of the motor (not shown) which feeds material into the hopper of the filling machine. The lead 882 has a solenoid valve 886 therein which, when activated, stops the flow of material from the hopper into the bag. Thus, when the beam switch 872 is closed, which occurs upon the bag being filled obtaining its desired fullness, valve 886 is activated to stop the flow of material from the hopper, and starter 844 is activated to start the hopper filling motor to bring more material into said hopper.

The switch 850 may be actuated to activate valve 858, whereby material may be manually dumped from the hopper into the bag; in this instance, switch 862 may be closed to bring the automatic flow-cutoff apparatus into use. Alternatively, the switch 850 may be turned to terminal 852 to automatically control the bag filling operation. The timing relay 848 of the bag hanging machine is connected into both lead 866 and lead 870 to cause the automatic flow control circuitry to be correlated with the operation of the bag hanging machine.

The bag hanging machine circuit 840 includes a lead 888 extending between the leads 832 and 834, which lead contains the normally closed limit switch 798 (FIG. 3) positioned above the bag magazine, whereby it will be

automatically opened when the top bag in the magazine has been elevated to the correct height. An ON-OFF switch 890 is connected into the lead 888 before the switch 798, and functions as a master control switch for the magazine elevating apparatus. The starter circuit 892 for the bag elevating motor 212 (FIG. 1) is also connected into the lead 888, and a pair of overloads 894 are disposed between it and the switch 798.

The circuitry for controlling the swinging motion of the transfer arms and for operating the bag gripping apparatus on the hopper is indicated generally at 896, and includes a lead 898 extending between lead 832 and one terminal 900 of a master control, ON-OFF switch 902. Connected into the lead 898 is a timing relay 904 for controlling the return delay of the transfer arms from the hopper, said relay 904 being itself connected between the leads 832 and 834 by a lead 906. A solenoid valve 908 is connected in the lead 898 between the other terminal of switch 902 and lead 834, said valve functioning to control the pneumatic cylinder 526 which moves the transfer arms between the bag magazine and the filling hopper (FIG. 1); the solenoid valve 908 is constructed to cause the arms to assume their down, or bag entering, position when no power is supplied thereto, and to cause said arms to swing toward the hopper when electricity is flowing therethrough.

A lead 910 is connected to the terminal 900, and extends to a point 912 on a lead 914, which lead 914 has one of its ends connected to lead 834 and its other end connected to one of the normally closed terminals 916 of the double-pole switch 274 mounted on the hopper and actuated by the rods 276 (FIG. 1). A solenoid control valve 918 is connected into lead 914 between point 912 and lead 834, and functions to control the pneumatic cylinder 358 which operates the pivoted bag support plate 352 on the conveyor (FIG. 1). Connected between point 912 and the terminal 916 is a timing relay 920 for controlling the bag pick-up operations of the transfer arms; the timing relay 920 is itself connected between the leads 832 and 834 by a lead 922, and has relay 904 suitably connected thereto to properly correlate the operations of the transfer arms.

The two input terminals of the switch 274 are connected by a lead 924 to one terminal 926 of a control relay 928, the terminals 930 and 932 of said control relay being connected to lead 832 by a lead 934 which is suitably connected across the timing relay 848. The other terminal 936 of the relay 928 is connected by a lead 938 to lead 834, said lead 938 having a solenoid control valve 940 connected therein which controls the bag-clamping air cylinders 270 attached to the hopper (FIG. 1). A lead 942 extends from the normally open terminal 944 of switch 274 to the lead 834, and has a control relay 946 connected therein; a lead 948 connects the leads 942 and 938 just ahead of the relay 946 and the valve 940, respectively.

When the switch 902 is initially closed, with the transfer arms in their down position, the valve 908 activates the air cylinder 526 to cause said arms to swing toward the hopper. As the bag approaches the hopper, switch 274 is actuated, opening terminal 916 and closing terminal 944; the plate 352 then is pivoted to its vertical position by the air cylinder 358, which cylinder is actuated by valve 918, and the valve 940 actuates the bag clamping arms. After the bag has been filled the timing relays will interrupt the flow of electricity to valve 940, permitting the filled bag to drop onto the conveyor; the switch 274 will then be returned to its initial position, and plate 352 will pivot open.

Connected between the leads 832 and 834 are a pair of leads 950 and 952, which in turn are connected to the normally open limit switches 552 and 554, respectively (FIG. 2). A solenoid control valve 954 is connected across the lead 950, and controls the lower, or longer stroke, chamber of the cylinder 452; the valve 954 is

connected so that when electricity is flowing therethrough the bag clamping arms will be moved from their clamping positions. Thus, when cam 558 actuates switch 552, as the transfer arms near their down position, the clamping arms will be moved inwardly toward each other for entry into the waiting bag.

A solenoid valve 956 is connected with lead 952, and functions when switch 554 is closed to operate the upper, or shorter stroke, chamber of the cylinder 452 to cause the clamping arms to move inwardly as the transfer arms reach the hopper. The switch 554 is activated by the cam 560.

Connected across the timing relay 904 is the normally closed switch 556 (FIG. 2), which when opened by the cam 562 causes a brief pause at the end of the upward movement of the transfer arms to allow time for the bag clamping mechanism on the hopper to function. After this brief time delay the transfer arms begin their downward travel, and once their down position has been reached they will remain there until the filled bag is dropped to the conveyor, which action returns switch 274 to its normal position and starts the transfer arms on their upward motion.

It is thus readily seen that the control circuitry just described cooperates with the cams 558, 560 and 562, and with the switches 274 and 798, to provide continuous automatic operation of the bag hanging machine of the invention, once said machine has been started in operation. The machine is initially started by closing switch 890 to place the top bag in the magazine in pick-up position; when said bag is properly positioned, and after switch 798 has stopped the motor 212, switch 902 is closed. This starts the transfer arms in motion, and thereafter the various relays maintain properly timed, automatic operation of the machine.

The transfer arms 378 and 380 of FIG. 1 may be adjusted to accommodate bags of various widths, and the single, two-chamber, double acting air cylinder 452 effectively operates the clamping arms for picking up and hanging an empty bag. A second embodiment for the transfer arms is illustrated in FIG. 21, however, which in certain instances may prove more desirable than the structure of FIG. 1.

Referring to FIG. 21, the two upright channel members 364 and 380 are shown with the shaft 376 mounted thereon, these elements being identical to the like numbered elements of FIG. 1. Mounted on the shaft 376 are a pair of transfer arms 620 and 622, said arms including mounting brackets 624 and 626 and bars 628 and 630, respectively.

The bracket 624 includes a pair of semi-cylindrical, flanged collars 384' and 382', which are connected by bolts 386', and which are constructed and mounted on the shaft 376 in a manner identical to the collars 384 and 386. The bracket 626 includes a similar pair of collars 390' and 392', and the two brackets 624 and 626 are adjustable longitudinally of the shaft 376 to permit adapting the distance between the transfer arms to various bag widths.

Stubs 632 and 634 are welded to project from the semi-cylindrical collars 382' and 390', respectively, and each has a recess on its inner face for receiving the upper end of its associated bar 628 or 630, respectively. The bars 628 and 630 are secured to their stubs by bolts 636, and have fingers 638 and 640, respectively, on their lower ends, which fingers are similar to the fingers 394 and 396 in FIG. 1.

About one-third down their length, the bars 628 and 630 have confronting base plates 642 and 644, respectively, secured thereto by bolts 646. The plates 642 and 644 have posts 648 and 650, respectively, projecting therefrom, to which are attached the upper cylinder ends of standard double-acting air cylinders 652 and 654, respectively. A pair of opposed mounting brackets 656 and

658 are secured by bolts 660 to the bars 628 and 630, respectively, below the plates 642 and 644, and have pivotally connected thereto the upper ends of a pair of clamping arms 662 and 664, respectively.

The clamping arms 662 and 664 are identical in construction, and terminate at their lower ends in clamping plates 666 and 668 positioned to engage the fingers 638 and 640, respectively. The upper end of the arm 662 has a crank arm 670 welded thereto to project normally therefrom, said crank arm being braced by a welded-in-place gusset plate 672 and extending from the transfer arm 620 sufficiently so that its tip lies directly below the tip of the post 648. The arm 664 has a similar crank arm 674 welded thereto and braced by a gusset plate 676, the tips of said crank arms 662 and 674 being pivotally connected to the lower ends of the piston of the air cylinders 652 and 654, respectively.

The air cylinders 652 and 654 are mounted so that when their piston rods are fully extended the clamping arms will be in engagement with the transfer arms, and so that when their pistons are retracted said arms will be moved inwardly to the positions indicated by phantom lines for entry into an awaiting bag. The air and electrical circuits for operating the air cylinders are indicated schematically in FIG. 21, and will now be described.

The upper ends of the air cylinders 652 and 654 are connected by flexible conduits 678 and 680, respectively to the opposite ends of a rigid conduit 682 attached to the members 364 and 380. Similarly, the lower ends of said air cylinders are connected by flexible conduits 684 and 686 to the opposite ends of a rigid conduit 688, which conduit 688 is also suitably supported on the members 364 and 380. Because the upper and lower ends of the two cylinders are respectively both connected to the conduits 682 and 688, said cylinders will act in unison whenever they are actuated by pressurized air.

The conduit 688 has a T-fitting 690 therein, and a conduit 692 extends from the center leg of said fitting to one of the outlets on a solenoid valve 954'. Similarly, the conduit 682 has a T-fitting 694 therein, and a conduit 696 extends from the center leg thereof to one outlet of a solenoid valve 956'. A conduit 698 connects the other outlet of the valve 954' with the inlet of the valve 956'.

The valves 954' and 956' are utilized in the embodiment of FIG. 21 instead of the valves 954 and 956 and are illustrated in FIG. 21 in their de-energized condition. When de-energized, the valve 954' conducts air from a supply conduit to conduit 698, from which it flows through valve 956', through conduit 696, through conduit 682, and into the upper ends of the cylinders 652 and 654 to hold the clamping arms against the transfer arms.

The valve 954' is connected into a lead 950' extending between the power leads 832 and 834, and a normally open switch 552' is also connected into said line and is mounted on the bar 550 instead of the switch 552 in position to be closed by cam 558; the switch 552' is identical in construction to the switch 552. Similarly, the valve 956' is connected together with a normally open switch 554' into a lead 952' extending between the power leads 832 and 834, the switch 554' being identical to the switch 554 and being installed on the bar 550 instead of said switch 554 in position to be activated by cam 560.

In operation, the valves 954' and 956' are both de-energized when the transfer arms 620 and 622 are in their down position, whereby the clamping arms are pressed thereagainst to clamp the top bag in the magazine. As the arms swing upwardly, the switch 552' overrides the cam 558, and the switch 554' is activated by the cam 560 when the arms have completed about 85 degrees of movement and are positioned adjacent the hopper 10.

Activation of switch 554' energizes solenoid valve 956', causing it to connect conduit 696 to an exhaust opening; this relieves the pressure in the upper ends of the cylinders 652 and 654, and permits the clamping arms 662 and 664 to move inwardly, thus releasing the bag held there-

by. As the arms continue upwardly to 90 degrees, switch 554' is again deenergized, and valve 956' returns to its original condition; this causes the arms 662 and 664 to again engage their transfer arms.

After a time delay the transfer arms begin their downward movement, after about 30 degrees of which cam 558 activates switch 552', energizing solenoid valve 954'. Upon energization, valve 954' connects conduit 692 to the air pressure supply, and conduit 698 to exhaust; this reverses the pressures at the ends of the cylinders 652 and 654, and causes the arms 662 and 664 to move inwardly for entry into an awaiting bag. When the arms 620 and 622 are fully down, switch 552' opens valve 954' is deenergized, and the cylinders 652 and 654 are again reversed to close the clamping arms.

The two, separate cylinder embodiment of FIG. 21 offers an advantage over the single, dual chamber cylinder of FIG. 1 in that it is more easily adjusted in width to accommodate various bags. In FIG. 1 the push rods 426 and 430 must be adjusted relative to the bar 438 whenever the distance between the transfer arms is varied. In FIG. 21 no such push bars are utilized, and hence such an adjustment is not required.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

I claim:

1. A machine for hanging a bag on the filling spout of a bagging machine, said spout including means thereon for alternately grasping and releasing the top edges of a bag suspended therebelow, comprising: a frame; a magazine supported by said frame and adapted to hold a plurality of bags in a horizontally stacked position; a pair of spaced transfer arms pivotally mounted at the upper ends thereof to said frame above said magazine, the lower ends of said arms being movable between said magazine and said spout; a pair of clamping arms pivotally mounted at their upper ends to the confronting faces of said transfer arms, one clamping arm being attached to each transfer arm; means for pivoting said transfer arms between said magazine and said spout; and means for pivoting each of said clamping arms toward and away from its associated transfer arm.

2. A machine as recited in claim 1, including additionally: a finger member on the inner face of the lower end of each transfer arm, said finger member projecting toward said magazine; and a clamping plate on the lower end of each of said clamping arms, positioned to be engageable with its adjacent finger member.

3. A machine as recited in claim 1, wherein said means for pivoting said clamping arms includes: an air cylinder attached at one end to said frame between said transfer arms; and push rod means pivotally connected to the other end of said air cylinder and to said clamping arms, whereby expanding and contracting movements of said air cylinder will pivot said clamping arms toward and away from said transfer arms.

4. A machine as recited in claim 3, wherein said air cylinder is dual chambered, and includes a relatively short stroke section and a relatively long stroke section, said relatively long stroke section being actuatable to move said clamping arms inwardly for pickup of a bag from said magazine, and said relatively short stroke section being actuatable to release a bag after it has been transferred to said spout.

5. A machine as recited in claim 4, including additionally: means to automatically actuate said longer stroke section to move said clamping arms inwardly while said transfer arms are pivoting between said spout and said magazine, and to actuate said longer stroke section to move said clamping arms outwardly when the lower ends of said transfer arms are positioned adjacent said magazine; and means to automatically actuate said shorter

stroke section to move said clamping arms inwardly when the lower ends of said transfer arms are positioned adjacent said spout.

6. A machine as recited in claim 1, wherein said means for pivoting said clamping arms includes: a pair of double-acting air cylinders, the upper end of one cylinder being mounted on each transfer arm above the clamping arm pivoted thereon, and the lower end of each cylinder being pivotally connected to its associated clamping arm, whereby said clamping arms will move toward and away from said transfer arms upon expansion and contraction, respectively, of said air cylinders.

7. A machine as recited in claim 6, including additionally: means to automatically and simultaneously actuate said air cylinders to move said clamping arms inwardly while said transfer arms are pivoting between said spout and said magazine, and to actuate said air cylinders to move said clamping arms outwardly against said transfer arms when the lower ends of the latter are positioned adjacent said magazine; and means to automatically and simultaneously actuate said air cylinders to momentarily allow said clamping arms to move inwardly when the lower ends of said transfer arms are positioned adjacent said spout.

8. A machine as recited in claim 1, including additionally: means mounted on said magazine and operable by movement of said transfer arms to open the top end of the top bag of said stack.

9. A machine for hanging a bag on the filling spout of a bagging machine, said spout including means thereon for alternately grasping and releasing the top edges of a bag suspended therebelow, comprising: a magazine spaced from said spout and adapted to hold a plurality of bags in a horizontally stacked position, said magazine including: a frame; a generally horizontal base plate mounted within said frame for vertical movement, and arranged to support said plurality of bags; means operable to elevate said base plate to bring the top bag of said plurality to a predetermined vertical height; and means connected with said elevating means to operate the same in response to the position of said top bag; and transfer arm means, including: a shaft supported for rotation by said frame above said magazine; a pair of spaced transfer arms attached at their upper ends to said shaft, said transfer arms being pivotal about the axis of said shaft to move the lower ends thereof between said magazine and said spout; a pair of clamping arms pivotally mounted at their upper ends to the confronting faces of said transfer arms, one clamping arm being attached to each transfer arm; means mounted on said frame and connected to said shaft for pivoting said transfer arms between said magazine and said spout; and means for pivoting each of said clamping arms toward and away from its associated transfer arm, whereby to alternately clamp and release the top lateral edges of a bag initially disposed in said magazine.

10. A machine as recited in claim 9, including additionally: a plurality of switches supported by said frame above said shaft; and a like plurality of cams mounted on said shaft, one in alignment with each switch to operate the same during rotation of said shaft; one of said switches and its associated cam being connected with a time delay circuit to initiate a time delay in the pivoting movement of said transfer arms when the lower ends of the latter are positioned adjacent said spout; another of said switches and its associated cam being connected with the means for pivoting said clamping arms to effect actuation of said means to release a bag clamped by said clamping arms when the lower ends of said transfer arms are positioned adjacent said spout; and a third one of said switches and its associated cam being connected with the means for pivoting said clamping arms to effect inward movement of said clamping arms during at least a portion of the pivoting movement of said transfer arms between said spout and said magazine, whereby said clamping arms are positioned inwardly away from said trans-

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fer arms as the latter approach the magazine, and to effect outward movement of said clamping arms when said transfer arms have completed their pivotal movement from said spout to said magazine.

11. A machine as recited in claim 10, wherein said means for pivoting said clamping arms includes: an air cylinder attached at one end to said shaft between said transfer arms; and push rod means pivotally connected to the other end of said air cylinder and to said clamping arms, whereby expanding and contracting movements of said air cylinder will pivot said clamping arms toward and away from said transfer arms.

12. A machine as recited in claim 10, wherein said means for pivoting said clamping arms includes: a crank arm secured to each clamping arm near the pivoted end thereof; and a pair of air cylinders, one for each clamping arm, one end of each air cylinder being secured to one of said transfer arms, and the other end thereof being pivotally connected to its associated crank arm.

13. A machine as recited in claim 9, including additionally: a second shaft rotatably mounted on said frame immediately above said magazine; a supporting arm secured to said shaft and projecting substantially normally therefrom; a suction means mounted on said supporting arm, said second shaft being rotatable to pivot said suction means into engagement with and away from the top end of the top bag of said stack; and means interconnecting said transfer arm supporting shaft with said second shaft, whereby rotation of said transfer arm supporting shaft will pivot said suction means toward and away from said top bag to effect opening thereof.

14. A machine as recited in claim 13, including additionally: a second suction means mounted on said magazine to confront said first suction means, and arranged to cooperate with said first suction means for opening said top bag.

15. A machine as recited in claim 9, wherein said magazine additionally includes: a front plate supported by said frame, said front plate having an elongated substantially vertical opening therein; a pair of spaced shaft means rotatably mounted on said front plate to extend across said opening; a continuous chain means disposed about said shaft means and connected with said base plate to move vertically therewith; and a plurality of spaced cleats secured to said chain means and projecting through said opening, said cleats being adapted to support the top ends of a plurality of bags to maintain said bags generally horizontal.

16. A machine for hanging a bag on the filling spout of a bagging machine, said spout including: means for alternately grasping and releasing the top edges of a bag suspended therebelow; and switch means actuable by a bag placed in said grasping means to cause the latter to grasp the top edges of said bag; said bag hanging machine including: a magazine spaced from said spout and adapted to hold a plurality of bags in a horizontally stacked position; transfer arm means, including: a shaft supported for rotation above said magazine; a pair of spaced transfer arms attached at their upper ends to said shaft, said transfer arms being pivotal about the axis of said shaft to move the lower ends thereof between said magazine and said spout; clamping arm means on said transfer arms, and arranged to clamp the top edges of a bag to the lower ends of said transfer arms; air cylinder means for alternately moving said clamping arms to clamp and release said bag; and means connected with said shaft for rotating the latter to move the lower ends of said transfer arms between said magazine and said spout; and means for automatically controlling the operation of said bag hanging machine, including: a plurality of switches mounted adjacent said shaft; a plurality of cams mounted on said shaft, one of said cams being positioned to actuate each of said switches upon rotation of said shaft; and a control circuit including a re-cycling relay and a time delay element; one of said switches and its associated

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cam being positioned and connected with said circuit to actuate said air cylinder means when the lower ends of said transfer arms are positioned adjacent said spout, to effect movement of said clamping arm means to release a bag clamped thereby simultaneously with the grasping of the top edges of said bag by said means on said spout; another of said switches and its associated cam being positioned and connected with said circuit and said time delay element to initiate a pause in the movement of said transfer arms when the lower ends thereof are positioned adjacent said spout; and a third one of said switches and its associated cam being positioned and connected with said circuit to actuate said air cylinder means during movement of said arms from said spout to said magazine to effect movement of said clamping arm means inwardly away from said transfer arms, and to effect movement of said clamping arm means toward said transfer arms when said transfer arms are positioned immediately adjacent said magazine, said re-cycling relay being connected with said means for rotating said shaft to effect repeated pivotal movement of the lower ends of said transfer arms between said magazine and said spout.

17. A bag hanging machine as recited in claim 16, including additionally: means connected with said shaft and positioned above said magazine for opening the top end of the top bag of said plurality of bags for clamping by said clamping arm means and the lower ends of said transfer arms.

18. A bag hanging machine as recited in claim 16, including additionally: a conveyor positioned in front of said bag hanging machine and below said spout; fixed back and end supporting plate means adjacent said conveyor; a front supporting panel pivotally mounted adjacent said conveyor to pivot between said bag hanging machine and said back and end supporting plate means; and means on said conveyor and connected with said control circuit to pivot said panel toward said bag hanging machine during movement of said transfer arms from said magazine to said spout, and to pivot said panel toward and into generally parallel relationship with said back supporting plate when said bag is grasped by said means on said spout.

19. In a bag hanging machine, a magazine adapted to hold a plurality of bags in a horizontally stacked position and to properly position the top bag of said stack for pickup by a transfer arm means, said magazine comprising: a base plate supported by said frame for vertical movement; means operable to elevate said base plate to bring the top bag of a plurality of horizontally stacked bags supported thereon to a predetermined vertical height; and means connected with said elevating means to operate the same in response to the position of said top bag, wherein said base plate is adjustable in length, and including additionally: a pair of spaced side plates supported by said frame and movable toward and away from each other; a front plate supported by said frame; a closure plate pivoted at its lower end to the base plate near the rear end thereof; and means on said closure plate and said base plate for releasably securing said closure plate in a position generally parallel to said front plate.

20. A magazine as recited in claim 19, wherein said base plate includes a front, generally horizontal portion, and a rear, downwardly inclined portion, and wherein said front plate has an elongated vertical opening therein, and including additionally: a pair of spaced shaft means rotatably mounted on said front plate to extend across said opening; a continuous chain means disposed on said shaft means, and connected with the front edge of said base plate to move vertically therewith; a plurality of spaced cleats secured to said chain means and projecting through said opening; and a backup plate connected to said front plate and positioned immediately behind the cleat-bearing portion of said chain means.

21. In a bag hanging machine, transfer arms means for transferring a bag from a magazine to a position removed from said magazine, said transfer arm means comprising:

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a rotatable shaft supported above said machine; a pair of spaced transfer arms secured to said shaft against relative rotation and longitudinally adjustable thereon; a pair of clamping arms pivotally secured to the confronting faces of said transfer arms; and air cylinder means connected to simultaneously pivot said clamping arms toward and away from their associated transfer arms.

22. A transfer arm means as recited in claim 21, wherein said air cylinder means includes: a two-chamber air cylinder supported at one end on said shaft between said transfer arms; and push rod means interconnecting said clamping arms with the other end of said cylinder.

23. A transfer arm means as recited in claim 21, wherein said air cylinder means includes: a pair of double-acting air cylinders, one for each clamping arm, the upper

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end of each cylinder being attached to the inner surface of its associated transfer arm and the other end thereof being attached to its associated clamping arm.

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