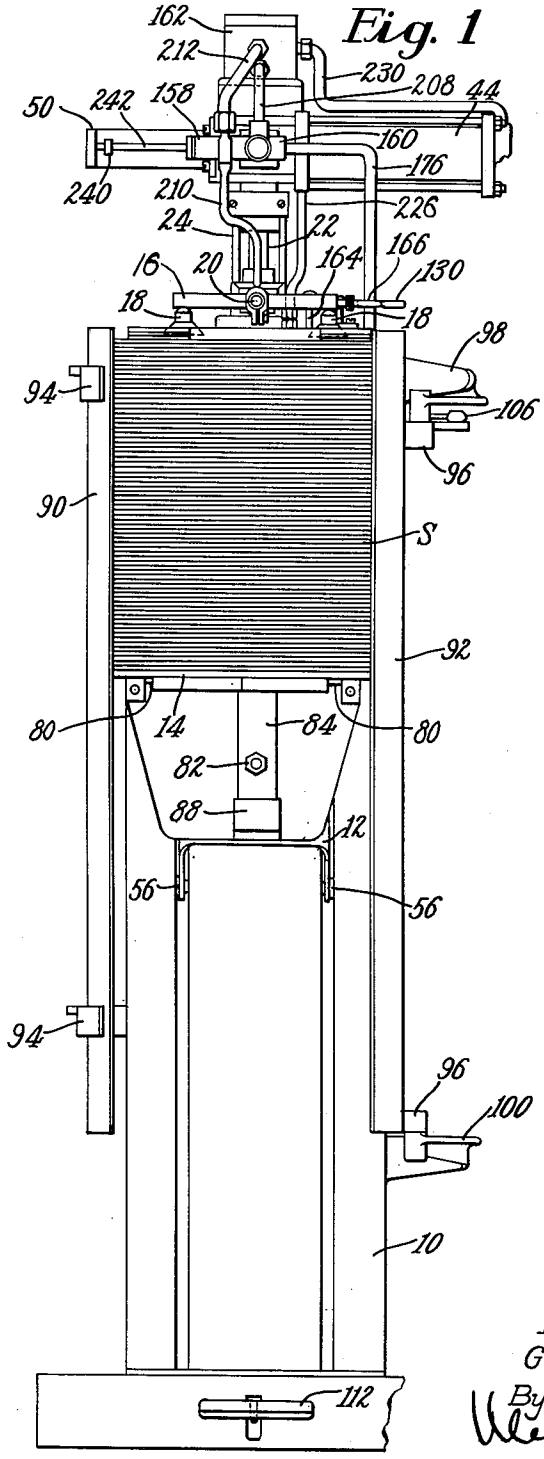
Nov. 13, 1962 G. MILLAR 3,063,578

BLANK HANDLING APPARATUS

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Fig. 1



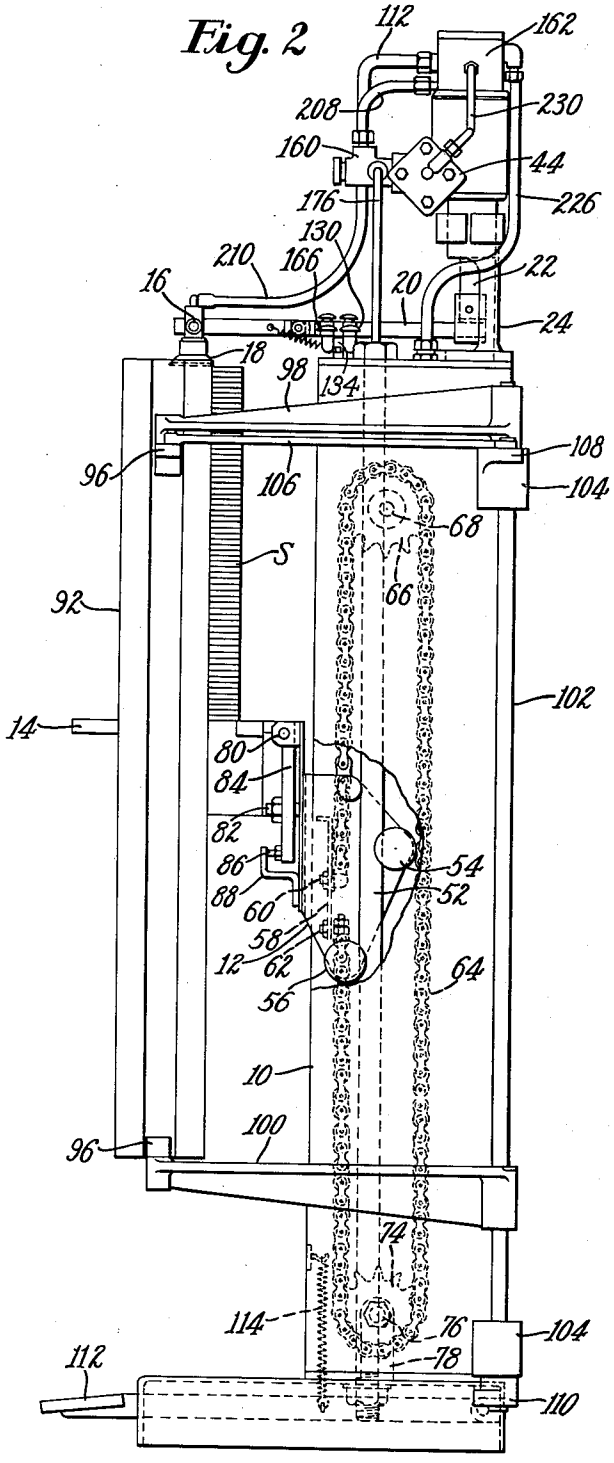
Inventor
George Millar
By his Attorney

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BLANK HANDLING APPARATUS

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Fig. 2

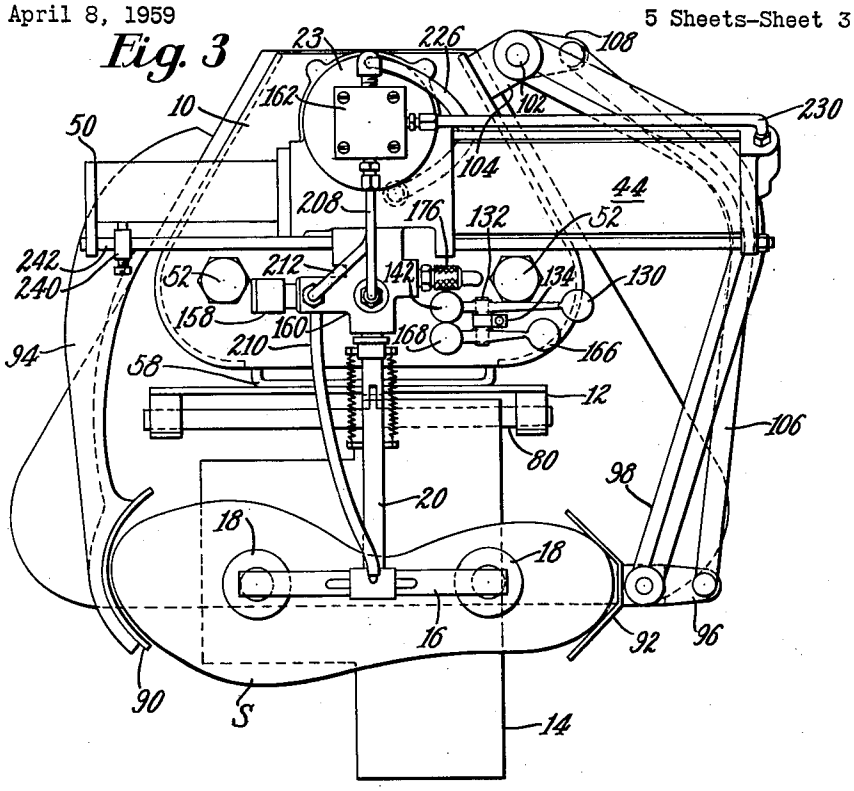


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BLANK HANDLING APPARATUS

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Fig. 3



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BLANK HANDLING APPARATUS

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Fig. 4

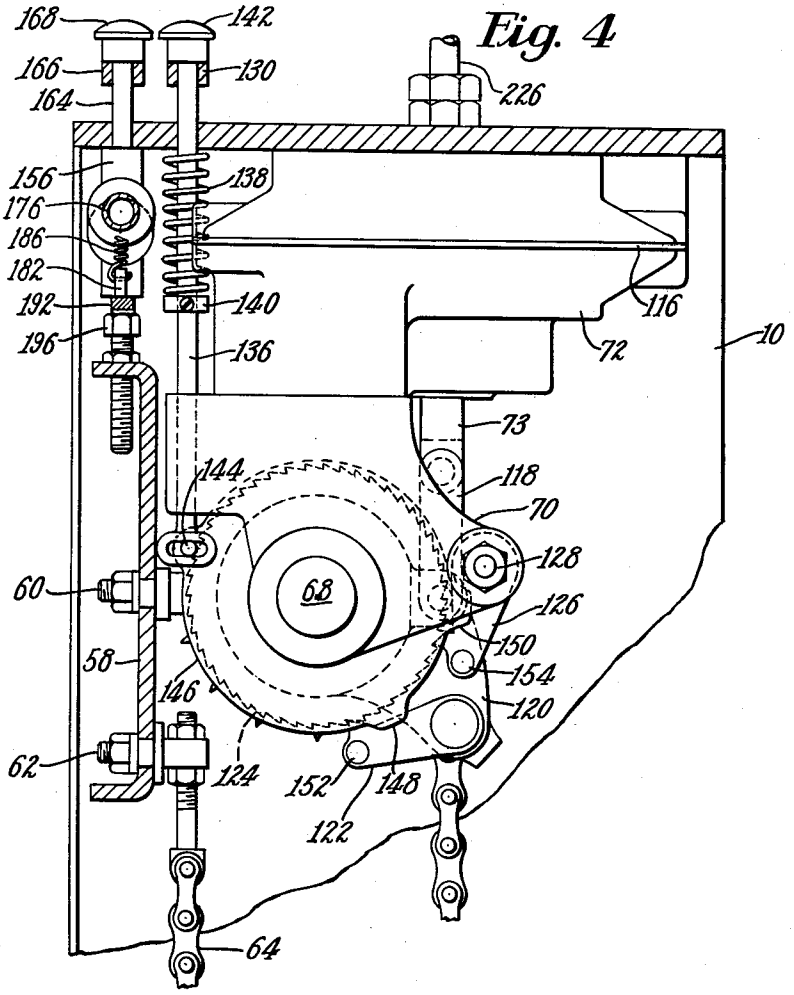
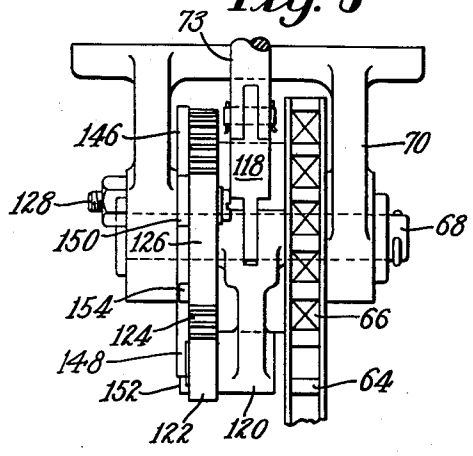


Fig. 5



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BLANK HANDLING APPARATUS

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Fig. 6

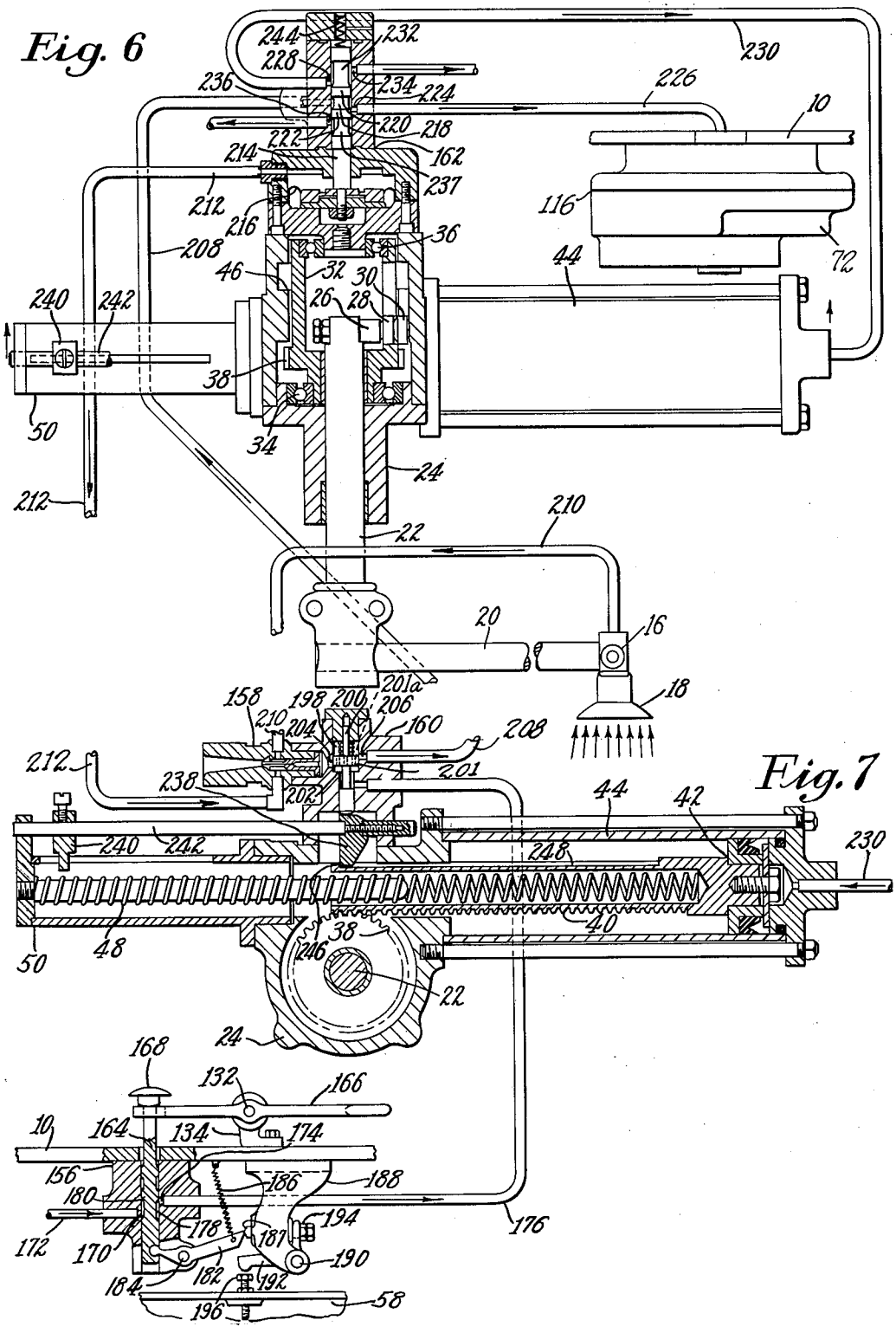


Fig. 7

United States Patent Office

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3,063,578

BLANK HANDLING APPARATUS

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Claims priority, application Great Britain Apr. 19, 1958

9 Claims. (Cl. 214—8.5)

This invention relates to improvements in blank handling apparatus and is illustrated herein as embodied in an improved apparatus adapted for automatically presenting blanks, of a kind commonly employed in shoemaking, one by one from a stack to another location or to a machine in which they are to be operated upon.

Such apparatus commonly includes a transfer head which has suction cups for holding a blank thereon and is operated through a delivery stroke comprising a motion directed, first, away from the stack endwise thereof to remove the endmost blank from the stack and then transversely of the stack, to deliver the blank. A cycle of operation of the transfer head is completed at the end of a return stroke comprising the above-mentioned movements reversed, and upon the engagement of the head with the next and endmost blank of the stack. In such apparatus, there also has been employed a carrier or magazine for the stack of blanks which is automatically indexed, once for each cycle of operation of the transfer head, to present the blanks in the carrier, in succession, to the transfer head.

The above-mentioned feeding movement of the carrier may be effected by a yieldingly operated driving means and stopped by a brake. In case the driving means is powered by a spring, the force applied to the carrier progressively diminishes as it is moved closer and closer to the transfer head. The load upon the driving means also is variable, not only because of the change in the size of the stack but also because of variations in the weight or size of the blanks. Accordingly, even though the brake is always actuated at a predetermined time, for example, upon the engagement of the transfer head with the endmost blank in the carrier, the feeding movement of the carrier may be stopped at different times, giving rise to the possibility of excessive pressure being set up between the transfer head and blank, particularly if the delivery motion of the head is not fully synchronized with the feeding movement of the carrier. Thus, a lack of uniformity in the engagement of the transfer head and the blanks may impair the efficiency of the apparatus and may result in damage to blanks of a light or flimsy material if excessive pressure is applied to them.

In view of the foregoing, it is a general object of the invention to effect, in a blank handling apparatus including an automatically operated transfer head and a carrier for a stack of blanks which also is automatically operated to present the endmost blank of the stack to the transfer head, such synchronization of the operation of the head and carrier as will not only insure the efficient transfer of blanks between the carrier and the head, but also will prevent the development of excessive pressure between the head and blank, regardless of the weight and size of the blanks or the number of blanks in the stack.

To this end, the invention contemplates the provision, with operating mechanism for a blank carrier, in an apparatus of the type referred to above, which is operable during each cycle of operation thereof to advance the carrier only slightly in excess of the distance required to establish contact between the transfer head and the endmost blank in the carrier, of means which, in response to the engagement of the endmost blank in the carrier with the transfer head, causes a delivery stroke of the transfer head to be initiated and, simultaneously therewith, an interruption and reversal of the feeding movement of the carrier. Accordingly, pressure between the blank and the transfer head is immediately reduced, and then eliminated, as soon as their engagement occurs.

The blank carrier and transfer head, in the illustrated construction, are elements of blank feeding and transfer mechanisms which, in accordance with a further feature of the invention, are powered by a fluid pressure system including a suction operated valve for selectively directing fluid pressure to and venting it from these mechanisms, their synchronization being under the control of a suction system comprising a fluid operated suction source which is connected to suction cups on the transfer head for holding blanks and also to the above-mentioned suction operated valve. The transfer head is operated through a delivery stroke when the above-mentioned valve is subjected to suction and the valve is set to direct fluid pressure to the blank feeding mechanism upon the removal of suction from the valve.

Invention is also to be recognized in the provision in the above structure of means operated by the transfer mechanism once, at the end of the delivery stroke of the transfer head, to de-activate the suction source whereby the blank is released by the transfer head and the return stroke of the head is initiated and again, at the end of the return stroke of the transfer head for re-activating the suction source and supplying fluid pressure, via the above-mentioned valve, to the blank feeding mechanism whereby a feeding movement of the carrier is initiated. Upon the engagement of the endmost blank in the carrier with the transfer head, its suction cups are closed by the blank, causing suction to be applied to the above-mentioned valve as well as to the blank engaged by the cups. Accordingly, the valve is set to initiate a delivery stroke to the transfer head and simultaneously to cause an interruption and reversal of the feeding movement of the carrier, as stated above.

The foregoing objects and features of the invention, and others related thereto, will now be described in greater detail with reference to the accompanying drawings and will be set forth in the claims.

In the drawings,

FIG. 1 is a front elevation of an illustrative apparatus embodying the invention;

FIG. 2 is a side elevation of the structure shown in FIG. 1, as viewed from the right;

FIG. 3 is a plan view of the apparatus;

FIG. 4 is a sectional elevation of a part of the structure of FIG. 2;

FIG. 5 is a front elevation of pawl-and-ratchet mechanism shown in FIG. 4; and

FIGS. 6 and 7 are diagrammatical views of driving and control mechanisms of the apparatus.

The illustrative apparatus comprises a stand 10 (FIGS. 1 and 2) with respect to which a carriage 12, comprising a table 14 adapted to hold a stack S of blanks, such as shoe soles, is movable heightwise to present the endmost blank at the top of the stack to a transfer head 16 provided with suction cups 18, 18.

The transfer head 16 is fixed upon the forward end of an arm 20 which is carried by a shaft 22, the latter being mounted to rotate and slide axially thereof in a bracket 24 which is fixed upon the top of the stand 10.

The shaft 22 carries, at its upper end, a stud 26 (FIG. 6) having rotatably mounted thereon rolls 28, 30, the former roll being received in a vertical slot in a housing 32 which is bored freely to receive the shaft 22 and is mounted to rotate freely with respect to the bracket 24 upon ball bearings 34, 36. The housing 32 has formed thereon a gear 38 with which meshes a rack 40 formed upon a piston 42, the latter being mounted to slide, laterally of the apparatus, within a cylinder 44 carried by the bracket 24.

The piston 42 is operated under fluid pressure, as will be described later, through a power stroke toward the left which causes, through the above-described connections, the transfer head 16 to be swung to the left through about 90°, from the position in which it is illustrated in FIG. 1, to deliver a blank picked off the stack S to another location at the left-hand side of the apparatus, or to a machine at this location for operating upon the blank. This delivery stroke of the transfer head comprises, with the lateral motion above referred to, an upward pickup motion caused by the engagement of the above-mentioned roll 30 with a cam 46 formed upon the bracket 24 and steeply sloped at one end between its higher level, shown in FIG. 6, and that of the lower portion of the roll 30. The transfer head 16 is thus elevated abruptly upon being moved away from the stack S, such movement of the head being permitted by the free axial movement of the shaft 22 within the housing 32 and bracket 24. At the end of the delivery stroke of the transfer head, suction at the suction cups 18 is eliminated, causing the blank to be dropped and, simultaneously, a return stroke of the transfer head is initiated. The return stroke of the transfer head is effected by a spring 48 which is received in a bore in the piston 42 and is compressed between the piston and a housing 50 which is fixed to the bracket 24.

The carriage 12 is guided for movement, vertically within the stand 10, by a pair of rods 52 (FIG. 2) which are engaged rearwardly thereof by a pair of rolls 54 rotatably mounted upon the rear of the carriage at each side thereof. Another pair of rolls 56, rotatably mounted upon the carriage at the bottom thereof, engage the forward portions of the rods. A channel 58, spanning the sides of the carriage, carries a pair of studs 60, 62 to which the ends of a chain 64 are attached. The chain runs over a driving sprocket 66 which is fixed upon a shaft 68, the latter being rotatably mounted in a bracket 70 (FIGS. 4 and 5) which is fixed upon the lower side of a diaphragm operated motor 72 for driving the carriage. The motor is fixed to the top of the stand 10 and is operated by air pressure, as will be described later, to impart a power stroke downwardly to a rod 73 which projects out of the bottom of the motor. The lower portion of the chain 64 runs over a sprocket 74 (FIG. 2) which rotates idly upon a shaft 76, the latter being mounted upon a bracket 78 which is fixed upon the bottom of the stand 10.

The table 14 (FIGS. 1, 2 and 3), upon which the stack S of blanks is supported, is pivotally mounted at 80 upon the carriage 12 for the purpose of leveling the table, this adjustment of the table being carried out by adjusting a setscrew 82 which is threaded into a downwardly extending lug 84 of the table and abuts the carriage 12. Another setscrew 86, which is threaded into the lug 84, upon being brought into engagement with a bracket 88 fixed upon the carriage 12, prevents upward movement of the table 14.

For the purpose of aligning the stack S of blanks vertically upon the table 14, there is provided an arcuate guide 90 and a V-shaped guide 92 which receive the left and right-hand ends, respectively, of the stack. The guide 90 is rigidly supported by a pair of arms 94 which are fixed upon the stand 10. The guide 92 is mounted, for movement toward and away from the guide 90, upon a pair of lugs 96 to which are pivoted upper and lower arms 98, 100, the arms being fixed to a shaft 102 which is rotatably mounted in a pair of brackets 104 fixed upon the stand 10. A link 106, pivoted upon the upper lug 96, is also pivoted upon an arm 108 which is integral with the upper bracket 104 and parallel to the upper lug 96, whereby the guide 92 is caused always to face the stack in the same way when it is swung toward and away from the stack. Upon the lower end of the shaft 102 there is fixed a quadrant 110 with which a treadle 112, pivoted upon the stand 10 at the rear thereof, is normally held in engagement by a spring 114 stretched between the treadle and the stand, whereby the guide 92 is held in any desired setting. By this means, the stack S is easily aligned by moving the guide 92, after depressing the treadle 112, against the right-hand end of the stack. By releasing the treadle, the guide 92 is locked so as thereafter to hold the stack upright upon the table and to prevent its being upset by the action of the transfer head 16.

The motor 72 has a diaphragm 116 (FIG. 4) which is clamped around its periphery within a chamber into which compressed air is admitted to act upon the upper side of the diaphragm, whereby the above-mentioned rod 73, which is fixed to and projects downwardly from the diaphragm, is operated through a driving stroke. A return spring (not shown) acts upon the lower side of the diaphragm, near its center, and urges the diaphragm upwardly into its normal position upon the release of air pressure from the chamber above the diaphragm. The rod 73 is connected by a link 118 to a pawl holder 120 which is rotatably mounted on the shaft 68 and has pivotally mounted thereon a spring loaded driving pawl 122 which is biased against a ratchet 124, the latter being fixed upon the shaft 68. An idle pawl 126, rotatably mounted upon a stud 128 carried by the bracket 70, cooperates with the ratchet to limit retrograde movement thereof during the return stroke of the pawl 122.

The stroke of the motor 72 is long enough to permit the carriage 12 to be raised only slightly in excess of the thickness of the thickest blanks which are to be used in the apparatus. However, as will be explained below, the driving stroke of the motor is interrupted as soon as the endmost blank in the stack will have been brought into engagement with the suction cups 18 with pressure sufficient to establish an air tight junction between the cups and the blank. Thus, the full driving stroke of the motor is not ordinarily utilized and, at the beginning of the return stroke of the motor, the carriage 12 will fall until the idle pawl 126 engages the adjacent tooth on the ratchet 124.

If it is desired manually to lower the carriage, as for the purpose of reloading the apparatus, both pawls 122, 126 are disengaged from the ratchet 124 by depressing a trip lever 130 (FIGS. 3 and 4).

The lever is pivoted upon a rod 132 which is carried by a standard 134 fixed on the top of the stand 10. The left-hand end of the lever 130 is bifurcated to receive a shaft 136 which is biased downwardly by a spring 138, the latter being compressed between the top of the stand and a collar 140 fixed upon the shaft 136. A pad 142, fixed upon the top of the shaft, is engaged by the top of the lever 130, when the latter is depressed, to cause the shaft to be lifted. The bottom end of the shaft is slotted to receive a pin 144 which is fixed upon a disk 146, the disk being rotatably mounted upon the shaft 68 adjacent to the ratchet 124. Formed upon the disk 146 are cams 148, 150 which, when the shaft 136 is lifted, are rotated into engagement with pins 152, 154, respectively, the pin

152 being fixed upon the pawl 122 and the pin 154 being fixed upon the pawl 126. Thus, when the lever 130 is depressed, the pawls 122, 126 are disengaged from the ratchet 124, any operation of the diaphragm motor 72 will be ineffectual to raise the carriage 12, and the latter can be freely lowered manually to receive a fresh stack of blanks. The pawls 122, 126 are re-engaged with the ratchet 124 upon the release of the lever 30 or, if necessary by pressing upon the pad 142. The disk 146 is thus returned to its original position and is held therein by the spring 138.

Control apparatus, for effecting the automatic synchronized operation of the transfer head 16 and carriage 12, comprises a main valve 156 (FIG. 6) for admitting air pressure to the apparatus, a venturi 158 with which there is associated a trip valve 160 operated by the driving mechanism for the transfer head, and a suction operated diaphragm valve 162 which controls the admission of air pressure to, as well as the venting of, the motor 72 and cylinder 44.

The main valve 156 is fixed to the lower side of the top of the stand 10 and has a stem 164 arranged to project above the stand and through the bifurcated left-hand end of a lever 166 which is pivoted upon the above-mentioned rod 132. A pad 168, fixed upon the top of the stem, is engaged by the lever 166 when it is depressed. The valve 156 is provided with an inlet port 170 to which compressed air is supplied through a pipe 172. An outlet port 174, offset from the port 170 axially of the stem 164, is connected by a pipe 176 to the above-mentioned trip valve 160. The valve stem 164 has a reduced shank 178 bounded at its upper end by a land 180 which is disposed between the ports 170, 174 when the valve is in its "off" position and is above the port 174 when the valve is in its "on" position whereby free passage of air is then permitted from the port 170 into the port 174. The valve stem 164 is biased toward its "off" position by connections including a lever 182 which is pivoted at 184 upon the valve and a spring 186 which is stretched between the lever and the stand 10. The left-hand end of the lever 182 is closely received within a slot in the valve stem and the other end of the lever, when the lever 166 is depressed, is moved past a spring biased detent 187 which causes the valve stem to be held in the "on" position. The detent is slidably mounted within a bracket 188 which is mounted upon the stand, there being pivotally mounted upon the bracket, at 190, a bell crank 192 the upper arm of which is normally held against the bracket 188 by a nut 194 threaded upon the detent. The bell crank 192 is operated to retract the detent from the lever 182, permitting the valve to be set in its "off" position, whenever the carriage 12 is elevated to its highest position, by the engagement of a screw 196, which is threaded into the channel 58, with the lower arm of the bell crank. The apparatus is thus stopped automatically when the stack S of blanks is depleted.

Air pressure supplied to the trip valve 160 by the pipe 176 is admitted to a chamber 198 which houses a plunger 200, the latter being biased downwardly toward a seat 202. The plunger 200 has a flange 201 which closely fits the chamber 198 and has in its rim a plurality of holes 201*a* which are closed when the flange rests upon the seat 202. Above the seat, a port 204 conducts air pressure to the above-mentioned venturi 158 and another port 206 leads to a pipe 208 through which air pressure is supplied to the above-mentioned diaphragm valve 162. The venturi is a suction source for the suction cups 18 and the diaphragm valve 162 and is connected to the cups and valve by tubes 210, 212, respectively.

The diaphragm valve 162 has a vertically sliding stem 214 upon the lower end of which is clamped a diaphragm 216, the diaphragm also being clamped, around its periphery, to the body of the valve so as to provide a closed chamber above the diaphragm with which the tube 212 communicates. A chamber in the valve below the diaphragm is vented to the atmosphere. The stem 214 has a central, reduced shank 218 which is bounded by upper and lower lands 220, 222, respectively. The pipe 208 supplies air pressure to a chamber in the valve around the shank 218 and opening into this chamber a port 224, just above the land 222 when the stem 214 is in its lower and normal position, conducts air pressure to a pipe 226 which is connected to the chamber of the motor 72 above the diaphragm 116, whereby motive force for the power stroke of the motor is provided. Another port 228 in the valve 162, disposed just above the land 220 when the stem 214 is in its normal position, is connected by a pipe 230 to the head of the cylinder 44. A reduced shank 232 of the stem 214, above the land 220, provides access between the port 228 and another port 234 which is open to the atmosphere, whereby the cylinder 44 is vented when the stem 214 is in its normal position.

Whenever suction is created within the chamber of the valve 162 above the diaphragm 216, atmospheric pressure acting upon the lower side of the diaphragm elevates the stem 214 to bring the lands 220, 222 just above the ports 228, 224, respectively, whereby air pressure is supplied to the pipe 230 and a power stroke is imparted to the piston 42. At the same time, air pressure is cut off from the motor 72 which is vented through a port 236 via a chamber in the valve afforded by a reduced shank 237 of the stem 214 below the land 222. It will thus be evident that the diaphragm valve 162 selectively directs air pressure to either the motor 72 or the cylinder 44, according to the setting of the stem 214, and vents the other.

FIGURE 6 represents the state of the illustrated apparatus between the end of the return stroke of the transfer head 16 and the beginning of its delivery stroke. At this time, a cam 238 engages the lower end of the plunger 200 and holds it off the seat 202 whereby, assuming the valve 156 is set in its "on" position, air pressure is supplied to the venturi 158 and, through the diaphragm valve 162, to the motor 72 which at this time is operated to raise the stack of blanks. As the suction cups 18 are now uncovered, the venturi is vented to the atmosphere whereby no suction is developed in the diaphragm valve and its stem 214 rests in its above-mentioned normal position. However, upon the engagement of the endmost blank in the stack with the cups 18, under sufficient pressure to close the cups, suction is set up above the diaphragm 216, causing the stem 214 to be moved into its upper position. Air pressure is immediately cut off from the motor 72 whereby upward movement of the stack is interrupted; and air pressure is supplied to the cylinder 44 whereby the delivery movement of the transfer head 16 is initiated. During the power stroke of the piston 42, the return stroke of the motor 72 takes place, as the motor is vented into the atmosphere through the port 236.

With the arrival of the transfer head 16 at the end of its delivery stroke, the left-hand end of the piston 42 engages an abutment 240 which projects through a slot in the housing 50 and is adjustably fixed upon a rod 242 mounted to slide axially thereof in the housing and the valve 160. The above-mentioned cam 238 is threaded upon the rod 242 and, in response to movement of the rod to the left, is carried out of engagement with the plunger 200, whereby the trip valve 160 is closed and air pressure is cut off from both the venturi 158 and the diaphragm valve 162. At this time, suction at the diaphragm valve and suction cups 18 having been eliminated, the blank drops from the suction cups and the valve stem 214 is returned to its normal position by gravity and a spring 244 which is compressed between the top of the stem and the diaphragm valve. Thus, the cylinder 44 is vented to the atmosphere through the port 234, and a return stroke of the transfer head 16, under the influence of the spring 48, is initiated.

As the transfer head **16** approaches the end of its return stroke, a shoulder **246** on the piston **42**, at the left-hand end of a groove **248** in the piston which receives the cam **238**, engages the cam and moves it to the right, causing the plunger **200** to be lifted off the seat **202**. Thus, the venturi **158** is again activated, suction is set up in the pipes **210**, **212** and air pressure is again supplied to the diaphragm valve which, with the stem **214** in its normal position, directs air pressure to the motor **72**. The carriage **12** is now elevated until the endmost blank of the stack is brought into engagement with the suction cups **18** and a new cycle of operation of the apparatus is started.

The use and operation of the illustrated apparatus will now be briefly summarized, it being assumed that the apparatus is in a state of rest, as represented by FIG. 6, and that the main valve **156** will have been set in its "off" position by depressing the pad **168**.

After depressing the treadle **112** (FIGS. 1 and 2), the guide **92** is swung to one side, permitting a stack of blanks readily to be placed upon the table **14**. The guide **92** is then swung against the right end of the stack to cause the blanks to be alined vertically. When the stack is suitably positioned upon the table, the guide **92** is separated from the stack enough to permit it to move freely vertically and the treadle **112** is released to cause the guide **92** to be locked in position.

The operator now depresses the lever **166**, causing the valve **156** to be set in its "on" position and the venturi **158** to be activated. Upon manually raising the carriage **12**, to bring the endmost blank of the stack into the pick-up position and into engagement with the suction cups **18**, **18**, the cups are closed by the blank and the blank is then held upon the cups. With the closure of the cups, suction is established above the diaphragm **216** of the valve **162** and its stem **214** is raised, whereby air pressure is delivered to the cylinder **44**. At the same time, air pressure is vented from the motor **72**, out of the port **236**, and the pawl holder **120** receives a retrograde movement (counterclockwise, FIG. 4).

With the initial swinging movement of the transfer head **16**, it is abruptly elevated about one inch as the roll **30** rises up the slope on the cam **46**, causing the blank held by the suction cups to be lifted heightwise off the stack, before any considerable lateral movement of the blank takes place. This pickup motion of the transfer head is followed by a lateral motion as the transfer head is swung, through about 90° to the left, into the delivery position.

Just before this position is reached and upon the displacement of the abutment **240** to the left, by the end of the piston **42**, the cam **238** is moved away from the plunger **200**, permitting the plunger to become engaged with the seat **202**. With this closure of the trip valve **160**, the venturi **158** is de-activated and suction is eliminated from the diaphragm valve **162** and the suction cups **18**, causing the blank to be dropped from the cups and the stem **214** of the valve to be returned to its original position under the influence of gravity and the spring **244**. As air pressure is no longer supplied to but is exhausted from the cylinder **44** through the port **234**, the piston **42** is urged by the spring **48** through a return stroke, to the right, near the end of which the shoulder **246** engages and displaces the cam **238** to the right. The plunger **200** is thus lifted off the seat **202**, whereby the venturi **158** is reactivated and air pressure is delivered through the diaphragm valve **162** to the motor **72**. Although suction is now being generated by the venturi, the diaphragm valve **162** is not operated because the suction system is vented through the suction cups **18**.

With the application of air pressure to the diaphragm **116** of the motor **72**, the pawl holder **120** is rotated clockwise (FIG. 4) causing the pawl **122**, acting upon the ratchet **124**, to rotate the shaft **36** and sprocket **66**, whereby feeding movement is imparted by the chain **64** to the carriage **12**. The available feeding movement of the carriage **12** per stroke of the motor **72** is somewhat greater than the thickness of the thickest blank to be used in the apparatus. However, the feeding movement of the carriage is interrupted when the cups **18** are closed by the endmost blank in the stack because, upon this event, suction is re-established in the valve **162** and its stem **214** is raised to cause the air pressure in the motor **72** immediately to be vented through the port **236**, whereby a return stroke of the motor takes place. The carriage **12** now falls until the pawl **126** engages the adjacent tooth on the ratchet **124**. Simultaneously with the arresting of the upward feeding movement of the carriage **12**, the upward pickup motion of the transfer head **16** begins. Accordingly, upon the engagement of the blank with the suction cups, the stack and the blank held by the transfer head are separated because each is moved away from the other. Thus, no pressure in excess of that required to close the cups **18** can be developed between the cups and the blanks which they engage.

The above described cycle of operation is rapidly repeated automatically until the main valve is set in its "off" position, in response to the engagement of the bell crank **192** by the set screw **196**, when the stack of blanks is depleted. The apparatus can be stopped at any time by depressing the pad **168**, which sets the main valve **156** in its "off" position.

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

1. In a blank handling apparatus, fluid operated blank feeding mechanism comprising a carrier for a stack of blanks, fluid operated blank transfer mechanism comprising a blank holder which is operable through alternate delivery and return strokes, and means for directing fluid pressure selectively to said feeding and transfer mechanisms, said means being operated by said transfer mechanism at the end of the return stroke of said holder to direct fluid pressure to said feeding mechanism whereby said carrier is operated to advance the endmost blank therein toward said holder, said means also being operated in response to the engagement of said endmost blank and said holder to reverse the movement of the carrier, stopping the advance of the stack, and simultaneously to direct fluid pressure to said transfer mechanism to initiate the delivery stroke of said holder thereby separating the endmost blank from the stack by movement in opposite directions.

2. In a blank handling apparatus, fluid operated blank feeding mechanism comprising a carrier for a stack of blanks which is operable through alternate feeding and return strokes, fluid operated blank transfer mechanism comprising a blank holder which is operable through alternate delivery and return strokes directed away from and toward said carrier respectively, and means for directing fluid pressure selectively to said feeding and transfer mechanisms to cause the delivery stroke of said holder and the feeding stroke of said carrier to occur in alternation with each other, said means being operated by said transfer mechanism at the end of the return stroke of said holder to direct fluid pressure to said feeding mechanism whereby the feeding stroke of said carrier is initiated, said means also being operated in response to the engagement of said holder and the endmost blank in said carrier simultaneously to direct fluid pressure to said transfer means and to vent fluid pressure from said feeding mechanism whereby the delivery stroke of said holder and the return stroke of said carrier are initiated at once.

3. In a blank handling apparatus, fluid operated blank feeding mechanism comprising a carrier for a stack of blanks which is operable through alternate feeding and return strokes, fluid operated blank transfer mechanism comprising a suction operated blank holder mounted for movement through alternate delivery and return strokes directed away from and toward said carrier respectively, and a fluid pressure system comprising a suction operated

valve for selectively directing fluid pressure to and venting said feeding and transfer mechanisms, said system also comprising a fluid operated suction source connected to said valve and holder and a second valve for admitting fluid pressure to said suction source and said suction operated valve, and means operated by said transfer mechanism for opening said second valve at the end of the return stroke of said holder whereby said suction operated valve is set to admit fluid pressure to said feeding mechanism, said means being operated by said transfer mechanism at the end of the delivery stroke of said holder to close said second valve whereby said suction operated valve is set to vent said transfer mechanism and a return stroke of said holder is initiated.

4. In a blank handling apparatus, fluid operated blank feeding mechanism comprising a carrier for a stack of blanks which is operable through alternate feeding and return strokes, fluid operated blank transfer mechanism comprising a suction operated blank holder mounted for movement through alternate delivery and return strokes directed away from and toward said carrier, respectively, a fluid pressure system comprising a suction operated valve for selectively directing fluid pressure to and venting said feeding and transfer mechanisms, said system also comprising a fluid operated suction source connected to said valve and holder, and a second valve for admitting fluid pressure to said suction source and said suction operated valve, and means operated by said transfer mechanism for opening said second valve at the end of the return stroke of said holder whereby said suction source is activated and said suction operated valve is set to cause said feeding mechanism to impart a feeding stroke to said carrier, said suction operated valve being set in response to the presentation of the endmost blank in said carrier to said blank holder to vent said feeding mechanism whereby a return stroke of said carrier is initiated and to direct fluid pressure to said feeding mechanism whereby a delivery stroke of said blank holder is initiated.

5. In a blank handling apparatus, fluid operated blank feeding mechanism comprising a carrier for a stack of blanks which is operable through alternate feeding and return strokes, fluid operated blank transfer mechanism comprising a suction operated blank holder mounted for movement through alternate delivery and return strokes directed away from and toward said carrier, respectively, a fluid pressure system comprising a suction operated valve for selectively directing fluid pressure to and venting said feeding and transfer mechanisms, said system also comprising a fluid operated suction source connected to said valve and holder, and a second valve for admitting fluid pressure to said suction source and said suction operated valve, means operated by said transfer mechanism for opening said second valve at the end of the return stroke of said holder whereby said suction source is activated and said suction operated valve is set to cause said feeding mechanism to impart a feeding stroke to said carrier, said suction operated valve being set in response to the presentation of the endmost blank in said carrier to said blank holder to vent said feeding mechanism whereby a return stroke of said carrier is initiated and to direct fluid pressure to said feeding mechanism whereby a delivery stroke of said blank holder is initiated, said means being operated by said transfer mechanism to close said second valve at the end of the delivery stroke of said holder whereby said suction source is de-activated and said suction operated valve is reset to vent fluid pressure from said transfer mechanism to cause a return stroke of said blank holder to be initiated.

6. In a blank handling apparatus, fluid operated blank feeding mechanism comprising a carrier for a stack of blanks which is operable through alternate feeding and return strokes, fluid operated blank transfer mechanism comprising a blank holder mounted for movement through alternate delivery and return strokes directed away from and toward said carrier respectively, a fluid pressure system comprising a valve which in one setting thereof directs fluid pressure to said feeding mechanism and vents said transfer mechanism, said valve being suction operated into a second setting in which fluid pressure is directed to said transfer mechanism and is vented from said feeding mechanism, a suction system comprising said valve, suction cups carried by said holder for holding a blenk thereon, and a suction source connected to said valve and said cups, a second valve for controlling the admission of fluid pressure to said suction source and said first-mentioned valve, and means operated by said transfer mechanism for opening said second valve at the end of the return stroke of said holder to activate said suction source and initiate a feeding stroke of said carrier whereby the endmost blank in said carrier is presented to said suction cups and said first mentioned valve is set in its second position to cause the delivery stroke of said holder and the return stroke of said carrier to be initiated, said means also being operated by said transfer mechanism at the end of the delivery stroke of said holder to close said second valve whereby said suction source is de-activated and said first-mentioned valve is returned to its first setting.

7. In a blank handling apparatus, fluid operated blank transfer mechanism comprising a holder having suction means for holding a blank thereon, said mechanism being operable to move said holder through alternate delivery and return strokes, fluid operated blank feeding mechanism comprising a carrier for a stack of blanks, said feeding mechanism being operable to impart a feeding stroke to said carrier directed toward said holder whereby the endmost blank in said carrier is presented to said suction means, a fluid pressure system comprising a suction operated valve for selectively directing fluid pressure to and venting said transfer and feeding mechanisms, a suction source connected to said suction means and said valve, and means operated by said transfer mechanism for de-activating said suction source at the end of the delivery movement of said holder whereby said suction means releases the blank thereon and said valve is set to vent said transfer mechanism and to direct fluid pressure to said feeding mechanism.

8. In a blank handling apparatus, fluid operated blank transfer mechanism comprising a holder having suction means for holding a blank thereon, said mechanism being operable to move said holder through alternate delivery and return strokes, fluid operated blank feeding mechanism comprising a carrier for a stack of blanks, said feeding mechanism being operable to impart a feeding stroke to said carrier directed toward said holder whereby the endmost blank in said carrier is presented to said suction means, a fluid pressure system comprising a suction operated valve for selectively directing fluid pressure to and venting said transfer and feeding mechanisms, a suction source connected to said suction means and said valve, and means operated by said transfer mechanism for de-activating said suction source at the end of the delivery movement of said holder whereby said suction means releases the blank thereon and said valve is set to vent said transfer mechanism and to direct fluid pressure to said feeding mechanism, said means also being operated by said transfer mechanism at the end of the return stroke of said holder to activate said suction source and to admit fluid pressure to said valve whereby a feeding stroke of said carrier is initiated.

9. In a blank handling apparatus, fluid operated blank feeding mechanism comprising a carrier for a stack of blanks which is movable through opposite feeding and return strokes, fluid operated blank transfer mechanism comprising a blank holder which is mounted for movement through opposite delivery and return strokes, and a fluid pressure system comprising means for selectively directing fluid pressure to and venting it from each of

said blank feeding and transfer mechanisms, said means being operated in response to movement of said holder to vent said transfer mechanism and direct fluid pressure to said feeding mechanism at the ends of the delivery and return strokes, respectively, of said holder, said means also being operated to direct fluid pressure to said transfer mechanism and to vent said feeding mechanism in response to the engagement of the endmost blank in said carrier and said holder.

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