April 21, 1959 H. E. DANIELS 2,882,659

STACK TRANSFER AND BOTTOM WRAPPER INSERTION UNIT

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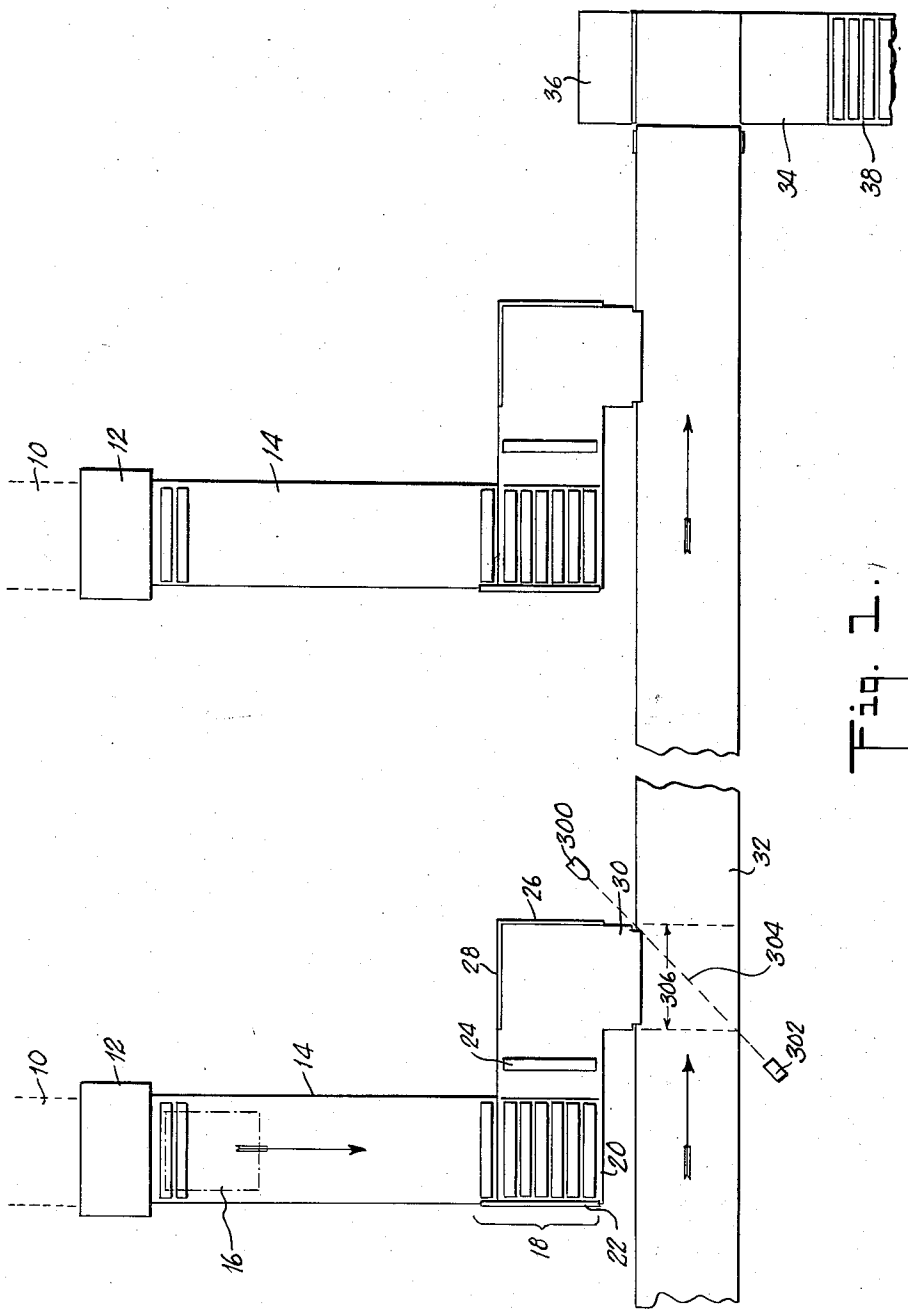


Fig. 1.

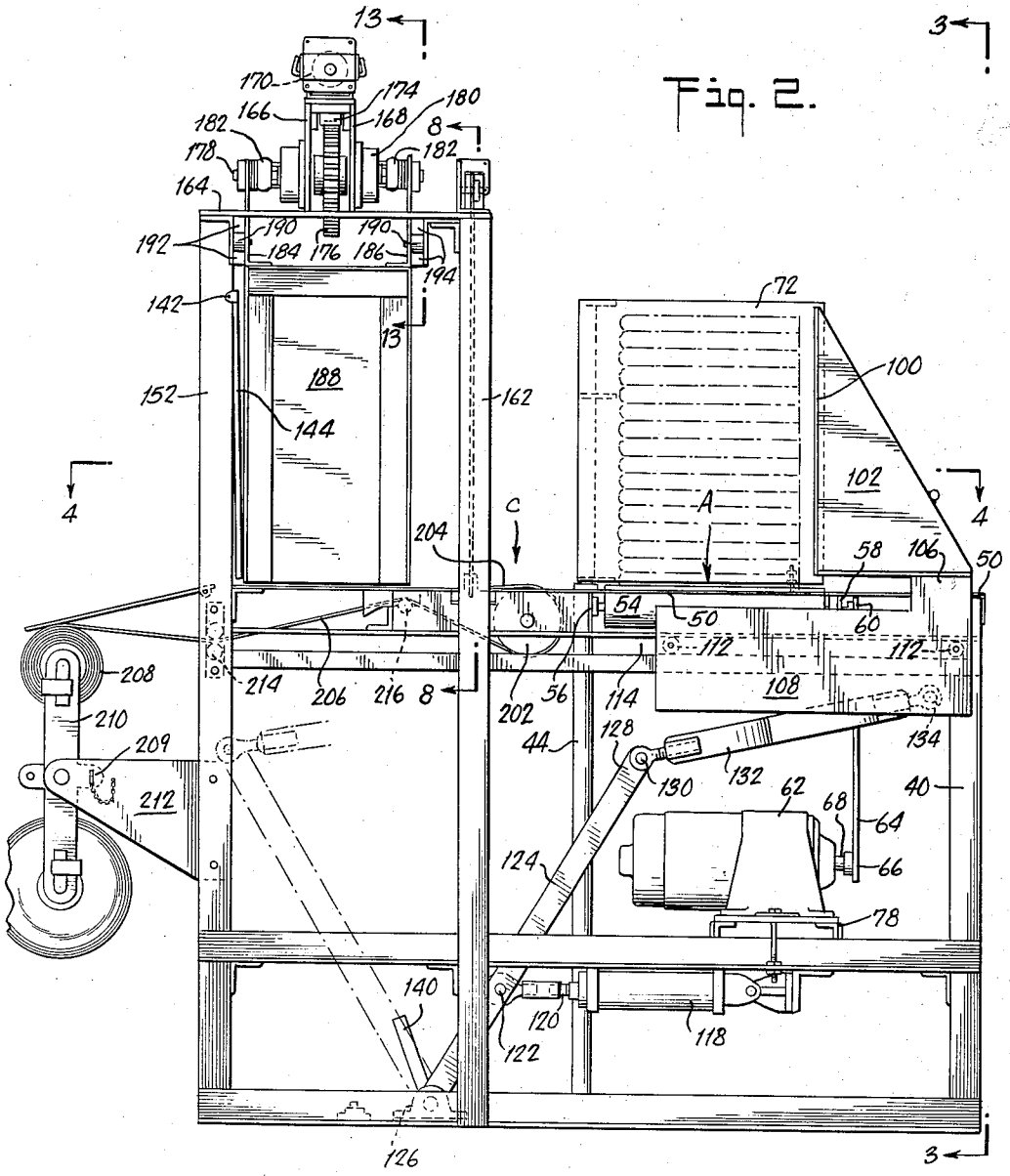
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STACK TRANSFER AND BOTTOM WRAPPER INSERTION UNIT

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Fig. 2.



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STACK TRANSFER AND BOTTOM WRAPPER INSERTION UNIT

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Fig. 3.

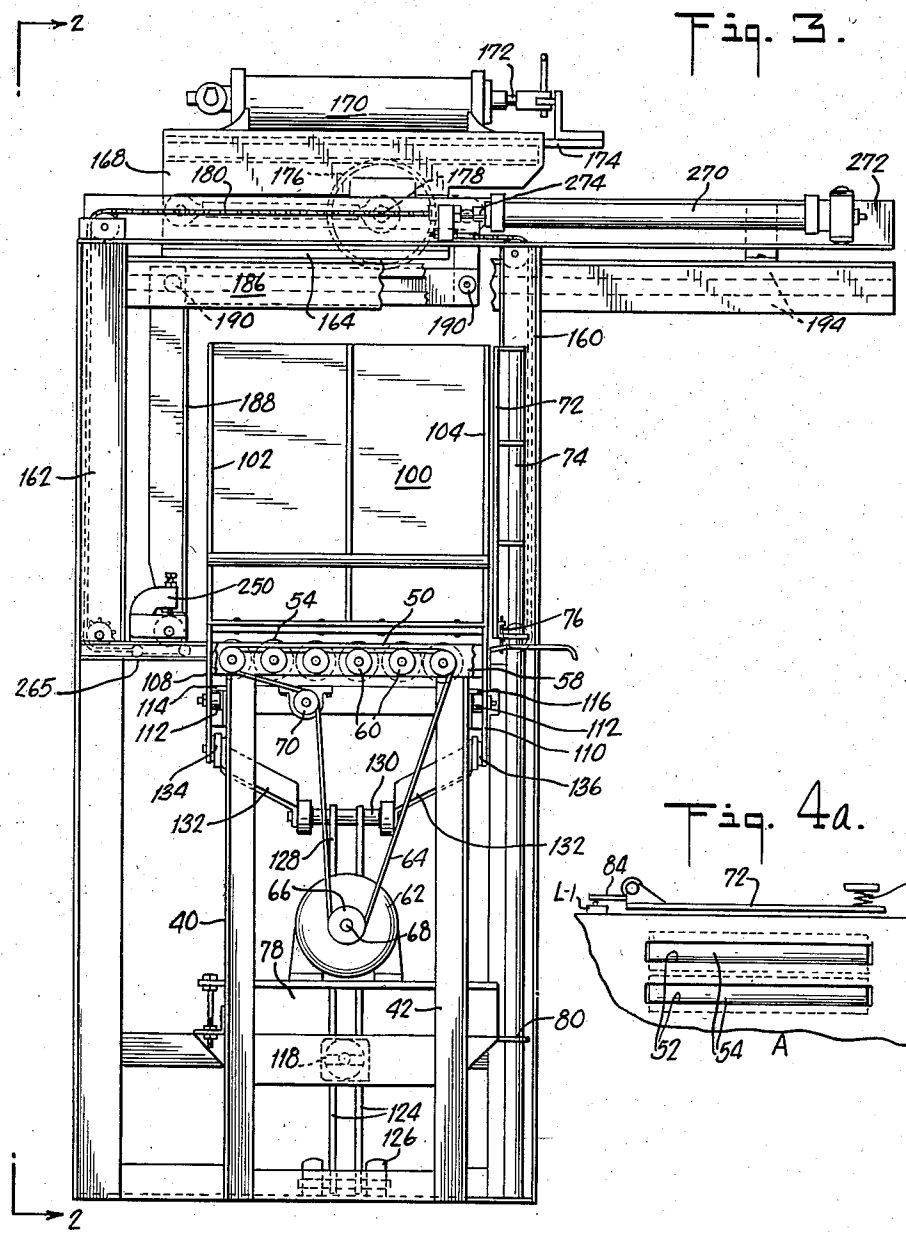


Fig. 4a.

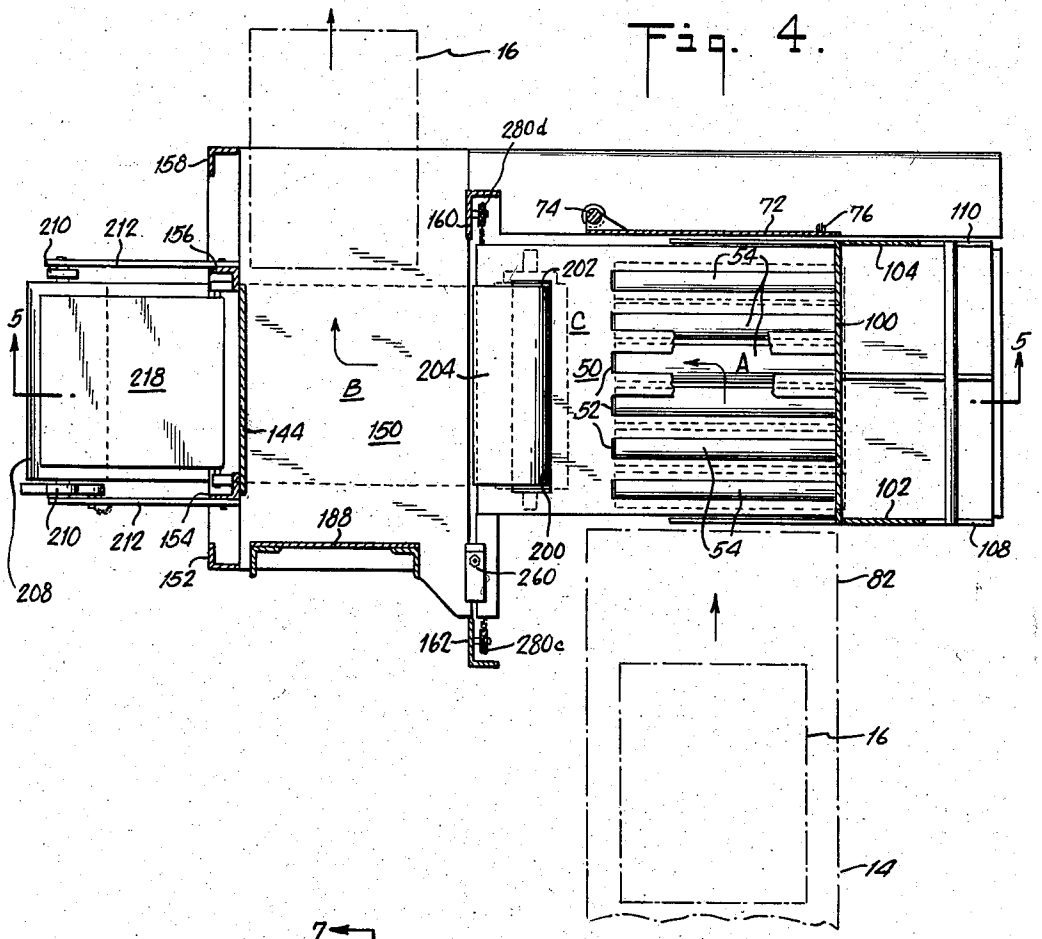
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STACK TRANSFER AND BOTTOM WRAPPER INSERTION UNIT

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Fig. 4.



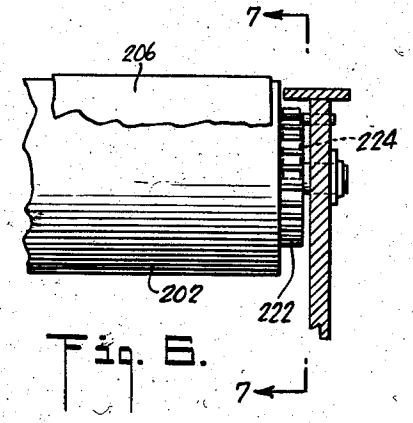


Fig. 6.

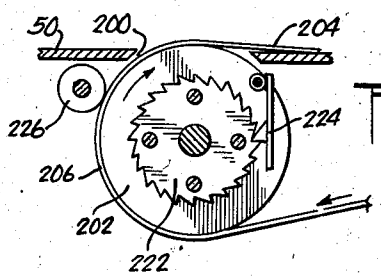


Fig. 7.

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STACK TRANSFER AND BOTTOM WRAPPER INSERTION UNIT

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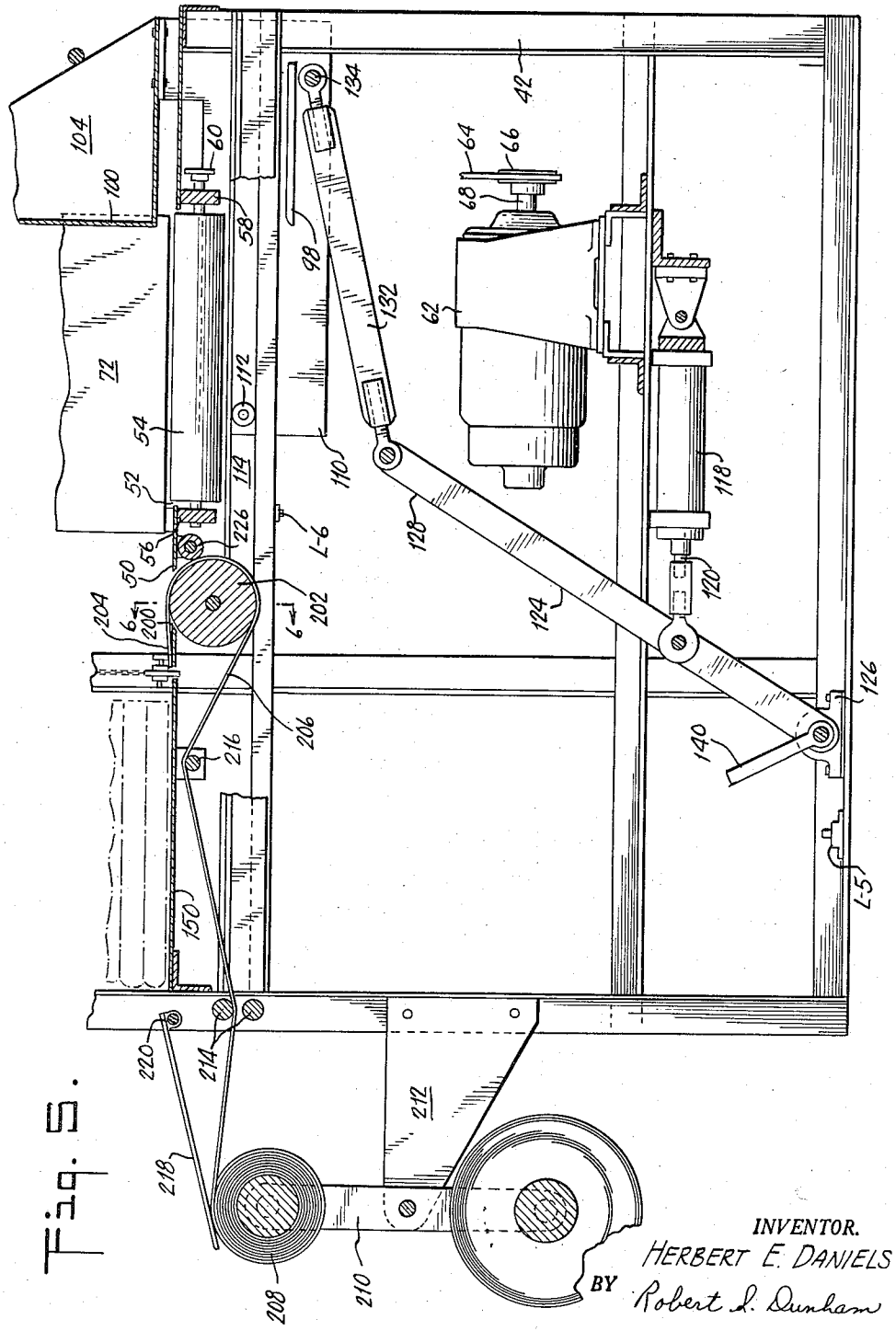


Fig. 5.

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STACK TRANSFER AND BOTTOM WRAPPER INSERTION UNIT

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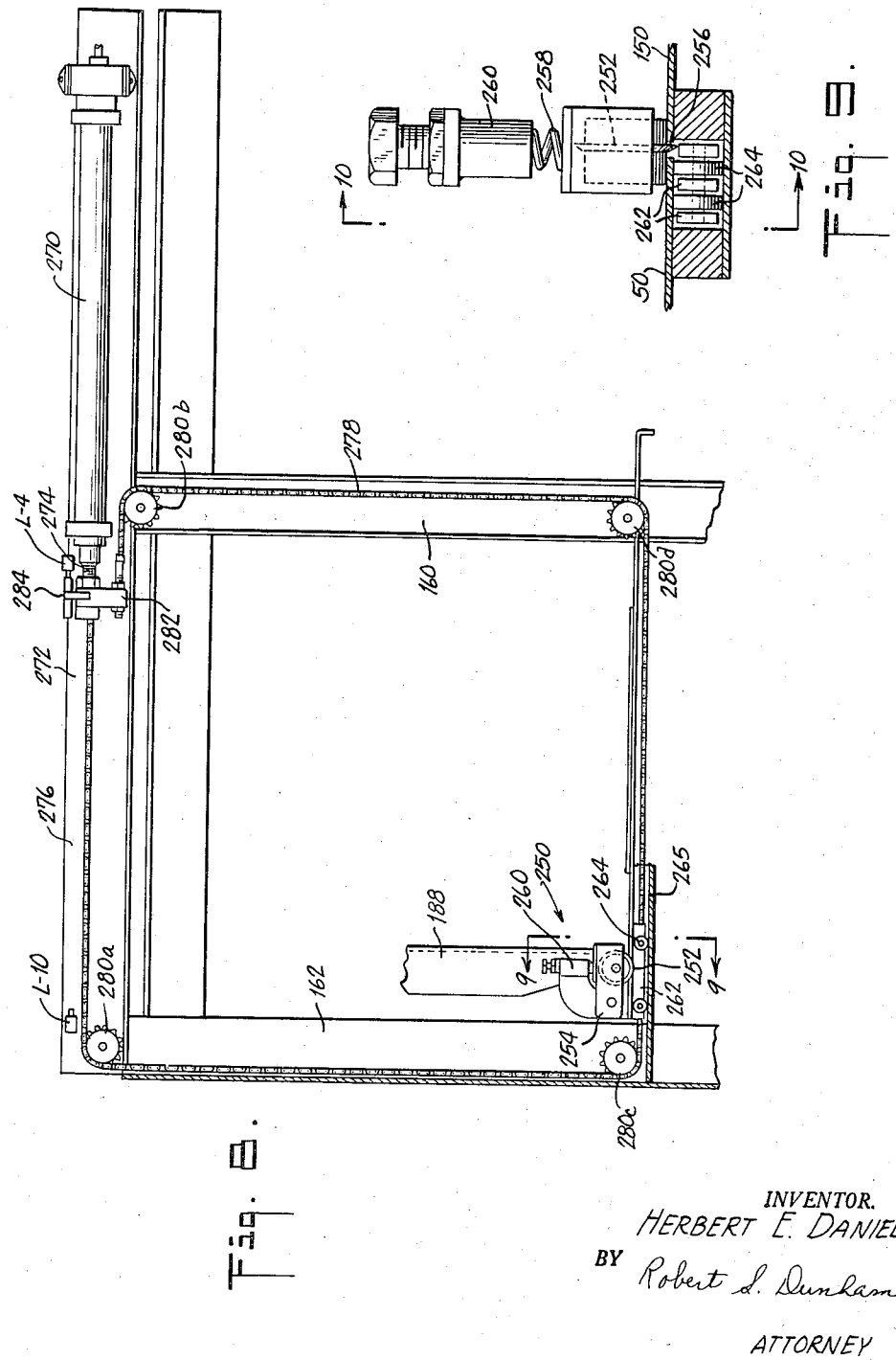


Fig. 8.

Fig. 5.

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STACK TRANSFER AND BOTTOM WRAPPER INSERTION UNIT

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Fig. 10.

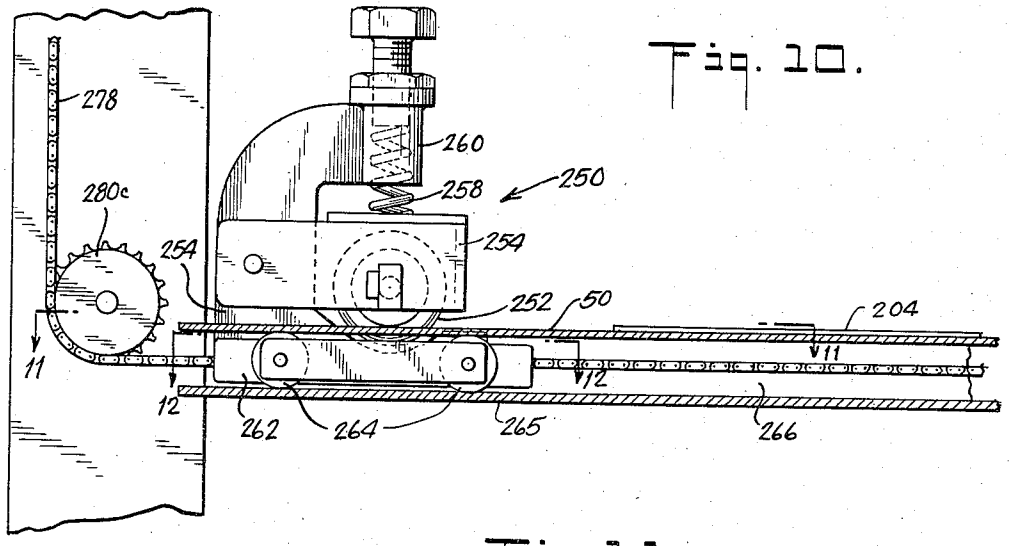
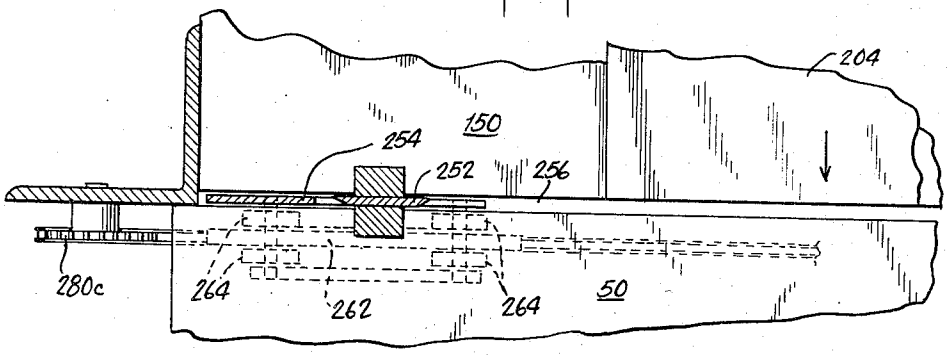


Fig. 11.



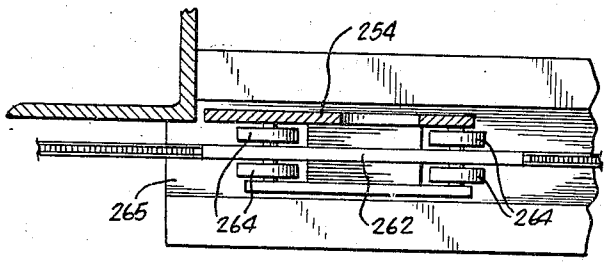


Fig. 12.

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STACK TRANSFER AND BOTTOM WRAPPER INSERTION UNIT

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Fig. 13.

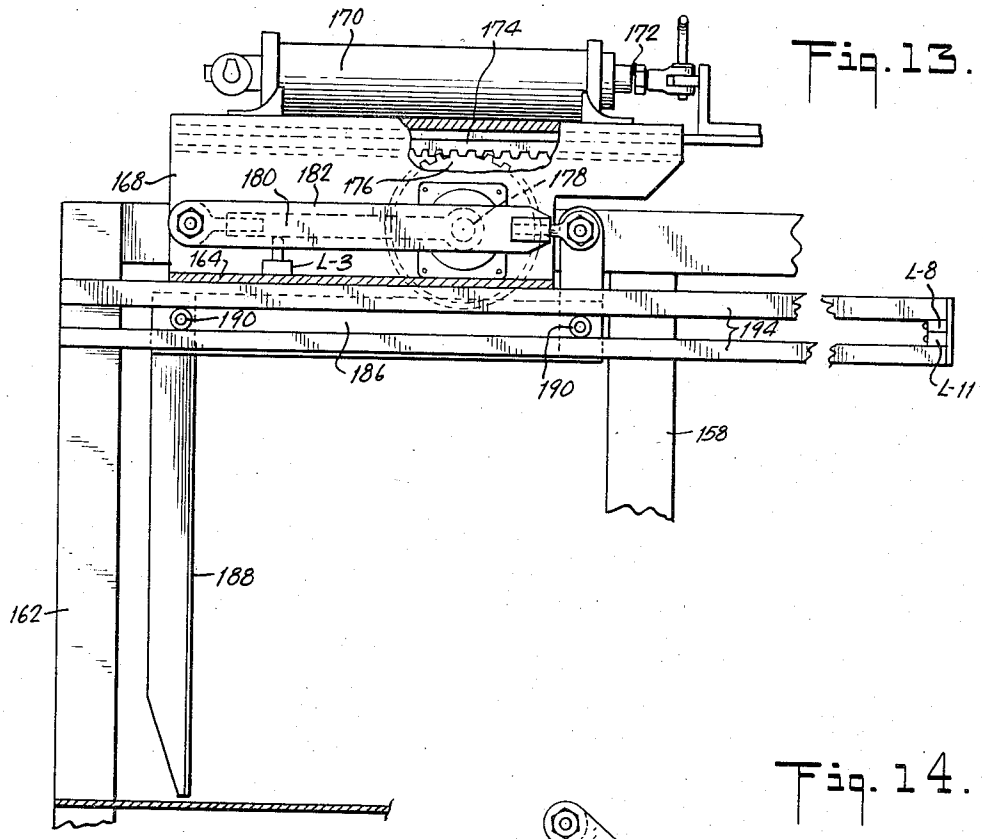
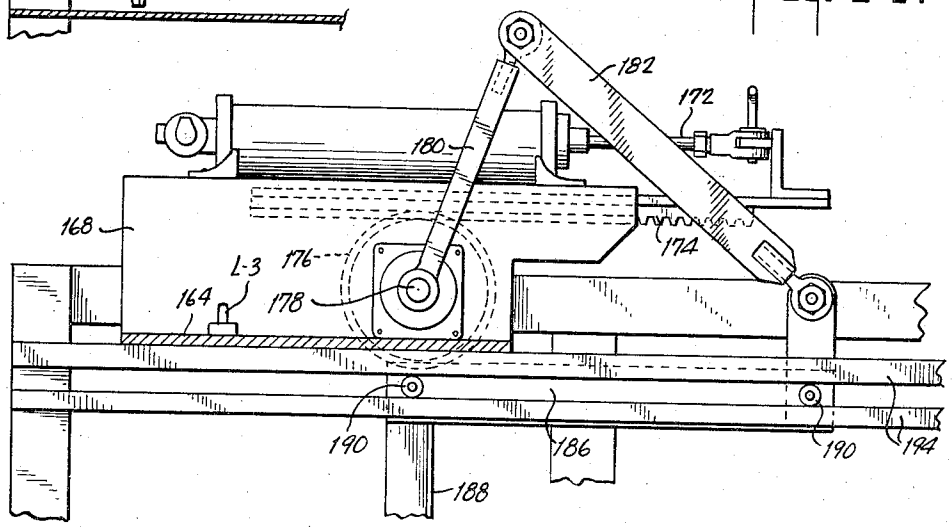


Fig. 14.



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STACK TRANSFER AND BOTTOM WRAPPER INSERTION UNIT

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Fig. 1S.

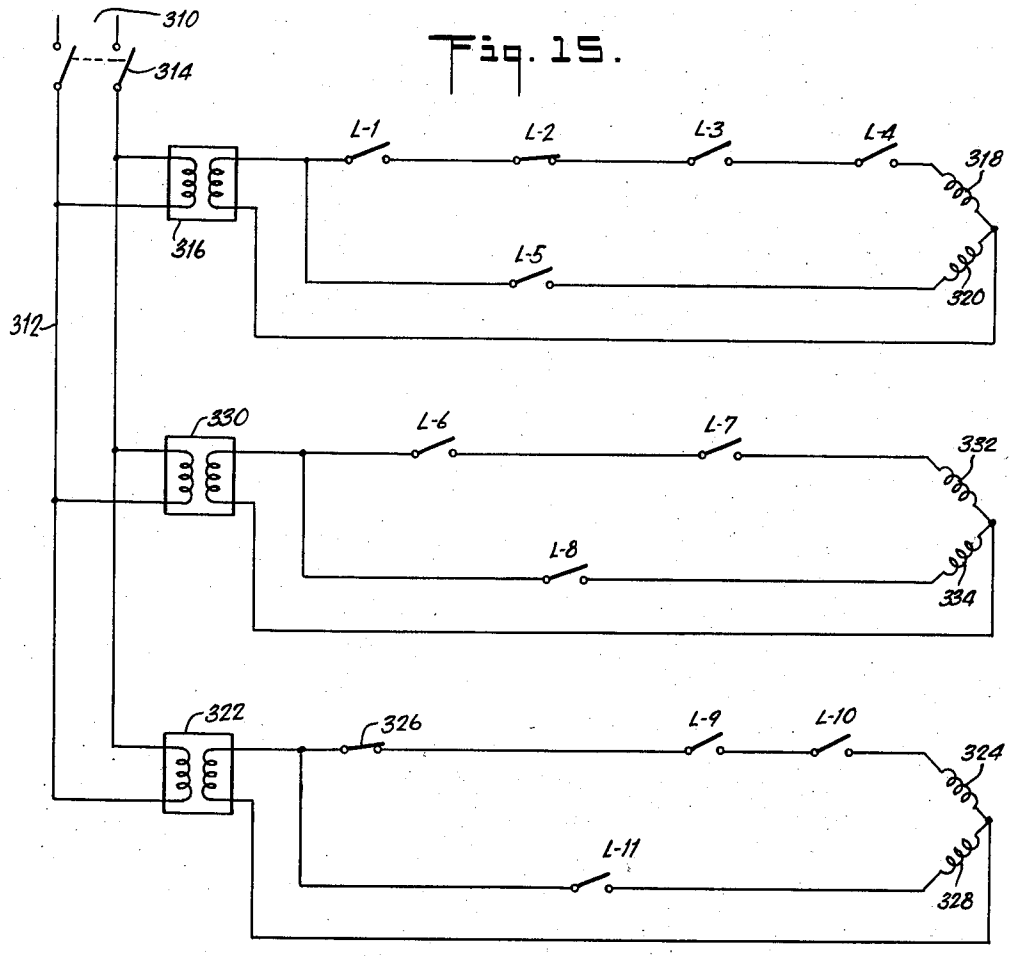
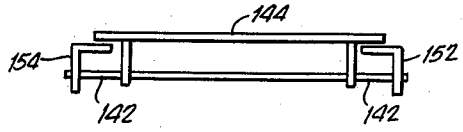


Fig. 2a.



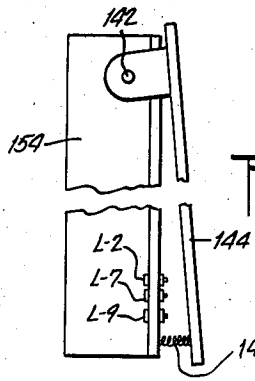


Fig. 2b.

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United States Patent Office 2,882,659 Patented Apr. 21, 1959

2,882,659

STACK TRANSFER AND BOTTOM WRAPPER INSERTION UNIT

Herbert E. Daniels, Orange, N.J., assignor to The Jampol Company, Inc., Brooklyn, N.Y., a corporation of New York

Application January 13, 1955, Serial No. 481,568

19 Claims. (Cl. 53—74)

This invention relates to newspaper mailroom handling equipment and particularly to a stack transfer and bottom wrapper insertion unit for stacks of folded newspapers.

In newspaper mailrooms the assembled newspapers usually enter in prefolded and unstacked form by means of multiple wire type conveyors of well-known construction. The outputs of the conveyors are assembled into stacks of predetermined number or weight, covered by protective top and bottom wrappers, tied with wire or other suitable material and routed to the waiting delivery trucks for distribution to newsdealers. In recent years the utilization of high speed presses, multiple editions and the increasing circulation figures for modern-day newspaper practice, particularly in the larger cities, have resulted in a continual increase in the demands made upon the production schedules in newspaper mailrooms.

The increased demands made upon newspaper mailrooms have led to the utilization of improved stack handling machinery, such as power operated conveyors and automatic stack tying machines, all of which are designed to reduce the manual handling operations required for conventional mailroom processing and to generally increase the speed and efficiency of the flow of stacks of newspapers therethrough.

Recent developments have indicated the utility and general feasibility of the utilization of automatic stacking machinery designed to receive the assembled and folded newspapers from conveyors, form the same into stacks of predetermined size or weight and to place the same in a predetermined positional relationship upon a suitable conveyor exiting therefrom. In most of the modern mailroom installations, the capacity of the existing automatic wire tying machines is sufficient to handle the output of several stacker units whether of the more recent automatic type or the more conventional manually operated units. However, present-day practice requires the manual insertion of protective coverings, i.e. bottom wrappers, underneath the stack intermediate the stacker units and the wire tying machines. This, due to the weight of the stack and its susceptibility to collapse in untied condition, is a relatively arduous and trying job at best and in general markedly limits the speed and efficiency of the general flow of stacks of newspapers through a newspaper mailroom.

This invention may be briefly described as an automatic newspaper stack transfer and bottom wrapper insertion unit particularly adapted for use in association with automatic stacking and wire tying machinery wherein a stack of newspapers, received in a predetermined positional relationship, is supplied with a protective bottom wrapper while being maintained in stack form and is subsequently introduced in a predetermined and proper positional relationship upon conveyor means leading to the wire tying unit. Among the advantages attendant the use of the present invention are the permitting of completely automatic handling of stacks of newspapers in their flow through a newspaper mailroom which renders utilization of the full efficiency and capacity of other and existing

automatic handling machinery a practical reality; positive shaping of a stack of newspapers undergoing processing both before, during and after bottom wrapper insertion; and automatic timed delivery of the bottom wrapper protected stack in proper positional relationship for subsequent operations thereon.

An object of this invention is the provision of an automatic stack transfer and bottom wrapper insertion unit for newspaper mailrooms.

Other objects and advantages of this invention will be pointed out in the following disclosure and claims and will be illustrated in the accompanying drawings which describe, by way of example, the principles of the invention and the presently preferred embodiment of the stack transfer and bottom wrapper insertion unit incorporating those principles.

Referring to the drawings:

Fig. 1 is a schematic illustration of the disposition of the invention in the general flow system in a modern-day newspaper mailroom;

Fig. 2 is an elevational view of the unit as viewed from the lines **2—2** on Fig. 1 and Fig. 3;

Figs. 2A and 2B are details of the mounting of the arresting plate for the stack delivery station B;

Fig. 3 is an elevational view taken on the line **3—3** of Fig. 2;

Fig. 4 is a sectional view taken on the line **4—4** of Fig. 2;

Fig. 4A is a plan view of a detail of a portion of the control mechanism;

Fig. 5 is a sectional view taken on the line **5—5** of Fig. 4;

Fig. 6 is a sectional view taken on the line **6—6** of Fig. 5;

Fig. 7 is a sectional view taken on the line **7—7** of Fig. 6;

Fig. 8 is a sectional view taken on the line **8—8** of Fig. 2;

Fig. 9 is a sectional view taken on the line **9—9** of Fig. 8;

Fig. 10 is a sectional view taken on the line **10—10** of Fig. 9;

Fig. 11 is a sectional view taken on the line **11—11** of Fig. 10;

Fig. 12 is a sectional view taken on the line **12—12** of Fig. 10;

Fig. 13 is a sectional view taken on the line **13—13** of Fig. 2;

Fig. 14 is a view similar to that of Fig. 13 but showing the positioning of the illustrated elements thereof at another portion of the cycle of operation;

Fig. 15 is a schematic circuit diagram for the control system.

As generally set forth above, the automatic stack transfer and bottom wrapper insertion unit forming the subject matter of this invention is particularly adapted for utilization in association with other automatic handling units in newspaper mailrooms in order to render the utilization of the full capacity of said automatic units a practical reality and to greatly increase the speed and efficiency of the flow of stacks of newspapers through the mailroom. Fig. 1 shows, in general and in schematic form, the positioning of the stack transfer and bottom wrapper insertion unit in the general flow system in a modern newspaper mailroom. Referring to the drawing, the assembled and folded newspapers enter a mailroom at a rate of up to 60,000 per hour by means of conventional Cutler-Hammer dispatch conveyors **10** and are introduced into stacker units **12** wherein they are formed into stacks of predetermined number or weight. As mentioned above, recent advances in the stacker art have resulted in the development of automatic stacker

units which receive the papers from the conveyors **10** and automatically form them into stacks of predetermined number or weight. Utilization of such automatic stacker units results in a great increase in the possible number of stacks formed per unit of time and also consequently permits an increase in the load to be handled by the subsequent processing units if the full capacity of said automatic stackers is to be utilized.

The output of the stacker units **12**, in the form of stacks of newspapers of predetermined number or weight, appears on the delivery conveyors **14** positioned so that the long axis of the stacked newspapers is disposed generally parallel to the center line of the delivery conveyor **14** as indicated by the dotted lines **16** representing a stack of papers. The stacks of papers are adapted to be transported by the delivery conveyor **14** to the automatic stack transfer and bottom wrapper insertion unit, generally designated **18**, forming the subject matter of this invention. In general, in the stack transfer and bottom wrapper insertion unit **18**, receipt of a stack of newspapers **16** against the arresting plate **20** results in actuation of a ram **22**. Actuation of the ram **22** effects a displacement of the stack at right angles to its previous direction of motion over the bottom wrapper insertion unit **24** which effects the disposition of a bottom wrapper beneath the stack. It should be noted that the abutting of the stack against the plate **20** and the consequent right angular displacement thereof by actuation of the ram **22** effects an automatic squaring up of the stack on the two sequentially engaged surfaces thereof. The displacement of the stack under the action of the ram **22** is terminated by the stack, now riding upon a bottom wrapper, abutting the arresting plate **26**. The engagement of the arresting plate **26** by the stack **16** results in severing of the bottom wrapper material from the supply thereof and in actuation of a second ram **28**. Actuation of the second ram **28** effects a displacement of the stack **16** onto the main feeder conveyor **32** with the stack positioned thereon so that the long axis of the stack is disposed substantially transversely to the longitudinal center line of said feeder conveyor **32**. As will be explained in detail later, the discharge of the stack from the stack transfer and bottom wrapper insertion unit **18** is effected in such a manner as to result in the introduction of the stack on the feeder conveyor **32** with a minimum of skewing, it being kept in mind that the feeder conveyor is moving in a direction at right angles to the direction of entry of the stack **16** thereon. It should also be noted that the abutting of the stack against the arresting plate **26** and the consequent right angular displacement thereof by the action of the ram **28** effects a further and automatic squaring up of the stack on the two sequentially engaged surfaces thereof, which, together with the previously described squaring operation, results in a positive squaring of the stack by engagement of all four of the surfaces thereof.

The feeder conveyor **32** serves to convey the stacks **16** in a predetermined positional relationship to a wire tying unit **34** of conventional construction operating in association with a feeder mechanism **36** of the type described in U.S. Patent No. 2,630,750. The introduction of the stacks into the wire tying unit **34** results in the automatic tying of the stacks after insertion of a top wrapper thereover. The finished stacks are then displaced along a conveyor **38** and are routed by a suitable conveyor system into the delivery trucks for distribution to newsdealers.

In certain types of operation it may be desirable to use a single wire tying unit **34** to accommodate the output of several stacker units **12** although in most instances a single wire tying unit **34** will operate in conjunction with a single stacker. In any event a possible arrangement is such as shown in Fig. 1 wherein a plurality of stacker units **12** and stack transfer and bottom wrapper insertion units **18** are arranged to feed a common feeder conveyor **32**. In such a multiple unit system it is imperative that the stacks delivered from the various stacker and bottom wrapper insertion units **18** be introduced onto the common feeder conveyor **32** in timed relation and with a minimum amount of skewing as the space thereon is limited in nature. These difficulties, of course, increase with the greater the number of units arranged to feed into a common feeder conveyor **32**.

Turning now to the details of the presently preferred embodiment of the transfer and bottom wrapper unit as illustrated in the drawings, and referring first to Fig. 4, the unit may be considered as including a stack receiving station or locality, generally designated as A, a stack delivery station or locality, generally designated as B, and an intermediate bottom wrapper insertion station, generally designated C. As explained earlier, a stack of papers **16** is adapted to be advanced along an entry conveyor **14** and is introduced into the stack receiving station A. A stack **16** so introduced is then transferred across the bottom wrapper insertion station C and introduced into the stack delivery station B from which it is delivered onto the main feeder conveyor **32** leading to the wire tying unit.

For the purpose of convenience the major components of the unit, as set forth above, will be separately described, and will be followed by a detailed description of the electrical control system associated therewith.

The stack receiving station

Referring to Figs. 2 to 5, the stack receiving station A is supported by a steel beam framework which includes the vertically disposed supporting members **40**, **42** and **44**. Mounted on the supporting members is a horizontally disposed stack transfer plate **50**, the surface of which extends over the stack receiving station A and the bottom wrapper insertion station C. The stack transfer plate **50**, within the area thereof included within the stack receiving station A, is provided with a plurality of elongated rectangular apertures **52** through which protrude a portion of the peripheries of a plurality of spaced rollers **54** disposed at right angles to the path of travel of the incoming stack of papers **16**. The rollers **54** are positioned so that the exposed peripheral portions thereof are positioned slightly above the surface of the stack transfer plate **50** so that rotation of said rollers **54** may be utilized to advance a stack of papers disposed therein. The rollers **54** are supported at their extremities by the horizontally disposed frame members **56** and **58** disposed beneath the stack transfer plate **50** and are further provided, at the end thereof remote from the bottom wrapper insertion station C, with individual extending drive sprockets **60**. The rollers **54** are positively driven by means of a drive chain **64** disposed in engagement with a drive sprocket **66** mounted on the shaft **68** of an electric motor **62**. The electric motor **62** is mounted beneath the transfer plate **50** on a suitable supporting frame generally designated **78** which preferably is made adjustable so that the desired degree of tension in the drive chain **64** may be maintained. **70** is merely a guiding idler sprocket.

Positioned at the side of the stack receiving station A remote from the point of entry of a stack thereto is a vertically disposed stack arresting plate **72** which serves to arrest the forward motion of an incoming stack of papers **16**. As shown in the drawings, the stack arresting plate **72** is mounted on a vertically disposed arresting plate supporting shaft **74** rotatably mounted in suitable lugs such as **80** extending from the supporting frame members.

As shown in detail in Fig. 4A, the arresting plate **72** is yieldingly biased in a clockwise direction by a spring **82**. Mounted on the plate **72** adjacent the shaft **74** is an extending arm **84** positioned to actuate, upon displacement thereof, a control microswitch L–1. Receipt of a stack of papers in the stack receiving station A and the engagement of said arresting plate **72** thereby under the action of the rollers **54** results in a slight counter-

clockwise rotative displacement of said arresting plate 72 about its supporting shaft 74. This counterclockwise displacement, although very slight, and limited by a stop 76, serves to rotatably displace the arm 84 and to actuate the control microswitch L–1. As described above, the control microswitch L–1 is actuated by the presence of a stack of papers 16 in the stack receiving station A. The actuation thereof, as will be explained in detail at a later point in this specification, performs a control function relative to the transfer of said stack from the receiving station A to the stack delivery station B. The above described and illustrated mounting of the stack arresting plate 72 permits the same to function to arrest an advancing stack of papers 16 in the stack receiving station A and to perform an additional control function for the unit as a whole.

Disposed above the rollers 54 a sufficient distance to clear the same and positioned perpendicularly to the longitudinal axis thereof and in substantial alignment with the edge 82 of the conveyor 14 is a vertically disposed ram plate 100 adapted to displace stacks of paper 16 from the stack receiving station A to the stack delivery station B. As the ram plate 100 must move in a direction so as to advance a stack of papers disposed in the stack receiving station A into compressive engagement with an arresting plate in the stack delivery station B with the stack riding on the transfer plate 50, it is provided with a pair of triangularly shaped side members 102 and 104 respectively. The triangularly shaped side members 102 and 104 are remotely connected, as at 106 (Fig. 2), to a pair of substantially rectangularly shaped side plates 108 and 110 disposed on the outer sides of the frame members supporting the transfer plate 50. Each of the side plates 108 and 110 have mounted thereon a pair of inwardly disposed support rollers 112. The support rollers 112 are contained within suitable horizontally disposed channel members 114 and 116 which form a portion of the supporting frame, and thereby both guide and support the vertically disposed ram plate 100 and the above described supporting members therefor during its reciprocation.

Mounted on the inner side of the side plate 110 (Fig. 5) is an actuating track 98 suitably positioned to engage a control microswitch L–6 mounted on the underside of the frame member 96 defining the channel 114 whenever the vertical ram plate 100 is disposed beyond the end of the transfer plate 50 when advancing a stack of papers into the stack delivery station B. The microswitch L–6 performs a control function for the mechanism utilized to sever the bottom wrapper material as will be explained in detail at a later point in this specification.

The reciprocation of the vertically disposed ram plate 100 to effect displacement of a stack of papers disposed in the stack receiving station A to the stack delivery station B is effected through the actuation of an air cylinder 118 suitably mounted on the support frame and, as illustrated, disposed beneath the drive motor 62 for the rollers 54. The piston rod 120 of the air cylinder 118 is pivotally connected, as at 122, to a lever arm 124. The fixed end of the lever arm 124 is pivotally mounted on the lugs 126 fixedly secured to the base of the unit. The free end 128 of the lever arm 124 is pivotally connected to a hinge pin 130 mounted at one end of a bifurcated link member 132. The other end of the bifurcated link member 132 is pivotally connected, as at 134 and 136 to the rear end of the side plates 108 and 110 respectively.

In operation of the unit, actuation of the air cylinder 118 results in displacement of the piston rod 120 thereof in a leftward direction as illustrated in Fig. 2. Displacement of the piston rod 120 results in a pivotal displacement of the lever arm 124 about the lug 126 and eventual assumption thereof, at the limit of the stroke, of a position in the vicinity of the dotted lines on Fig. 2. The pivotal displacement of the lever arm 124 is transmitted through the link member 132 and results in a horizontal displacement of the vertical ram plate 100 with said displacement being effectively guided by the rollers 112 riding in the horizontally disposed channels 114 and 116. Through the above described displacement of the vertical ram plate 100 a stack of papers is displaced from the stack receiving station A into the stack delivery station B. In a similar manner retraction of the piston rod 120 results in a return of the ram plate 100 to its starting or rest position. In operation of the unit it is desired that the length of stroke of the ram plate 100 be such as to effect a compression of the delivered stack against a suitably positioned arresting plate in the stack delivery station B for positive positioning and alignment of the stack. Consequently, it is highly desirable to be able to adjustably determine the limit of the stroke and to provide for positive retraction of the ram plate 100 to its rest position. As best shown in Figs. 2 and 5, the lever arm 124 is provided with an actuating arm 140 adapted to actuate adjustably positioned control microswitch L–5 mounted on the base of the unit adjacent the lugs 126. As will be described in detail later, actuation of the control microswitch L–5 serves to limit the length of stroke of the ram plate 100 and to initiate the retraction of the same from its advanced position.

The stack delivery station

Referring initially to Figs. 2 to 4, the stack delivery station B includes a horizontally disposed plate member 150 positioned in the same plane as the transfer plate 50 and supported by a plurality of vertically disposed supporting members, such as for example, the members 152, 154, 156, 158, 160 and 162.

Pivotally mounted as at 142 (Fig. 2A) on the frame members 152 and 154 is a vertically disposed arresting plate 144 positioned so as to arrest the movement of a stack of papers 16 being introduced into the delivery station B by the ram plate 100. As shown, the arresting plate 144 is pivotally mounted adjacent its upper extremity and its lower end is yieldingly biased out of engagement with the frame members 152 and 154 by a biasing spring 146. Mounted on the frame member 154 and positioned to be actuated by the displacement of the arresting plate 144 resulting from contact with a stack of papers 16 introduced into the stack delivery station B by the ram plate 100, are three control microswitches L–2, L–7 and L–9, respectively. The control microswitches L–2, L–7 and L–9 are thus all responsive to the presence of a stack of papers 16 in the stack delivery station B and the control functions performed thereby will be described in detail at a later point in this specification.

Referring now to Figs. 2, 3, 13 and 14, disposed above the plate member 150 defining the stack delivery station B and mounted upon the vertically disposed support members 152, 158, 160 and 162 is a horizontally disposed supporting plate 164. Perpendicularly mounted on the supporting plate 164 are a pair of vertically disposed supporting plates 166 and 168 on top of which is mounted an air cylinder 170. The piston rod 172 of the air cylinder 170 is connected to a rack 174 disposed between the vertically disposed and spaced apart supporting plates 166 and 168. The rack 174 is disposed in operative engagement with a pinion 176 mounted on a shaft 178 that is rotatably supported by said vertically disposed supporting plates 166 and 168. The shaft 178 extends outwardly beyond the supporting plates 166 and 168 and secured to each of said extending portions is one end of a rocker arm 180. The other ends of the rocker arms 180 are secured to link members 182 which in turn are connected to the horizontally disposed support members 184 and 186 for the vertically disposed delivery ram plate 188 suspended therefrom. The support members are provided with rollers 190 which are contained within the extending channel members 192 and 194 and serve

to guide, support and position the suspended delivery ram plate **188** during the reciprocation thereof.

The reciprocation of the suspended delivery ram plate **188** to effect a displacement of a stack of papers disposed in the stack delivery station B is effected through actuation of the air cylinder **170**. With the parts positioned as illustrated in Fig. 13, actuation of the air cylinder **170** results in a displacement of the piston rod **172** thereof to the right. The displacement of the piston rod **172** results in a similar displacement of the rack **174** secured thereto, and in a clockwise rotation of the pinion **176** in engagement therewith. Rotation of the pinion **176** results in a rotative displacement of the rocker arms **180** which, through the links **182**, is translated into horizontal displacement of the support members **184** and **186** and the delivery ram plate **188** suspended therefrom. Retraction of the piston rod **172**, in a similar manner, results in retraction of the delivery ram plate **188**. It should be noted that the above arrangement provides a form of harmonic motion wherein a constant speed of rotation of the rocker arms **180** through a 180 degree displacement thereof effects a varying speed of displacement, in the nature of a sine function, for the linear speed of the delivery ram plate **188** with the maximum speed thereof being effected when the rocker arms **180** have been displaced 90 degrees from their rest position. This variation in speed of the delivery ram plate **188** is of decided utility as will be explained later in this specification.

The horizontal displacement of the support member **186** is also utilized to perform a control function in the operation of the machine. As shown in Fig. 13 a pair of control microswitches L–3 and L–11 are mounted in the track formed by the channel members **194** and are positioned at the end thereof so as to be actuated when the support member **186** reaches the limit of its stroke. In a similar manner a control microswitch L–3 is mounted on the horizontal support member **164** so as to be actuated by the rocker arm **180** when the same is positioned as illustrated in Fig. 13 with the delivery ram **188** in retracted position. The control functions of these control microswitches will be described in detail at a later point in this specification.

The bottom wrapper insertion station

Referring now to Figs. 2 and 4 through 7, the stack transfer plate **50** is provided with a substantially rectangular aperture **200** having its long dimension disposed perpendicularly to the path of travel of a stack **16** in transit from the stack receiving station A to the stack delivery station B. Disposed beneath the aperture **200** is a freely rotatable bottom wrapper feed roller **202**. The feed roller **202** is positioned so that a portion of the periphery thereof extends through said aperture **200** and is located slightly above the surface of the transfer plate **50**. Disposed around the roller **202** and with the free end thereof disposed on the top of the transfer plate **50** as at **204** is a web or strip of suitable bottom wrapper material **206** such as brown paper. The web of bottom wrapper material **206** is obtained from a supply roll **208**. The supply roll **208** is rotatably mounted at one end of a pair of support arms **210** which are positioned at their midlength by the standards **212** mounted on the vertically disposed frame members **154** and **156**, respectively. As illustrated, the arms **210** support a supply roll **208** at each end thereof so that when one of the supply rolls **208** is exhausted, a fresh supply may be conveniently displaced into the feed position. Suitable locking means such as the pin **209** (Fig. 2) are provided to position the support arms relative to the standards **212**.

The web of bottom wrapper material **206** is led from the upper supply roll **208** through a pair of snubber bars **214** mounted intermediate the frame members **154** and **156**, over a web guide **216** disposed beneath the plate **150** and thence around the feed roll **202** and through the aperture **200** onto the upper surface of the transfer plate **50**. Means, such as a tension plate **218** pivotally mounted on the frame members **154** and **156** as at **220** are provided to prevent overrunning of the supply roll **208** and to thereby maintain a small amount of back tension in the bottom wrapper material **206** to assure uniform feed and guiding thereof. Similarly, the feed roll **202** is provided with an integral ratchet **220** (Figs. 6 and 7) which is engaged by a pawl **224** so as to permit rotation of the feed roll **202** only in one direction. Associated with the feed roll **202** is an auxiliary pressure roller **226** which maintains the bottom wrapper material **206** in close engagement with the periphery of the roller **202** at all times.

In operation of the unit the displacement of a stack of papers **16** from the stack receiving station A by the ram plate **100** results in said stack being moved over the protruding surface of the feed roll **202**. The weight of the stack undergoing displacement and the frictional engagement of the bottom of said stack with the bottom wrapper material **206** disposed on the upper surface of the feed roll **202** will usually be sufficient to cause said strip material to be advanced in conjunction with said advancing stack and to thereby result in an automatic pick up of a length of protective bottom wrapper material **206** as the stack is transferred from the stack receiving station A to the stack delivery station B. If desired, however, the roll **202** may be positively driven as by a suitable rack associated with the advancing ram plate **100** engaging a pinion mounted on the roll **202** in association with a unidirectional clutch mechanism therefor.

After the stack **16** has reached the stack delivery station B and is positioned therein against the arresting plate **144**, the advanced length of the bottom wrapper material **206** now disposed beneath the stack must be severed from the remainder of the web. Referring to Figs. 3 and 8 to 12, there is provided a web cutting assembly generally designated **250** which includes a horizontally displaceable mounting member **254** having a circular cutting blade **252** rotatably mounted therein. The cutting blade **252** is positioned so as to be disposed in a track **256** defined by the space intermediate the edge of the stack transfer plate **50** and the plate **150**, and it is maintained in cutting position within said track by a biasing spring **258** mounted in the arcuate support member **260**. The mounting member **254** is provided with an integral carriage **262** disposed beneath the surface of the stack transfer plate **50** on which are mounted a plurality of rollers **264** adapted to be positioned within a channel **266** defined by the transfer plate **50** and the channel member **265**.

The necessary reciprocation of the cutting assembly **250** to sever the advanced portion of the web **206** is effected by an air cylinder **270** mounted on an extending horizontally disposed frame member **272**. The piston rod **274** of the air cylinder **270** is connected by chains or cables **276** and **278** running over suitable guide sprockets **280***a* through **280***d* to either end of the carriage **262**. Actuation of the air cylinder **270** (Fig. 9) results in a displacement of the piston rod **274** to the left. A leftward displacement of the piston rod **274** results in the carriage **262** being displaced to the right intermediate the frame members **162** and **160** due to the action of the chain **278** and the guide sprockets **280***b* and **280***d*. In a similar manner retraction of the piston rod **274** from its extended position results in a return of the cutting blade assembly **250** to its rest position by action of the chain **276** and guide sprockets **280***a* and **280***c*. Through the above described structure, reciprocation of the cutting assembly **250** effectively severs the advanced portion of the bottom wrapper material disposed beneath a stack of newspapers located in the stack delivery station B from the remainder of the web of material **206**.

The displacement of the piston rod **274** is also utilized to perform a control function for the machine. The con-

necting member 282 has a T-shaped actuating arm 284 mounted thereon which serves to trip the control microswitch L–10 mounted on the frame 272 when the piston 274 is in its advanced position. In a similar manner a control microswitch L–4 is also mounted on the frame member 272 so as to be actuated by the actuating arm 284 when the piston 274 is in its retracted position.

Control system

In the preceding portions of this specification the physical location of the control microswitches L–1 through L–11 have been described in detail. Included in the general control system and in association therewith is an additional control unit in the form of a photoelectric cell control to control the delivery of stacks from the stack delivery station B onto a common feeder conveyor 32 when a plurality of stack transfer and bottom wrapper insertion units are arranged to feed a common feeder conveyor.

As shown in Fig. 1 there is provided a photocell 300 and a light source 302 therefor arranged so that the beam of light 304 emanating from the light source traverses the portion of the feeder conveyor 32 required for insertion of a stack thereinto. If the area traversed by the beam 304 contains any portion of a stack 16, the beam will, of course, be interrupted and, as explained later, the interruption of the beam is utilized to open a relay to prevent actuation of the delivery ram 188. In addition to performing the above control function, the photocell 300 also serves as a safety device in preventing delivery of a stack if there is any obstruction in its path of travel.

The circuit diagram for the control system associated with the stack transfer and bottom wrapper insertion unit forming the subject matter of this invention is schematically set forth in Fig. 14. As there illustrated, there is provided a suitable A.C. source 310 connectable to the line 312 through closure of a main switch 314. A separate control circuit is provided for each of the air cylinders described above, i.e., the air cylinder 118 for the ram plate 100; the air cylinder 170 for the delivery ram plate 188; and the air cylinder 270 for the cutting assembly 250. Each of the air cylinders is provided with solenoid actuated valves with the actuating coils for the solenoid valves being included in the illustrated control system.

The control circuit for the air cylinder 118 includes a step-down transformer 316, the secondary of which includes the advance valve solenoid coil 318 connected in series with the normally open contacts of control microswitches L–1, L–3 and L–4 and the normally closed contacts of control microswitch L–2. As discussed earlier, the control microswitch L–1 is positioned behind the arresting plate 72 in the stack receiving station A and the contacts thereof will be closed in response to the displacement of the arresting plate 72 resulting from engagement therewith by a stack under the influence of the driven rollers 54. The control microswitch L–2 is disposed behind the arresting plate 144 in the stack delivery station B and is arranged to be opened by the compressive engagement of a stack with said arresting plate 144. As such the presence of a stack of papers in the stack delivery station B will open the control microswitch L–2 and will prevent actuation of the advance valve solenoid coil 318. The control microswitch L–3 is mounted on the supporting plate 164 and is positioned to be closed by the rocker arm 180 when the delivery ram plate 188 is in its retracted position. The normally open control microswitch L–4, as discussed earlier, is positioned on the support member 272 for the air cylinder 270 and is adapted to be closed only when the piston rod 274 of said air cylinder is in its retracted position. Through the above described control circuit it will be seen that advance valve solenoid 318 for the air cylinder 118 will be actuated to effect an advance of the ram plate 100 only when the contacts of control microswitch L–1 are closed due to the presence of a stack in the stack receiving station A; the contacts of the control microswitch L–2 are in their normally closed position indicative of the absence of a stack in the stack delivery station B; the contacts of control microswitch L–3 are closed indicative of the fact that the delivery ram plate 188 is in its retracted position; and the contacts of the control microswitch L–4 are closed indicative of the fact that the cutting assembly 250 is in its rest or retracted position. Thus only when these operating conditions are satisfied will the ram plate 100 be actuated to advance a stack from the stack receiving station A to the stack delivery station B.

The return valve solenoid 320 for the air cylinder 118 is connected in series with the normally open contacts of the control microswitch L–5. As discussed earlier, the contacts of the control microswitch L–5 are adapted to be closed only when the lever arm 124 reaches its limiting position determinative of the length of stroke of the vertical ram plate 100. Through the above circuit, the piston rod 120 will thus be positively retracted due to energization of the solenoid 320 as soon as the lever arm 124 reaches its limiting position which, as mentioned above, is adjustable so as to effect a desired amount of compression of the stack of papers delivered to the stack delivery station B against the arresting plate 144 therein.

The control system for the air cylinder 170 includes a step-down transformer 322, the secondary of which includes the advance solenoid coil 324 connected in series with the normally open contacts of control microswitches L–9 and L–10 and the normally closed contacts of a switch member 326 which is responsive to the photoelectric cell 300 disposed adjacent the feed conveyor 32 and is arranged to be opened when the presence of a stack of papers in the area 306 is sensed. As discussed earlier, the control microswitch L–10 is mounted on the support member 272 for the air cylinder 270 and the contacts thereof are adapted to be closed when the piston rod 274 reaches its extended position. As such closure of the contacts of the control microswitch L–10 is indicative of the fact that the cutting assembly 250 had been advanced across the web of bottom wrapper material severing the advance portion thereof from the remainder of the web and is in the advanced position. The control microswitch L–9 is disposed behind the arresting plate 144 for the stack delivery station B and the contacts thereof are adapted to be closed only when a stack of papers is disposed against said plate. As such, closure of the contacts of the control microswitch L–9 is indicative of the fact that a stack of papers is disposed within the stack delivery station B. Through the above described control circuit it will be seen that the advance valve solenoid 324 for the air cylinder 170 will be actuated to effect an advance of the delivery ram plate 188 only when a stack is present in the stack delivery station B, the web of bottom wrapper material has been severed, and the cutting assembly 250 is in its advanced position, and when there is a space available on the feeder conveyor for the stack to be delivered from the stack delivery station B.

The return valve solenoid 328 for the air cylinder 170 is connected in series with the normally open contacts of the control microswitch L–11. As discussed earlier, the control microswitch L–11 is disposed at the end of the channel members 194 and is adapted to be closed by the support member 186 when the delivery ram 188 is in its advanced position. Thus the advance of the delivery ram 188 to its advanced position results in closure of the contacts of the control microswitch L–11, actuation of the return solenoid 328 and a positive return of the piston 172 of the air cylinder 170 to effect a return of the delivery ram plate 188 to its retracted position.

The control system for the air cylinder 270 includes

a step-down transformer 330, the secondary circuit of which includes the advance valve solenoid 332 connected in series with the normally open contacts of control microswitches L–6 and L–7. As discussed earlier, the control microswitch L–6 is actuated by the timing track 98 disposed on the side member 110 of the ram plate 100. The contacts of the control microswitch L–6 are arranged to be closed only when the ram plate 100 is positioned out of the stack delivery station B which is indicative of the fact that the cutting assembly 250 has an unobstructed path of travel. The control microswitch L–7 is disposed behind the arresting plate 144 associated with the stack delivery station B and is arranged so that the presence of a stack in the stack delivery station B will effect a closure of the contacts thereof. Through the above described control circuit it will be seen that the advance valve solenoid 332 for air cylinder 270 will be actuated to effect an advance of the cutter assembly 250 only when a stack is present in the stack delivery station B and the vertical ram plate 100 is located so as to permit unobstructed travel of the cutter assembly.

The return valve solenoid 334 for the air cylinder 270 is connected in series with the normally open contacts of control microswitch L–8. As discussed earlier, the control microswitch L–8 is physically located intermediate the channel members 194 and is positioned so as to be closed by the support member 186 when the delivery ram 188 reaches its most advanced position. Thus it will be seen that the cutter assembly 250 and the delivery ram 188 will be returned to their rest positions simultaneously.

Operation of the unit

In operation of the unit disclosed herein, a stack of papers 16 exiting from a stacker unit 12 on the conveyor 14 is introduced into the stack receiving station A. The engagement of the bottom of the stack 16 with the driven rollers 54 disposed within the stack receiving station A effects a positive advance of the stack into compressive engagement with the vertically disposed arresting plate 72. The frictional engagement between the driven rollers 54 and the bottom of the stack insures that the stack is compressively urged against the arresting plate 72 in an amount sufficient to actuate the control microswitch L–1 as well as to aid in squaring the stack. If it be assumed that the stack delivery station B is empty and that the delivery ram plate 188 associated therewith and the cutting assembly 250 are in their retracted positions, closure of the contacts of the control microswitch L–1 will result in energization of the advance valve solenoid 318 for the air cylinder 118.

The actuation of the advance valve for the air cylinder 118 resulting therefrom will effect an advance of the piston rod 120 contained in said cylinder and an advance of the vertically disposed ram plate 100 displacing the stack of papers 16 across the bottom wrapper feed roll 202 and into the stack delivery station B. The engagement of the stack by the vertical ram plate 100 and the initial displacement thereof by said plate past the arresting plate 70 results in a further positive squaring of the stack.

As the stack 16 being displaced from the receiving station A to the delivery station B passes over the bottom wrapper feed roll 202, the frictional engagement of the bottom of the stack 16 with the web of bottom wrapper material 206 disposed on the upper surface of said feed roll 202 results in a pick up of said web and an advance of the same together with the moving stack 16. As mentioned above, the length of stroke of the vertical ram plate 100 is preferably adjusted so that the stack 16, when disposed in the stack delivery station B with the bottom wrapper material disposed therebeneath is compressively urged against the vertically disposed arresting plate 144. The compressive engagement of the stack intermediate the arresting plate 144 and the ram plate 100 results in a further positive squaring of the stack.

When the ram plate 100 reaches its limiting position, closure of the contacts of the control microswitch L–5 results in actuation of the return valve solenoid 320 and a positive retraction of the ram plate 100 to its rest position, thus rendering the stack receiving station A ready to receive a subsequent stack of papers 16 delivered along the conveyor 14.

The return of the vertical ram plate 100 and the presence of a stack 16 disposed against the arresting plate 144 in the stack delivery station B results in closure of the contacts of the control microswitches L–6 and L–7 and in actuation of the advance valve solenoid 332 for the air cylinder 270 associated with the cutting assembly 250. Actuation of the advance valve solenoid 332 results in a displacement of the piston rod 274 for the air cylinder 270 and an advance of the cutting assembly 250 across the web of bottom wrapper material 206. The advance of the cutting assembly 250 effectively severs the advanced portion of said web material 206 disposed beneath the stack 16 now positioned in the stack delivery station B from the remainder of said bottom wrapper material.

If it be assumed that a space is available on the feeder conveyor 32 for delivery of the stack 16 disposed in the stack delivery station B, the displacement of the cutting assembly 250 to its most advanced position results in closure of the contacts of the control microswitch L–10. Closure of the contacts of the control microswitch L–10, together with the previous closure of the contacts of the control microswitch L–9 due to the presence of a stack 16 against the arresting plate 144 in the stack delivery station B, results in the energization of the advance valve solenoid 324 for the air cylinder 170. Actuation of the air cylinder 170 results in displacement of the piston 172 therein and in rotative displacement of the rocker arms 180 which effects a horizontal advance of the delivery ram 188 which delivers the stack of papers disposed in the stack delivery station B onto the feed conveyor 32.

It should be noted that the rotative displacement of the rocker arms 180 results in a speed variation in the linear advance of the delivery ram plate 188 with the maximum speed thereof being effected when the rocker arm 180 is displaced 90 degrees from its rest position. This displacement of the delivery ram plate 188 which is in the nature of a sine function, provides a fast rate of delivery for the stack being so expelled from the stack delivery station B. This results in a minimum amount of skewing of the stack delivered onto the feeder conveyor 32 and thereby provides for minimum space wastage on said feeder conveyor. It should also be noted that the delivery of the stack by the ram plate 188 results in a further squaring of the stack on the only side thereof that has not been engaged by a component of the stack transfer and bottom wrapper unit.

The advance of the delivery ram 188 to its most advanced posiion results in closure of the contacts of the control microswitches L–11 and L–8 and in actuation of the return valve solenoids 328 and 334 of the air cylinders 170 and 270 respectively. Actuation of the return valve solenoid 328 results in a positive retraction of the piston 172 and a positive return of the delivery ram 188, thus rendering the stack delivery station B available for receipt of a new stack from the stack receiving station A. Actuation of the return valve solenoid 334 results in positive retraction of the piston 274 and accompanying retraction of the cutting assembly 250 to its rest position which thus permits delivery of a second stack of papers now disposed in the stack receiving station A to the stack delivery station B and another cycle of operation.

In accordance with the provisions of the patent statutes, I have herein described the principle of operation of this invention, together with the elements which I now consider to constitute a workable embodiment thereof, but

I desire to have it understood that the structure disclosed is only illustrative and the invention can be carried out by other means. Also, while it is designed to use the various features and elements in the combinations and relations described, some of these may be altered and modified without interfering with the more general results outlined.

Having thus described my invention, I claim:

1. A newspaper stack transfer and bottom wrapper unit comprising means positioned to receive a stack of papers moving in a predetermined direction, stack delivery means positioned to receive a stack of papers expelled from said stack receiving means in a direction substantially at right angles to its original direction of movement, bottom wrapper positioning means disposed intermediate said stack receiving means and said stack delivery means and arranged to place a length of bottom wrapper material in engagement with the underside of a stack of papers being displaced therepast, means associated with said stack receiving means for arresting the movement of a stack of papers introduced therein, means responsive to said arresting means for displacing said stack of papers from said stack receiving means to said stack delivery means across said bottom wrapper positioning means, means associated with said stack delivery means for arresting said stack of papers therein, and means responsive to said last mentioned arresting means for expelling said stack from said stack delivery means.

2. The apparatus as set forth in claim 1 including means responsive to the receipt of said stack in said stack delivery means for cutting the trailing edge of said bottom wrapper material disposed beneath said stack.

3. A newspaper stack transfer and bottom wrapper unit comprising means positioned to receive a stack of papers moving in a predetermined direction, means associated with said stack receiving means for arresting the movement of a stack introduced therein, means responsive to said arresting means for displacing said arrested stack of papers from said stack receiving means in a direction substantially transverse to that of its initial direction of motion, stack delivery means positioned to receive said stack of papers displaced from said stack receiving means, bottom wrapper insertion means disposed intermediate said stack receiving means and said stack delivery means for placing a length of bottom wrapper material in engagement with the underside of the stack of papers being displaced therepast, means associated with said stack delivery means for arresting the forward movement of a stack of papers introduced therein, and means responsive to said last mentioned arresting means for displacing said arrested stack therefrom.

4. The unit as set forth in claim 3 wherein the means for displacing the stack from said stack delivery means is provided with a driving mechanism arranged to displace said stack displacing means with a substantially harmonic type of motion.

5. A newspaper stack transfer and bottom wrapper unit comprising means positioned to receive a stack of papers moving in a predetermined direction, means associated with said stack receiving means for arresting the movement of a stack introduced therein, means responsive to said arresting means for displacing an arrested stack of papers from said stack receiving means in a direction substantially transverse to that of its initial direction of motion, stack delivery means positioned to receive said stack of papers displaced from said stack receiving means, bottom wrapper insertion means disposed intermediate said stack receiving means and said stack delivery means arranged to position the leading edge of a strip of bottom wrapper material in frictional engagement with the underside of said stack of papers being advanced therepast, means associated with said stack delivery means for arresting the movement of a stack of papers introduced therein, and means responsive to said last mentioned arresting means for displacing said stack from said stack delivery means.

6. The unit as set forth in claim 5 including means responsive to the receipt of said stack in said stack delivery means for severing the portion of said strip of bottom wrapper material disposed beneath said stack from the remainder of said strip.

7. A newspaper stack transfer and bottom wrapper unit comprising means positioned to receive a stack of papers moving in a predetermined direction, a stack delivery means positioned to receive a stack of papers from said stack receiving means, bottom wrapper positioning means disposed intermediate said stack receiving means and said stack delivery means and arranged to place a length of bottom wrapper material in engagement with the underside of a stack of papers being displaced therepast, means associated with said stack receiving means for displacing a stack of papers therefrom in a direction substantially transverse to that of its original direction of movement to said stack delivery means across said bottom wrapper positioning means, and means responsive to the receipt of said stack in said stack delivery means for displacing said stack from said stack delivery means in a direction substantially parallel to that of its orginal direction of motion.

8. The unit as set forth in claim 7 wherein said means for displacing said stack from said stack delivery means is provided with a driving mechanism arranged to displace said stack displacing means with a substantially harmonic type motion.

9. A newspaper stack transfer and bottom wrapper unit comprising means positioned to receive a stack of papers moving in a predetermined direction, means associated with said stack receiving means for arresting the movement of the stack introduced therein, a horizontally displaceable ram responsive to said arresting means for displacing a stack from said stack receiving means in a direction substantially transverse to that of its initial direction of motion, stack delivery means positioned to receive said stack of papers displaced from said stack receiving means, bottom wrapper insertion means disposed intermediate said stack receiving means and said stack delivery means arranged to position the leading edge of a strip of bottom wrapper material in frictional engagement with the underside of the stack of papers being advanced therepast and to be advanced thereby, means associated with said stack delivery means for arresting the movement of a stack of papers introduced therein, cutting means associated with said stack delivery means and responsive to the engagement of said last mentioned arresting means by said stack for severing the advanced portion of said strip of bottom wrapper material from the remainder thereof, and a second horizontally displaceable ram responsive to the arresting of said stack in said stack delivery means for displacing said stack from said stack delivery means in a direction substantially parallel to that of its original direction of motion.

10. The unit as set forth in claim 9 wherein the second ram is provided with a driving mechanism arranged to displace said ram with a substantially harmonic type motion.

11. The unit as set forth in claim 9 including control means responsive to the presence of a stack in the stack delivery means for preventing actuation of said first mentioned ram.

12. The unit as set forth in claim 9 including means responsive to the retraction of said first mentioned ram for preventing actuation of said cutting means.

13. The unit as set forth in claim 9 wherein said cutting means is reciprocable transversely of said strip of bottom wrapper material.

14. The unit as set forth in claim 9 including control means responsive to the location of said second ram for controlling actuation of said first ram.

15. The unit as set forth in claim 9 including control means responsive to the location of said cutting means for controlling actuation of said first ram.

16. A newspaper stack transfer and bottom wrapper unit comprising means to halt the movement of a stack in a predetermined direction, means for displacing a halted stack in a direction substantially transverse to that of its initial direction and in substantially the same plane therewith, means for positioning a length of bottom wrapper material in the transverse path of travel of said stack in such manner as to be engaged by the under surface of said moving stack and to be advanced in conjunction therewith, means for arresting the transverse movement of said stack subsequent to its passage over the bottom wrapper positioning means, and means for displacing said arrested stack in a direction substantially parallel to and in substantially the same plane as that of its original direction of motion.

17. A newspaper stack transfer and bottom wrapper unit comprising means to halt the movement of a stack in a predetermined direction, means for displacing a halted stack in a direction substantially transverse to that of its initial direction and in substantially the same plane therewith, means for inserting the leading edge of a length of bottom wrapper material in the transverse path of travel of said stack in such manner as to be engaged by the under surface of said moving stack and to be advanced in conjunction therewith, means for arresting the transverse movement of said stack subsequent to its passage over the bottom wrapper insertion means, and

means for displacing said arrested stack in a direction substantially parallel to and in substantially the same plane as that of its original direction of motion.

18. A newspaper stack transfer and bottom wrapper unit comprising means to halt the movement of a stack in a predetermined direction, means for displacing a halted stack in a direction substantially transverse to that of its initial direction, means for inserting the leading edge of a web of bottom wrapper material in the transverse path of travel of said stack in such manner as to be engaged by the under surface of said stack and to be advanced in conjunction therewith, means for arresting the transverse movement of said stack, means responsive to said last mentioned means for severing the advanced portion of said web of bottom wrapper material from the remainder thereof, and means for displacing said arrested stack in a direction substantially parallel to that of its original direction of motion.

19. The unit as set forth in claim 18 wherein said bottom wrapper insertion means includes a roller over which said material is disposed to be frictionally engaged by the stack as said stack advances therepast.

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