Nov. 27, 1956 E. H. OWEN ET AL 2,771,726

SHEET HANDLING AND ENVELOPE STUFFING MACHINE

Filed Sept. 10, 1953 9 Sheets-Sheet 1

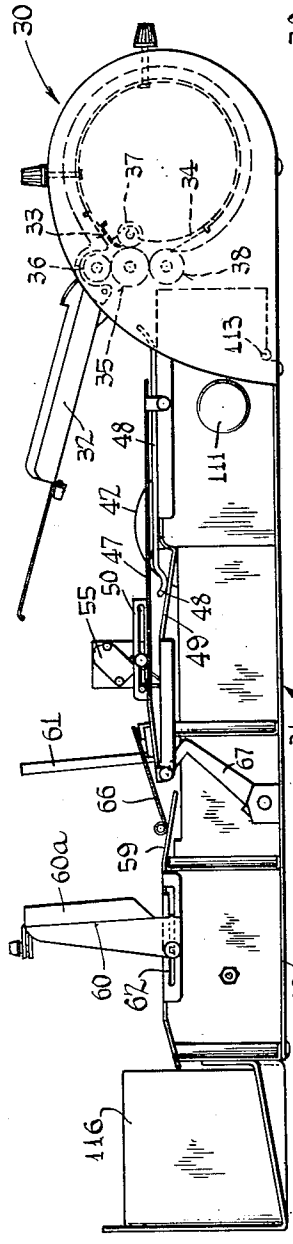


Fig. 1

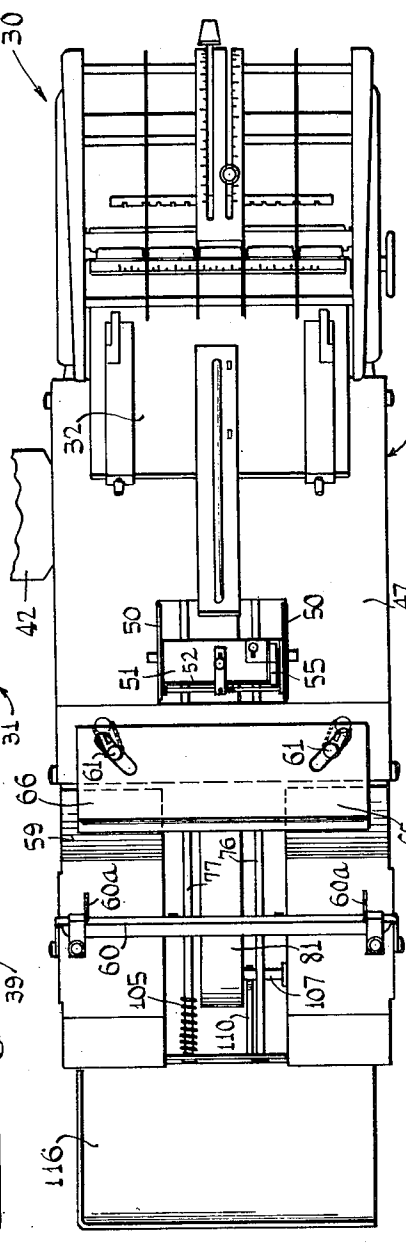


Fig. 2

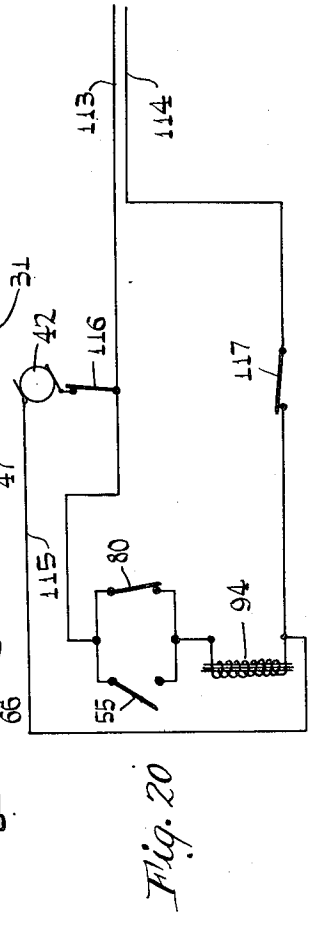


Fig. 20

INVENTORS
Edwin H. Owen
Walter J Hanson
BY
Edwin H. Owen
ATTORNEY

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SHEET HANDLING AND ENVELOPE STUFFING MACHINE

Filed Sept. 10, 1953 9 Sheets-Sheet 2

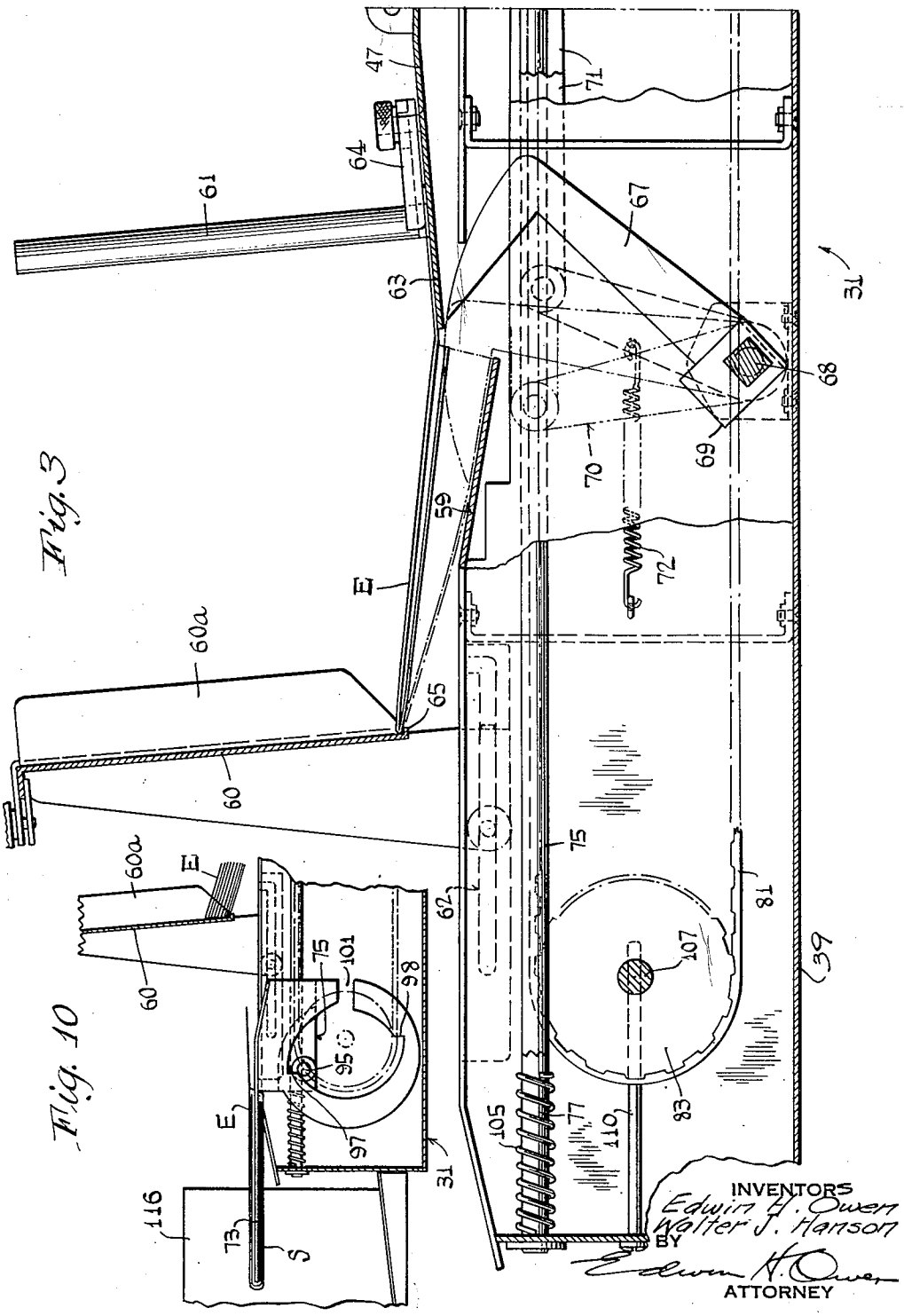


Fig. 3

Fig. 10

INVENTORS
Edwin H. Owen
Walter J. Hanson
BY
Edwin H. Owen
ATTORNEY

Nov. 27, 1956 E. H. OWEN ET AL 2,771,726

SHEET HANDLING AND ENVELOPE STUFFING MACHINE

Filed Sept. 10, 1953 9 Sheets-Sheet 3

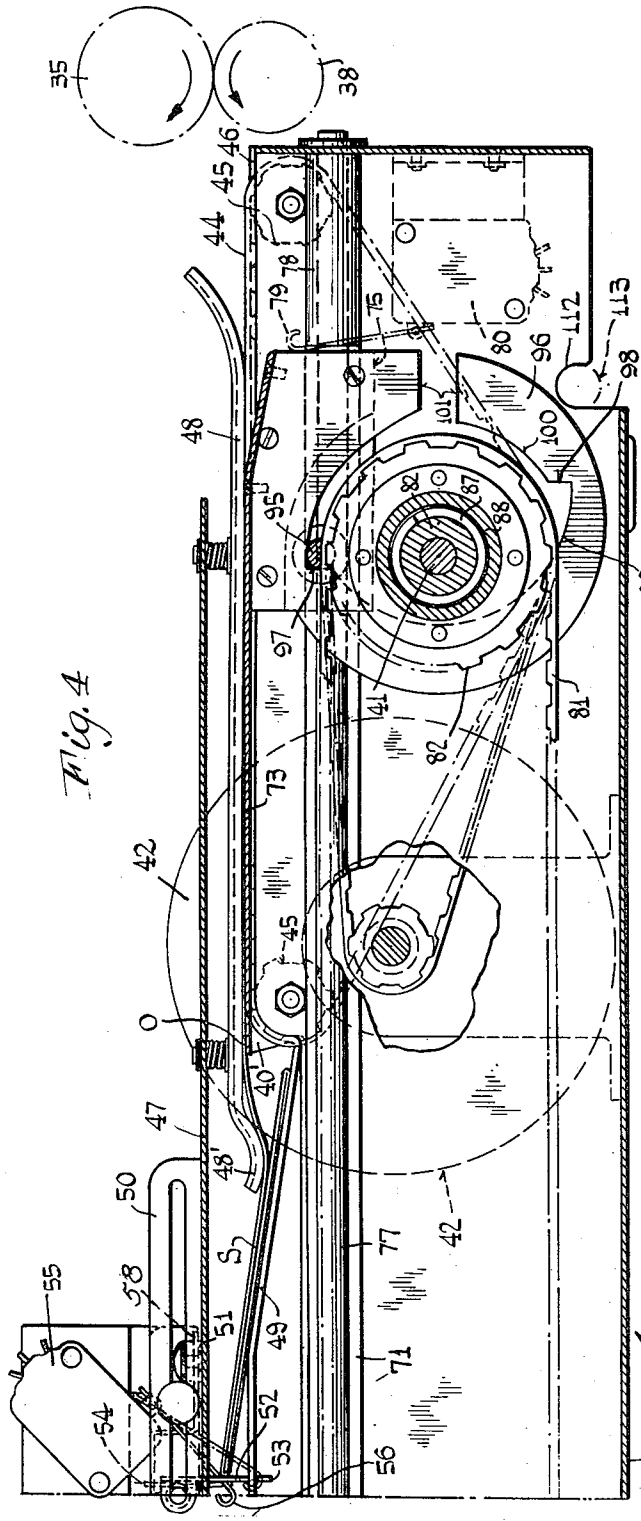


Fig. 4

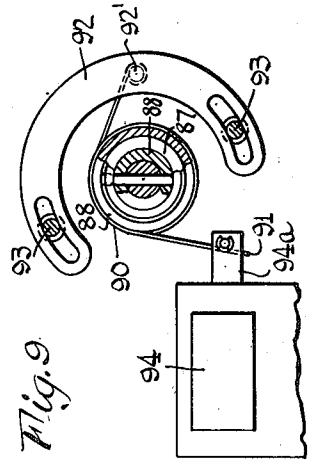


Fig. 9

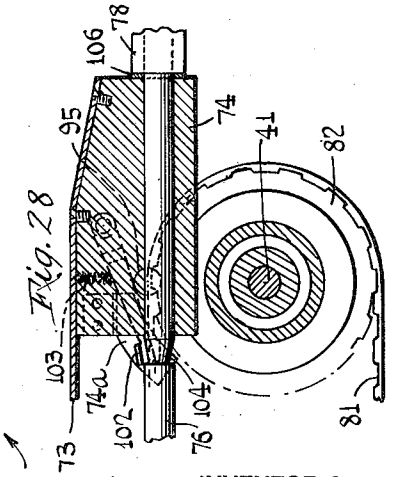


Fig. 28

INVENTORS
Edwin H. Owen
Walter J. Hanson
BY
Edwin H. Owen
ATTORNEY

Nov. 27, 1956 E. H. OWEN ET AL 2,771,726

SHEET HANDLING AND ENVELOPE STUFFING MACHINE

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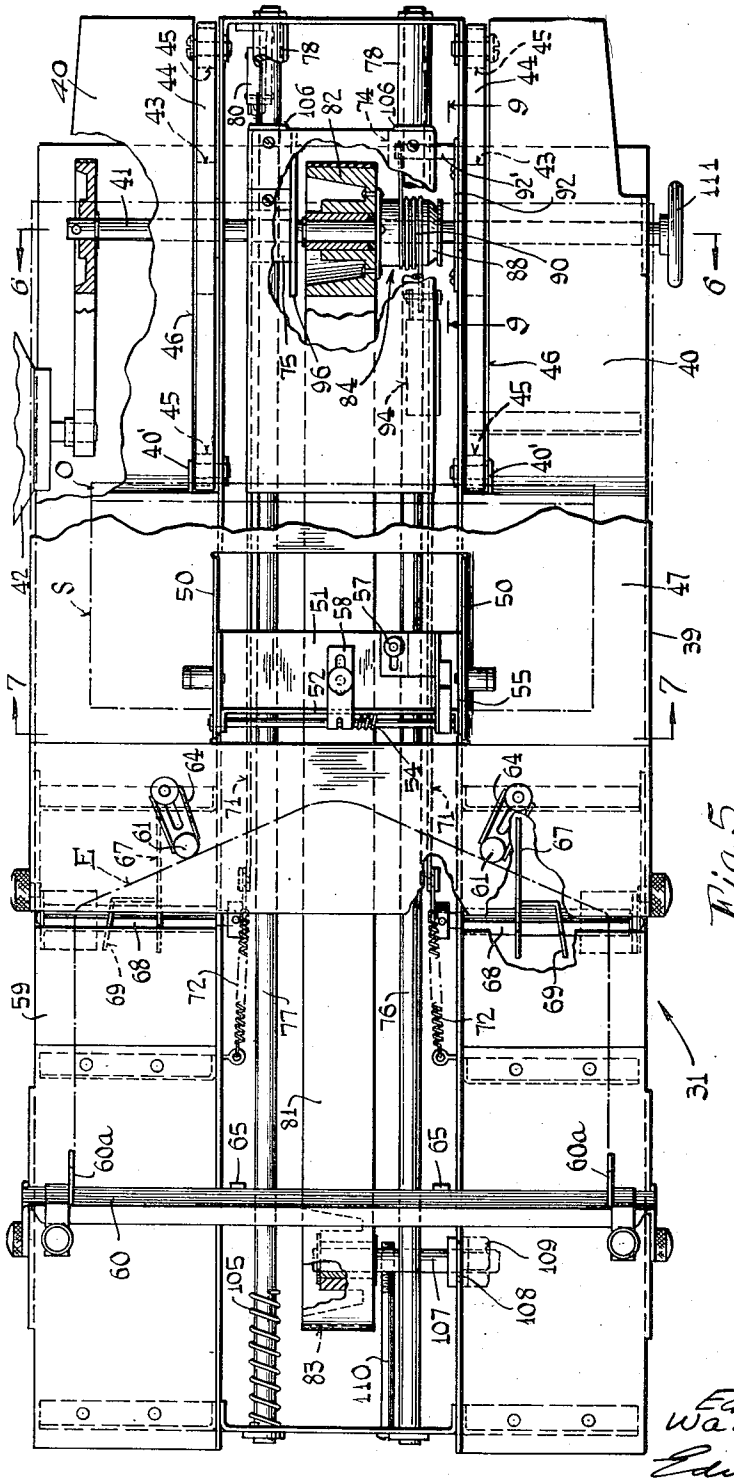


Fig. 5

INVENTORS
Edwin H. Owen
Walter J. Hanson
BY
Edwin H. Owen
ATTORNEY

Nov. 27, 1956 E. H. OWEN ET AL 2,771,726

SHEET HANDLING AND ENVELOPE STUFFING MACHINE

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Fig. 6

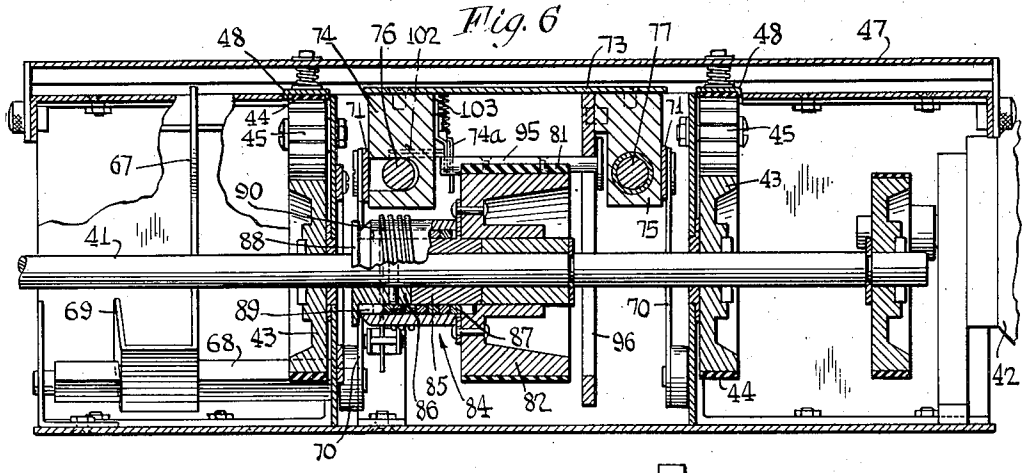


Fig. 7

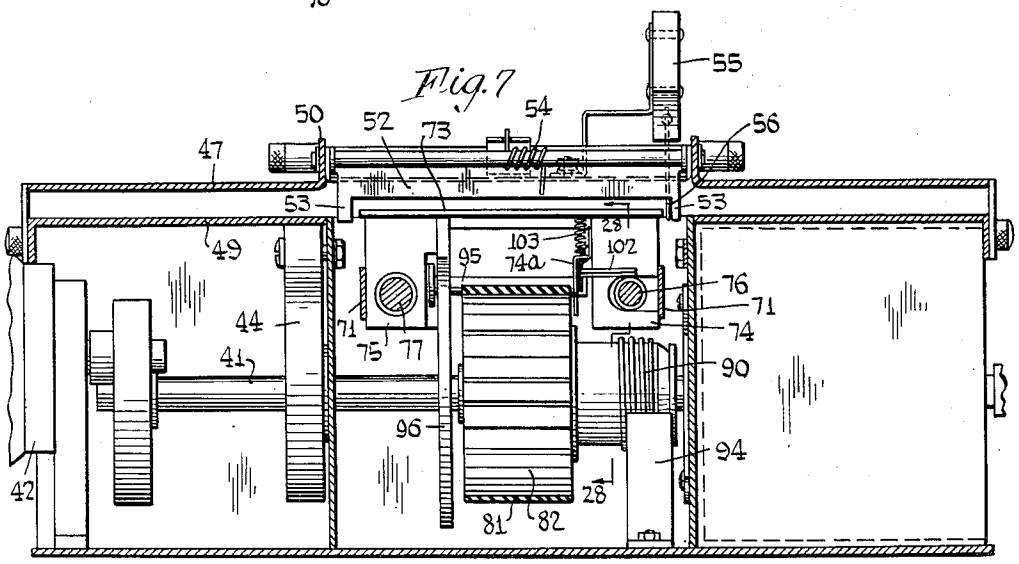
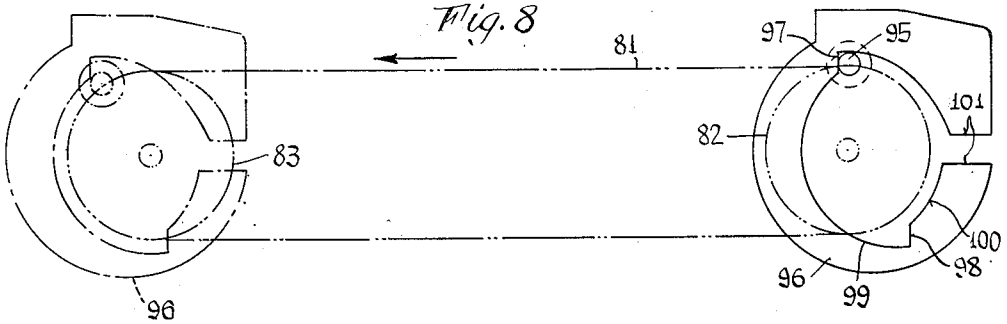


Fig. 8



INVENTORS
Edwin H. Owen
Walter J. Hanson
BY
Edwin H. Owen
ATTORNEY

Nov. 27, 1956 E. H. OWEN ET AL 2,771,726

SHEET HANDLING AND ENVELOPE STUFFING MACHINE

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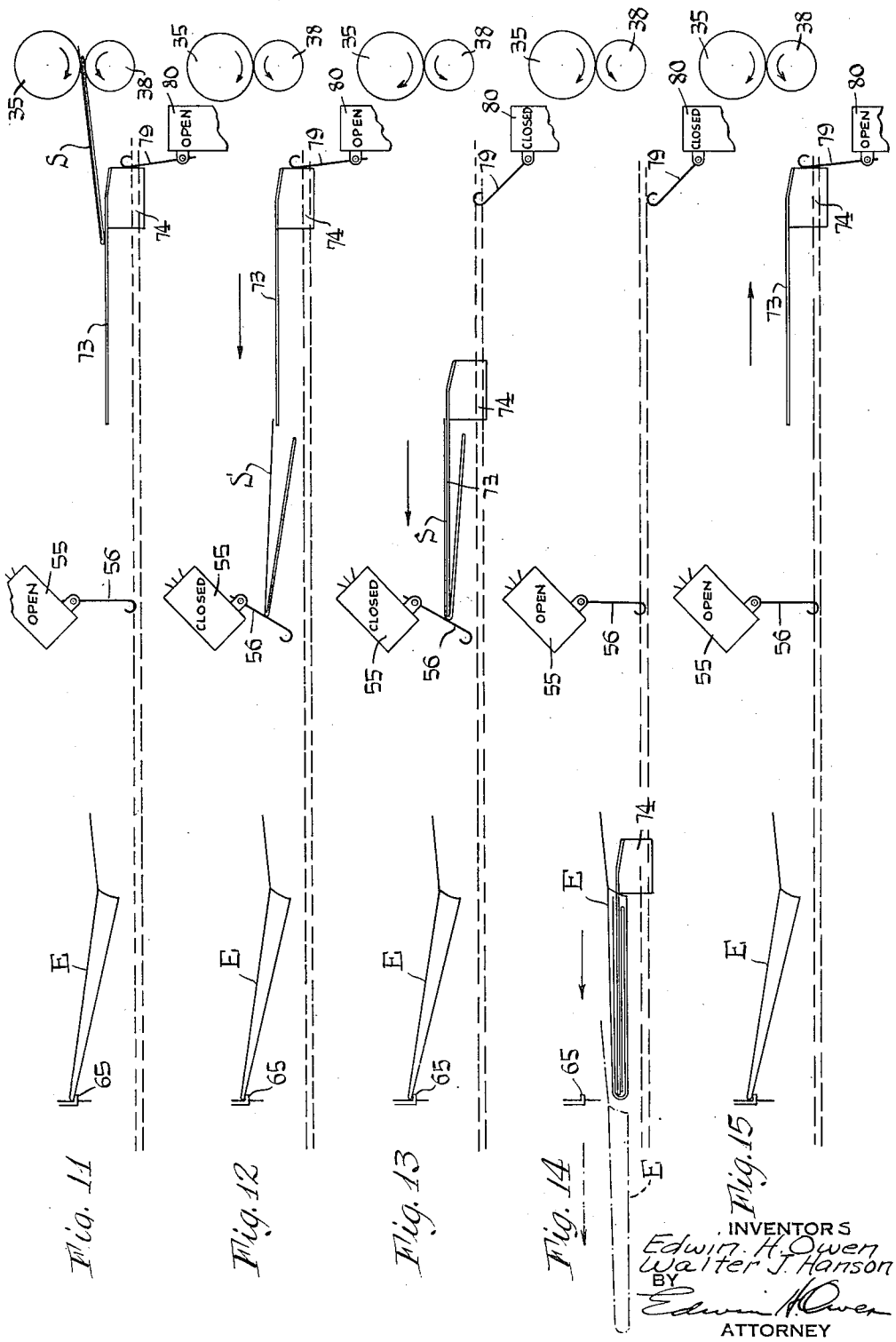


Fig. 11 Fig. 12 Fig. 13 Fig. 14 Fig. 15

INVENTORS
Edwin H. Owen
Walter J. Hanson
BY
Edwin H. Owen
ATTORNEY

Nov. 27, 1956 E. H. OWEN ET AL 2,771,726

SHEET HANDLING AND ENVELOPE STUFFING MACHINE

Filed Sept. 10, 1953 9 Sheets-Sheet 7

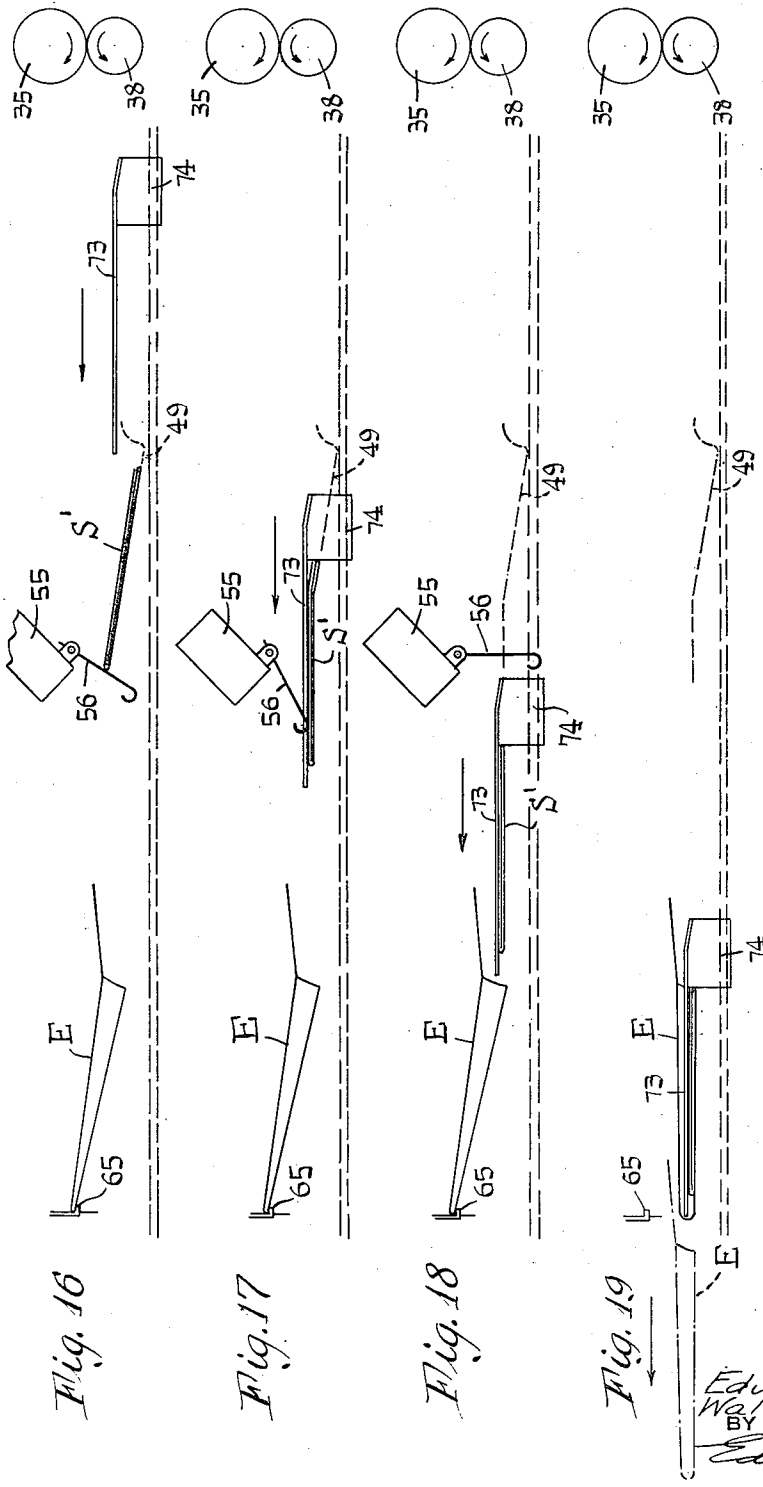


Fig. 16 Fig. 17 Fig. 18 Fig. 19

INVENTORS
Edwin H. Owen
Walter J. Hanson
BY
Edwin H. Owen
ATTORNEY

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SHEET HANDLING AND ENVELOPE STUFFING MACHINE

Filed Sept. 10, 1953 9 Sheets-Sheet 8

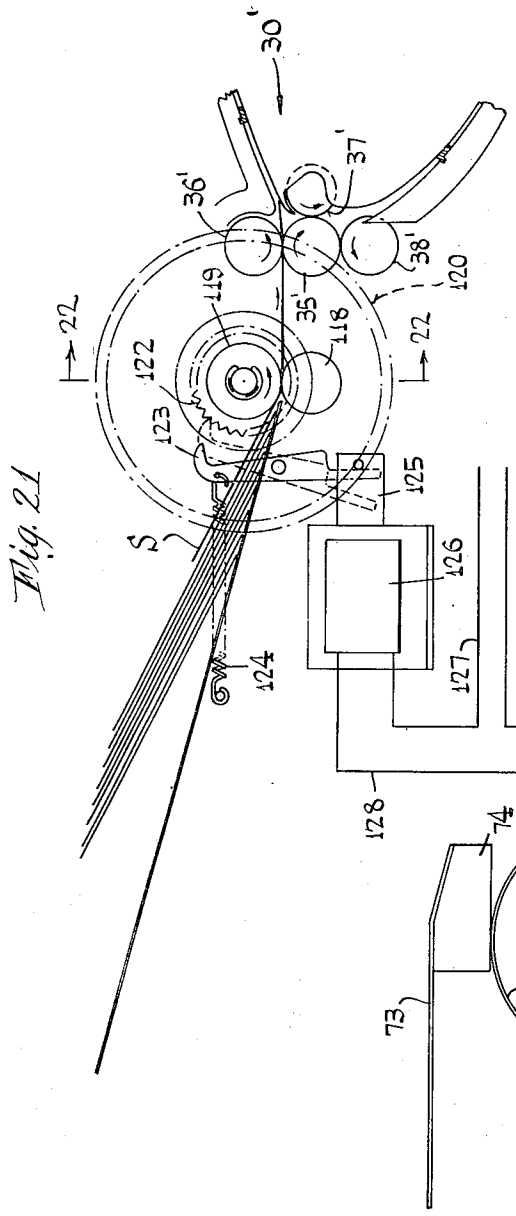


Fig. 21

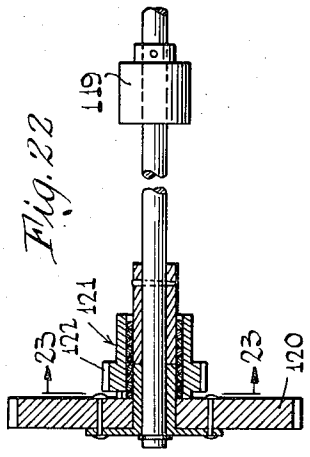


Fig. 22

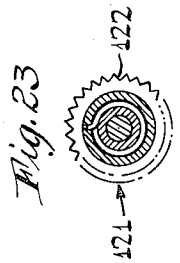


Fig. 23

INVENTORS
Edwin H. Owen
Walter J. Hanson
BY
Edwin H. Owen
ATTORNEY

Nov. 27, 1956 E. H. OWEN ET AL 2,771,726

SHEET HANDLING AND ENVELOPE STUFFING MACHINE

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Fig. 24

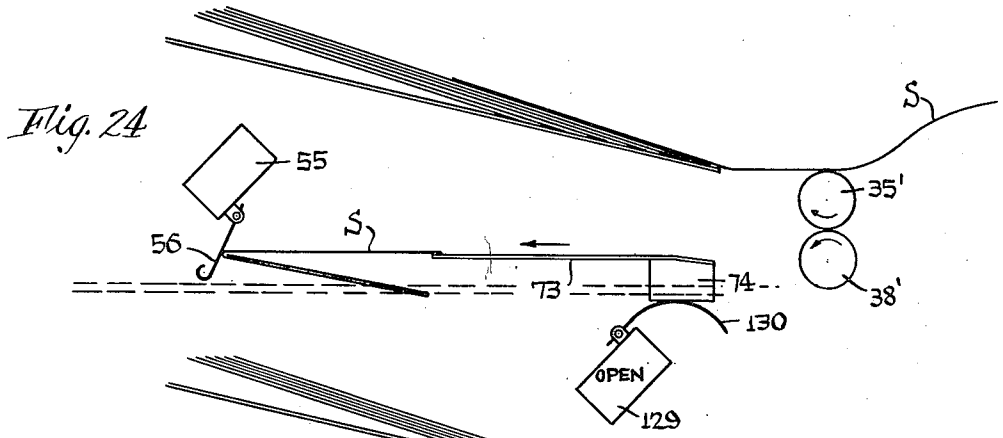


Fig. 25

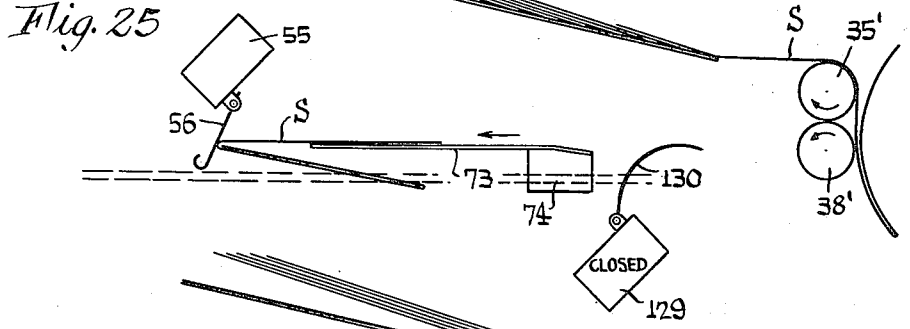


Fig. 26

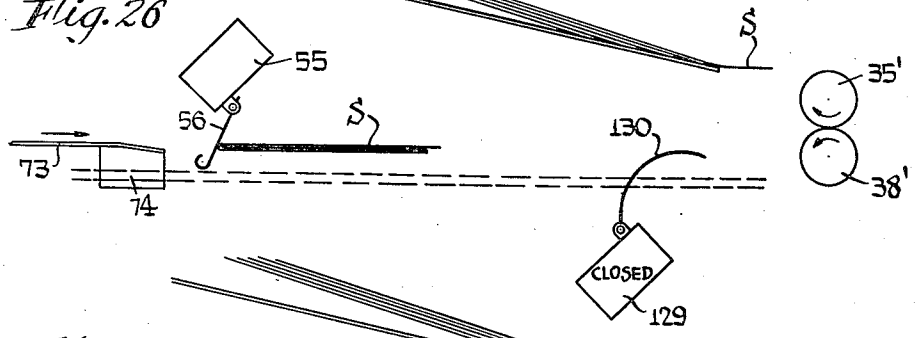
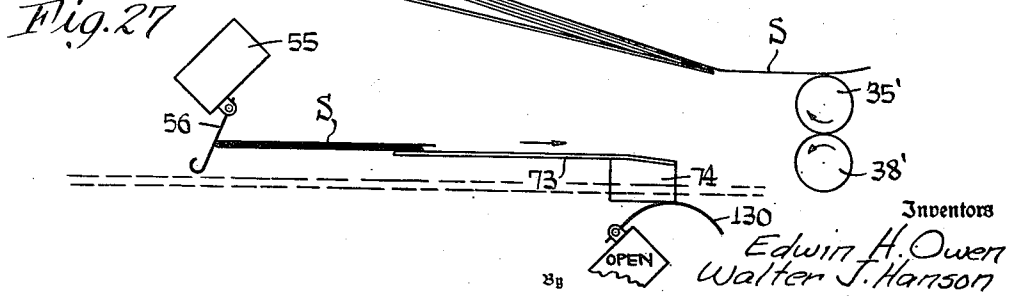


Fig. 27



Inventors
Edwin H. Owen
Walter J. Hanson

By
Edwin H. Owen
Attorney

United States Patent Office 2,771,726 Patented Nov. 27, 1956

2,771,726

SHEET HANDLING AND ENVELOPE STUFFING MACHINE

Edwin H. Owen, Old Greenwich, Conn., and Walter J. Hanson, Port Chester, N. Y., assignors to Pitney-Bowes, Inc., Stamford, Conn., a corporation of Delaware

Application September 10, 1953, Serial No. 379,342

12 Claims. (Cl. 53—235)

This invention relates to the stuffing of envelopes with workpieces such as folded sheets, and especially to the taking of such workpieces one-by-one and inserting each one in turn in an envelope.

One object of the invention is to remove workpieces one-by-one from a stack of workpieces, fold or otherwise handle each removed workpiece, convey the workpiece to a stack of opened envelopes and stuff it into the ultimate envelope of the stack, simultaneously stripping the envelope from its stack.

Another object of the invention is to provide a simple means for taking the workpieces discharged from the final feed rollers of a sheet handling machine and for stuffing each one into an open envelope as it is so discharged.

Still another object of the invention is to provide a simple means for taking the workpieces discharged from the final feed rollers of a manually fed sheet folding machine and for stuffing each one into an open envelope as it is so discharged.

A further object of the invention is to provide a simple means for taking the workpieces discharged from the final feed rollers of an automatically fed, high speed, sheet folding machine and for stuffing each one into an open envelope as it is so discharged without danger of jamming or of duplicate inserts.

A feature of the present invention is the use of a reciprocating inserting ram which takes the workpieces from a receiving position and stuffs each into an envelope, and a continuously operating conveyor which brings each workpiece in turn into the receiving position as it is discharged from a sheet handling machine.

Another feature of the invention is the provision of a reciprocating inserting ram together with means for controlling the operation of the reciprocating ram so that no stuffing action of the ram will be initiated unless or until a workpiece is in receiving position, thus avoiding the possibility of empty envelopes appearing in the supposedly filled stack.

Another feature of the invention is the provision of a reciprocating inserting ram together with means for controlling the operation of the reciprocating ram so that when a ram stroke is once initiated, the ram will complete its stroke and return to home position ready for another operation, regardless of the position of the workpiece being carried thereby, or the position of any subsequently fed workpiece.

Still another feature of the invention is the provision of automatic means for controlling the feeding operation of an automatically fed folding machine in dependence upon the position of a reciprocating ram taking the workpieces as they are fed by the folding machine, and so arranged as to permit the feeding of a workpiece only when the ram is in a predetermined position in its stroke, and for a period sufficient to feed only one workpiece to the ram.

A further feature of the invention is the provision of a mechanism for controlling operation of a reciprocating inserting ram which permits continued operation of the ram driving means only when a workpiece is in receiving position, or when the ram is substantially removed from home position, or both.

With the above and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that various changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

A preferred embodiment of the invention is illustrated in the accompanying drawings, wherein:

Fig. 1 is a side elevation of a machine embodying the present invention.

Fig. 2 is a top plan of the device of Fig. 1.

Fig. 3 is a view similar to Fig. 1, but showing only a portion of the left hand end of the machine drawn to a larger scale, with portions of the frame broken away to show the operating parts, and illustrating an envelope in place, an alternative position of the parts being shown in broken lines.

Fig. 4 is a view similar to Fig. 1, but showing only a portion of the right hand end of the machine drawn to the same scale as Fig. 3, with portions of the frame broken away to show the operating parts, and illustrating a folded sheet in receiving position.

Fig. 5 is a view similar to Fig. 2 but with the end portions omitted and drawn to a larger scale, parts being broken away to illustrate the interior structure, and the folded sheet and envelope positions being indicated by broken lines.

Fig. 6 is an enlarged section taken substantially on line 6—6 of Fig. 5, but with the sheet stopping mechanism and envelope hopper omitted for convenience.

Fig. 7 is an enlarged section taken substantially on line 7—7 of Fig. 5.

Fig. 8 is a diagram illustrating the operation of the reciprocating mechanism for the ram, an alternative position of the ram parts being shown in broken lines.

Fig. 9 is an enlarged detail section taken substantially on line 9—9 of Fig. 5.

Fig. 10 is a fragmentary section showing the ram in fully extended position just prior to discharge of the stuffed envelope.

Figs. 11 to 15 illustrate diagrammatically the positions of certain parts of the device of Figs. 1 to 10, and particularly of the control switches, under various conditions of operating; Fig. 11 showing the parts as the folded sheet issues from the feed of the folder, Fig. 12 showing the sheet in receiving position as the ram begins to move, Fig. 13 showing the ram picking up the folded sheet to carry it forward, Fig. 14 showing the ram completing the insertion of the folded sheet in the envelope and releasing the envelope, and Fig. 15 showing the ram as it reaches home position on the return stroke.

Figs. 16 to 19 illustrate diagrammatically the positions of certain parts of the device of Figs. 1 to 10 during an insertion cycle, but when the workpiece is a folded sheet which is prepared without an overhang so that the ram does not enter between the folds of the sheet, and the views shown correspond approximately to the range of movement illustrated in Figs. 12 to 14 described above.

Fig. 20 is a wiring diagram showing the electrical circuit connection of the switches whose operation is illustrated in Figs. 11 to 15.

Fig. 21 is a diagram showing portions of an automatically fed folding machine and illustrating the means for controlling the feed of the same in response to the position of the envelope stuffing ram.

Fig. 22 is a condensed detail section taken substantially on line 22—22 of Fig. 21.

Fig. 23 is a section on line 23—23 of Fig. 22.

Figs. 24 to 27 illustrate diagrammatically the positions of certain parts of the device of Fig. 21 and particularly of the feed control switch under various conditions of operation; Fig. 24 showing the parts as the ram leaves home position to pick up a waiting workpiece, the next workpiece being started through the folder due to contact of the ram with the starting switch; Fig. 25 showing the ram as it leaves the starting switch to prevent starting of any further workpieces and is picking up the workpiece in ready position, the next workpiece continuing its processing by the folder; Fig. 26 showing the ram as it returns from stuffing the first folded workpiece in an envelope and the starting switch closed to prevent starting of another workpiece, with the next workpiece folded and waiting in receiving position; and Fig. 27 showing the ram approaching home position beneath the waiting workpiece and striking the starting switch to initiate another folding operation.

Fig. 28 is a detail section taken substantially on line 28—28 of Fig. 7.

Referring to the drawings, the invention as shown in its presently preferred embodiment, includes a device which comprises a sheet handling machine such as a folder 30, and an envelope stuffer 31. The folder 30 is shown as being a four-roll buckle folder including a sheet supply hopper 32, buckle chutes 33 and 34. In use unfolded sheets are stacked in the hopper 32 and are manually fed one at a time into the nip of rollers 35, 36. The folding rollers 35, 36, 37 and 38 are continuously rotating and cooperate with buckle chutes 33 and 34 to fold the sheet in a known manner. As the folding is completed, the sheet emerges from between the rollers 35 and 38, and is taken over by the envelope stuffer 31.

The envelope stuffer comprises a frame 39 including an approach deck 40 (Figs. 4 and 5) having overhang-supporting ears 40'. Rotatable on the frame and mounted below the deck 40 is a main drive shaft 41 which is continuously rotated by any suitable power source, e. g. electric motor 42. Drive pulleys 43 are drivingly connected with shaft 41, and drive the feed belts 44. The belts 44 are guided by pulleys 45, and move through slots 46 in the deck 40, with their surfaces just above the surface of the deck.

Mounted above the deck 40 is a cover plate 47 which carries a pair of loosely mounted spring actuated pressure strips 48 which are normally urged downwardly towards the outer surfaces of the upper reaches of belts 44, as best seen in Fig. 4. Mounted on the frame 39 near the discharge end of the approach deck 40 is two-part sloping receiving deck 49 which also underlies a portion of the cover plate 47 and is so disposed that a folded sheet which has just left contact with the belts 44 will be caught by said receiving deck the near end of which is depressed below the level of the approach deck.

The cover plate 47 carries a pair of slotted upstanding ears 50 between which is adjustably mounted a carrier 51 which carries a depending yieldable stop flap 52 having fingers 53 extending down into the space between the parts of the receiving deck 49, the flap being urged to a depending position against a suitable stop surface by a spring 54. Also supported on the carrier 51 is an electric sheet detector switch 55 which has an operating finger 56 depending adjacent the stop flap 52. Preferably the switch is also mounted for adjustment of its position on the carrier 51, for example, by means of a clamp screw 57, best seen in Fig. 5. If desired, the spring 54 may also be provided with an adjustable spring perch 58 by means of which the pressure required to overcome the stop 52 may be set at any desired value.

As seen in Fig. 4, a folded sheet S which has issued from between the last roller pair 35, 38 of the folder 30 is deposited on the upper surface of the approach deck 40 and is carried forward by the conveyor belts 44, being held in driving friction contact therewith by pressure strips 48. As the sheet leaves the belts 44 its leading edge will strike against the yieldable stop 52 but with insufficient force to move the same. At the same time the sheet will operate finger 56 to close switch 55 for a purpose which will hereinafter appear. Preferably the folder 30 will have been so adjusted as to provide a folded sheet having a slight trailing overhang O, and the position of the carrier 51 is so adjusted that when the leading edge of the folded sheet strikes the stop 52 and the body portion of the sheet drops to the receiving deck 49 (preferably being urged to this position by downwardly bent ends such as ends 48' provided on presser strips 48) the overhang O will fail to drop to the receiving deck but will still be retained in elevated position either by the ears 40' located adjacent the margin of the approach deck 40, or by parts associated therewith to be described hereinafter. Thus the sheet S is accurately positioned and has its trailing open edge spread to receive the conveying mechanism to be hereinafter described, and is then said to be in receiving position.

Proceeding along the machine to the left of the receiving deck, there is found an envelope hopper station including an envelope deck 59 (Figs. 3 and 5). The end portion of the envelope deck which extends towards the receiving deck is also downwardly sloping. Above the envelope deck are mounted an adjustable guide plate 60 and adjustable guide rods 61 which form between them a hopper for holding and guiding a supply stack of envelopes E with their flaps opened. The envelopes are positioned in this hopper with their bottom edges towards the plate 60 and their back surfaces down so that the flap is uppermost. The plate 60 is capable of major adjustments by reason of slots 62 on frame 39 and is designed to position an envelope of any given size so that its flap will overlie a shelf 63 which may conveniently be formed by the trailing edge of the cover plate 47. The rods 61 are then swingable into guiding contact with the edges of the envelope flaps by virtue of adjustable mountings 64; side guides 60a are slidably mounted on and clampable to the plate 60 to accommodate envelopes of various widths. At the lower end of the plate 60 is a narrow lip portion, shown as formed by spaced ears 65, which restrains the bottom margin of the lowermost envelope and holds it in elevated position slightly above the elevation of its flap. In order to urge the envelopes E of the stack into position against the lip 65 and shelf 63, a follower weight 66, slidable on the rods 61, may be provided as shown in Figs. 1 and 2.

A pair of claws 67 are provided and arranged to enter the mouth of the lowermost envelope E to spread the same and hold the back wall of the envelope releasably against the upper surface of the envelope deck 59. Each of the claws 67 is slidably mounted on a squared rock shaft 68, and its position is determined by a releasable spring clamp 69 which may be manually released to adjust the claw along its rock shaft for envelopes of any desired width. Operating means is provided for the rock shafts in the form of an operating lever 70 connected to each, and a link 71 connected to the end of each lever. Springs 72 are provided for urging the levers, rock shafts and claws towards envelope spreading position, i. e., towards broken line position in Fig. 3.

The means for taking the folded sheet S from the receiving position and inserting it in the envelope E comprises a reciprocating conveyor which includes a ram plate 73 mounted on a pair of guide blocks 74 and 75 slidable on rods 76 and 77 respectively, said rods extending the length of the envelope stuffer 31 and being affixed to the ends of the frame 39 thereof. As shown in Figs. 4 and 5, the ram 73 is in home position and its blocks 74 and 75 are arrested by a pair of resilient buffer sleeves 78 on the ends of rods 76 and 77. Some portion of the ram, block 75 in the form shown, also comes into contact with an arm 79 of an electric ram position switch 80 and holds the arm actuated to keep the switch open for

a purpose which will presently appear. With the ram in this home position, the extreme margin of the ram plate **73**, acting as a filler portion between the two spaced portions of the approach deck **40**, assists the ears **40'** in catching and preventing dropping of the overhang O when the sheet S is in receiving position as shown in Fig. 4.

The means for reciprocating the ram **73** includes a ram drive belt **81** driven by a head or drive pulley **82** and supported by a tail pulley **83**. The head pulley **82** is supported on the main drive shaft **41** and is drivingly connectable to the same by a clutch mechanism **84**. The clutch **84** includes a driven drum **85** rigidly mounted on the pulley **82** and a driving drum **86** adjacent the driven drum and rigidly mounted on shaft **41**, together with a helical spring **87** which is of a size to frictionally grip the drums **85**, **86** and wound in such direction that normal rotation of the shaft **41** (anticlockwise in Fig. 4) will also rotate the pulley **82**. The clutch **84** also includes control means in the form of a brake sleeve **88** connected to the leading end **89** of the clutch spring **87** and designed to cooperate with spring brake band **90**. As seen in Fig. 9, the brake band **90** normally grips the sleeve **88** and holds it against anticlockwise rotation but when the free end **91** thereof is swung to the left, the brake band is expanded slightly and drum **88** is permitted to rotate. The anchored end of brake band **90** is fastened to a pin **92'** on a sector **92** which can be adjusted to the exact position for correct operation of the brake band and clamped by screws **93**. Operating movement of the end **91** is effected by means of the plunger **94***a* of a solenoid **94**.

Mounted on the ram drive belt **81** is a laterally extending drive pin **95** which is received in the central opening of a follower plate **96** secured to the block **75** supporting ram plate **73**. The central opening is shaped to provide two drive edges **97** and **98** positioned perpendicular to the path of the pin so as to cause driving of the ram by the pin **95** whenever the pin is travelling on either of the horizontal reaches of the belt, and two arcuate idle faces **99** and **100** which permit the ram to remain stationary while the pin traverses each of the pulleys **82** and **83**. This operation is clearly illustrated by the diagram constituting Fig. 8 which shows the follower plate **96** at each of its end positions. In the right hand or home position the pin **95** is just beginning to drive the ram, and in the left hand broken line position the pin **95** is shown as if it had just stopped driving and were starting its idle travel of 180 degrees about the tail pulley **83**.

The follower plate **96** preferably has a slot **101** which is convenient for assembly and disassembly of the ram from its connection with the pin **95**, inasmuch as the pin is preferably provided with a head which would normally prevent disengagement by relative movement axially of the pin. In order to retain the ram exactly in home position as seen in Fig. 4 while the pin **95** is crossing the mouth of slot **101** during its traverse of the head pulley **82**, the ram carrying block **74** carries a pivoted latch member **102** having a portion which is bent to overlie the rod **76** and is normally urged towards contact with the rod by a spring **103**. A suitable groove or notch **104** is formed in the rod **76** in a position such that the nose of the latch **102** drops freely into the same just as the ram reaches its ultimate right hand or home position. Release of the latch is caused by an extension of the pin **95** moving underneath the latch **102** which will effect camming of the latch to release position just prior to the pin's striking the driving edge **97** of the follower plate **96** to start forward ram movement.

A guard element **74***a* attached to the forward end of block **74** is arranged to prevent conflict between the latch member **102**, in any of its positions, with a workpiece being carried by the ram.

The rod **77** is provided near the discharge end of the frame **39** with a cushioning or buffer spring **105** which impinges on a suitable surface of the block **75** as the ram reaches the limit of its stroke, and which is compressed slightly by the ram assembly before it comes to a stop. This helps to reverse ram motion and take some of the inertia load from the ram driving parts as the ram is brought to rest and then reversed.

The operation of the claws **67** is automatically timed by ram movement, for the links **71** have ends **106** bent at right angles and which are pierced and slidable on the rods **76** and **77**. The ends **106** are so positioned that they abut the outer end surfaces of the blocks **74** and **75** and draw the claws **67** into the full line position of Fig. 3 whenever the ram is in home position. Whenever the ram is substantially spaced from the home position, the springs **72** draw the claws **67** into position to spread and grip an envelope as seen in broken lines in Fig. 3.

As best seen in Fig. 7, the fingers **53** of stop flap **52** and operating finger **56** of switch **55**, although they normally depend between the spaced parts of the receiving deck **49**, are arranged to clear the ram plate **73** and to be operated solely by the piece being carried by the ram so as to avoid conflict on the return stroke of the ram.

In order that the belt **81** may be maintained at the proper tension the tail pulley **83** is preferably mounted on a movable shaft **107** which may be moved to any desired position in a slot **108** in the frame and fixed by a clamp nut **109**. An adjusting screw **110** threaded into shaft **107** perpendicular thereto will also be rotated to provide a corresponding adjustment and to support the shaft adjacent the pulley so as to directly oppose the belt tension.

The main drive shaft is shown as having a hand wheel **111** affixed thereto (Fig. 5) and this is the preferred arrangement in order to simplify the making of adjustments to the machine or for clearing the machine in the event of a misoperation.

As seen in Figs. 1 and 4, the accurate positioning of the approach deck **40** and feed belts **44** with respect to the discharge rollers **35**, **38** of the folder **30** is accomplished by providing a pair of hook elements or locating notches **112** designed to receive and firmly position an element of the folder **30**, for example tie bar **113**.

A receiver **116** is preferably provided at the discharge end of the frame to collect the stuffed envelopes as they issue.

Fig. 20 is a wiring diagram which shows the interconnection between the electrical portions of the device, and, as shown therein, line conductors **113** and **114** have connected thereacross a conductor **115** which includes in series the electric drive motor **42**, and a manual motor control switch **116**. A manual master switch **117** may be included in one of the line conductors, e. g. conductor **114** if desired.

Connected across the line conductors in parallel with the motor circuit is a control circuit which includes the solenoid **94**. The sheet detector switch **55** and the ram position switch **80** are connected in parallel relationship and are collectively in series with the solenoid, so that when either one or both are closed, the solenoid **94** is energized, but when both are open the solenoid is deenergized.

Figs. 11 to 15 illustrate diagrammatically the operation of the device which will now be described, it being assumed that the ram plate **73** is at rest in its home position as shown in Fig. 11. A sheet S is manually fed into the folder **30** and, when folding is completed, issues from between continuously rotating rollers **35** and **38** to be deposited on the approach deck **40** in contact with continuously moving feed belts **44** which carry the sheet forward to receiving position as seen in Fig. 12 where it strikes the stop flap **52** and simultaneously moves the operating finger **56** of switch **55** to close the same. This closes the circuit to the solenoid **94** energizing the same and releasing brake band **90** so as to engage the clutch mechanism **84** and start motion of the belt **81**. As the pin **95** approaches the Fig. 4 position, it releases latch **102** and starts to move the ram **73**, **74**, **75** through fol-

lower plate 96. As the ram comes away from its home position (Fig. 13) it releases the finger 79 of switch 80 allowing the same to close and providing a holding circuit which permits continued ram movement at least until the ram is again returned to home position. The blocks 74, 75 also simultaneously release the turned over ends 106 of links 71 whereupon the springs 72 draw the claws 67 into the mouth of the waiting envelope E to spread the same in readiness for the ram when it arrives. The ram them bottoms against a fold of the sheet S, overcomes the tension of the stop flap 52 and carries the sheet on towards the waiting envelop E which is the lowermost envelope in the envelope hopper. The forward portion of the sheet-covered ram strikes the inner sloping back surface of the spread envelope and strips it downwardly from the ears 65 in the manner disclosed at length and claimed in an application Serial Number 376,297 filed August 25, 1953. Thereafter the ram carries both the envelope E and its enclosed sheet S away from the claws 67 and beyond the envelope hopper to a position shown in broken lines in Fig. 14, where the ram comes to rest momentarily and the filled envelope is thrown free of the ram by its momentum, whereby the filled envelope will drop into the receiver 116. Alternatively to the filled envelopes being thrown from the ram it may be suitably stripped therefrom in any desired manner at the commencement of the return stroke. As soon as the pin 95 has traversed 180° of the tail pulley 83 it strikes the driving edge 98 of follower plate 96, the return travel of the ram commences, and continues until the ram reaches its home position ready for another cycle as seen in Fig. 15. As it reaches the home position the block 75 on the ram will operate finger 79 of switch 80 to open the same. This will open the circuit to the solenoid 94 controlling clutch 84 unless or until another sheet S has been fed to receiving position as in Fig. 2. If a sheet has already reached receiving position, before the ram is completely returned, the ram drive will automatically continue on to another cycle. If not, the clutch 84 will stop the ram drive and the ram will be at rest until another sheet is ready to be stuffed. In this way there is prevented the possibility of any empty envelopes being discharged from the machine due to a ram operation without a folded sheet in readiness. As the ram comes to rest its latch 102 will drop into the notch 103 in rod 77 and will remain there until the pin 95 has crossed the mouth of slot 101 and is again approaching the driving surface 97 of follower plate 96. Simultaneously ends 106 of links 71 will be drawn back against the force of springs 72, whereby the claws 67 are retracted to inoperative position to prepare the same for spreading the next envelope E, now waiting in ready position.

It will be noted that, with the structure described, sheet feeding is controlled to some extend by the operator who feeds the sheets manually into the folder 30. The speed of the ram 73, 75, 76, however, will normally be such that it will be unlikely for an operator to cause the sheets to feed more rapidly than the ram can take them away. In any event, however, the feeding operation is at all times under the operator's immediate observation and control so that the speed of sheet feeding can be readily accommodated to the needs of the envelope stuffing operation.

Figs. 16 to 19 cover a range of movement similar to that shown in Figs. 12 to 14 but illustrate the principle that the device may be employed to stuff folded sheets S' which are folded without an overhang, and which accordingly do not embrace the end of the ram plate 73. As seen in Fig. 16, a sheet S' so folded will drop completely and will present no spread opening for the ram plate 73 to enter. It will, however, be picked up and carried due to contact of its trailing edge with leading surfaces of blocks 74 and 75 and will be inserted in the waiting envelope E in exactly the same manner as accomplished in the previously described operation. Use of the device according to the particular manner shown in Figs. 16 to 19 can also be conducted with cards or other unfolded elements in place of sheets S' if desired. While the pieces thus inserted will normally be of a substantially standard size in depthwise measurement, it will be realized that an adjustable abutment taking the place of the leading faces of blocks 74 and 75 may be provided in case narrower pieces are to be inserted.

The invention also contemplates, in addition to the above described combination of a manually fed folder 30 with an envelope stuffing mechanism 31, an arrangement whereby the stuffing mechanism 31 can be arranged to properly receive and operate on the material discharged from a folder 30' (Fig. 21) which is automatically fed. In essential structure the folders are substantially the same. The folder 30', however, includes an abutment 118 and a sheet starting roller 119 which is driven from a continuously rotating gear 120 (Fig. 22) through a feed clutch 121. The clutch 121 is of the helical spring type and includes a brake wheel 122 which, when allowed to rotate permits clutch operation to drive the starting roller 119 from gear 120, and when stopped, breaks the drive connection therebetween. Suitable means is provided for controlling the operation of the brake wheel 122. In the form shown in the drawing the brake wheel is toothed and cooperating therewith is a dog 123 which is urged away from the brake wheel by a spring 124 and operated into stopping engagement with the wheel 122 by the plunger 125 of a solenoid 126 when the latter is energized. A circuit for supplying the solenoid 126 includes line conductors 127 and 128. A feed control switch 129 is connected in the conductor 128 and controls energization of the solenoid. An operating finger 130 is arranged to lie in the path of block 74 or 75 of the ram and to hold the switch 129 open whenever the ram is in a predetermined position, home position in the present case, thus opening the solenoid circuit and allowing the spring 124 to withdraw dog 123 from brake wheel 122 to cause clutching operation of the clutch 121, whereby the starting roller 119 separates a sheet S from the supply and introduces it into the folder, where it undergoes a folding operation in a known manner under the influence of continuously rotating rollers 35', 36', 37', and 38', finally issuing from between rollers 35' and 38' to be stuffed into the waiting envelope by the stuffing machine 31 as previously described. The feed control switch 129 is thus effective, whenever it is opened, to initiate the feeding of a sheet into the nip of the folding rollers 35', 36' whence it is automatically folded and then fed to receiving position. The switch 129 is thus arranged to be operated, i. e., opened, when the ram is at a suitable position in its stroke so that, by the time the ram is again in home position, the sheet which has been started by opening of the switch 129 will have had time to reach receiving position ready for the next stuffing stroke. Likewise the switch finger 130 is so designed that with the stuffing machine operating at its normal speed, the switch will be held open just long enough for the started sheet to reach the nip of continuously rotating rollers 35', and 36' so that a feed will have been affirmatively initiated. Thereafter, of course, feeding is controlled solely by the continuously operating folding rollers 35', 36', 37' and 38', with the starting roller rotating idly through a conventional one-way clutch connection in a well-known manner. Thus it can be seen that a single folding and feeding operation is permitted to be initiated for each reciprocation of the ram 73, 74, 75, and even though the automatically fed folder 30' tends to operate at speeds somewhat in excess of those of which the stuffing machine 31 is capable, its operation is so correlated with the operation of the stuffing machine by means of switch 129 that there is no tendency for a plurality of folded sheets to accumulate at the receiving position.

Figs. 24 to 27 illustrate the relationship of the various

ram positions to the condition of switch 129 in a single cycle of normal operation, and are self-explanatory.

While devices 30 and 30' have been described as folders, it will be understood that they need not be used for folding but, if the occasion requires, they may have their folding parts set to values high enough to prevent folding and to act merely as means for feeding cards or the like through the folding machine and into receiving position ready for stuffing into envelopes. It will also be understood that other devices adapted for similarly handling, working on or treating sheets or cards and feeding them forth one by one may be substituted for the folders 30 or 30', if desired.

The stuffing machine 31 has been described in connection with folders 30 and 30' with which it is especially useful, but it will be understood that it is possible to feed previously folded sheets or otherwise prepared workpieces directly to the approach deck 40 of the envelope stuffer 31 without the intervention of a folding or other handling machine if desired.

From the foregoing description it can be seen that the present invention provides speedy, accurate uncomplicated and economical automatic means for stuffing folded sheets or other workpieces into envelopes, and especially for accomplishing this operation at the same time as, and as an incident to, the handling of the sheets by a machine which handles (e. g. feeds), or handles and treats the sheets such as a folding machine.

What is claimed is:

1. In a device of the type described, a reciprocating ram for engaging flat workpieces, for conveying them edgewise in a path and for placing each workpiece as it approaches a loading station in said path, in an envelope positioned thereat; mechanism disposed adjacent said path for providing conveyable workpieces by taking sheets one-by-one and folding them transversely; means to receive and convey each folded workpiece in turn as it leaves said folding means, means supported in the path of the conveying means to position the workpiece in a predeterminded location in said path for engagement by said ram as the folded workpiece leaves the conveying means; and means for preventing operation of said ram past said predetermined location in an envelope filling direction until a workpiece from said folding mechanism has reached said predetermined location.

2. In a device of the type described, means for holding a supply stack of open envelopes with the terminal envelope thereof at a loading station; a reciprocating ram for engaging flat workpieces, for conveying them edgewise in a path including said station, and for placing each workpiece as it approaches said station in the terminal envelope of said stack; mechanism disposed adjacent said path for providing conveyable workpieces by taking sheets one-by-one and folding them transversely; a continuously driven conveyor for receiving each workpiece in turn as it leaves said folding means and delivering same in a predetermined location in said path for engagement by said ram; and means for preventing operation of said ram past said predetermined location in an envelope filling direction until a workpiece from said folding mechanism has reached said predetermined location.

3. In a device of the type described, a reciprocating ram for engaging flat workpieces, for conveying them edgewise in a path and for placing each workpiece as it approaches a loading station in said path in an envelope positioned thereat; mechanism, including an automatic sheet starter, disposed adjacent said path for providing conveyable workpieces by taking sheets one-by-one from a sheet supply, and folding them transversely; means for conveying each workpiece in turn as it leaves said folding means; means for positioning each workpiece in a predetermined location in said path for engagement by said ram after it leaves the conveying means; means for preventing operation of said ram past said predetermined location in an envelope filling direction until a workpiece from said folding mechanism has reached said predetermined location; and control means for normally preventing operation of said sheet starter but actuable by said ram during a period of ram travel sufficient to start a sheet once for every placement of a folded sheet in an envelope by the ram.

4. As an attachment for use with a sheet folding machine provided with a feed mechanism discharging folded sheets one at a time in a predetermined direction, a device for inserting each of said folded sheets, as it issues, into an envelope and comprising a frame readily orientable with the sheet folding machine adjacent the discharge feed thereof; a hopper on the frame holding a stacked supply of envelopes with their flaps opened and with the envelope openings directed towards the discharge feed mechanism of the sheet folding machine; and conveyor means on the frame frictionally engageable with each folded sheet as it issues from the discharge feed of said folding machine, move it to a predetermined position, and a reciprocating ram operable after the folded sheet reaches the latter position to engage and advance the folded sheet into the lowermost envelope of the stacked supply.

5. A machine for inserting workpieces, fed to it seriatim, into envelopes comprising a frame; means on the frame holding an envelope with its flap opened and with the envelope opening oriented in a predetermined direction; conveyor means on the frame including a reciprocating ram for carrying each workpiece from a predetermined receiving position to and into the waiting envelope, and for carrying said envelope with its enclosed workpiece forward and discharging it at a collection station, said ram having a home position at the end of its stroke remote from said envelope holding means; a first sensing means operable by a workpiece when in receiving position; a second sensing means operable by said ram when in home position; and means for preventing operation of said ram except when said first sensing means is operated, or when said second sensing means is unoperated.

6. A machine for inserting workpieces, fed to it seriatim, into envelopes comprising a frame having a receiving deck for holding a workpiece in readiness for insertion, and adjacent the receiving deck at one end of the frame an approach deck for initial contact with each workpiece, said approach deck comprising a pair of laterally spaced platforms; a hopper adjacent the other end of the frame holding a stacked supply of envelopes with their flaps opened and with the envelope oriented so as to present the opening towards said approach deck; a ram mounted on the frame for reciprocation in a path from a position wherein the ram lies between said spaced platforms of the approach deck and a position wherein the ram extends beyond said hopper; a readily removable cover plate mounted above said frame and spaced from said approach deck to form therewith an entry chute for workpieces being fed to the machine; and a resilient stop member on said cover plate and depending therefrom adjacent said receiving deck tensioned for motion restraining initial contact with the leading edge of a workpiece in a receiving position thereon and yieldable to the drive of the ram upon engagement with the workpiece.

7. In combination, a sheet folding machine provided with folding elements, a feed mechanism discharging completed workpieces one at a time in a predetermined direction, and an automatic sheet separating and starting mechanism for feeding sheets one-by-one from a supply stack to the folding elements of the machine; and a device for inserting each of said workpieces into an envelope as it issues comprising a frame associated with the folding machine adjacent the discharge feed thereof, means on the frame holding an envelope with its flap opened and with the envelope opening directed towards

the folding machine, a ram reciprocating on the frame for taking each workpiece as it issues from said discharge feed, carrying it to and into the waiting envelope and for carrying the filled envelope forward and discharging it at a collection station; means for normally preventing operation of said sheet separating mechanism; ram position sensing means operated by the ram during a small fraction only of its cycle; and means for defeating the operation of said preventing means whenever said sensing means is operated.

8. In combination, a sheet folding machine having a transverse tie bar and provided with a feed mechanism discharging completed workpieces one at a time in a predetermined direction; and an inserting device comprising a frame having a receiving station for the discharged workpieces, means on the frame for holding an open envelope and means on the frame for inserting each of said workpieces into an envelope held by the holding means as it issues from the folding machine and discharging the stuffed envelope at a collection station, and hook elements on said frame fitting said tie bar and fixedly positioning said frame with respect to said folding machine in a position such that the receiving station is aligned with and proximate to the discharge feed of the folding machine and the holding means is positioned spaced from said discharge feed and with the open end of an envelope held therein facing the same.

9. In combination, a sheet folding machine having means to rest upon a plane support and provided with a feed mechanism for discharging workpieces one at a time to one side of the folding machine; a device for inserting each of said workpieces into an envelope as it issues from the folding machine comprising a frame having means to rest on the same plane support as said folding machine and at the discharge side thereof, means on the frame holding an envelope with its flap opened and oriented with the envelope openings facing towards the folding machine, a ram reciprocating on said frame for taking each workpiece from a receiving station carrying it to and into the waiting envelope and carrying the filled envelope forward and discharging it at a collection station; a continuously operating conveyor on said frame located between the discharge side of the folding machine and the receiving station for carrying a discharged workpiece from the folder feed mechanism substantially horizontally to said receiving station; and interfitting means for connecting said folding machine and said frame side-by-side in position for the intake of the conveyor to receive the workpieces directly from the discharge feed mechanism of the folding machine.

10. In a sheet folding and envelope stuffing mechanism, the combination with a sheet feeding and folding unit having sheet folding and ejecting members; of a horizontally reciprocating ram, conveying means to receive and convey the folded sheet in substantially the same plane as the ram upon emerging from the ejecting members, sheet locating means in the path of and engageable by the folded sheet upon emerging from the conveying means to position the folded sheet for ram pick-up, and means for supporting an envelope with its flap and mouth opened in the path of the ram, whereby upon pick-up by the ram the said folded sheet is inserted into the envelope.

11. In a sheet folding and evelope stuffing mechanism, the combination with a sheet feeding and folding unit having sheet folding and ejecting members; of a horizontally reciprocating ram, continuously driven frictional conveying means to receive and convey the folded sheet in substantially the same plane as the ram upon emerging from the ejecting members, yieldable sheet locating means in the path of and engageable by the folded sheet upon emerging from the conveying means to position the folded sheet for ram pick-up, and means for supporting an envelope with its flap and mouth opened in the path of the ram, whereby upon pick-up by the ram the said folded sheet is moved past the yieldable locating means and is inserted into the envelope.

12. A sheet folding and inserting device comprising driven folding rollers including final folding and discharge rollers positioned to effect discharge of the folded sheet in a substantially horizontal direction, conveyor means including continuously driven horizontally disposed belts having the sheet receiving portions thereof projected into the path of the leading end of a folded sheet issuing from the discharge rollers, hold-down strips yieldingly urged toward the surface of the conveyor belts, whereby a folded sheet is frictionally conveyed therebetween, a depending yieldable flap in the path of and engageable by the folded sheet to initially position said sheet, means to support the folded sheet after engaging the flap, means supporting an open flapped envelope with its mouth opened in the direction of the folded sheet, and means to advance the folded sheet past the flap and into the envelope.

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