

June 6, 1939.

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2,161,124

SHEET-FEEDING MECHANISM

Filed Jan. 10, 1938

3 Sheets-Sheet 1

Fig. 1.

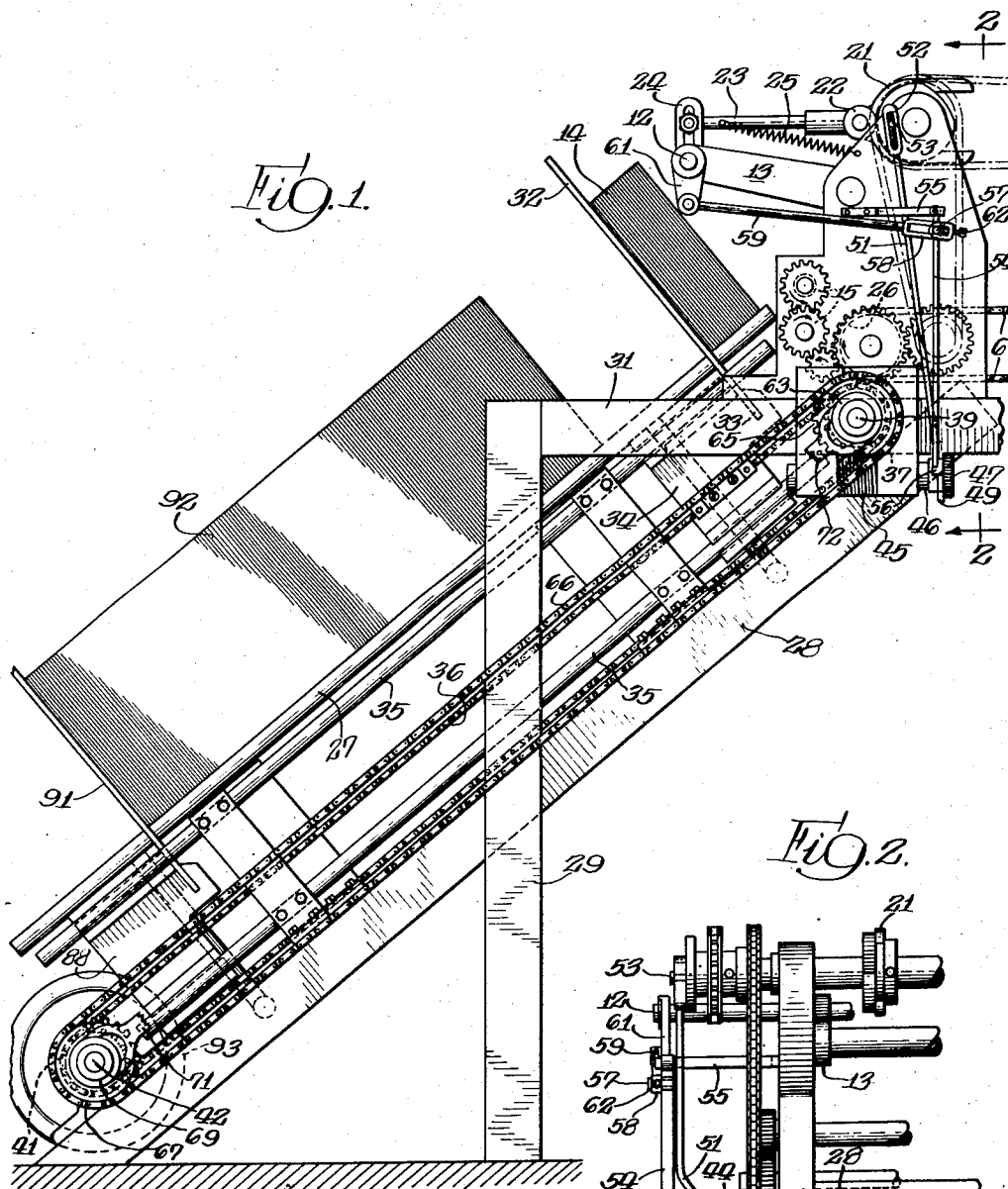
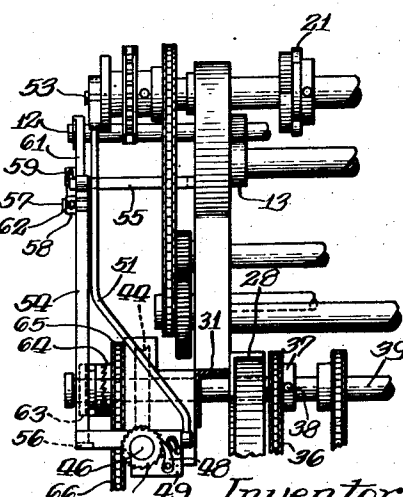


Fig. 2.



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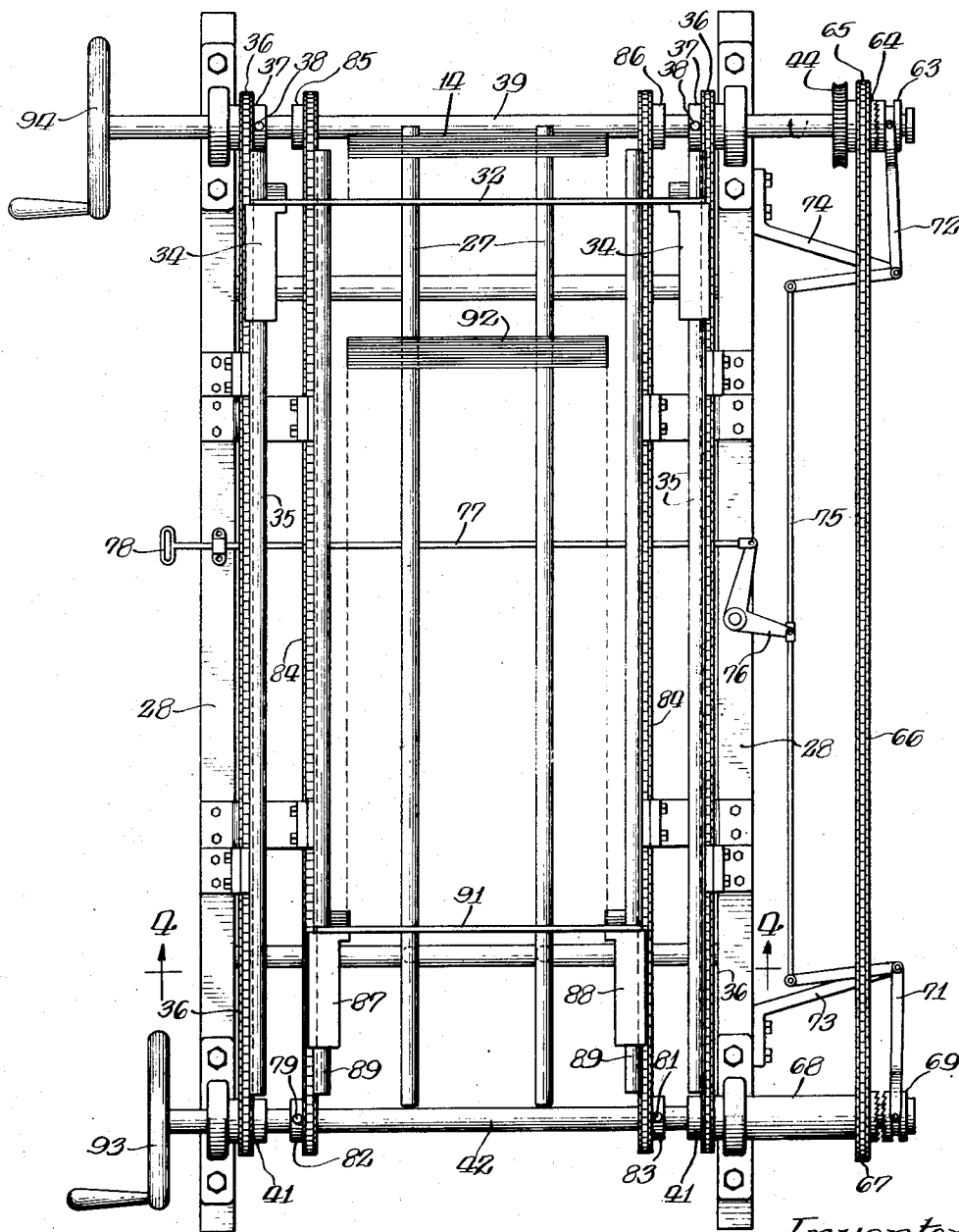
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SHEET-FEEDING MECHANISM

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3 Sheets-Sheet 2

FIG. 3.



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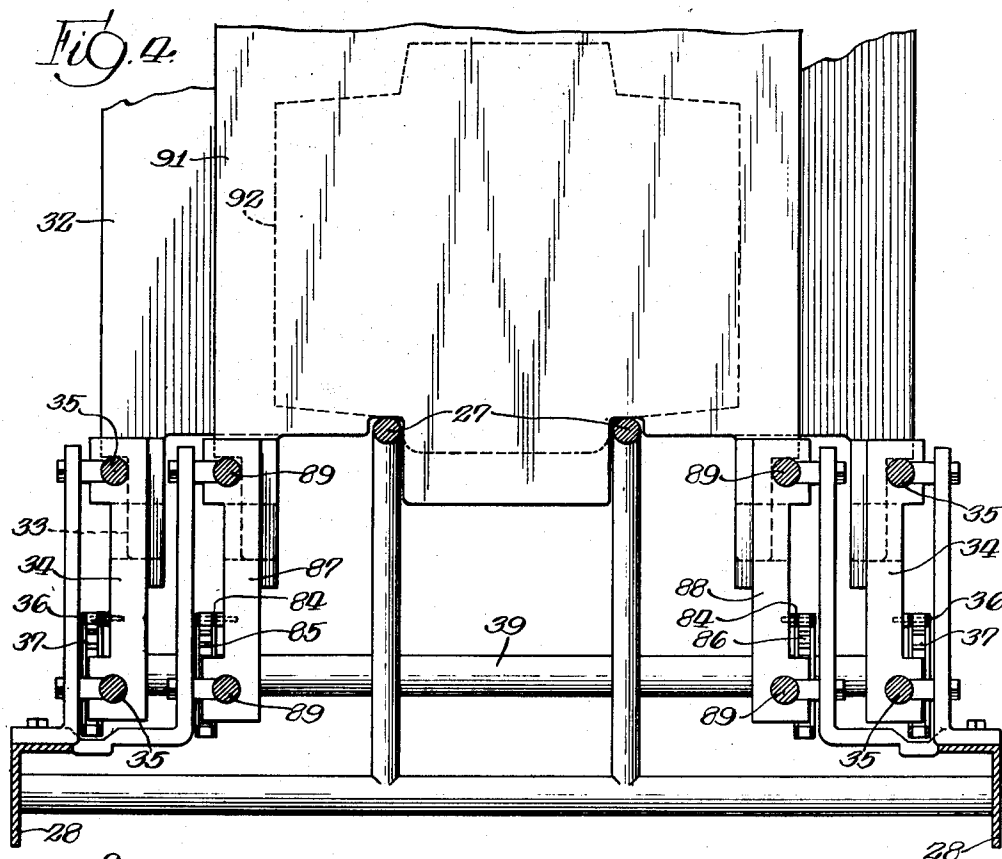
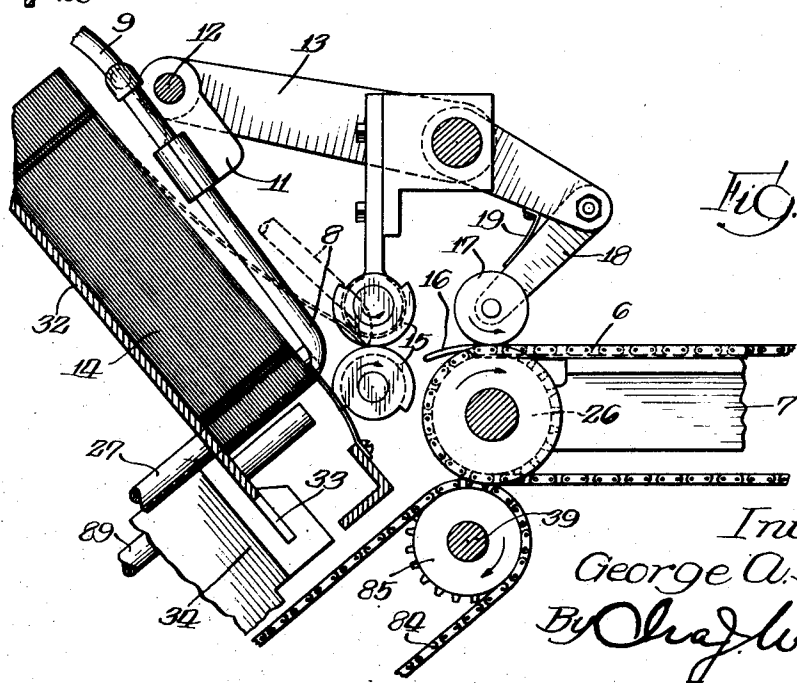
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SHEET-FEEDING MECHANISM

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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SHEET-FEEDING MECHANISM

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Application January 10, 1938, Serial No. 184,212

6 Claims. (Cl. 271-62)

This invention relates in general to mechanism for feeding blanks or sheets of material, and while the principles thereof may be utilized in mechanisms for feeding sheets and blanks of various characters, the embodiment of the invention herein disclosed for illustrative purposes is designed particularly for feeding paper sheets, such for instance, as envelope blanks which have been cut to the requisite shape and size for fabrication by printing, folding and gluing operations into completed envelopes.

Prior to my present invention, three different types of feeding mechanisms have been employed as adjuncts to envelope-making machines. Since machines of this character have been developed and perfected to a point where they are run at an approximate speed of 300 envelopes per minute, the mechanism which feeds the blanks to such machines must be very accurate and reliable in operation and capable of running continuously at these high speeds. It is highly desirable, also, that the machines operate continuously and without stopping for prolonged periods, because each time an envelope machine is stopped troubles arise such as drying of the glue on the applicators, drying of the ink on the rolls if a printing operation is involved, liability to a jam occurring in the machine as the result of stopping while some envelopes remain in the machine, and in any event, the time lost from production at each stoppage of one of these high speed machines adds materially to the production cost of an order being run.

One type of feed mechanism employed heretofore in conjunction with envelope machines is known as a bottom feed type. In this type, the sheets or blanks are stacked in a magazine and are fed in succession from the bottom thereof. The height of the stack of blanks in the magazine is necessarily limited, however, because if too many blanks are stacked their weight interferes with the separation of the lowermost blanks from the stack. The operator, therefore, is required to add a small number of blanks at a time to the top of the stack, and when a machine is running at 300 per minute, one operator is kept busy replenishing the stack of envelopes with a small number at a time.

Another type of feed employed in connection with envelope making machines is known as the fan feed in which the blanks are fanned out upon an inclined table from which they are fed in succession, the topmost and farthest extended or fanned blank being separated from the remain-

der and fed to the machine at each operation. This type of feed, however, requires that the supply of blanks on the table be replenished by lifting the rear edge of the fanned out stack and inserting a small quantity of additional blanks beneath those already on the table. This manner of supplying the blanks also requires practically all of one operator's time when the machine is running.

A third type of feeding mechanism is known as the top feed type in which a quantity of envelopes is stacked and from the top of which they are fed in succession. The stack in this type is gradually fed upwardly as the envelopes are removed from the top thereof until the entire stack has been delivered to the machine. When this has occurred, however, the machine must be stopped while the stack is being replenished, and such stoppage results not only in loss of production during the time required to replenish the stack, but almost inevitably additional loss because of some impairment of the machine which is occasioned by the stop.

One of the primary purposes of my present invention is to overcome the objections above indicated to the envelope feeding mechanism at present in use by providing a mechanism which will operate to supply blanks continuously to an envelope-making machine without stoppage for replenishment of the stack and which will utilize a stack of such size that replenishment is necessary only at prolonged intervals, therefore leaving the operator free during the interim for other duties. In fact, instead of requiring one operator for each machine, as has been necessary heretofore, my present invention will enable one operator to attend to several machines, thereby not only reducing the cost of necessary labor but also increasing the production of the machines themselves; since they are able to operate continuously without stoppage for replenishment purposes.

Other objects and advantages of my invention should be readily appreciated as the same becomes better understood by reference to the following description when considered in connection with the accompanying drawings.

Referring to the drawings:

Fig. 1 is a side elevation of a mechanism constructed in accordance with the principles of my invention;

Fig. 2 is a fragmentary elevation on the line 2-2 of Fig. 1;

Fig. 3 is a rear plan view of a portion of the mechanism shown in Fig. 1;

Fig. 4 is a sectional view on the line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary sectional view showing particularly the operation of the pick-off or separating device.

Referring to the drawings more in detail, it will be understood that the mechanism here disclosed is designed as an adjunct or attachment to an envelope-making machine of any preferred type, the forward or feed-in end of which includes a carrier or chain conveyor 6 by which the blanks or sheets are conveyed to the operating mechanisms of the envelope machine. The details of construction of such a machine are immaterial so far as the present invention is concerned, and only the conveyor and a portion of the frame 7 of the machine are here illustrated.

My present invention is concerned more particularly with what is known as the top-feed type of mechanism, which has been above referred to in a general way, and such mechanism comprises, as exemplified in Fig. 5, a pneumatic sucker or separator 8 connected through a conduit 9 with a source of vacuum or partial vacuum, the separator being carried by an arm 11 fixed upon a shaft 12 which is mounted in suitable supporting arms 13. The shaft 12 is oscillated to move the head of the sucker 8 from the position shown in full lines in Fig. 5 against the upper surface of the topmost sheet of the stack 14 to the dotted line position shown in this figure in which the edge of the sheet has been moved into position to be grasped by the feed rolls 15 and fed thereby over the guide 16 onto the conveyor 6. Positioning of the blanks upon the conveyor is assisted by the guide roll 17 carried by a pivoted arm 18 which is urged toward the conveyor 6 by a spring 19.

The shaft 12 is actuated to move the sucker 8 from the full to the dotted line position of Fig. 5 by cam 21 (Fig. 1) operating upon a follower 22 to move the link 23 to the left viewing Fig. 1, thereby, through the arm 24 fixed on the shaft, rocking the shaft 12 in a counter-clockwise direction. Reverse movement of the shaft is produced by a tractile spring 25 connected at one end with the link 23 and at its other with the frame of the machine. The pneumatic sucker is actuated in synchronism with the operations of the envelope-making machine, and as illustrated in Fig. 1, the cam 21 and the feed rolls 15 are all connected through suitable driving trains with the sprocket wheel 26 of the envelope-making machine. The stack of blanks indicated by reference character 14 is supported partially by a pair of spaced rods 27 extending in inclined position longitudinally of the frame structure which comprises the inclined frame members 28 and the vertical and horizontal members 29 and 31 respectively, all rigidly connected together to form a suitable supporting frame structure. The sheets or blanks are disposed on edge upon these rods 27, as will be apparent from Fig. 5, and they are supported in this inclined position by a plate 32 which is removably positioned in a holding slot 33 of a pair of blocks 34, which blocks are slidably mounted upon and guided by rods 35 extending longitudinally of the frame. These blocks guided upon the rods are connected with and operable by the upper laps of a pair of chains 36, the upper ends of which are trained over sprockets 37, each fixed by a pin 38 to a transversely extending shaft 39 at the top of the frame. The lower end of each chain 36 is trained over a sprocket wheel 41 rotatably mounted upon

a transverse shaft 42 at the lower end of the frame. It will be apparent, therefore, that the stack of blanks 14 is fed upwardly to maintain the uppermost blank in position to be separated by the pneumatic sucker and delivered to the machine, by moving the blocks 34 and thereby the plate 32 upwardly in successive short movements as the topmost sheets are delivered to the machine.

The mechanism for feeding the stack of blanks upwardly in conformity with the removal of the topmost blanks therefrom will now be explained. Shaft 39 to which the sprocket wheels 37 are fixed carries a worm wheel 44 rotatably mounted thereon which meshes with and is driven by a companion worm 45 on a shaft 46 provided with a ratchet wheel 47 adapted to be intermittently operated by an oscillatory pawl 48 carried by a block 49 journaled on the shaft 46 and connected with a link 51 provided at its upper end with an elongated eye 52 in which is disposed a crankpin 53 rotatable with the shaft upon which the cam 21 is mounted. The link 51 will drop by gravity to move the pawl 48 in a clockwise direction relatively to the ratchet wheel 47 and will be lifted to thereby rotate the ratchet wheel in a counter-clockwise direction as the crankpin 53 travels upwardly in its revolution. Each actuation of ratchet wheel 47 will impart a slight rotary movement through worm 45 and worm wheel 44 to the shaft 39, thereby moving the blocks 34 and the plate 32 carried thereby slightly upwardly so as to correspondingly elevate the stack of blanks.

To control the upward feeding of the stack of blanks and prevent the same from being elevated too much, I have provided the following control mechanism. A bar 54 is suspended from a bracket 55 so that its lower end is normally disposed above and in the path of travel of an extension 56 from the block 49. When the parts are in the position shown in Figs. 1 and 2, rotation of the block 49 in a clockwise direction, viewing Fig. 2, under the influence of the weight of the link 51 is precluded, since the extension 56 will abut against the end of bar 54. So long as the parts remain in this position, no elevation of the stacked blanks will take place. When elevation of the stack of blanks, however, is necessary in order to bring the uppermost blank into proper relation with the sucker head 8, the bar 54 is moved out of the path of the extension 56 to permit actuation of ratchet wheel 47 in the manner previously described. With this end in view, the bar 54 is provided with a laterally projecting pin 57 extending through an eye 58 in a link 59 connected to an arm 61 fixed on shaft 12.

The extent of rotative movement of the shaft 12 in a clockwise direction viewing Figs. 1 and 5 under the influence of spring 25 is limited at each actuation by contact of the sucker head 8 with the topmost blank in the stack 14. When the height of the stack is normal, the rotation of shaft 12 will be stopped before abutment screw 62 carried by link 59 engages the pin 57. When the height of the stack has been lowered, however, by removal of the topmost blanks until the sucker head travels to an abnormally depressed position, the link 59 will be swung to the left viewing Fig. 1 sufficiently to displace the bar 54 from the path of block extension 56 by reason of engagement of abutment screw 62 with pin 57. Block 49 will therefore be permitted to swing in a clockwise direction about its axis under the influence of the link 51 which upon upward movement of

crankpin 53 will rotate shaft 46, thereby partially rotating shaft 39 to feed the supporting plate 32 upwardly, thereby elevating the stack of blanks. In this manner the blanks are intermittently fed upwardly so as to maintain the topmost blank at substantially a predetermined level and in position to be separated from the stack by the sucker 8.

The worm wheel 44, as has been stated, is rotatably mounted on shaft 39 and driving connection between this wheel and the shaft is established through a clutch comprising a member 63 splined on the end of shaft 39 and a companion clutch member 64 formed integrally with or rigidly connected to the worm wheel 44 and having clutch teeth adapted to be engaged by the teeth of the clutch member 63, as illustrated in Fig. 3, whereby rotation of worm wheel 44 will impart a similar rotation to the shaft 39. The clutch member 64 comprises also a sprocket wheel 65 which is connected by a chain 66 with a companion sprocket wheel 67 fixed upon a sleeve 68 surrounding the outwardly projecting end of shaft 42. The outer end of this sleeve is equipped with clutch teeth adapted for cooperative engagement with companion teeth formed on a clutch member 69 splined to the end of shaft 42. Clutch operating bell crank levers 71 and 72 mounted on brackets 73 and 74 respectively are connected by an operating link 75 which in turn is operated from a bell crank lever 76 by means of a manually operable link or rod 77 having a hand grip 78 disposed in position accessible to the operator.

It will be apparent from Fig. 3 that the controlling mechanisms for the two clutches are so constructed that the clutches become operative or inoperative in alternation only. Thus, when shaft 39 is clutched to worm wheel 44 to be driven thereby, shaft 42 will be unclutched from the sleeve 68 which will simply turn idly under the influence of chain 66. Similarly, when shaft 39 is disconnected or unclutched from worm wheel 44, shaft 42 will be clutched or connected to said wheel to be driven thereby. The purpose of driving shafts 39 and 42 in alternation will now be explained.

Shaft 42 has fixed thereon by pins 79 and 81 a pair of sprocket wheels 82 and 83 respectively, and chains 84 trained over these sprocket wheels also are trained over sprocket wheels 85 and 86 rotatably mounted upon shaft 39.

The chains 84 have driving connections with blocks 87 and 88 which slide upon bars or rods 89 similar to the rods 35. The blocks 87 and 88 are slotted similar to the blocks 34 for the reception of a second supporting plate 91 similar in structure and function to the previously described plate 32. While the plate 32 is supporting and elevating the stack of blanks 14, plate 91 is in lowered position shown in Figs. 1 and 3 where another stack of blanks 92 may be loaded on to it without interfering with the feeding of the blanks from stack 14.

Assuming now that the parts are in the position shown in Figs. 2 and 3, feeding of blanks from the top of stack 14 by means of the sucker head 8 and associated mechanisms is being carried on. The shaft 39 is at this time clutched to worm wheel 44 so that through chains 36 the plate 32 will be gradually elevated to raise the stack of blanks 14 as the top ones are fed off. During the continuation of the feeding operation an additional supply of blanks is stacked upon the plate 91, such stack being indicated by reference character 92, which stack may be extended up-

wardly almost to the plate 32. The shaft 42 which is unclutched from the drive worm wheel 44 is then turned manually by means of the hand wheel 93 to bring the top of stack 92 up against the lower face of plate 32. Clutch control rod 77 is now pulled to the left viewing Fig. 3 unclutching shaft 39 from worm wheel 44 and clutching shaft 42 to said worm wheel. Plate 32 is now withdrawn from blocks 34 permitting the remaining blanks in stack 14 to rest upon and be supported upon the top of stack 92 which is then fed upwardly by the automatic driving and control mechanism previously described so as to maintain the top of the stack in proper position for the feeding of the topmost blanks by the pneumatic sucker head.

The operator need give no further attention to the feed until the stack 92 has approached a point of exhaustion whereupon, through the hand wheel 94, the shaft 39 is turned to lower the blocks 34 to the lower end of the frame where the supporting plate 32 is reinserted in the block grooves. A new stack of blanks may then be placed upon the plate 32, its top in turn is brought up against the lower face of plate 91 whereupon the clutches are again reversed, the plate 91 is removed, and the automatic feeding and elevation of the blanks proceeds.

It will be apparent from the foregoing that my invention provides for the loading of new stacks of blanks into the feeding mechanism without interfering with the feeding of the preceding blanks. The feeding proceeds continuously, since the lower blanks in one stack become the upper blanks in the next succeeding stack. No stoppage of the machine is required in progressing from one stack of blanks to the next, and the machine enables the loading of such a large stack at one time that reloading is required only infrequently. The operator is therefore relieved from continuous reloading in small numbers and is free for other duties, such, for instance, as attending to a number of machines equipped with my improved invention instead of being required to devote his entire attention to one machine as heretofore.

The details of construction shown and described are, it should be understood, merely illustrative and may be varied within considerable limits without exceeding the scope of my invention, as defined in the following claims:

I claim:

1. In a sheet feeding mechanism, the combination of an inclined frame structure, transversely extending shafts mounted at the upper and lower ends respectively of said structure, two sets of sprocket wheels mounted on each shaft, chains connecting the sprocket wheels of each set on the respective shafts, the sprocket wheels of one set being fixed to the upper shaft and the sprocket wheels of the other set being fixed to the lower shaft, a plurality of stack-supporting plates, each plate being detachably mounted on one set of chains and free from the other set of chains, mechanism for rotating said shafts, and means for selectively connecting said mechanism with said shafts in alternation to thereby elevate one or the other of said stack-supporting plates.

2. In a sheet feeding mechanism, the combination of a frame structure, a pair of shafts journaled thereon in spaced relation, a pair of sprocket wheels fixed on each shaft, a pair of sprocket wheels loosely mounted on each shaft, chains connecting each fixed sprocket wheel on one

shaft with a loose sprocket wheel on the other shaft, a stack-supporting plate removably carried by each pair of chains, operating mechanism, and manual means for selectively connecting said
5 operating mechanism with said shafts in alternation to thereby move one of said plates under the control of said feed device while the other plate and shaft remain free for manual manipulation.

10 3. In a sheet feeding mechanism, the combination of a pair of spaced-apart parallel shafts, a pair of sprocket wheels fixed upon each shaft, a pair of sprocket wheels loosely mounted upon each shaft, chains encircling each fixed sprocket
15 wheel on one shaft and a loosely mounted sprocket wheel on the other shaft to provide a plurality of chain conveyors, one operable from one of said shafts and the other operable from the other of said shafts, a stack-supporting plate removably mounted upon each conveyor, and
20 mechanism for operating said shafts in alternation.

25 4. In a sheet feeding mechanism, the combination of a pair of parallel spaced-apart shafts, hand wheels for manually rotating said shafts, a pair of sprocket wheels fixed on each shaft, a pair of sprocket wheels rotatably mounted on

each shaft, chains connecting the fixed sprocket wheels on each shaft with the rotatable sprocket wheels on the other shaft, a stack-supporting plate detachably mounted on each pair of chains, driving mechanism for said shafts, and
5 clutch mechanism for selectively connecting said shafts in alternation only with said driving mechanism.

5. In a sheet feeding mechanism, the combination of an inclined frame, rotatable shafts
10 mounted respectively in the upper and lower portions of said frame, stack elevating devices operable respectively by said shafts, and mechanism for actuating said shafts in alternation to thereby operate said elevating devices in alternat-
15 ion.

6. In a sheet feeding mechanism, the combination of an inclined frame, rotatable shafts
20 mounted respectively in the upper and lower portions of said frame, stack elevating devices including fast and loose sprocket wheels on each shaft, chains connecting said sprocket wheels
25 and removable stack supports associated with said chains, and means for alternately driving said shafts to thereby actuate said elevating devices in alternation.

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