July 29, 1930. A. NOVICK 1,771,652

SHEET FEEDING MECHANISM

Original Filed May 9, 1923 5 Sheets-Sheet 1

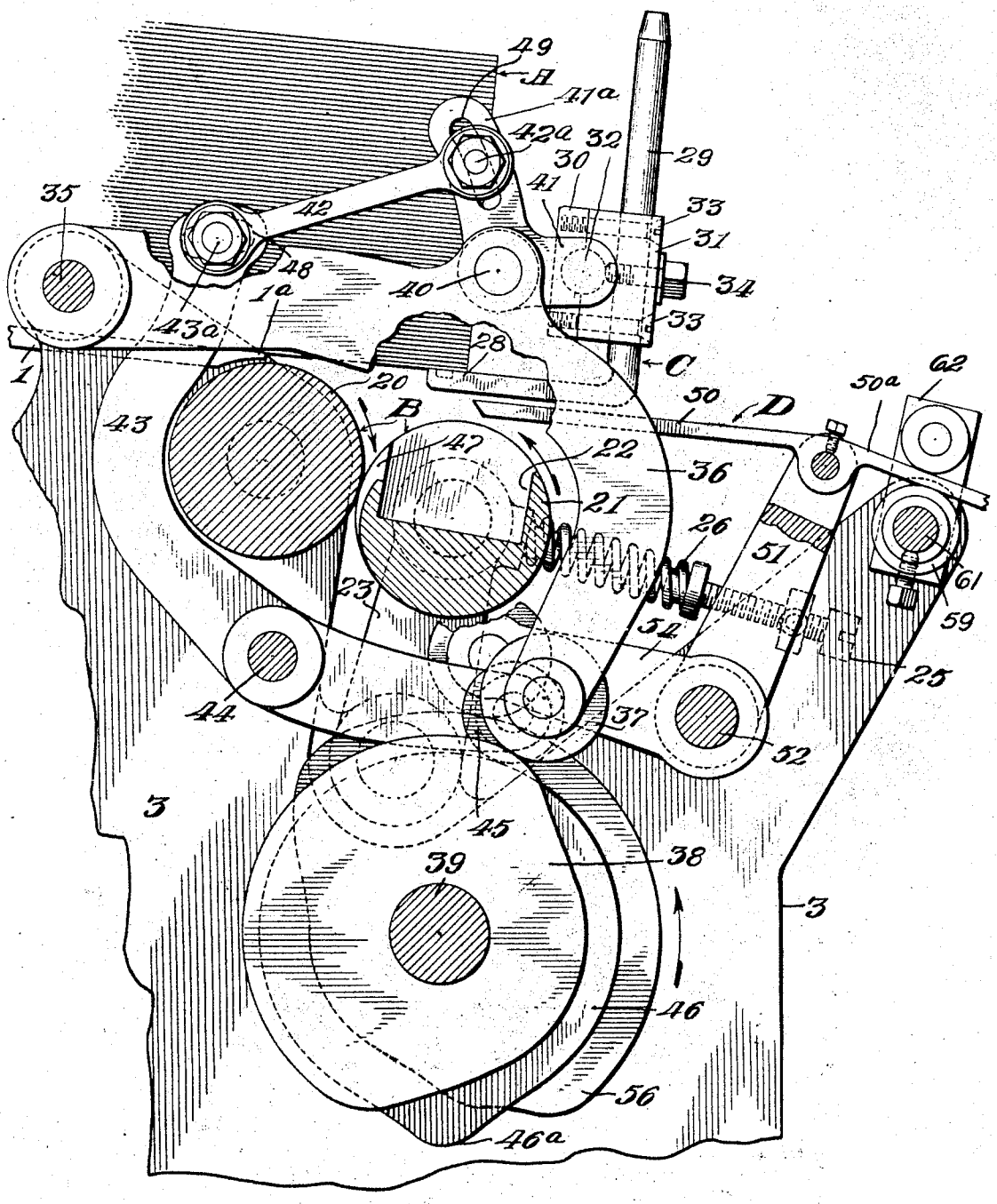


Fig. 1.

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SHEET FEEDING MECHANISM

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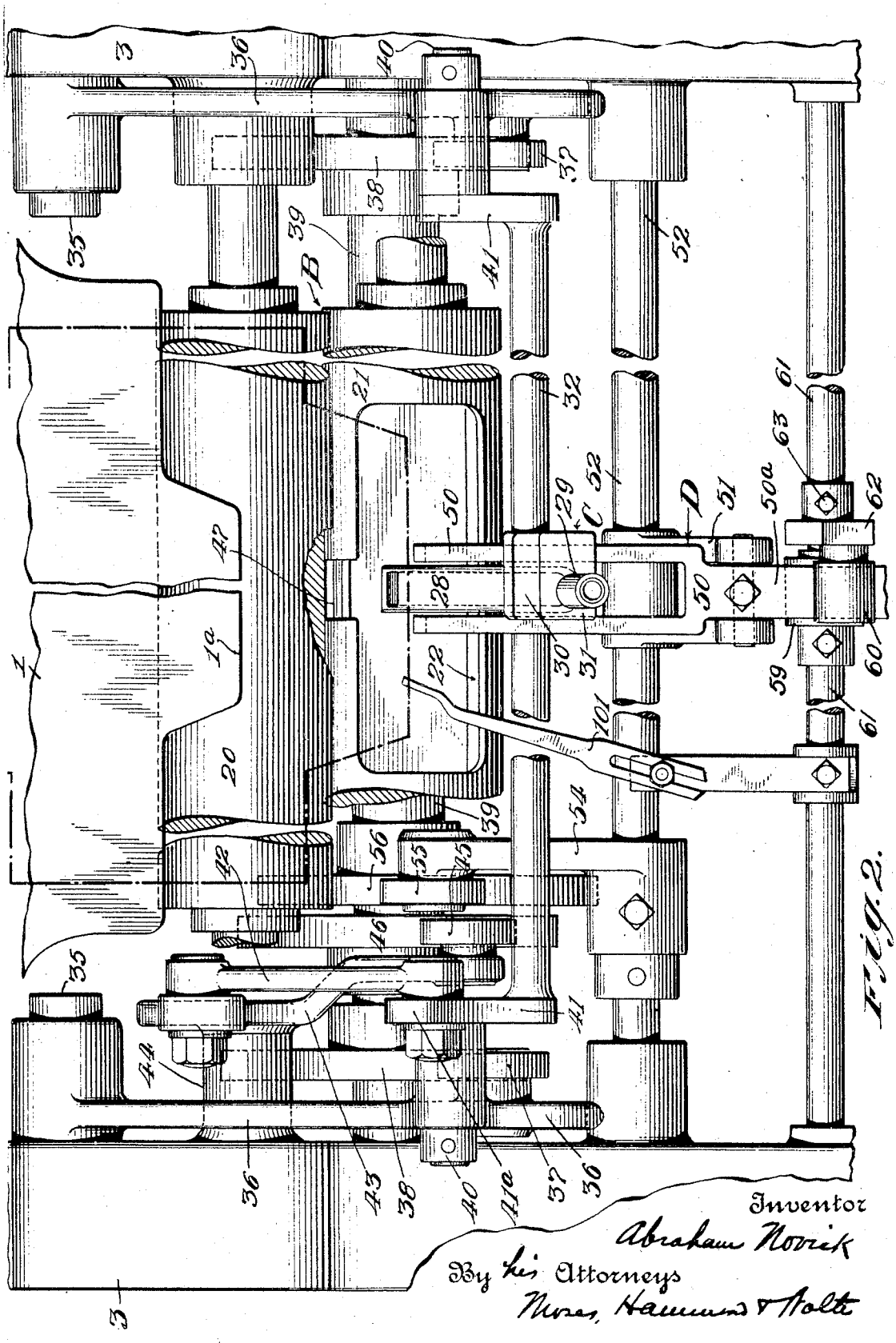


Fig. 2.

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SHEET FEEDING MECHANISM

Original Filed May 9, 1923 5 Sheets-Sheet 3

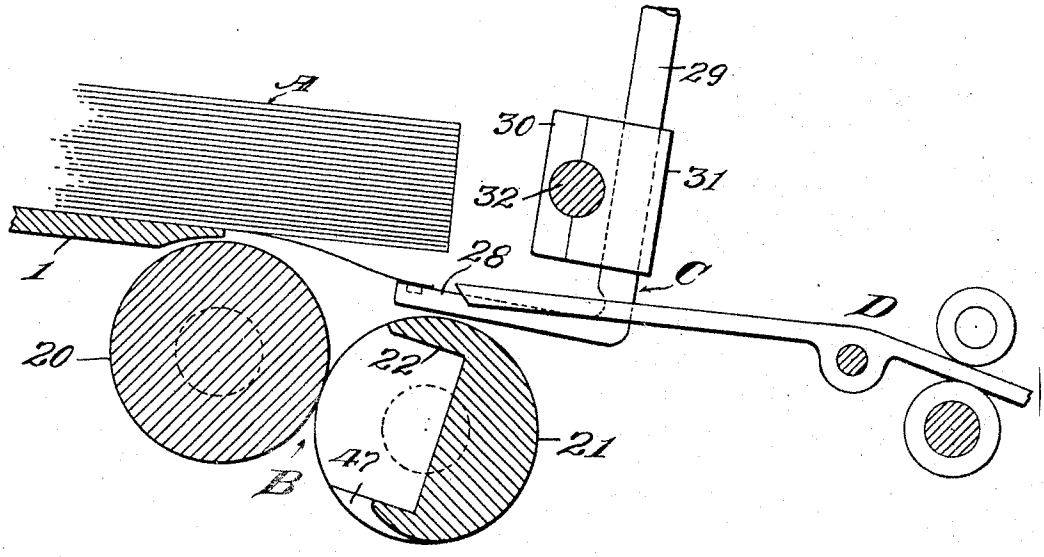


Fig. 3.

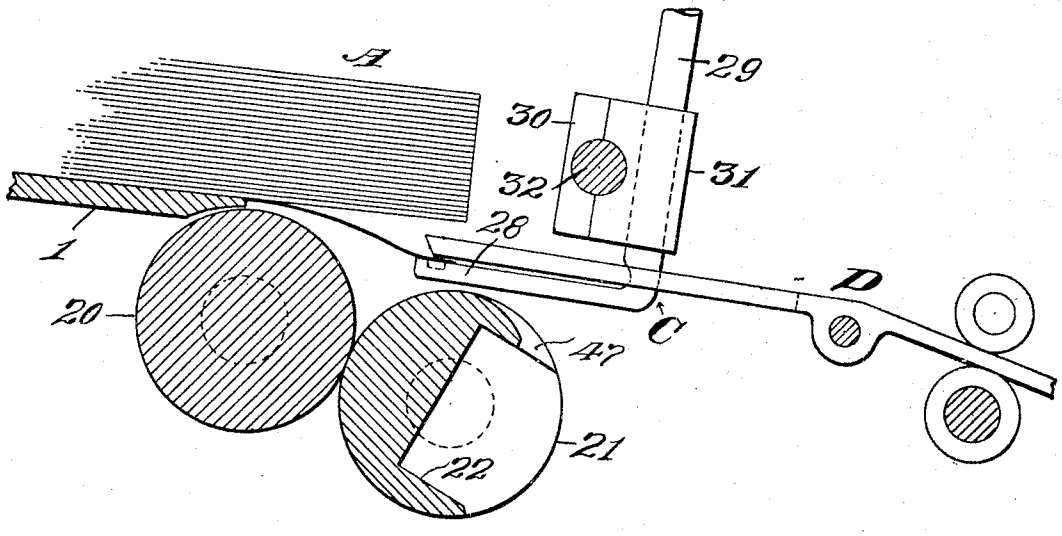


Fig. 4.

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SHEET FEEDING MECHANISM

Original Filed May 9, 1923 5 Sheets-Sheet 4

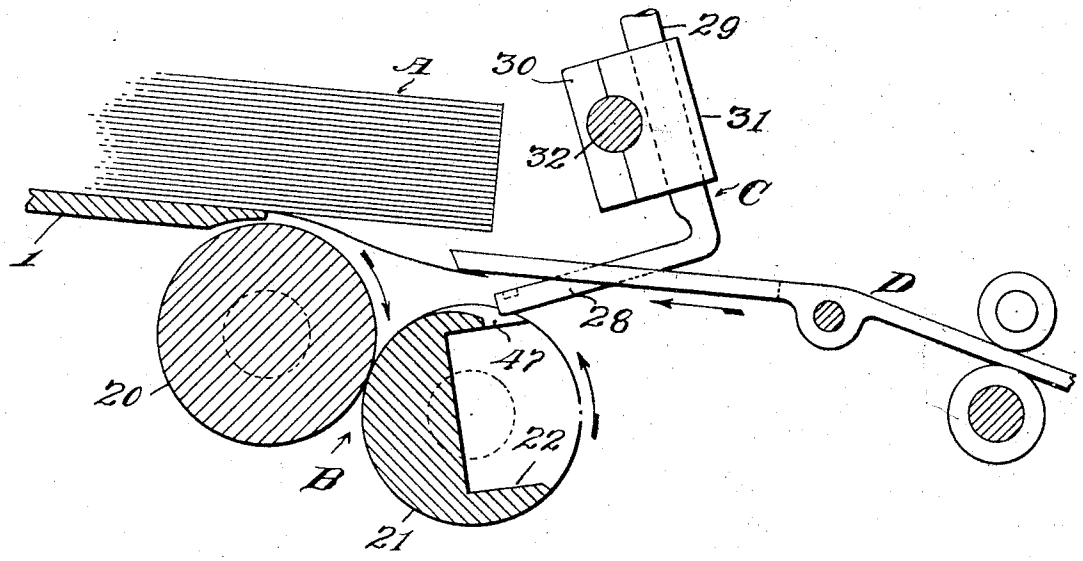


Fig. 5.

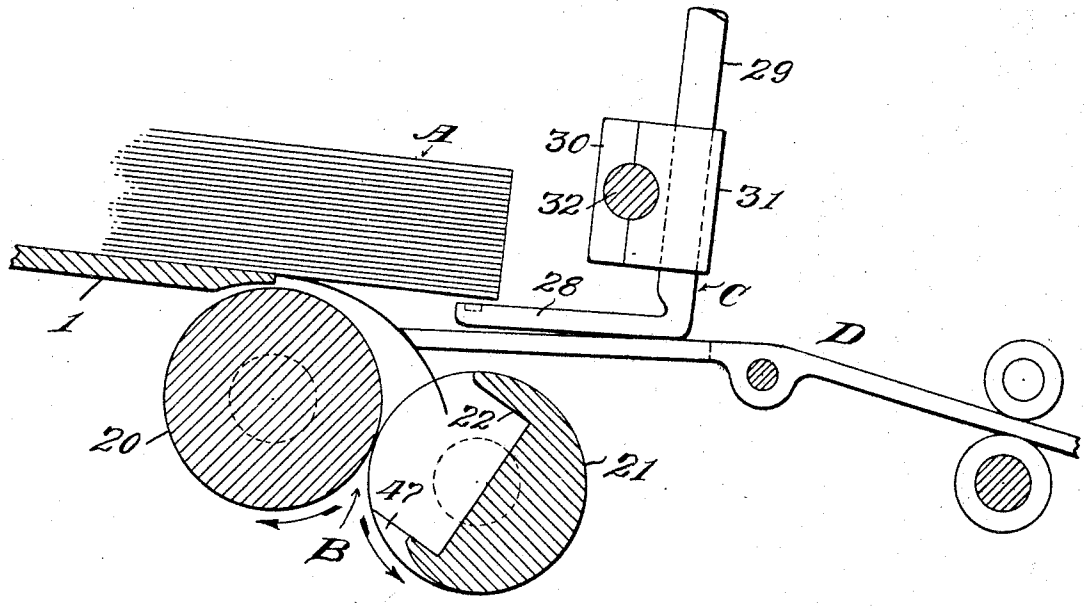


Fig. 6.

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SHEET FEEDING MECHANISM

Original Filed May 9, 1923 5 Sheets-Sheet 5

Fig. 7.

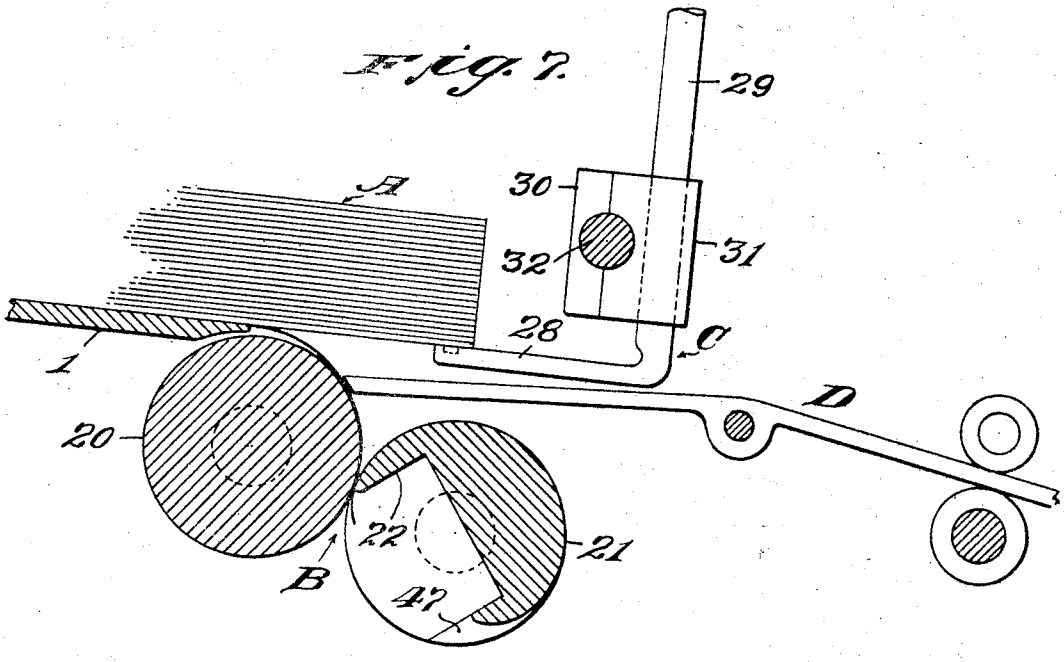
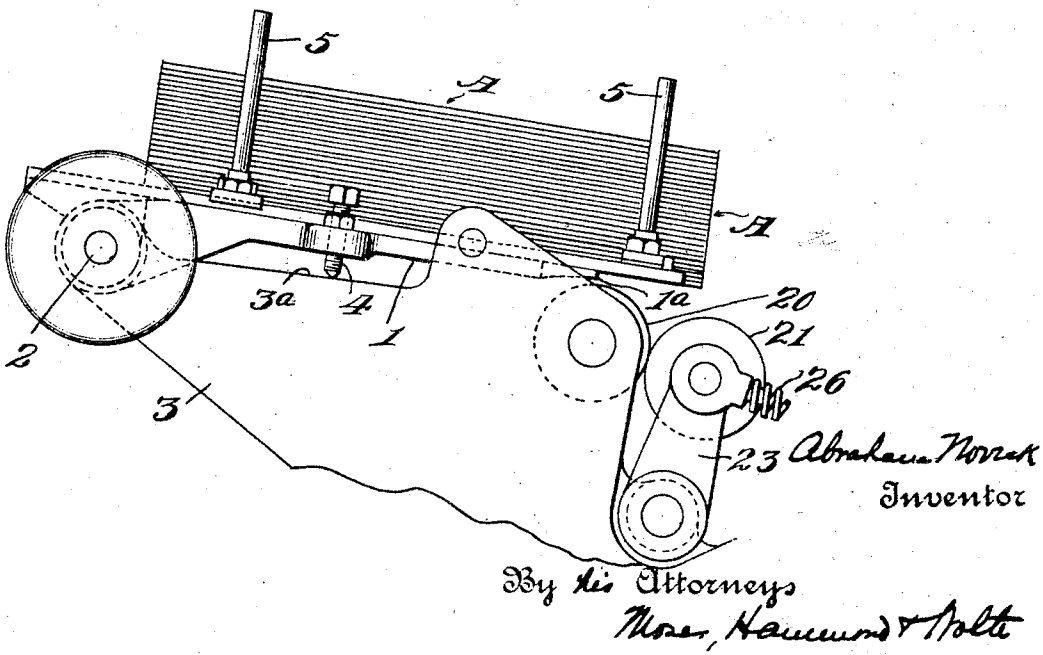


Fig. 8.



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Patented July 29, 1930

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UNITED STATES PATENT OFFICE

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SHEET-FEEDING MECHANISM

Application filed May 9, 1923, Serial No. 637,626. Renewed April 23, 1929.

This invention relates to mechanisms for feeding blanks, particularly blanks of paper or like sheet material. It is primarily concerned with a feeder whereby the blanks are fed individually from a stack into mechanism for operating on the blanks, as for example envelope making machinery. But it will be understood that the invention in its broader phases is not limited to such use.

The feeder of the present invention is of the general type in which the individual blank is separated from the stack by having its leading end inserted into a conveying mechanism, as for example feed rolls, this insertion being accomplished by means of a plurality of devices acting on the blank in sequence to separate or deflect its leading end from the stack. In the preferred form of embodiment of the invention the first of these devices is a pneumatically operable member, herein termed picker, for effecting an initial separation of the blank from the stack, and the other is a mechanically operable device herein termed deflector, which is introduced between the so-separated blank and the stack to carry the deflection further and insert the leading end thereof into the conveying or removing mechanism.

An important feature of the present invention consists in controlling the two separating devices, namely the picker and deflector in such manner that during the time when one of them is operating on a blank the other is being returned into position for its next operation. By virtue of this feature the operation on the one blank is commenced while the operation on the other blank is still in progress, so that an exceedingly high speed of operation may be effected. This feature is of particular importance when the picker is pneumatic in character, as in the preferred form of embodiment herein described, because the picker is given ample time to secure its suction hold on the one blank during the time the deflector is performing its operation on the preceding blank. The feeder of the present invention, therefore, is capable not only of a high speed, but also of an unusual accuracy and uniformity of operation.

A further feature of the present invention consists in providing mechanism whereby each of the separating devices, namely the picker and deflector, after finishing its operation, is entirely withdrawn from the path described by the blank in response to the operation of the other of the separating devices, so that all buckling of the blank or other interference with its free movement is obviated. This again serves to augment the speed of operation of which the feeder is capable.

In the preferred form of embodiment of the invention, the picker is operated in a direction substantially at right angles to the bottom of the stack to initiate the deflection of the individual blank, and the deflector is operated in a direction substantially parallel to the blanks of the stack, being introduced into the space between the separated blank and the stack and moved inwardly so as to bear obliquely against the face of the blank. The deflector is preferably so guided that there is a clearance space between its upper edge and the stack and between its lower edge and the blank at the time it enters between the stack and the blank, so that there is no danger of its tip striking the forward edge of either. Close adjustment of the operating parts need, therefore, not be maintained.

In the preferred form of construction the withdrawal of the picker from the path of the blank is accomplished by tilting its nozzle from under the stack during its return into operative position. A further feature of this construction consists in the provision of mechanism whereby the tilting operation may be accomplished independently of the blank-deflecting movement of this device. By virtue of this mechanism each movement may be accomplished by devices operable and adjustable independently of the other. Simplicity and rigidity of construction and facility of operation and adjustment are thus achieved.

The above and various other features and objects of the invention will now be described more in detail with particular reference to the accompanying drawings in which

Figure 1 is a diagrammatic side elevation

showing the invention in a preferred form of embodiment;

Figure 2 is a view showing the parts of Figure 1 in plan view;

Figures 3, 4, 5, 6 and 7 are views showing parts of Figure 1 in successive stages of operation; and

Figure 8 is a side elevation showing the manner of mounting of the table of the machine.

Similar characters of reference designate similar parts in each of the several views.

In Figure 1 of the drawing the stack of blanks is indicated by reference character A, the feed rolls between which the individual blanks are to be inserted are denoted by reference character B, the picker for initiating the separation of the individual blanks from the stack is marked C, and the device for carrying the separation further and introducing the blanks into the feed rolls is indicated by D. The above-named means constitute the main operating members of the mechanism and their construction and operation will now be described in detail.

The stack A is supported by the table 1, which is mounted on pivots 2 (Figure 8) in the side frames 3 of the machine, so as to be adjustable in height at its forward end, by means of set screws 4 cooperating with fixed members 3^a of the frame. The table extends beyond the set screws 4 a distance such that the tip 1^a terminated substantially over the center line of one of the rollers 20 of the feed rolls B.

Mechanism comprising vertical rods 5 is provided for guiding the blanks at convenient reentrant corners thereof, the positions of these rods being adjustable as in usual practice. The table is preferably inclined downwardly towards its forward end so as to cause the blanks, by force of gravity, to remain in engagement with the guide rods 5. The blanks are so placed on the table that their leading ends project beyond the table edge 1^a, as illustrated in Figure 1.

The feed rolls B are suitably mounted in the side frames 3 of the machine to revolve in contact with each other, with their line of contact below the projecting ends of the blanks. The one roller 20 of the feed rolls has an unbroken peripheral surface, whereas the other roller 21 is mutilated, being provided with a cup 22, the object of which is to receive the leading edge of a blank about to be introduced between the rolls. The pivots of roller 20 are fixed, but those of roller 21 are movable, the latter being provided on an arm 23 adapted to swing about pivots 24 in the side frames of the machine. A spring 26, the pressure of which may be adjusted by means of a screw 25 mounted on the frame of the machine, serves to hold roller 21 in resilient engagement with roll 20, so that a blank introduced into the rolls is securely held between them and prevented from slipping with respect thereto.

The picker C is preferably pneumatic in character and consists of a hollow tube 29 provided at its end with a nozzle 28 for engaging the lowermost blank of the stack at its leading edge. The tube 29 is connected through flexible tubing to a source of suction not illustrated in the drawing. Tube 29 is firmly fixed in a block 31, which block is mounted on a rod 32 by means of a second block 30 against which block 31 is clamped by screws 33. The angular position of the picker with respect to rod 32 is adjustable and may be fixed by means of a set screw 34.

The picker is capable of two separate and independent movements, one of these being an up-and-down motion with reference to the stack, and the other a tilting or rocking motion. The up-and-down motion of the picker takes place about a pivot 35 fixed in the frame of the machine at a point approximately in the plane of the paper, the picker being supported on this pivot by means of a link 36, the free end of which is provided with a roller 37 for riding on a cam 38 mounted on a shaft 39. Resilient means, not shown, are provided for holding the cam rollers in engagement with the cam. The shape of the cam surface is such that, as the cam rotates from the position indicated in Figure 1, the picker moves down a short distance to a position such as indicated in Figure 3, remains in this position for a period of time, and thereupon returns to its elevated position, shown in Figure 1. The cam 39 and link 36 are duplicated on the opposite side of the machine, as illustrated in Figure 2, for purposes of greater mechanical strength and rigidity of the picker support.

Air is exhausted from the picker nozzle during its downward movement, so that the lowermost blank of the stack is caused to follow this movement. This operation, therefore, serves for the purpose of deflecting the free end of the blank away from the stack through a slight angle, such as indicated in Figure 3. The upward movement of the picker serves merely to re-apply the nozzle to the stack. It will be observed that the nozzle is held in engagement with the stack during an entire half revolution of the cam, so that a sufficient time interval is provided for the suction nozzle to secure the proper hold on the blank. A separator 101 (Figure 2) of usual construction, is provided for supporting the forward edge of the stack, and for preventing more than one blank being carried down by the picker nozzle at a time.

The tilting operation of the picker is for the purpose of permitting the picker to be returned to its upper position without obstructing the path of the blank which has

just been carried down. This tilting takes place about pivots 40 located in links 36 at points close to the forward edge of the stack, the supporting rod 32 of the picker being carried in pivots 40 by means of crank arms 41. For effecting the tilting movement, one of the cranks 41 is provided with a right angled extension 41ª which is connected by means of a link 42 to a lever 43 mounted to swing about a pivot 44 fixed in the frame of the machine. A roller 45 carried by the end of lever 43 cooperates with a cam 46 mounted on cam shaft 39. Suitable resilient means are provided for holding the roller in engagement with the cam. Cam 46, it will be observed, is circular throughout the greater portion of its circumference, except for a small portion 46ª. It is this portion which serves to rock lever 43 about pivot 44, the movement impressed on roller 45 being communicated to the picker through lever 43 and link 42.

It will be observed that the rocking movement of the picker is timed so as to occur when the picker is moving from its lower to its upper position. The tilt of the picker, as illustrated in Figure 5, is such that its edge clears the leading edge of the detached blank as the picker returns to its upper position. Upon reaching this position, the nozzle is returned to the horizontal position and is thus brought into operative engagement with the stack, as illustrated in Figure 7.

To provide clearance for the rocking movement of the picker, roll 21 is provided with a circumferential recess 47, slightly greater in width than the picker nozzle, into which recess the picker projects in its tilted position, as indicated in Figure 5. The movement of the picker nozzle may be adjusted by means of a horizontal slot 48 in lever 43, and a vertical slot 49 in lever 41ª.

As hereinabove mentioned, the two motions of the picker, namely the movements about centers 35 and 40, respectively, are independent of each other, either movement being capable of being performed without causing appreciable effect on the other. Undue wear or binding of the parts is thus eliminated and adjustment is facilitated. This is accomplished in the preferred form of embodiment by placing the point 43ª at which link 42 is fulcrumed to 43 close to the center 35. For purposes of practical design, this condition need only be approximated, as apparent from the drawings, because of the smallness of the movements involved. Lever 43, moreover, is pivoted at such a point that its movement in response to cam 46 causes point 43ª to move in a direction substantially radial to center 35, i. e., in a line connecting center 35 with the point 42ª at which lever 42 is joined to crank 41ª. By virtue of this feature, the rocking motion of the picker is made independent of the angular position of the link 36. The slot of crank 41ª, furthermore, extends from center 40 in a direction substantially concentric to point 43ª and the slot in the end of lever 43 extends substantially concentric to pivot 44, so that the above-named condition holds true irrespective of the particular position to which link 42 may be adjusted. Each of the link mechanisms is thus capable of effecting its movement without interference from the other, and adjustment of one movement may be made without upsetting the adjustment of the other movement.

While the pneumatically operated picker thus serves to bring about an initial deflection of the blank from the stack, the insertion of the blank into the feed rolls is accomplished by the mechanically acting deflector D, the movement of which is in a direction substantially at right angles to the deflecting movement of the picker, namely in a plane substantially parallel to that of the blanks in the stack.

In the illustrated preferred form of embodiment, the deflector consists of a bifurcated member 50, the forks of which are spaced from each other a sufficient distance to permit nozzle 28 to move between them. The deflector is mounted on a crank 51 pivoted on a shaft 52 journaled in side frames 3. This shaft is provided with a crank 54 having a cam roller 55 which cooperates with a cam 56. The shape of this cam is such as to cause an in-and-out movement of the deflector during each rotation of the cam. The inward movement commences when the picker is in its lower position, illustrated in Figure 3, and serves to introduce the deflector between the stack and the sheet detached therefrom by the picker. As this inward movement continues the beveled edge 57 of the deflector passes over the face of the free end of the blank, thus bearing obliquely thereon and consequently deflecting the same further from the stack, until the tip of the blank enters into the cup 22 of feed roller 21, as illustrated in Figure 6. At its innermost position the deflector actually forces the blank against roller 21, as illustrated in Figure 7. At this time the edge of cup 22 engages the blank and thus clamps the same between the rolls. The cam now causes the deflector to be withdrawn to its outer position in which it remains during the downward movement of the picker, so that the edge 57 is out of the path of movement of the blank which subsequently is carried down by the picker.

It should be noted that the deflector in its inward and outward movements is guided by means of an extension 50ª which runs between rollers 59 and 60, the former of which is adjustably mounted on a shaft 61 fixed in the frame of the machine, and the latter of which is mounted on a bracket 62 adjust-

ably secured on shaft 61 by means of a collar 63. The shape of extension 50ª and the positions of rollers 59 and 60 are such that the inward and outward movements of the deflector are in a plane substantially parallel to the plane of the sheets in the stack.

From the above description of the various parts and their functions, the operation of the complete machine will be readily understood. In the position illustrated in Figure 1, the picker nozzle is partially exhausted of air and is firmly pressed against the stack, so that when a moment later it is moved downward, the lowermost blank is carried along into the position shown in Figure 3. The deflector D now moves inwardly between the blank and the stack, but out of contact with the stack, into the position shown in Figure 4. It should here be observed that the forks of the deflector, because of their closeness to the side of the nozzle, enter over the lowermost portion of the blank. This portion of the blank, however, is held by the picker nozzle at a small distance below the deflector forks. Engagement of the tip of the deflector with the edge of the blank is thus prevented. The deflector, in fact, has ample clearance between both the stack and the blank, so that the need of maintaining great nicety of adjustment is obviated.

The deflector remains in the position of Figure 4 for a short period of time in order to permit the roller 21 to come into position for receiving the tip of the blank within its cup. During this time the picker releases its hold on the blank (see Fig. 5), and commences its return movement, with the picker nozzle tilted so as to avoid contact with the leading edge of the blank. The deflector then recommences its inward movement and thus bends the leading edge of the blank (see Figure 6) into the cup of roller 21, as hereinbefore described. The picker nozzle at this time has completed its return movement and is about to engage the next blank of the stack. As this engagement takes place the deflector finishes its inward movement and the feed rolls bite the deflected blank between them so as to pull it out of the stack and pass it to subsequent operating mechanism not shown in the drawing. It should here be observed that the roll 20 is placed so close to the stack that the leading end of the blank is literally bent about the roll when the deflector approaches the roll. As soon as the feed rolls take hold of the blank, the deflector is quickly withdrawn into the initial position shown in Figure 1, so as to be out of the path of the deflection movement of the next blank. This movement takes place a moment later, suction having been restored in the picker nozzle the moment the same entered into engagement with the stack. The train of operation is then repeated.

It will thus be apparent that the cycle of operations of the picker and deflector overlap each other, the one being reset into position for its next operation while the other is either performing its operation or commencing to perform the same. The total period of time for the composite cycle is thus materially reduced. Each separating member, moreover, i. e., the picker as well as the deflector, is moved out of the path described by the blank when acted upon by the other separating member, so that the movement of the blank is entirely unobstructed. Each operating member of the present form of construction, furthermore, performs a function which is simple in itself, and all parts are of rugged design. High speed of operation therefore may not only be reached but actually maintained for indefinite periods of time.

Although I have herein shown and described only one form of mechanism embodying the invention, it will be readily understood that many changes and modifications may be made therein within the scope of the following claims without departing from the spirit and scope of the invention, it being my intention to claim the same broadly in whatever form its principles may be employed.

What I claim is:

1. In combination, stationary means for supporting a stack of blanks with their leading ends free to be deflected from the stack, and means for deflecting individual blanks of the stack, said means comprising a plurality of deflecting members operable in succession on a blank for effecting successive deflections thereof, and means for removing the first deflecting member from the path described by the blank under the action of the second deflecting member.

2. In combination, stationary means for supporting a stack of blanks, means for withdrawing blanks from the stack, and a plurality of blank moving devices for operating in succession on individual blanks of the stack for inserting the leading ends thereof into said withdrawing means, and means for each of said devices for withdrawing the same from the path described by the blank when operated upon by the other of said devices.

3. In combination, means for supporting a stack of blanks with their leading ends free to be deflected from the stack, means for deflecting individual blanks of the stack, said means comprising a plurality of members for effecting successive deflections thereof, each of said members projecting into the path described by the blank upon deflection from the stack, and means for withdrawing each member from said path of movement during deflection operation of the other member so as to provide clearance between the blank and said member.

4. In a device for detaching individual

blanks from a stack of such blanks, the combination of a plurality of deflecting members operable in sequence for deflecting blanks from the stack, and operating means for reciprocating each of said members to cause, during the deflecting operation of either of said members, the retraction of the other of said members, into position for the next ensuing operation.

5. In combination, stationary means for supporting a stack of blanks, a plurality of reciprocating deflecting members acting in succession on individual blanks for deflecting the same from the stack, one of said members being arranged to engage the blank by pneumatic force, and the other of said members being arranged to engage the blank by mechanical force.

6. In combination, means for supporting a stack of blanks with their leading edges free to be deflected from the stack, a picker for initiating deflecting movement of an individual blank of the stack, a deflector for carrying further said deflecting movement and being positioned above the nozzle of the picker and substantially parallel thereto prior to its engagement with said blank, said picker and deflector operating in non-intersecting paths.

7. In combination, means for supporting a stack of blanks with their leading edges free to be deflected from the stack, a picker for initiating deflecting movement of the blank, and a deflector for carrying further said deflecting movement, and means whereby the picker is withdrawn from the path of the blank and reset into position for the next ensuing operation during the operation of the deflector.

8. In a device for removing individual blanks from a stack of such blanks, conveying mechanism, means reciprocable in a direction substantially at right angles to the blanks of the stack for detaching individual blanks from the stack, and means reciprocable in a direction substantially parallel to the plane of the blanks for inserting said blanks into said conveying mechanism.

9. In a device for removing blanks from a sack of such blanks, conveying means for the blanks, a picker operable by pneumatic force for detaching a portion of a blank from the stack, reciprocating means operable subsequently to said picker for engaging the blank to cause the same to enter said conveying means, and means for resetting the picker into operative position during the period of operation of said reciprocating means.

10. In combination, means for supporting a stack of blanks, means for withdrawing the blanks from said stack, means for inserting individual blanks of said stack into said withdrawing means, said means comprising a member for entering between the blank and the stack, and means for retracting the said member to position for the next ensuing operation while the said withdrawing means is operating.

11. In combination, stationary means for supporting a stack of blanks with their leading ends free to be deflected from the stack, means for deflecting individual blanks from said stack, said means comprising a picker for providing initial deflection of the blank from the stack, a deflector for providing a further deflection of the blank from the stack, and means whereby said deflector is caused to bear obliquely against the face of the blank and to reciprocate longitudinally over the greater portion of the leading free end of the deflected blank.

12. In a device for deflecting individual blanks from a stack of such blanks, means for causing an initial deflection of a blank from the stack, means operable in a plane approximately parallel to that of the blanks of the stack for causing an increase in the deflection of the blank, and means for retracting either of the said means when the other is operating.

13. In combination, means for supporting a stack of blanks with their ends free for being deflected from the stack, means movable at right angles to the blanks of the stack for slightly deflecting individual blanks from the stack, means operable in a plane substantially parallel to that of the blanks of the stack for increasing the deflection of the blanks from the stack, means for resetting either of the said means when the other is operating, and means for withdrawing either of said means from the path of the blank, under the action of the other of said means.

14. In combination, means for supporting a stack of blanks with their leading ends free to be deflected from the stack, means for withdrawing the blanks from said stack, said means comprising a plurality of rotating elements, and means for deflecting individual blanks from the stack and inserting the same into said removing means, said removing means being placed directly below the free ends of the blanks with one of said elements so close to the stack that the blank to be inserted into the removing means is substantially tangential to said rotating element.

15. In combination, stationary means for supporting a stack of blanks with their leading ends free to be deflected from the stack, a plurality of feed rolls for removing individual blanks from the stack, one of said rolls being provided with a cup for receiving the leading tip of a deflected blank, and the other of said rolls being placed in such position with reference to said first-mentioned roll and the supporting means for the stack that the blank, in order to be inserted between the rolls, must be laid against the first-mentioned roll, and means for deflecting in-

dividual blanks from the stack and laying them against said roll.

16. In combination, means for supporting a stack of blanks, a picker for deflecting the leading ends of individual blanks away from the stack, first means for impressing movement on said picker about a first center approximately in the plane of the blank about to be deflected, and second means for impressing movement on said picker about a second center approximately in line with the forward edge of the stack.

17. The device according to claim 16, in which the said first and second means comprise mechanism whereby either of said movements of the picker may be effected independently of the other movement.

18. The device according to claim 16, in which the first means comprises a member containing a point movable close to, and in a direction substantially parallel to, the leading edge of the stack and in which the said second center is placed at the said point.

19. In combination, a pneumatic picker, means whereby said picker is mounted to be free to rotate about either of a plurality of centers, and means for rotating said picker about either of said centers without appreciable rotation about the other of said centers.

20. In combination, a pneumatic picker, means whereby said picker is mounted to be free to rotate about either of a plurality of centers, a cam for controlling movement of the picker about one of said centers, a second cam for controlling movement of the picker about the other of said centers, and means whereby each of said cams is rendered effective to exercise its control over the picker independently of the other cam.

21. In a device for detaching individual blanks from a stack of such blanks, the combination of a pneumatic picker and a mechanical deflector for operating on the blanks in succession to deflect the same from the stack, and means for returning the picker into operative engagement with the stack during the time the said deflector is engaged in its deflecting operation.

22. In a feeding mechanism, a table for supporting a stack of blanks with their leading ends extending over the forward end of the table, a plurality of feed rollers, a pneumatic picker, a link, means for operating said link, means for pivotally mounting said picker on said link, means for rocking said picker about said pivot, a deflector, means for reciprocating said deflector, means for guiding said deflector to move substantially parallel to the blanks of the stack to introduce the leading end of a blank into the feed rollers.

23. In a machine of the kind described, in combination, a picker for engaging a blank of a stack adjacent one edge of the blank for deflecting it, and a deflector reciprocable in a path substantially parallel to the planes of the blanks in the stack and at right angles to the deflected edge of the blank.

24. In a blank feeding apparatus, in combination, means for supporting a stack of blanks with their leading margins extending clear of the support and with their rear margin pressed toward the support, a pair of cooperating feed rolls near the stack, one of said rolls having a gap therein, and means operating between the stack and the feed rolls and in non-intersecting relation to the latter for bending an end blank of the stack to introduce the leading end thereof into the feed roll gap and between the feed rolls before the blank has been separated bodily from the stack.

25. In combination, means for supporting a stack of blanks, a picker for deflecting the leading ends of individual blanks away from the stack, first means for impressing movement on said picker about a first center approximately in the plane of the blank about to be deflected, and second means for impressing movement on said picker about a second center approximately in line with the forward edge of the stack, said first means comprising a lever pivoted at the first center and containing a point movable close to and in a direction substantially parallel to the leading edge of the stack, the second center being placed at said point.

26. The device according to claim 25, in which the mechanism for effecting movement about the second center comprises a link having a point located close to the first center, means for moving said link so as to cause the said point thereof to move in a direction approximately radial to said first center, and means for effecting movement of the picker about the second center.

27. In a device for separating individual blanks from a stack of such blanks, means for securing an initial separation of a blank from the stack, a stack to further deflect said blank, and means for guiding said member so as to provide clearance between said member and the stack and between the member and the blank and for maintaining movement thereof substantially parallel to the plane of the blank.

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