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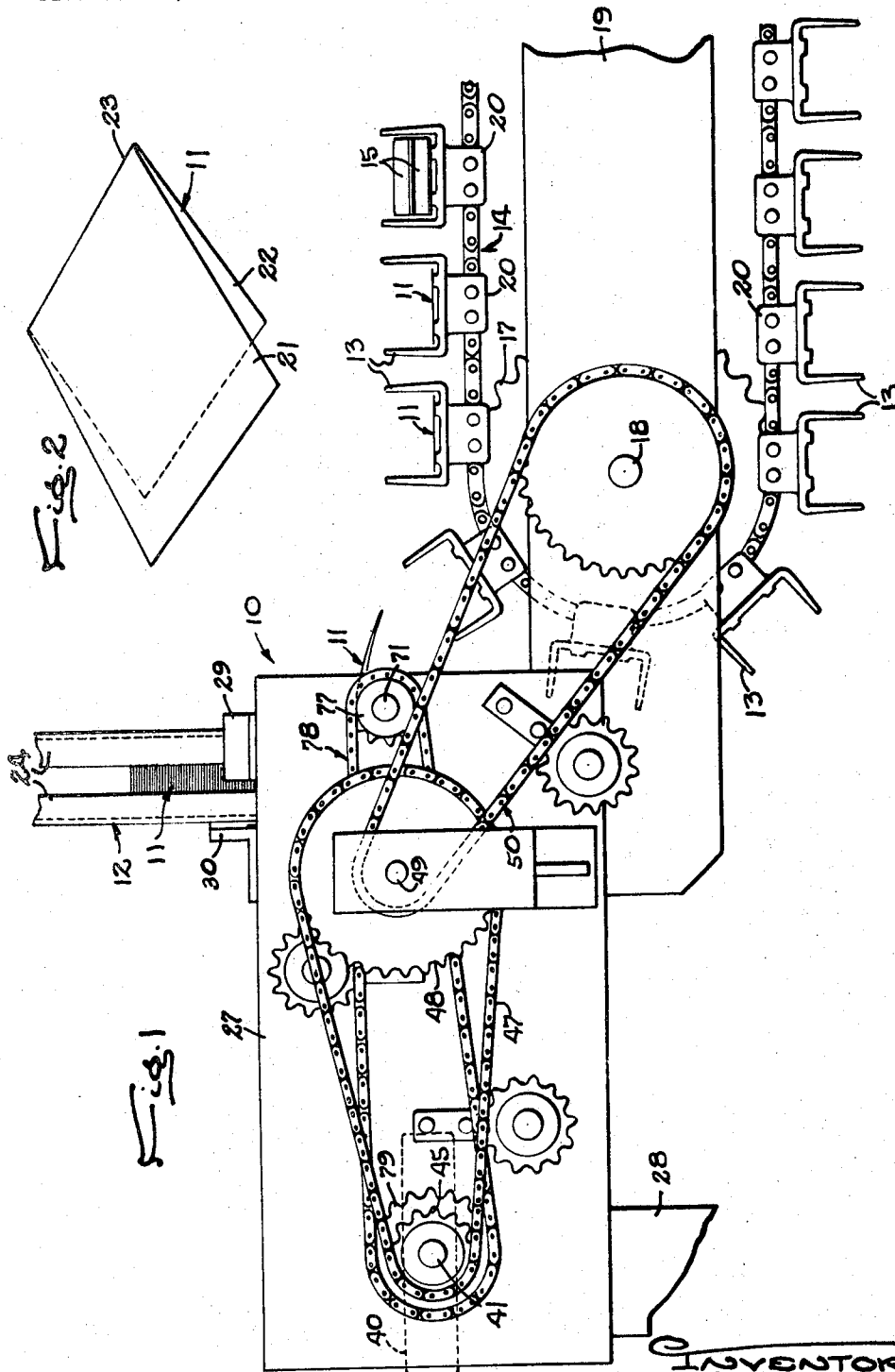
C. J. BEERT ET AL

3,390,875

COUPON FEEDER

Filed Oct. 6, 1965

3 Sheets-Sheet 1



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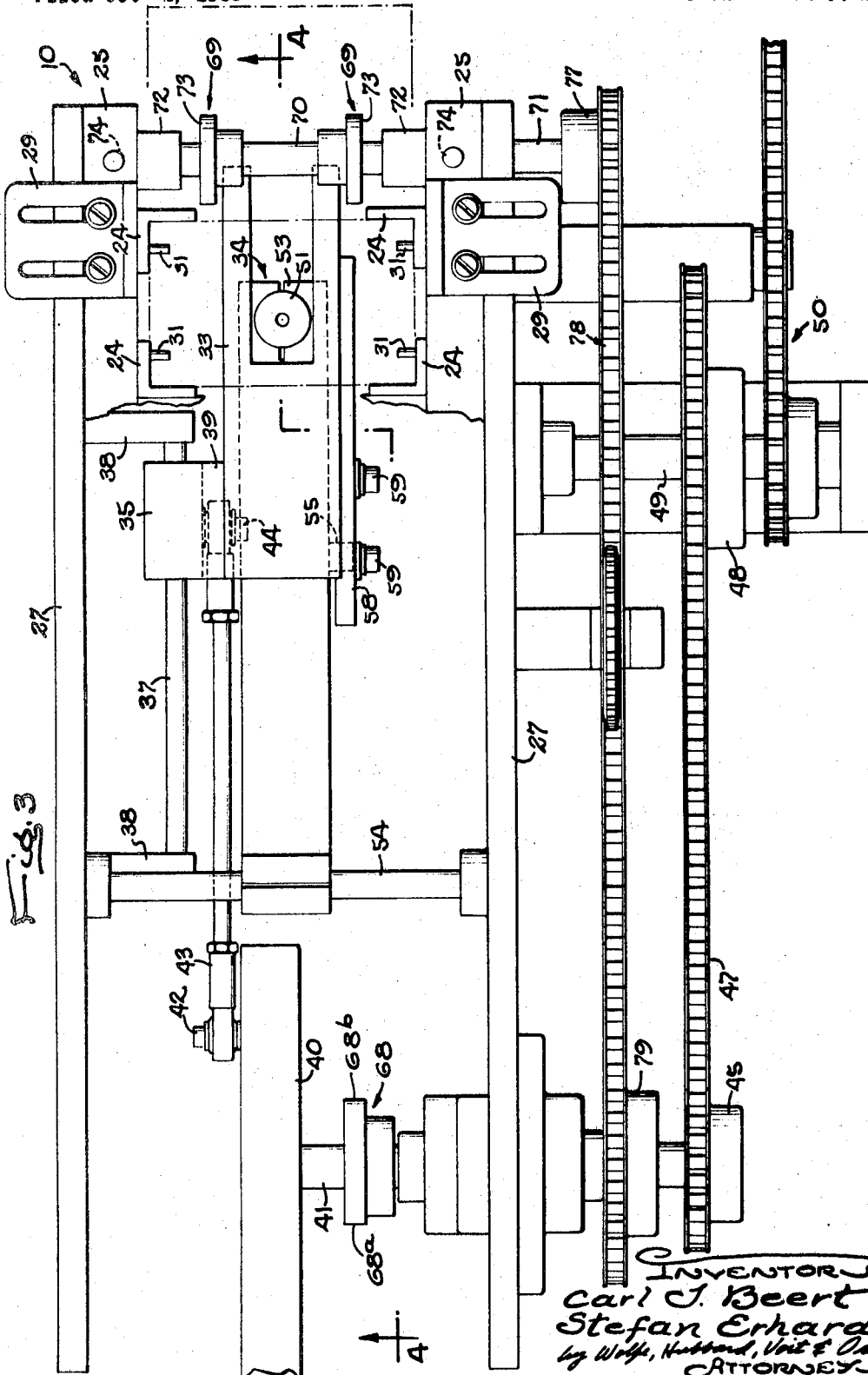
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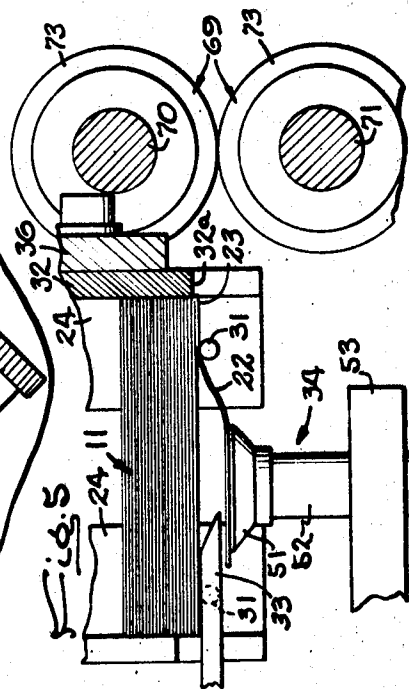
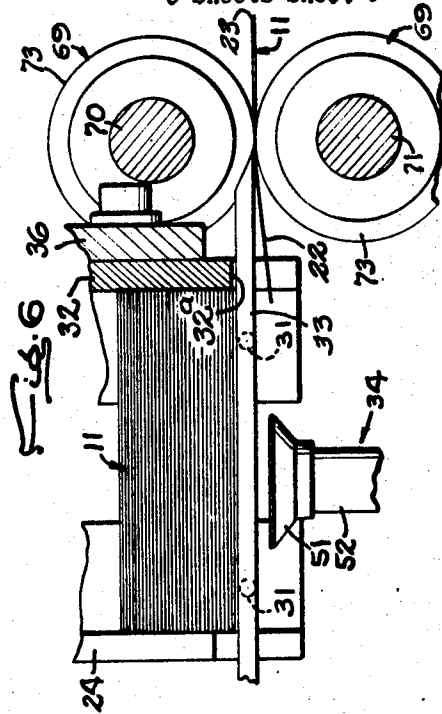
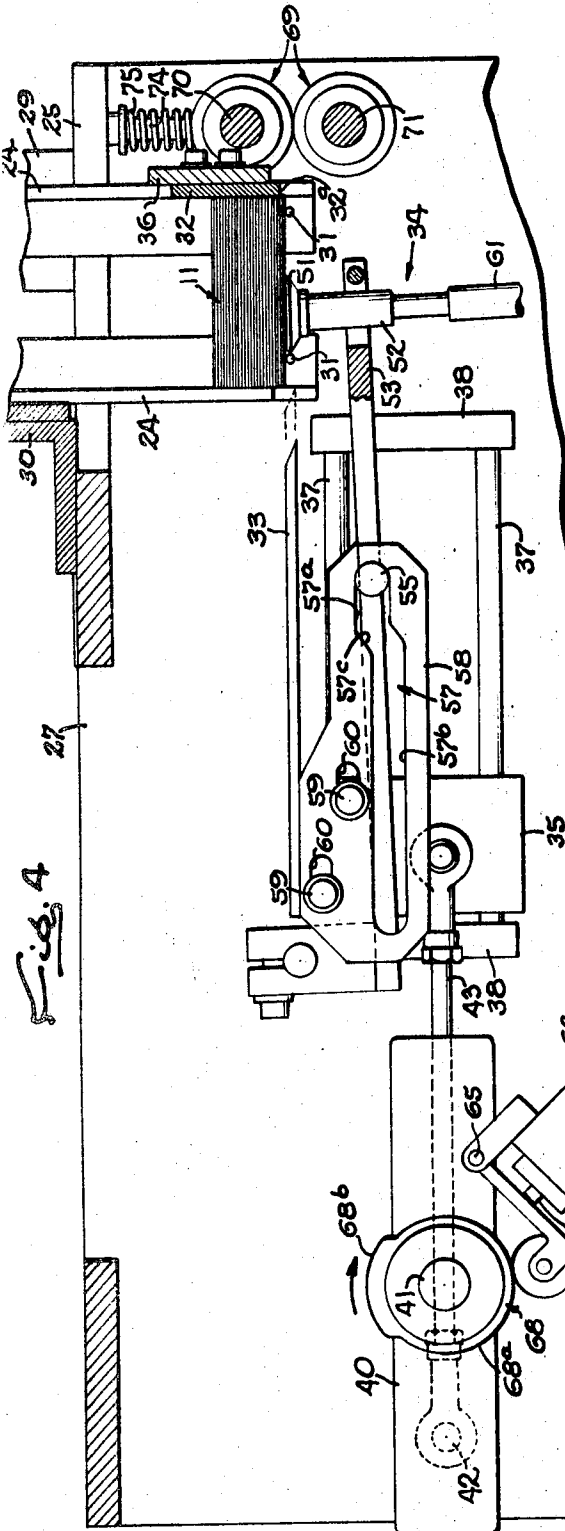
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3 Sheets-Sheet 3



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COUPON FEEDER

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ABSTRACT OF THE DISCLOSURE

Apparatus for removing folded coupons from a stack which is supported in a magazine having an open lower end with detent pins underlying the terminal coupon to support the stack in the magazine. Each coupon is folded to form a shorter sheet or flap exposed at the bottom of the stack, and the terminal coupon in the stack is aligned with a laterally opening gate for edgewise removal from the magazine. A reciprocating suction cup separator beneath the magazine moves up and down to grip the flaps of the terminal coupons and pull the flaps away from the bottom of the stack, and a laterally reciprocating finger moves back and forth across the lower end of the magazine to move between the two sheets of each coupon, engage the fold thereof, and push the coupon laterally through the gate into a stripper comprising two pairs of rollers for ejecting the coupons from the separating mechanism. The finger and the separator are mechanically connected to convert the reciprocation of the finger into timed movement of the separator, and a bucket conveyor is provided for receiving coupons from the stripper.

This invention relates to the feeding of flexible articles out of a stack and, more particularly, to the removal of coupons in the form of folded flexible strips one by one from a magazine for insertion in receptacles.

The general object of the present invention is to provide a new and improved coupon feeding apparatus which is relatively simple in construction and operation, positive in operation, and can be operated at high speeds despite the flimsy nature of the material being handled.

Another object is to use a reciprocating blade or finger for entering between two sheets of the folded strip and engaging the fold to transfer the strip edgewise out of the stack, and to combine with the reciprocating blade a novel separator for pulling the sheets apart and enabling the blade to enter and transfer successive strips at high speed.

A further object is to utilize the reciprocating motion of the blade in a novel manner to operate the separator at high speed and in precisely timed relation with the blade.

A more detailed object is to connect the separator mechanically and directly to the reciprocating blade in a novel manner such that the forward stroke of the blade produces the separating stroke of the separator, while the return stroke of the blade produces the return stroke of the separator, the respective motions being timed and precisely correlated with each other to permit substantially higher speed operation than has been practical with prior apparatus of this general character.

Another object is to effect the rapid removal of the coupons from the blade and discharge thereof from the feeding apparatus in a simple and effective manner.

Still another object is to facilitate the adjustment of the apparatus to coupons of different thicknesses.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

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FIGURE 1 is a fragmentary side elevational view of a machine equipped with a feeding apparatus embodying the novel features of the present invention.

FIG. 2 is an enlarged perspective view of a representative coupon.

FIG. 3 is an enlarged fragmentary plan view of the feeding apparatus.

FIG. 4 is a fragmentary cross-sectional view taken substantially along the line 4-4 of FIG. 3.

FIGS. 5 and 6 are enlarged views of a portion of FIG. 4 showing successive steps in the feeding of the coupons.

As shown in the drawings for purposes of illustration, the invention is embodied in an apparatus 10 for removing coupons 11 one by one from a stack supported in a magazine 12 and delivering the coupons to receptacles in the form of buckets 13 spaced along a conveyor 14 moving past the magazine. In such a machine, one or more packages 15 (FIG. 1) may be inserted in each bucket either before or after the coupon is delivered to the bucket. Herein, the coupons are shown as being placed on the bottoms of the buckets near the upstream end of the conveyor prior to insertion of the packages.

The illustrative conveyor 14 comprises a pair of side-by-side endless chains disposed in spaced vertical planes and trained around two sets of sprocket wheels 17 on horizontal shafts 18 journaled on elongated horizontal rails 19 extending along opposite sides of the conveyor. Since the conveyor construction is well known, it is shown only partially herein. One of the shafts 18 is power rotated, either continuously or with an intermittent motion, to advance the buckets 13 from left to right along the upper runs of the chains. Each bucket is of U-shaped cross-section opening upwardly along the upper runs of the chains, and is secured to the chains by lugs 20 depending from its underside.

As shown in FIG. 2, the illustrative coupons 11 comprise two side-by-side sheets 21 and 22, the lower sheet 22 being slightly shorter than the upper sheet 21 to constitute a flexible flap which herein is joined to the upper sheet by a fold 23. Obviously, the sheets of the coupon may be joined together by other means. A stack of such coupons is supported in the magazine 12 which herein comprises four vertical bars 24 of right angle cross-section each receiving one corner of the stack. The angle bars project upwardly from two parallel supports 25 (see FIG. 3) disposed along the adjacent sides of two parallel side plates 27 supported as shown in FIG. 1 on a post 28 and on the left ends of the rails 19. The bars are secured to the supports by L-shaped brackets 29 and 30 (FIGS. 1 and 3) permitting adjustment of the size of the magazine for different sizes of coupons.

Projecting part way across the lower or discharge end of the magazine from the angle bars 24 are four supports, herein in the form of detent pins 31, which underlie the opposite edge portions of the terminal coupon 11 of the stack to support the latter in the magazine. Each coupon is arranged in the stack with its shorter sheet 22 facing downwardly and thus exposed when the coupon reaches the lower end of the stack, and with the fold 23 at the right side of the magazine. Because the coupons are composed of flexible material, the pins hold each terminal coupon in the magazine but permit easy release and withdrawal of the shorter sheet downwardly through the discharge end. It will be seen in FIGS. 5 and 6 that the bars 24 are cut away on the right and left sides of the magazine, and on the right side, the lower edge of a plate 32 extending between the bars is disposed just above the lower coupon in the stack, forming a gate 32^a through which successive coupons may be shifted edgewise out of

the magazine. The plate 32 is supported on a crossbar 36 spanning the angle bars 24, the plate being adjustably secured to the crossbar by a plurality of screws as shown in FIG. 4.

The present invention contemplates a new and improved apparatus 10 for positively separating and removing successive folded coupons 11 one by one from the magazine 12 at high speed despite the flimsy nature of the coupons. For this purpose, a blade or finger 33 is supported for back and forth reciprocation across the discharge end of the magazine from the side thereof opposite the folds 23, and a separator 34 is supported beneath the magazine to grip the exposed side of the terminal coupon and pull its flap 22 downwardly prior to the passage of the blade across the magazine to insure that the blade enters the coupon and engages the fold. Moreover, the separator is connected to and operated by the reciprocating blade to synchronize the separator motion precisely with the blade motion.

In this instance, the blade 33 is a flat elongated plate supported at one end on a car formed by a block 35 (FIGS. 3 and 4) slidable back and forth along parallel guide rods 37 supported between two brackets 38 on the rear side plate 27 on the left side of the magazine. Projecting laterally from the upper end portion of the block is a bar 39 to which the left end of the blade is fastened with the free end portion of the blade projecting cantilever fashion toward the right at a level immediately below the level of the terminal coupon in the magazine. The blade is narrower than the spacing of the detent pins 31 and passes between the pins with its upper side approximately level with the upper sides thereof.

To impart back and forth motion to the blade 33, the car 35 is slid back and forth along the guides 37 by a rotating crank 40 fastened intermediate its end to a shaft 41 and having a pivot 42 adjacent one of its ends carrying a connecting link 43 which is pivoted at 44 on the side of the car. As the crank turns clockwise (FIG. 4) with its supporting shaft, the pivot 42 revolves about the shaft axis to shift the link generally endwise back and forth and reciprocate the car along the guides. Herein, the crank is driven with the conveyor 14 to reciprocate the blade in timed relation with the movement of the buckets 13. The crankshaft 41 carries a sprocket wheel 45 driven by an endless chain 47 trained around a second sprocket wheel 48 on a parallel intermediate shaft 49, and this shaft is driven by a chain-and-sprocket connection 50 with the conveyor shaft 18.

The separator 34 comprises an upwardly opening suction cup 51 mounted on the upper end of a pipe 52 clamped in the split end of a generally horizontal lever 53 pivoted at its left end on a shaft 54 spanning the side plates 27 (see FIG. 3) with the free end portion of the lever disposed below the path of reciprocation of the blade 33 and the suction cup disposed below the discharge end of the magazine 12. Thus, up and down rocking of the free end portion of the lever swings the suction cup toward and away from the bottom of the stack of coupons in the magazine.

As shown most clearly in FIGS. 3 and 4, a follower roller 55 mounted on the lever 53 between the pivot shaft 54 and the suction cup 51 projects laterally from the lever parallel to the pivot into an elongated slot 57 in a plate 58 bolted at 59 to the end of the bar 39 on which the blade 33 is supported. This plate thus is mounted for back and forth reciprocation with the blade and moves back and forth generally parallel to the lever. The slot is slightly wider than the diameter of the pin and formed with a right end section 57^a that is offset upwardly from the left end section 57^b and is joined to the latter by a section 57^c that is inclined downwardly and to the left relative to the path of reciprocation of the blade.

With this arrangement, the walls of the slot 57 form a cam for raising and lowering the free end portion of the

lever 53 as the blade 33 moves horizontally back and forth, thereby converting this horizontal motion into vertical motion of the suction cup 51. When the blade is retracted (FIG. 4), the roller 55 is disposed in the higher section 57^a of the slot and the suction cup is held against the underside of the stack. As the blade moves through the initial portion of its forward stroke toward the magazine 12, the roller rides along the slot and into the inclined section 57^c by which it is lowered an amount equal to the offset of the two end sections of the slot, thereby swinging the cup proportionally away from the stack. The lever remains in the lowered position as the blade completes its forward stroke and until it again approaches the retracted position during the return stroke. Then, the roller rides up along the inclined section into the higher section to return the cup to its raised position.

The bolts 59 holding the cam plate 58 on the bar 39 pass through horizontally elongated slots 60 (FIG. 4) in the plate which thus is adjustable relative to the blade to vary the timing of the up and down motion of the separator relative to the back and forth blade motion. The downward stroke occurs just before the tip of the blade reaches the left side of the magazine 12 as shown in broken lines in FIG. 4, and the upward stroke occurs just after the tip passes from under the magazine back to this position.

Vacuum is applied to the suction cup 51 through the pipe 52 and a flexible tube 61 (FIG. 4) communicating with a vacuum valve 62 opened and closed by an operator button 63 and a lever 64 pivoted at 65 on one side of the valve body for movement toward and away from the end of the latter in engagement with the button. On the free end of the lever is a follower roller 67 engageable with a cam 68 mounted on and rotating with the crankshaft 41. When the roller is in engagement with the peripheral surface 68^a of the cam, the lever 64 is in the position shown in FIG. 4 with the button moved outwardly and the valve open to create suction within the cup. When the lobe 68^b of the cam engages the roller in passing, the valve is closed and the suction is released for release of a coupon 11 by the separator 34. It will be seen that the angular relation of the cam lobe and the crank 40 is such that the suction is released just before the blade 33 reaches its fully extended position, while the cup is in its lowered position, and is applied after the blade begins its retracting stroke and before the cup again is raised.

Cooperating with the blade 33 to complete the removal of the coupons 11 from the magazine 12 is a stripper formed by two pairs of rollers 69 disposed on opposite sides of the tip of the blade in the extended position of the latter (see FIG. 3) and power-rotated in frictional engagement with each other to grip the folded edge portions of successive coupons, draw the latter off the blade, and kick the coupons to the right ejecting the latter from the apparatus for insertion in the buckets 13. As shown in FIGS. 3-6, the rollers are mounted on vertically spaced shafts 70 and 71 journaled in bearings 72 (FIG. 3), and each comprises two disks 73 spaced apart along the respective shaft a distance less than the width of the coupons but greater than the width of the blade 33 to permit the latter to pass freely through the rollers. The bearings 72 for the upper shaft 70 are carried on two vertical pins 74 depending from the supports 25 and are urged downwardly by compression springs 75 (FIG. 4) coiled around the pins thereby to press the upper roller disks yieldably against the lower roller disks.

As shown in FIGS. 1 and 3, the lower shaft 71 projects through and beyond the front side plate 27 and carries a sprocket wheel 77 rotated clockwise by an endless chain 78 driven by a sprocket wheel 79 on the crankshaft 41. Thus, each coupon 11 shifted to the right through the gate 32 by the blade 33 is inserted between the rollers 69 as shown in FIG. 6 and then is stripped off the blade and propelled edgewise to the right away from the magazine.

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In operation, assuming that the blade 33 is retracted as shown in FIG. 4 and the crank pivot 42 is at the beginning of its upward swing, the follower roller 55 will be disposed in the upper section 57^a of the cam slot 57 with the suction cup 51 raised against the flap 22 of the terminal coupon 11 in the magazine 12. The vacuum valve 62 is open so that suction is applied to the cup and the latter grips the flap. As the crank pivot swings upwardly and to the right, the car 35 and the blade move to the right toward the magazine and the follower rides along the cam slot toward the inclined section 57^c, entering the latter when the blade tip is in the position indicated by broken lines in FIG. 4. This shifts the suction cup quickly down to its lowered position and pulls the flap down past the detent pins 31 and away from the other sheet 21 of the coupon for entry of the blade in the manner shown in FIG. 5. As the blade continues to the right, the tip engages the fold 23 and pushes the coupon edgewise through the gate 32 and between the rollers 69. The cam lobe 68^b engages the follower roller 67 to rock the lever 64 counterclockwise and close the vacuum switch 62 to release the suction just before the blade begins to push the coupon to the right, thereby releasing the flap for free movement of the coupon out of the magazine.

As soon as the right edge portion of the coupon 11 passes between the rollers 69, the coupon is gripped and propelled to the right by the disks 73 (see FIG. 6) which thus strip the coupon from the blade 33 and feed the coupon into a passing bucket 13. Then the blade begins to move back to the left as the pivot 42 swings downwardly and back to the left, shifting the cam plate 58 to the left relative to the follower roller 55. The cam lobe 68^b moves off the follower roller 67 at the beginning of this return stroke to permit reopening of the vacuum valve, and the inclined slot section 57^c raises the suction cup back into engagement with the bottom of the stack as the blade approaches the end of its stroke. The entire cycle is repeated automatically, beginning again as the crank pivot swings back upwardly and to the right.

It will be seen that the automatic cycle may be accomplished at the very high speeds that are being sought in modern packaging machines despite the filmy and difficult-to-handle nature of the coupons 11. Of course, the folded coupon is not sufficiently thick to permit separation of successive coupons by a tool that works on the exposed edges at one side of the stack. Moreover, prior relatively slow machines that utilized reciprocating blades were not effective at higher speeds to insure entry of the blades into the terminal coupons. With the present arrangement, the separation of the sheets for entry of the blade 33 does not limit the practical speeds of the machine. The feeder is capable of feeding filmy folded coupons out of a stack at speeds as high as or higher than the production rate of the rest of the machinery with which it is used.

We claim as our invention:

1. In an apparatus for feeding coupons comprising two flexible sheets joined together by a fold, the combination of, an upright magazine for holding a stack of such coupons with the folds along one side of the magazine and having a lower discharge end for the edgewise removal of successive coupons from the stack, means on said magazine for holding the exposed sheet of the terminal coupon releasably against the bottom of said stack, a lever having a free end portion extending generally horizontally across said discharge end and swingable toward and away from the latter between a raised position closely adjacent said discharge end and a lowered position spaced below the latter, a suction cup on said free end portion engageable with the exposed sheet of said terminal coupon in said raised position, a blade supported for back and forth reciprocation along a horizontal path across and closely adjacent said discharge end and generally parallel to said free end portion, said blade being movable through a forward stroke toward said one side

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into an extended position from a retracted position on the other side of said magazine, and then through a return stroke back to said retracted position, mechanism for reciprocating said blade back and forth between said positions, a cam carried by said blade, a follower on said free end portion slidably engaging said cam, the latter being shaped to move said lever to said raised position during each return stroke and to said lowered position during the initial portion of each forward stroke, and means applying suction to said cup in said raised position and releasing the suction after the exposed sheet has been separated from said stack for entry of said blade into each successive terminal coupon in the stack.

2. Apparatus as defined in claim 1 further including means for stripping said coupons from said blade in said extended position and discharging the coupons from said apparatus.

3. Apparatus as defined in claim 2 in which said stripping means include a pair of rollers frictionally engaging the opposite sides of the coupon on said blade when the latter is in said extended position, and means rotating said rollers in a direction to draw each coupon off the blade and discharge the coupon away from said magazine.

4. In an apparatus for feeding strips comprising two flexible sheets joined together by a fold, the combination of, a magazine for holding a stack of such strips with the folds along one side of the magazine and having a discharge end for edgewise removal of successive strips from the stack, means on said magazine for holding said stack with the exposed sheet of the terminal coupon movable away from the stack, a lever pivotally supported on said frame and having a free end portion extending across said discharge end and swingable toward and away from the latter between an extended position closely adjacent the discharge end and a retracted position spaced therefrom, means on said free end portion for gripping the exposed sheet in said extended position and pulling the sheet away from the stack as the lever swings to said retracted position, a blade reciprocable back and forth along a predetermined path across said discharge end generally parallel to said lever and passing between said extended and retracted positions, said blade being movable from a first position on the other side of said magazine to a second position across said discharge end, mechanism for reciprocating said blade through a forward stroke toward said second position and a return stroke toward said first position, and means connecting said lever to said blade and converting the reciprocation of the latter into swinging movement of the lever to said extended position during each return stroke and to said retracted position during the initial portion of each forward stroke whereby the exposed sheet of each terminal strip is positively separated from said stack for entry of said blade and edgewise removal of the strip thereby.

5. In an apparatus for feeding articles having flexible flaps on one side, the combination of, means for supporting a stack of articles in side-by-side relation for edgewise removal from the stack with the flap of the terminal article forming one end of the stack and movable away from the stack, a separator supported adjacent said one end for movement toward and away from the stack between an extended position closely adjacent said one end and a retracted position spaced therefrom, means on said separator for gripping the terminal flap in said extended position and pulling the flap away from the stack as the separator moves toward said retracted position, a finger reciprocable back and forth along a predetermined path closely adjacent said one end between a first position spaced laterally from said one end and a second position across said one end, mechanism for reciprocating said finger through a forward stroke to said second position and a return stroke back to said first position, and means connecting said separator to said finger and converting the reciprocation of the latter into movement of the separator to said extended position

during each return stroke of said finger and to said retracted position during the initial portion of each forward stroke whereby the flap of each terminal article is positively separated from the stack for entry of the finger.

6. Apparatus as defined in claim 5 in which said finger extends across and beyond said one end in said second position, and further including a stripper engageable with the article on said finger when the latter is in said second position and operable to eject the article laterally from the apparatus.

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