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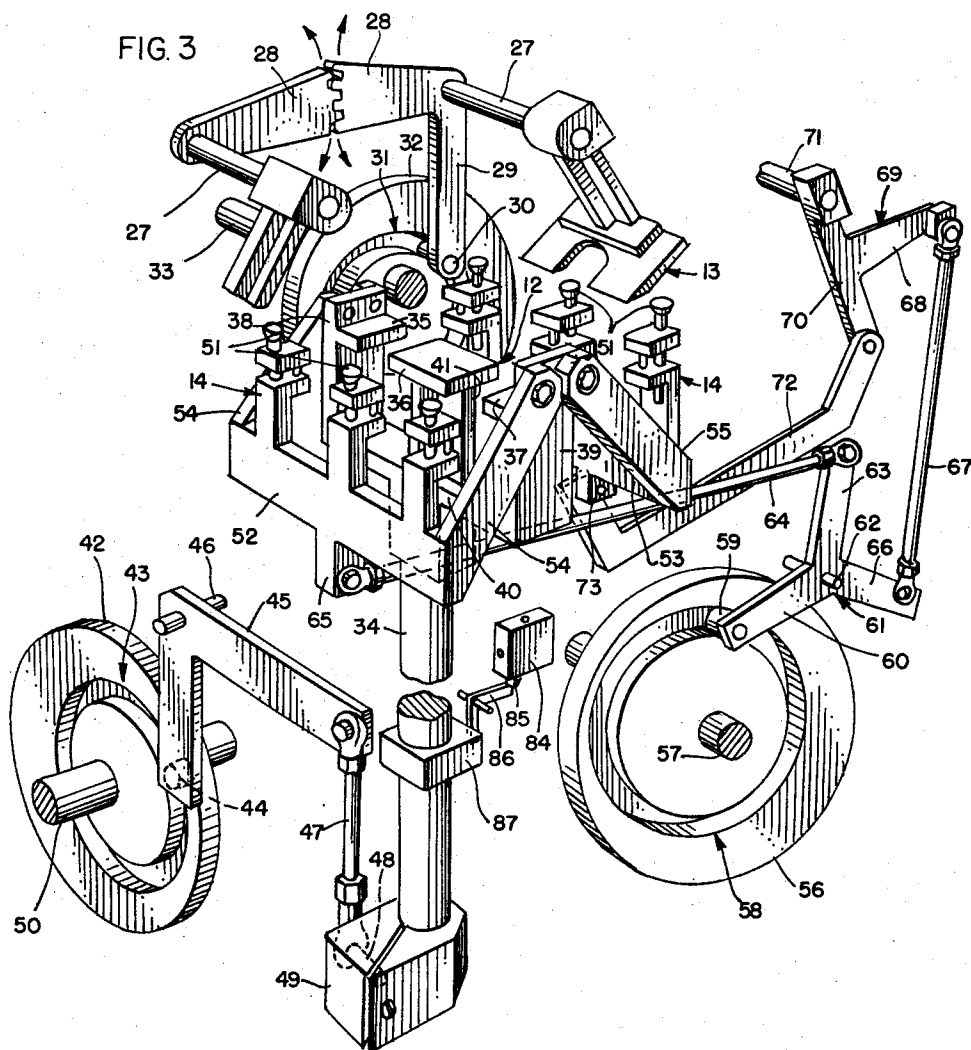
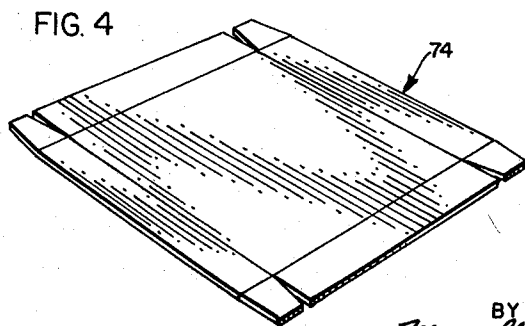
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3,069,158

APPARATUS FOR REMOVING BLANKS FROM A MAGAZINE

Filed July 17, 1959

5 Sheets-Sheet 2



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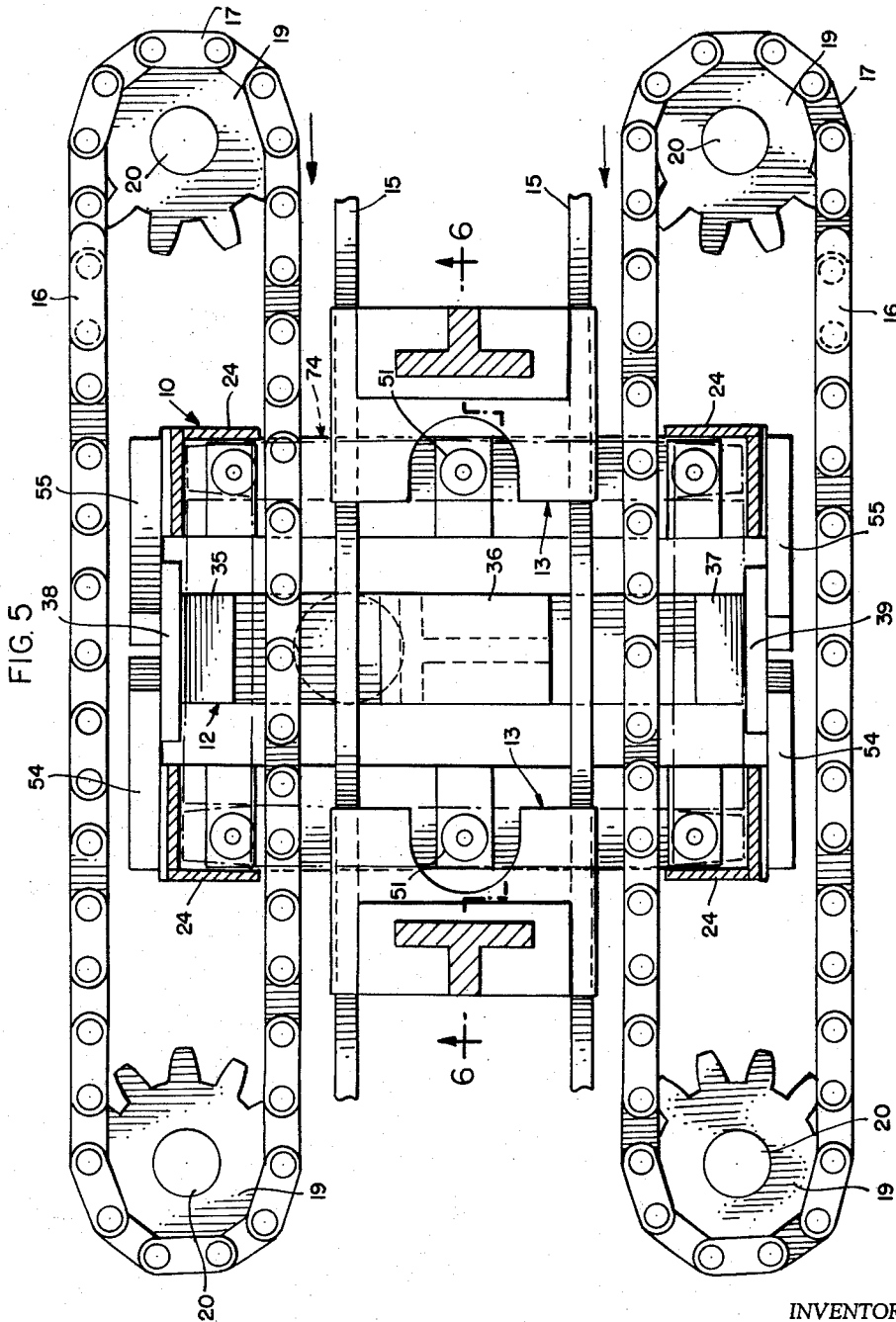
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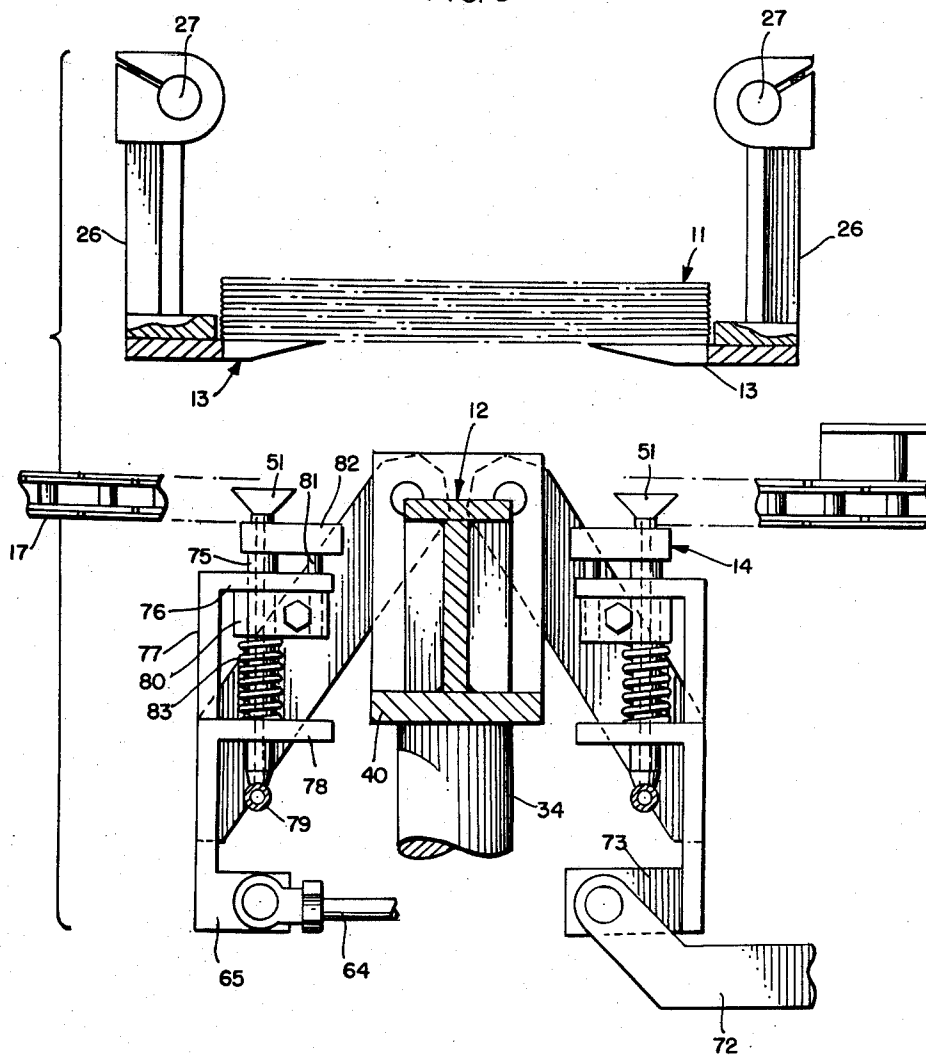
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FIG. 6



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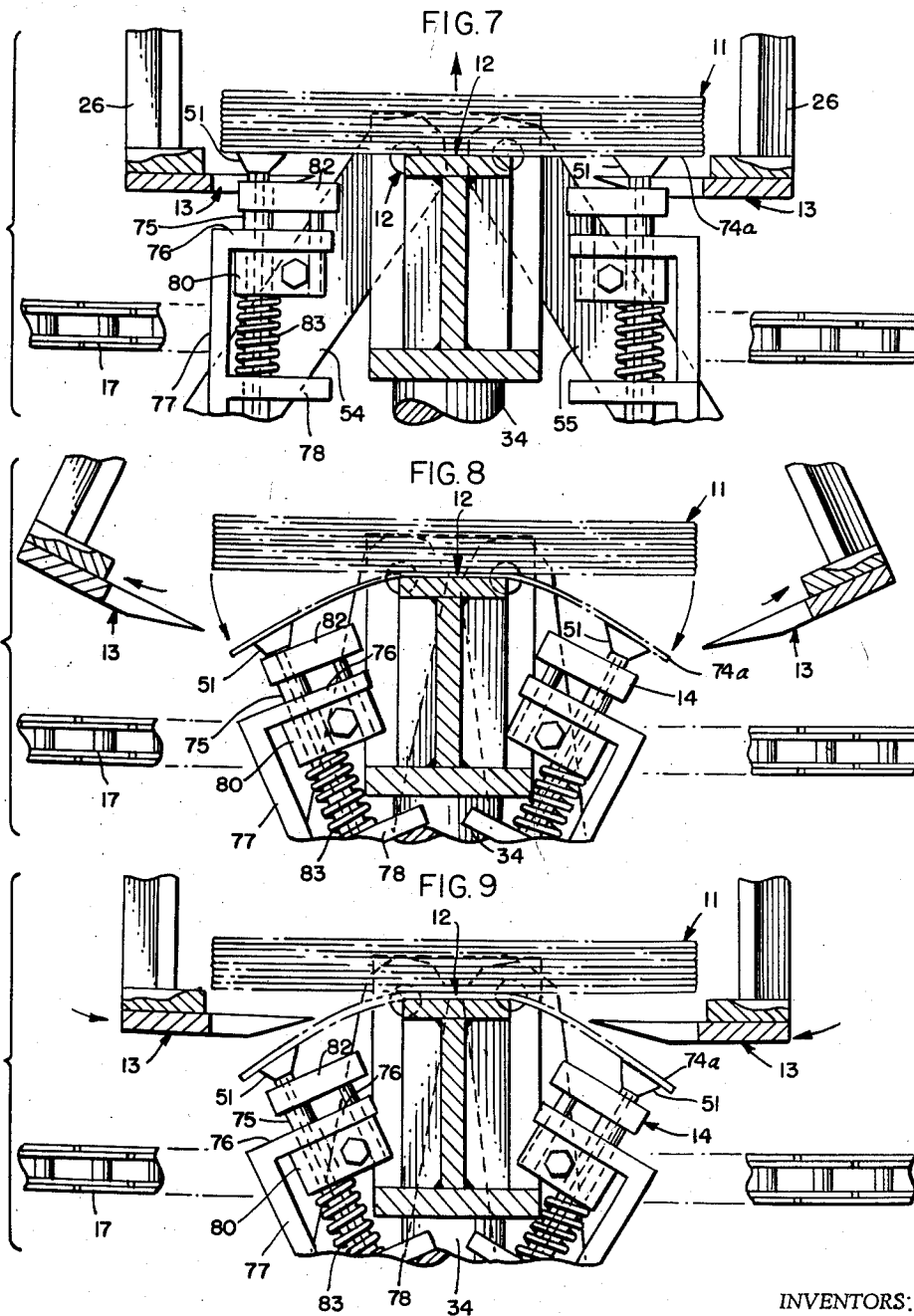
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1

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APPARATUS FOR REMOVING BLANKS FROM A MAGAZINE

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5 Claims. (Cl. 271-29)

This invention relates in general to an apparatus for removing blanks from a magazine or a magazine unloader, wherein the apparatus may be associated with any type of packing or packaging machine, or may be set up as a machine for individual use.

Present day competition in industry continually demands more efficient and faster operating machinery. The packaging industry therefore demands better and faster packaging machines, and machines that can operate to perform a packaging operation independent of other auxiliary machines. Generally, packaging requires the insertion of goods into paperboard cartons or trays, which are initially received from the carton and tray manufacturers in flat or collapsed condition thereby necessitating an erection or set-up operation. Hereinafter the term "blank" will be used which is to cover a carton or tray. The usual manner of handling blanks is to feed them one by one to an erection apparatus, and since the blanks usually come in stacks, they are removed one at a time from a magazine by an apparatus. Inasmuch as the overall speed of a packaging machine must be relatively fast, it also necessitates a relatively high speed magazine unloader or apparatus for removing blanks from a magazine.

The apparatus for removing blanks one at a time from a magazine according to the present invention includes a first supporting member arranged to support the stack of blanks centrally thereof, suction heads for pulling downwardly opposite unsupported end portions of the lowermost blank, and a second stack supporting means in the form of opposed blades for supporting the stack at opposite edge portions thereof. The suction heads and first stack support are mounted on a common vertically reciprocable carrier which eliminates any necessity for complex mechanical construction.

Accordingly, it is an object of this invention to provide an improved apparatus for removing blanks from a magazine.

Another object of this invention resides in the provision of an apparatus for removing blanks one at a time from a stack of blanks held in a magazine, which is capable of operating at a relatively high rate of speed.

While it may be appreciated that the present invention provides an apparatus which is capable of removing blanks one at a time from a stack of blanks without inflicting any damage or marks on the blanks during removal thereof from the magazine, another important feature involves resiliently mounting the suction heads or cups in order to compensate for any irregularities in the blanks such as a bowing or warping thereof, thereby assuring positive removal of a blank from the magazine during each cycle of operation of the apparatus. The spring loaded suction heads move upwardly beyond a horizontal plane in which the lowermost blank would normally be positioned.

2

Therefore, another object of this invention is in the provision of an apparatus for removing blanks from a magazine, wherein positive and accurate removal of the trays is accomplished, regardless of irregularities in the blank structure and the positioning of the blanks in the magazine.

A still further object of this invention is to provide an apparatus for removing blanks from a magazine, wherein a better removal action is accomplished, and wherein the suction heads or cups are resiliently mounted to compensate for bowing, warping, or other irregularities in the blanks.

Other objects, features, and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is a perspective view of the apparatus for removing blanks from a magazine, according to the invention, with some parts broken away to show underlying parts for purposes of clarity;

FIG. 2 is a perspective detail view of the center stack support and suction heads;

FIG. 3 is a perspective view of the various mechanisms provided for driving the apparatus of the present invention in timed sequential relation;

FIG. 4 is a perspective view of a tray that may be stacked in the magazine for removal therefrom;

FIG. 5 is a sectional view taken substantially along line 5-5 of FIG. 1 and illustrating in plan view the arrangement of several operating components in the apparatus of the present invention; and

FIGS. 6, 7, 8 and 9 are sectional views of the apparatus according to the invention, taken substantially along line 6-6 of FIG. 5, and illustrating sequential steps in the movement of the associated components during operation of the apparatus.

Referring now to the drawings, and particularly to FIG. 1, the apparatus of the present invention includes generally a magazine 10 for holding a stack of blanks 11 (FIGS. 6 to 9), a stack support 12 arranged centrally below the magazine 10, a second stack support including coacting opposed blades 13, and opposed coacting sets of suction heads 14. The blanks are removed one at a time from the magazine and lowered to a pair of supporting rails 15, FIGS. 1 and 5, along which they are advanced to a station in a packing or packaging machine for further operation thereon. The blanks are advanced along the rails 15 by pushers 16 carried on spaced endless chains 17. All of the above mechanisms are generally supported on a mounting plate 18.

Each chain 17 is trained around spaced sprockets 19, arranged generally at opposite sides of the magazine 10. The sprockets 19 are carried on shafts 20 rotatably mounted along a vertical axis in frame pieces secured to the mounting plate 18. The shafts 20 at one end of each chain have mounted at their lower ends bevel gears 21 in meshing engagement with bevel gears 22 carried on a horizontally extending shaft 23. The shaft 23 may be connected to any suitable drive source of the machine.

The magazine 10 includes four rectangularly arranged guide bars 24 for containing a stack of blanks. At the lower ends of the guide bars 24, stripping blades 25, FIG. 1, are mounted and project inwardly a slight distance to serve as stripping or separating members during the removal of the blanks one at a time from the magazine.

3

The stack supporting blades 13 are mounted on the lower ends of arms 26, the upper ends of the arms being secured to shafts 27 which are suitably pivotally mounted to the mounting plate 18. As seen in FIG. 3, the shafts 27 are further secured to meshing segmental gears 28, one of which has an extension 29 having a cam follower 30 mounted thereon. The cam follower 30 is received in a cam track 31 of a cam wheel or disk 32 mounted on a driven shaft 33. Thus, rotation of the shaft 33 and cam wheel 32 oscillates the extension 29 and the segmental gears 28 which, in turn, oscillate the shafts 27 and the stack supporting blades 13. The manner in which the stack supporting blades 13 support the stack of blanks 11 is seen in FIG. 6, wherein the blades support opposite edge portions of the stack.

The stack support 12 arranged below the magazine 10 is carried on the upper end of a vertically reciprocable post 34, and includes three spaced horizontal plates 35, 36 and 37. The outer plates 35 and 37 extend inwardly from upwardly projecting mounting bars 38 and 39, respectively, which are in turn carried on a transversely extending support member 40 mounted directly on the post 34. The center plate 36 is carried on the upper end of a mounting bar 41 which is secured at its lower end to the support member 40. As seen most clearly in FIG. 5, the spacing of the plates 35, 36 and 37 provides clearance for the supporting rails 15 and the innermost runs of the chains 17. As also seen in FIG. 5, the plates 35, 36 and 37 are in alignment with each other and arranged substantially along a vertical plane extending centrally through the magazine 10.

The post 34 may be suitably supported and guided by the framework of the apparatus, and is vertically reciprocated by means of a cam wheel or disk 42 having a cam track 43 receiving a cam follower 44 therein which is mounted on a bellcrank 45. The bellcrank 45 is pivoted on a fixed pin 46 carried by the frame of the apparatus, and has a push-pull link 47 pivotally attached to one end. The push-pull link is, in turn, pivotally connected to the pin 48 on a block 49 secured to the post 34. The cam wheel 42 is mounted on a ribbon shaft 50, whereby rotation of the shaft 50 and cam wheel 42 oscillates the bellcrank 45 about the pin 46 to reciprocate the link 47 connected to the post 34 thereby reciprocating the post 34 and the stack support 12 mounted thereon.

The suction heads 14 are mounted in sets or gangs wherein three suction cups 51 of suitable flexible material, such as neoprene rubber, are arranged on opposite sides of the stack support 12 and carried on spaced mounting bars 52 and 53. The mounting bars 52 and 53 have, respectively, arms 54 and 55 connected therewith and pivotally secured to the outer sides of the mounting bars 38 and 39. Thus, an arm 54 is arranged at opposite ends of the mounting bar 52 and an arm 55 is also arranged at opposite ends of the mounting bar 53. The arms are angularly positioned relative to the longitudinal axes of the suction heads 14.

Operation of the suction heads 14 is accomplished by a cam wheel or disk 56 carried on a driven shaft 57, and having a cam track 58 receiving a cam follower 59. The cam follower 59 is mounted on an arm 60 of a tri-armed bellcrank 61 pivotal on a fixed pin 62. The bellcrank 61 also includes an arm 63 angularly related to the arm 60 and pivotally connected to one end of a connecting link 64. The other end of the link 64 is pivotally connected to an extension 65 integral with the mounting bar 52 of one of the banks of suction heads. A second arm 66 is provided on the bellcrank 61 and angularly positioned relative to the arms 60 and 63. The arm 66 has pivotally connected to its outer end a connecting link 67 which has its other end pivotally connected to the end of an arm 68 of a T-shaped bellcrank 69. The bellcrank 69 includes a second arm 70 which is pivotally mounted at one end to a fixed shaft 71 and pivotally mounted at the other end to a connecting bar 72. An extension 73 pro-

4

jects downwardly from the mounting bar 53 of the other bank of suction heads and has pivotally connected thereto the other end of the connecting bar 72. The linkage and bellcranks between the cam wheel 56 and the suction heads 14 are arranged to operate the suction heads synchronously so that they pivot downwardly and outwardly together during the operation of the apparatus. Thus, driving of the shaft 57 and cam wheel 56 pivots or oscillates the suction heads 14 on the upper end of the post 34. Inasmuch as the suction heads are pivotally mounted to a supporting framework for part of the stack support 12, it will be appreciated that the suction heads move up and down with the up and down movement of the stack support 12.

One form of blank that may be handled in stack form, with the apparatus of the present invention, is a tray blank as shown in FIG. 4 and generally designated by the numeral 74. The positioning of this tray blank in the magazine 10 is shown in FIGS. 5 to 9, and it may also be seen in FIG. 5 how the suction cups 51 are arranged to engage the opposite edge portions of the tray blank. It is noted that suction cups are positioned quite close to the opposite edges of the tray blank in order to obtain a peeling action of the lowermost blank from the next lowermost blank during removal of the blanks one at a time from the magazine.

Inasmuch as irregularities sometimes exist in the blanks, such as bowing or warping, that may be caused by manufacturing processes or handling, each suction cup 51 is individually spring mounted to compensate for such irregularities. It is necessary to contact each tray blank completely with all of the suction cups at the same time in order to obtain the suction gripping action since all of the cups are intercommunicated with a common vacuum source.

Accordingly, each suction cup 51 is mounted on the upper end of a hollow stem 75 slidably carried by a horizontal arm 76 of a bracket 77 upstanding from the mounting bars 52 and 53, FIGS. 6 to 9. The lower ends of the suction cup stems 75 are also slidably guided in an inwardly extending flange 78 carried by the brackets 77, and the lower ends of the stems are connected to a common vacuum line 79, FIG. 6. A stop 80 is mounted on the underside of the arm 76 and secured to the stem 75. The stop 80 is also provided with a bore for slidably receiving a guide pin 81 carried by a bracket 82 secured to the stem 75 above the arm 76. The pin 81 is also received in a bore extending through the arm 76 and therefore prohibits rotational movement of the stem 75. A coil spring 83 embraces the stem 75 and is bottomed at one end against the upper side of the flange 78 and at the other end against the bottom side of the stop 80 to continually urge the stop and stem upwardly until the stop abuts against the under side of the arm 76.

A vacuum control valve 84, FIG. 3, may be provided to control the vacuum for the suction heads 14, wherein a plunger 85 on the valve 84 is operated by a bellcrank 86 cammed into position by a block 87 carried on the post 34.

The shafts 33, 50 and 57, mounting the cam wheels 32, 42 and 56, respectively, are interconnected to a common drive in order to effect synchronous and sequential timed operation of the various movable components of the apparatus.

In operation of the apparatus of the present invention, FIGS. 6 to 9, the initial position of the stack support blades 13, the stack support 12 and the suction heads 14 is shown in FIG. 6, wherein the blades 13 are supporting the stack of blades 11 at opposite edge portions thereof, and the stack support 12 and suction heads 14 are in lowered position, and the longitudinal axes of the suction heads extend along a substantially vertical axis. The post 34 advances the stack support 12 and the suction heads 14 upwardly to the position as seen in FIG. 7, wherein the stack of blades 11 is actually lifted upwardly a distance free of the blades 13 in order to relieve the weight of the

5

stack on the blades 13 and to assure that all of the suction cups 51 are in suction engaging position with the bottommost blank 74a. The vacuum source to the suction heads 51 will have been established prior to the engagement of the suction cups 51 with the lowermost blank. It may also be noted in FIG. 7 that the center stack support 12 engages the bottommost blank along the center of the stack. In actual practice, the upper engaging surface of the suction cups 51 will normally be slightly above the upper engaging surfaces of the stack support 12, whereby the suction cups will be spring loaded against the under side of the bottommost blank 74a when the suction cups reach the position as seen in FIG. 7.

Referring now to FIG. 8, the blades 13 have withdrawn from beneath the outer edges of the stack of blanks 11, followed by pivotal movement of the suction heads 14 about their pivot points on the mounting bars 38 and 39 to peel the opposite edge portions of the lowermost blank from the next lowermost blank. After the pivotal movement of the suction heads 14, a void space is defined at opposite sides of the stack between the lowermost blank and the next lowermost blank into which the stack supporting blades 13 are inserted. The post 34 with the suction heads and the stack support 12 is then moved downwardly to remove the lowermost blank completely from the bottom of the stack and to deposit it on the supporting rails 15. Prior to the time that the blank is deposited on the rails 15, the suction heads 14 will return to normal position, as seen in FIG. 6, and the suction will be broken to the suction cups 51 to effect a smooth and easy deposit of the blank on the supporting rails 15.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention, but it is understood that this application is to be limited only by the scope of the appended claims.

The invention is hereby claimed as follows:

1. Apparatus for successively removing the bottommost blank from a stack of blanks in a magazine comprising, a pair of opposed coacting supporting blades for supporting the stack at opposite sides thereof and mounted for reciprocation into and out of stack supporting position, a vertically movable member below said magazine, a stack support carried on said movable member, opposed suction heads pivotally carried on said movable member for gripping opposite end portions of said bottommost blank and to pull said end portions downwardly and inwardly to bow the cartons about the stack support thereby defining void spaces between the next bottommost blank and the bottommost blank for receiving the coacting supporting blades, said suction heads being resiliently mounted on said movable member for movement along an axis perpendicular to said blanks during initial engagement of the bottommost blank by said heads, and means to operate said coacting supporting blades, movable member and suction heads in timed sequential relation, whereby the coacting supporting blades are moved into stack supporting position for supporting the stack when said stack support is moved downwardly with the bottommost blank gripped by the suction heads.

2. Apparatus for successively removing the bottommost blank from a stack of blanks in a magazine comprising, a pair of opposed stack supporting blades for supporting the stack at opposite sides thereof and mounted for oscillation into and out of stack supporting position, a vertically movable member positioned below the magazine, a stack support carried on said movable member and arranged centrally of the magazine for supporting the stack along a central area thereof, opposed suction heads pivotally mounted on said movable member for gripping opposite end portions of said bottommost blank to pull said end portions downwardly and inwardly and bow the cartons about the stack support thereby defining void spaces between the next bottommost blank and the bottommost blank for receiving the opposed stack

6

supporting blades, said suction heads being resiliently mounted on said movable member for movement along an axis perpendicular to said blanks during initial engagement of the bottommost blank by said heads and means to operate the stack supporting blades, movable member and suction heads in timed sequential relation, whereby the opposed supporting blades are moved into stack supporting position for supporting the stack when said stack support is moved downwardly with the bottommost blank gripped by the suction heads.

3. Apparatus for successively removing the bottommost blank from a stack of blanks in a magazine comprising, a pair of opposed stack supporting blades for supporting the stack at opposite sides thereof and mounted for oscillation into and out of stack supporting position, a vertically movable member positioned below the magazine, a stack support carried on said movable member and arranged centrally of the magazine for supporting the stack along a central area thereof positioned between the stack supporting blades thereby leaving the end portions normally supported by said blades unsupported when the blades are oscillated out of stack supporting position, opposed suction heads pivotally mounted on said movable member for gripping opposite end portions of said bottommost blank to pull said end portions downwardly and inwardly and bow the cartons about the stack support thereby defining void spaces between the next bottommost blank and the bottommost blank for receiving the opposed stack supporting blades, said suction heads being resiliently mounted on said movable member for movement along an axis perpendicular to said blanks during initial engagement of the bottommost blank by said heads and means to operate the stack supporting blades, movable member and suction heads in timed sequential relation, whereby the opposed supporting blades are moved into stack supporting position for supporting the stack when said stack support is moved downwardly with the bottommost blank gripped by the suction heads.

4. A magazine unloader adapted to remove one blank at a time from a stock of blanks in a magazine comprising, first means for supporting the stack of blanks along a longitudinal central axis of the stack, means for gripping the portions of the lowermost blank at opposite sides of said first supporting means and for pulling down and in the gripped portions away from the next above carton along an arcuate path, said first supporting means and said gripping means mounted on a vertically movable member, means for resiliently mounting said gripping means on said vertically movable member for movement along an axis perpendicular to said blanks during initial engagement of the bottommost blank by said gripping means, second means coacting to support the stack of blanks at the outer portions left exposed by pulling down of the side portions of the lowermost blank, and means for inserting said second means and for lowering said first means when the side portions of the lowermost blank have been pulled down.

5. Apparatus for successively removing the bottommost blank from a stack of blanks in a magazine comprising, a vertically reciprocated member positioned below said magazine, first stack support means carried on said member and when in stack support position adapted to support the stack along a central area thereof, a plurality of suction cups arranged in two gangs, one on each side of said first stack support means, said gangs of suction cups being pivotally carried on said member and adapted to grip opposite edge portions of the lowermost blank and pull the edge portions downwardly and inwardly to define void areas, means for resiliently mounting each suction cup for movement along an axis perpendicular to said blanks during initial engagement of the bottommost blank by each suction cup, second stack support means including a pair of coacting swingably mounted blades adapted to support the stack along the opposite edge portions thereof, and

means for driving said vertically reciprocable member, said gangs of suction cups, and said second stack supporting means in timed sequential relation.

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