

United States Patent

Nystrand et al.

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[54] BAG-BOXING MACHINE

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[52] U.S. Cl. 53/120, 53/159

[51] Int. Cl. B65b 63/04

[58] Field of Search 53/113, 116, 117, 120

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Primary Examiner—Travis S. McGehee

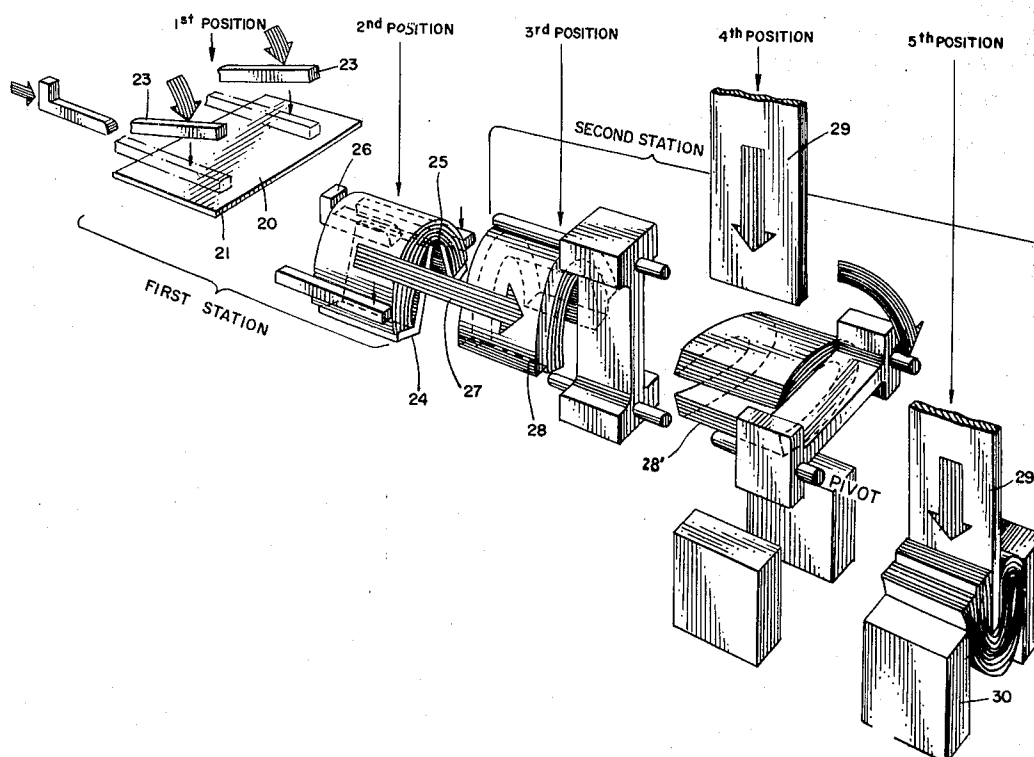
Attorney—Dawson, Tilton, Fallon & Lungmus

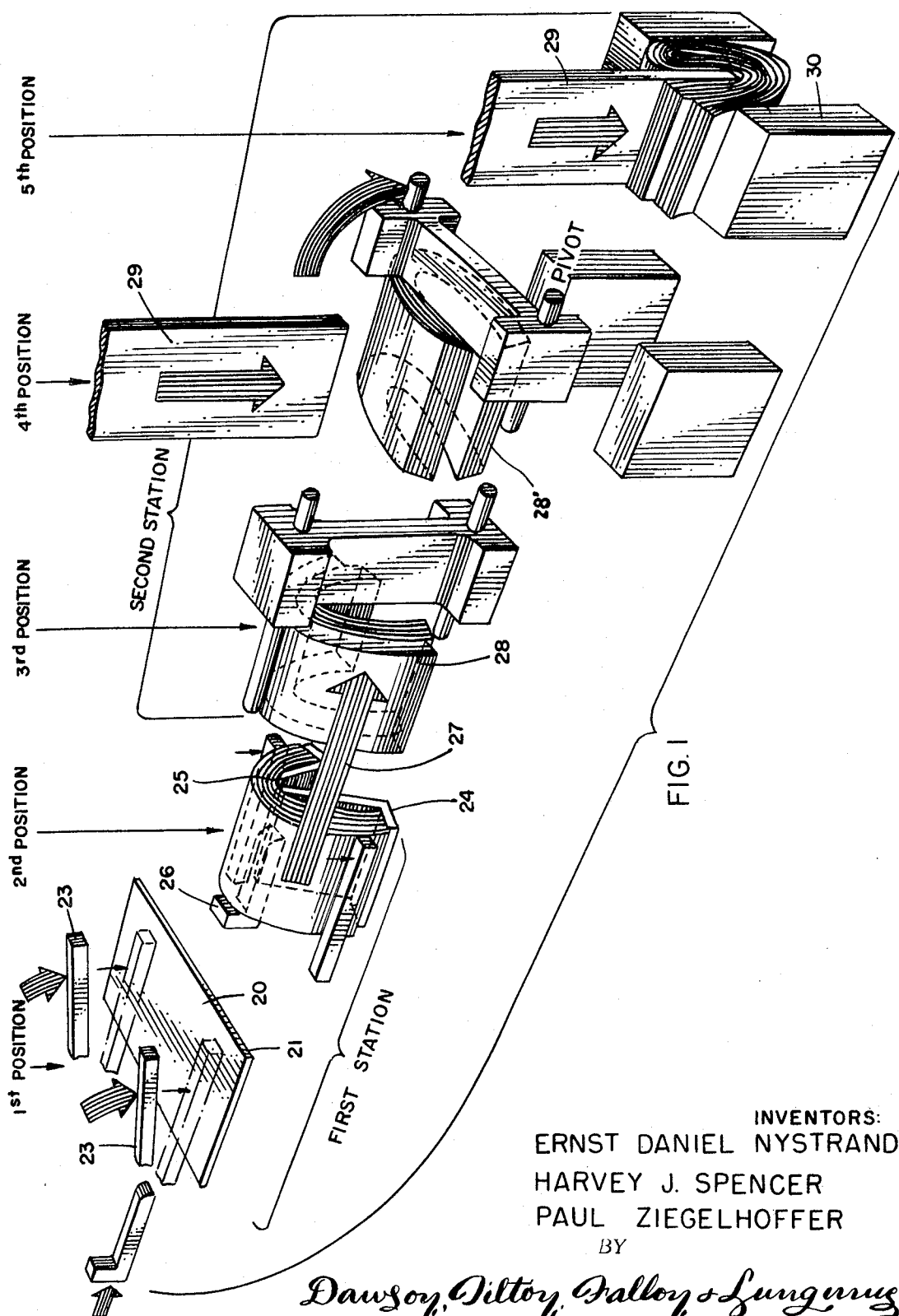
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ABSTRACT

A machine for introducing a twice-folded stack of bags into a carton wherein the bags are singly delivered through a first path to a partial folding support, thereafter a partially folded stack being conducted along a second path into a housing consisting of two pivotally interconnected jaws and finally the once-folded stack is ejected from the housing which achieves a second fold in the stack incident to introducing the twice-folded stack into a carton.

6 Claims, 13 Drawing Figures

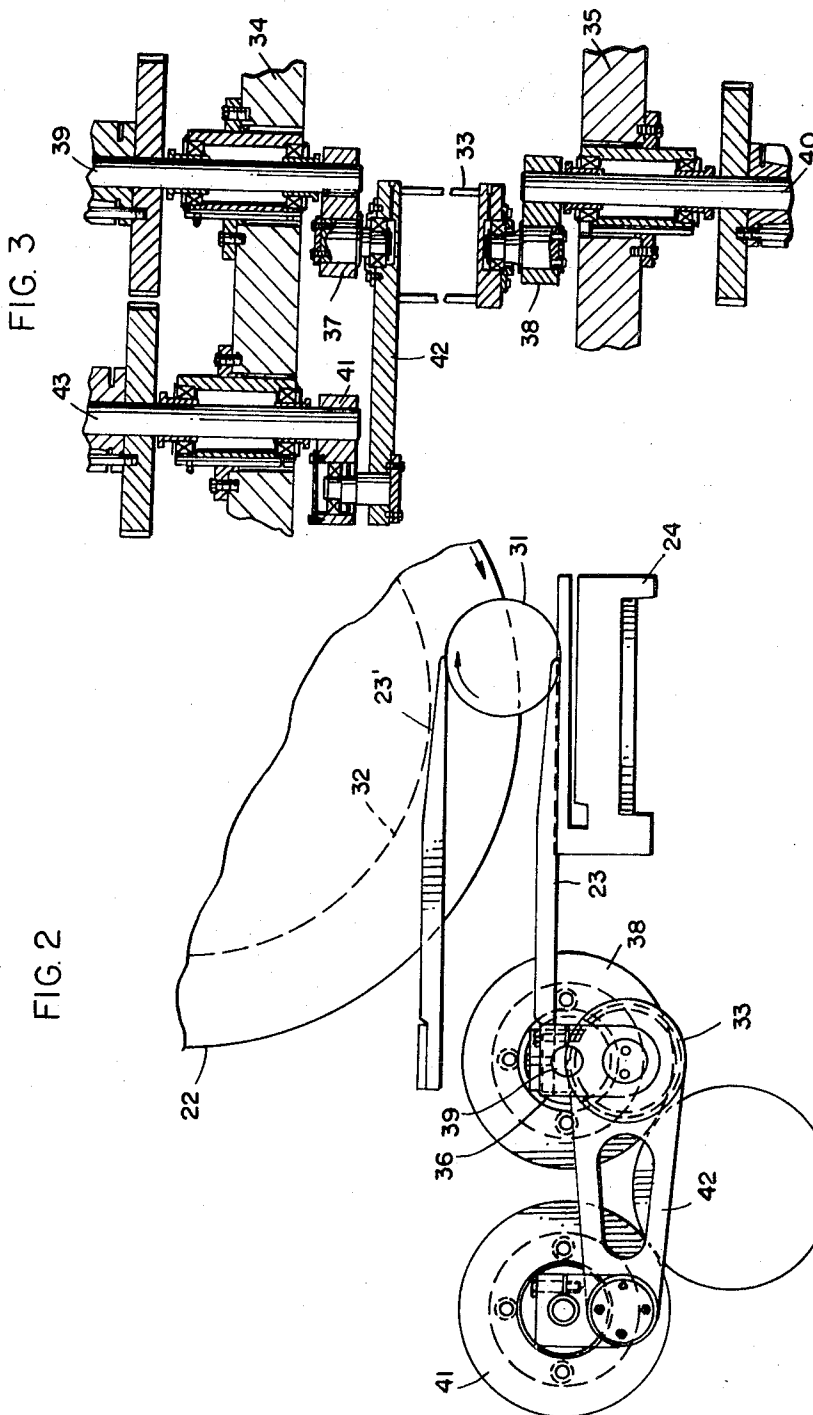




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FIG. 5

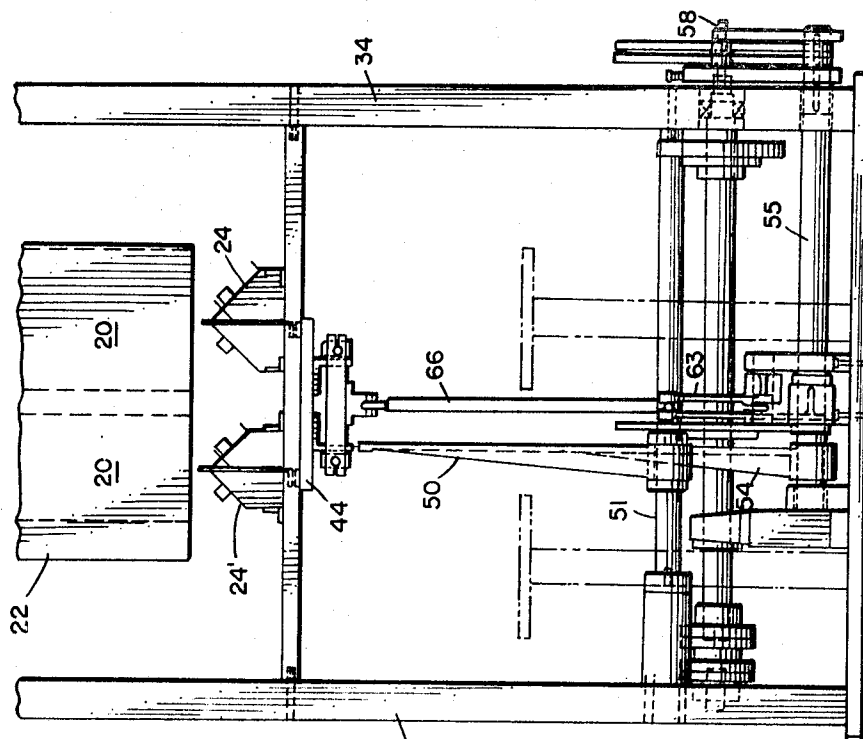
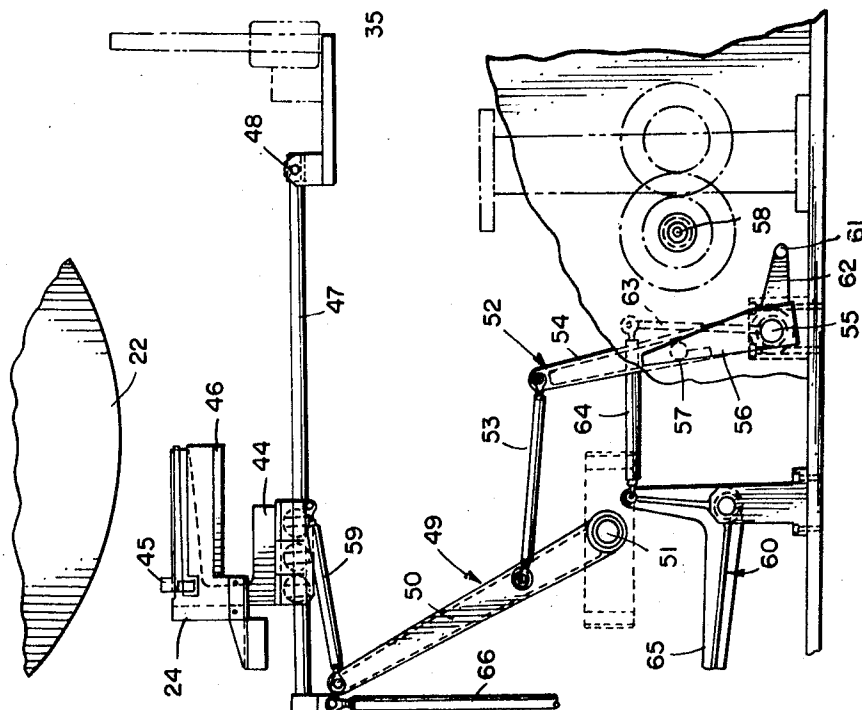


FIG. 4



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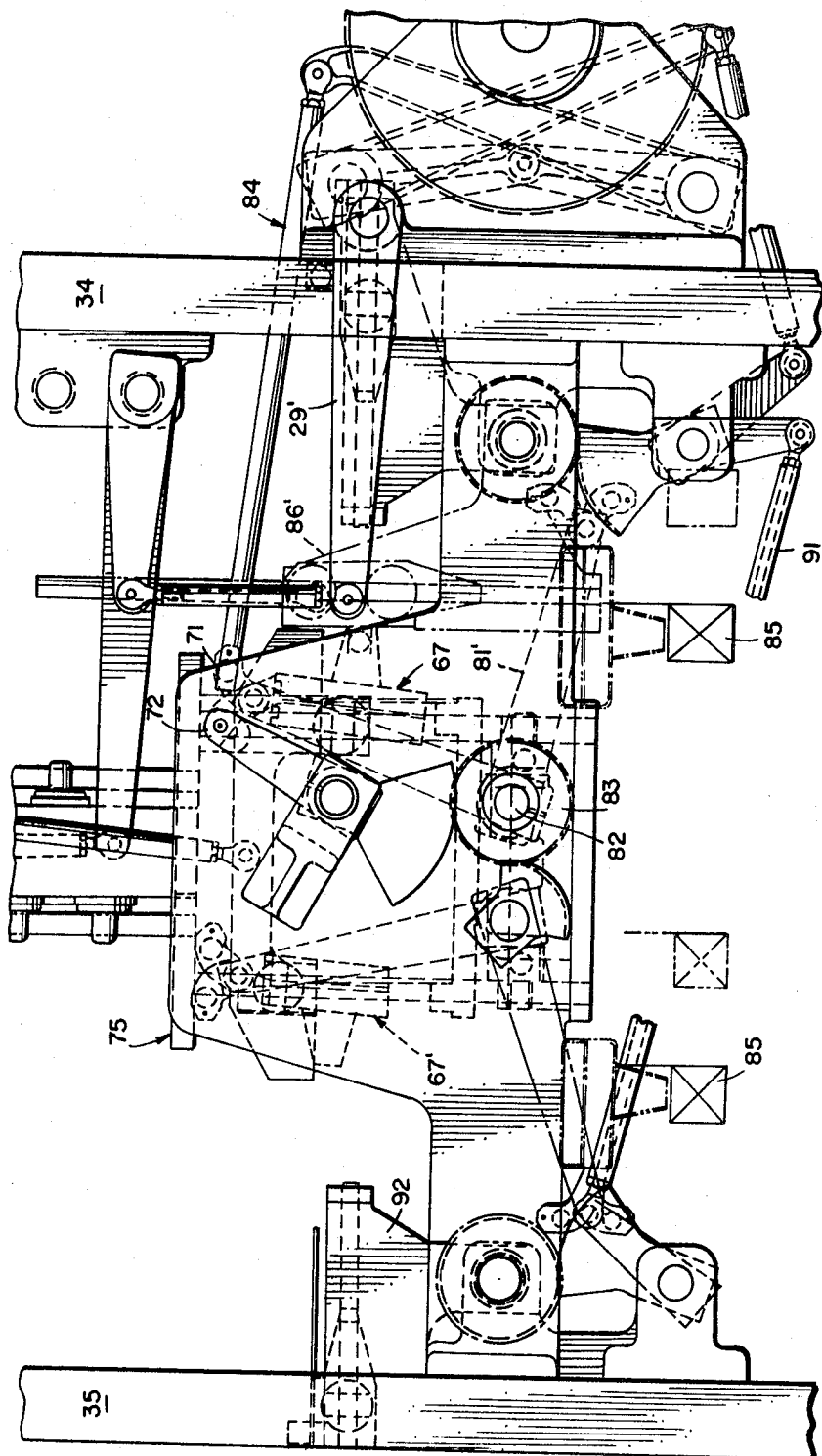
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FIG. 6



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FIG. 7

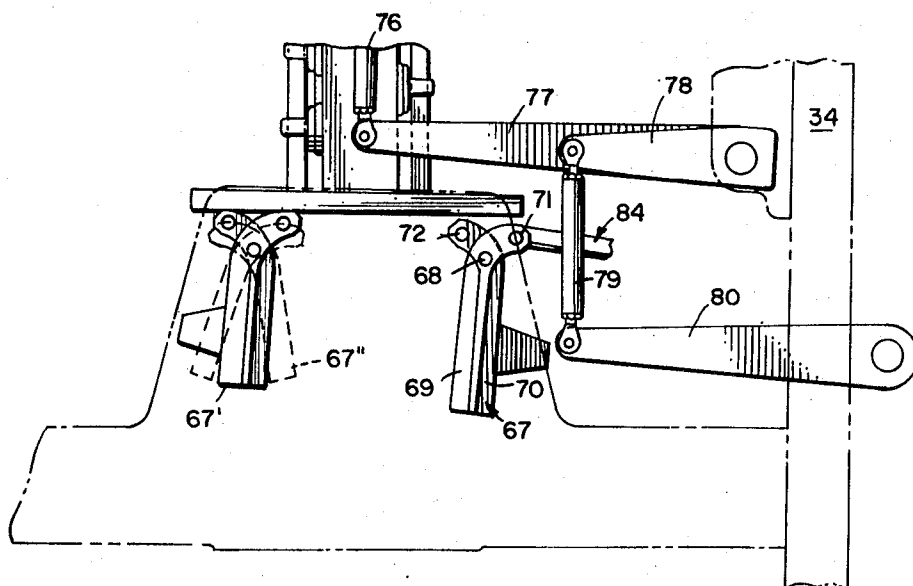
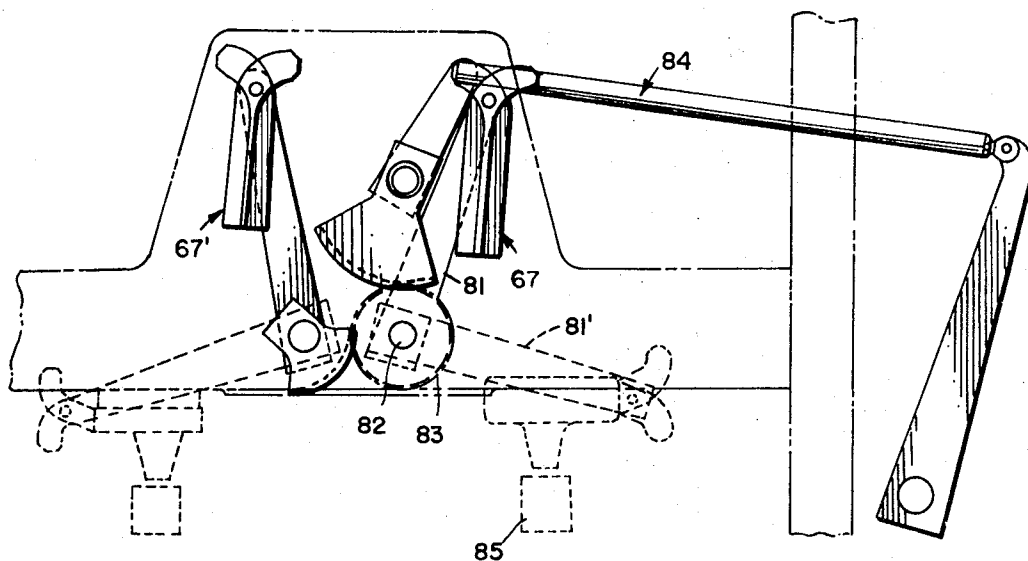


FIG. 8



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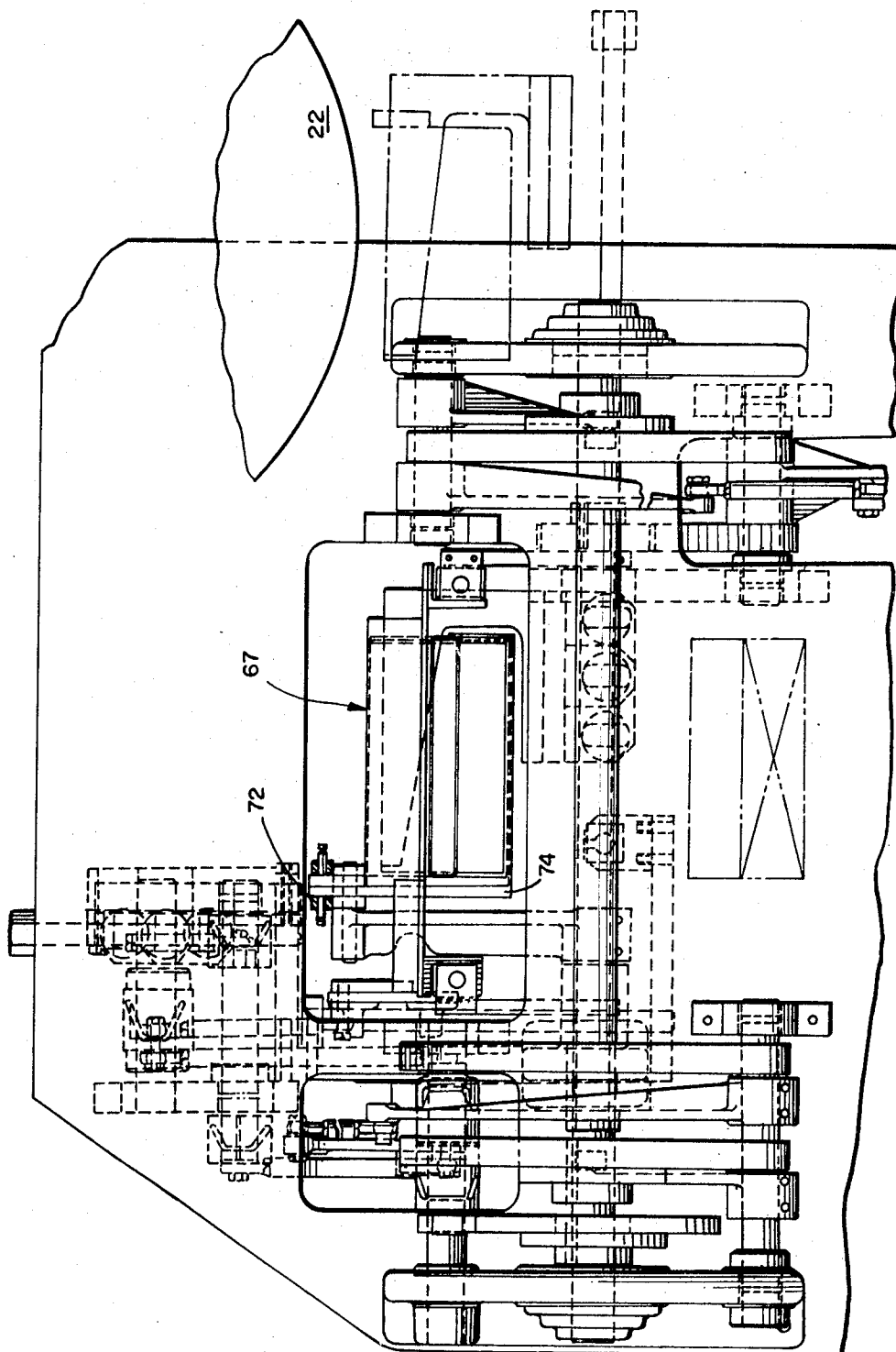
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FIG. II



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FIG. 12

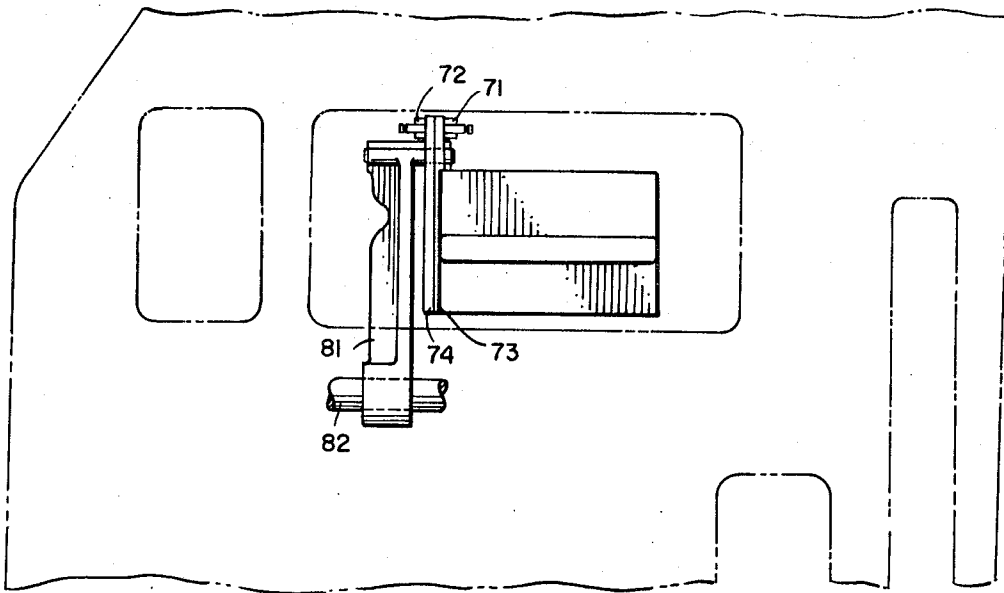
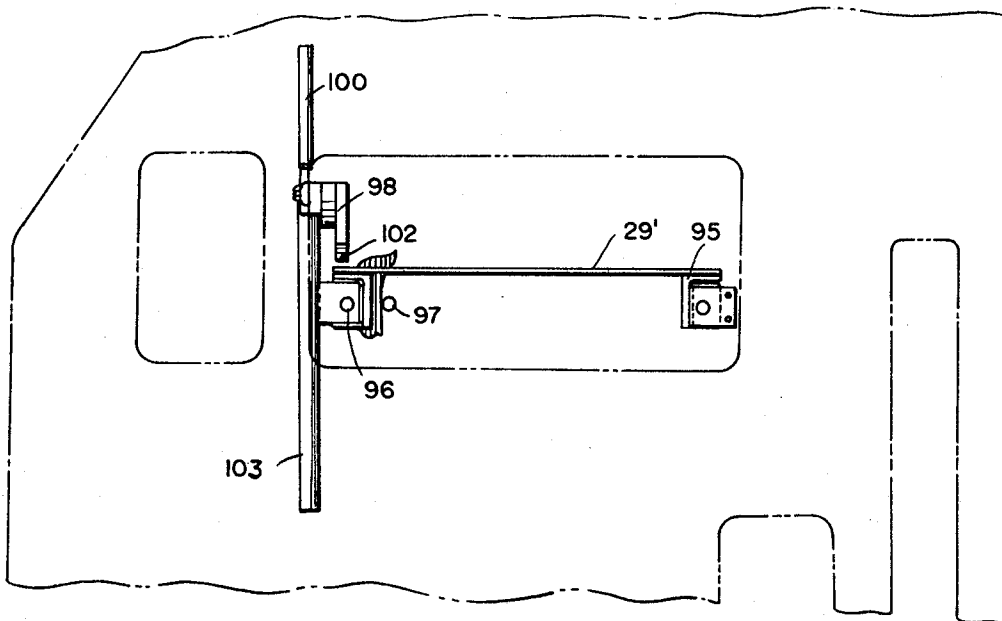


FIG. 13



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BAG-BOXING MACHINE

BACKGROUND AND SUMMARY OF INVENTION

The invention has particular utility in connection with discrete bags which are intended for sequential dispensing from a carton. In particular, bags which have a zipper-type closure cannot be boxed in a continuous stream because of the impossibility of retaining connecting bonds between successive bags. The invention provides a novel way of loading bags into cartons in a twice-folded condition by first delivering individual bags sequentially through a first path to form a partially folded stack on a support, thereafter the partially folded stack is moved along a second path generally perpendicular to the first path into an enclosure which completes the folding of the stack. Thereafter the enclosure is positioned so as to permit pusher means to eject the once-folded stack in a fashion whereby a second fold is developed incident to introducing the bags into a carton.

DETAILED DESCRIPTION

The invention is described in conjunction with an illustrative embodiment, in which

FIG. 1 is a schematic diagram of the mechanical operations previously referred to and showing the various steps performed according to the invention;

FIG. 2 is a fragmentary side elevation of that portion of the machine which delivers the bags sequentially along the already referred to first path to a support;

FIG. 3 is a fragmentary plan view of a portion of the apparatus seen in FIG. 2;

FIG. 4 is a fragmentary side elevation of another portion of the machine which is found immediately below that illustrated in FIG. 2;

FIG. 5 is a fragmentary end elevational view of the apparatus seen in FIG. 4;

FIG. 6 is a detailed end elevational view of that portion of the machine operative to provide the second fold in the stack of bags;

FIGS. 7-10 are fragmentary portions of FIG. 6 to explain the sequence of operations achieved by the various structures depicted in FIG. 6;

FIG. 11 is a side elevational view of the apparatus seen in FIG. 6; and

FIGS. 12 and 13 are fragmentary detailed views of portions of FIG. 11.

In the illustration given and with particular reference to FIG. 1, the numeral 20 designates an individual bag which is equipped with a press-type closure as at 21. The bag 20 is in the process of being removed from a vacuum roll 22 (see FIG. 2) by means of packer fingers 23. The packer fingers move the bags 20 sequentially down a first path on to a V-shaped support 24.

After a predetermined number of bags have been accumulated on the support (which can be seen to be equipped with a slot as at 25 at its upper end) a pusher 26 moves through the slot to advance the partially folded stack along a second path designated by the arrow 27 and which is generally normal to the first path. At the end of the second path, the partially folded stack is in a third position 28, more particularly being received within a housing 67 (see FIG. 6) which is made up of pivotally interconnected jaws. The jaws are brought together around the partially formed stack to complete the folding, after which housing is rotated 90° to dispose the once folded stack in the position designated 28' in FIG. 1. Thereafter, the pusher 29 moves downwardly to force the stack out of the housing into a carton 30 and, in so doing, achieves a second fold parallel to the first fold.

Turning now to the second and third sheets of the drawing, it will be noted in FIG. 2 that the packer fingers 23 are operated to follow a generally circular orbit 31. The finger position 23' indicates the zenith of the orbit relative to a groove 32 in the delivery roll 22. The roll 22 is constructed with a plurality of such grooves 32 to accommodate the vari-

ous packer fingers 23, and also the roll 22 has an internal vacuum manifold (not shown) to cause the bags to adhere to the periphery of the roll but which is shut off just prior to the bags being mechanically removed by the operation of the packer fingers 23. In the illustration given, the roll 22 is seen in FIG. 2 to be rotating in a clockwise manner, while the orbiting packer fingers 23 follow a clockwise orbit. The bags removed sequentially from the roll 22 are deposited on an angled support 24 which can be seen in FIGS. 2, 4, and 5. In FIG. 5, a second support 24' is also depicted, this being narrower so as to accommodate the receipt of a narrower bag 20'. Normally, however, the machine will be set up for one size of bag on both portions of the roll 22, the supports 24 or 24', as the case may be, being replaceable accordingly.

FIG. 3 shows the layout of the portion of the machine responsible for driving the orbital packer fingers. The numeral 33 designates a supporting tube which extends transversely of the machine. The term "transversely" is employed herein to denote a direction perpendicular to the travel of the bags, i.e., parallel to the axis of the roll 22. In FIG. 3, the tube 33 is seen to be positioned between the side frames 34 and 35. The tube 33 is equipped with a bracket 36 (see FIG. 2) which carries the packer fingers. The tube 33 is connected at its ends with crank mechanisms 37 and 38 which are carried respectively on rotating shafts 39 and 40 suitably journaled in the machine frames. Thus, rotation of the shafts 39 and 40 cause the tube 33 to orbit, i.e., follow an eccentric path relative to the axis of the shafts 39 and 40.

The tube is connected to a second crank mechanism 41 (see FIGS. 2 and 3) by means of a connecting bar 42. The crank 41 is mounted on a shaft 43 also journaled in the frame 34 and this connection insures that the packer fingers 23 are maintained parallel to the top of the support 24 at all times during orbital motion. It will be noted from a consideration of FIG. 2 that the nadir of the finger orbit 31 is slightly above the angled support 24 so that the sequential bags are caused to move through a generally vertical path in a controlled fashion under the influence of the packer fingers 23.

As indicated previously, the next step in the operation of the machine is to translate a completed stack of partially folded bags through a second path generally perpendicular to the first path, i.e., in the illustration given, the second path being generally horizontal. This is achieved through the operation of a carriage 44 which is equipped with upstanding pusher elements 45 and an angled platform surface as at 46. The carriage 44 is slidably supported on a way 47 pivotally mounted at its downstream end as at 48.

Providing the motive power for moving the carriage 44 downstream is a linkage arrangement generally designated 49 and which includes a first arm 50 rotatably fixed to the machine frame as at 51. Movement of the carriage, back and forth, is achieved through a second linkage system generally designated 52 which includes arms 53 and 54. The arm 54 is pivotally mounted as at 55 and is caused to oscillate by the action of a cam follower arm 56 fixed to the same shaft 55 carrying the arm 54. A cam follower is provided at 57 which is engaged by a cam (not shown) but mounted on the machine frame with its axis at 58. Thus, oscillation of the arm 54 induced by the similar action of the arm 56 is translated through the arm 53 to the arm 50. This in turn is transmitted via the arm 59 to the carriage 44.

On the return stroke of the carriage 44, it is necessary to depress or lower the carriage so that the same will not encounter the leading edges of bags being stacked on the support 46. For this purpose a second linkage system is provided which includes a crank arrangement generally designated by the numeral 60. This arrangement is controlled by a second cam (not shown) mounted about the axis 58 and which operates against a cam follower 61. As the cam follower 61 follows the contour of the cam, particularly toward the end of the return stroke of the carriage 44, the cam follower arm 62 pivots to the left and in so doing by means of links 63 and 64 causes the crank arrangement 60 to pivot counterclockwise

The crank arm 65 is pivotally interconnected with a link 66 which in turn is coupled to the way 47. Thus, at the end of the return movement of the carriage 44, the carriage 44 is depressed to pass under the partially completed stack of bags being accumulated on the support 24 and thereafter is moved upwardly into the position shown in FIG. 4 so as to be ready to move a completed stack of bags to the right and into a confining enclosure for further handling.

Turning now to FIG. 11, the enclosure just referred to is generally designated by the numeral 67. The side elevational view seen in FIG. 11 is taken from the opposite side of the machine from the side elevational view seen in FIG. 4. In other words, in FIG. 4, the flow of material is to the right whereas in FIG. 11 it is to the left. However, it will be appreciated that the carriage 44 is operative to introduce a partially folded stack of bags into the enclosure 67. In the illustration given, two such enclosures are provided as can be seen from the central portion of FIG. 6 wherein the smaller size enclosure (corresponding to the smaller support 24') is generally designated 67'. Inasmuch as the machine involves a considerable amount of mechanism for performing the various operations, it was felt desirable to disassociate certain portions of the mechanism for presentation in simpler form. For this purpose, a reference is now made to FIG. 7 which shows those portions of the machine of FIG. 6 which have to do with the receipt of the partially folded stack of bags by the enclosure 67. In FIG. 7, the dotted line showing as at 67'' is of the receiver or enclosure in the condition it assumes when the carriage delivers a partially folded bag thereto. The enclosure 67 is made up of two housinglike jaws which can be spread apart to accommodate the partially folded stack and, after the carriage has been withdrawn, close to the solid line showing in FIG. 7. Each enclosure 67 has its two housinglike jaw portions pivotally interconnected as at 68, the pivotal interconnection providing a support for the enclosure which will be described hereinafter in connection with FIG. 8. Each of the housing jaw portions 69 and 70 has an upwardly curved extension carrying an actuating roller as at 71 and 72 respectively.

Reference is now made to FIG. 12 where a portion of FIG. 11 is reproduced and it will be noted that the roller 71 and 72 are associated with arm portions 73 and 74 provided on the housing jaw portions 69 and 70.

To position the enclosures 67 in a proper condition for the receipt of a partially folded stack of bags, a carriage generally designated 75 is moved downwardly into engagement with the roller 71 and 72 to achieve a scissorlike action in opening the enclosure 67 to the dotted line condition designated 67''. For this purpose, a linkage system made up of arms 76, 77, 78, 79 and 80 is employed, suitably actuated by a cam synchronized with the remaining portions of the machine. The carriage 75 is lowered for only that length of time necessary to receive the partially folded stack of bags. After that occurs and for the remainder of the cycle of boxing a given stack, the carriage 75 remains in elevated position.

The next stage of operation can be appreciated better from a consideration of FIG. 8. In FIG. 8, the enclosures 67 and 67' are seen to be mounted on rocker arms 81. The rocker arms 81 are pivotally mounted on shafts 82 which extend lengthwise of the machine and are suitably journaled in bearings supported between the side frames 34 and 35. Gears as at 83 are affixed to the shafts 82 and are controlled by means of a cam actuated linkage generally designated 84 for the purpose of pivoting the enclosure 67 through a 90° arc to the position wherein the supporting arm is designated by the symbol 81' in FIG. 8. At that orientation, the enclosures are in a position to have their contents ejected into a receiving carton 85. A part of the apparatus detail just described can also be seen from FIG. 12 wherein the rocker arm 81 is seen to be mounted for pivotal movement about the axis of the longitudinally extending shaft 82.

The next phase of the operation of the machine includes the steps preparatory to the pusher element 29 being introduced into the enclosure for ejecting the once folded stack of bags.

For this purpose, a bracket 86 is affixed to a longitudinally extending shaft 87, the shaft 87 also carrying a gear 88. A cam-actuated linkage system generally designated 89 acts upon another longitudinally extending shaft 90 to pivot the bracket from the solid line position 86 to the dotted line position 86'. In similar fashion a connecting link 91 is operatively associated with and connected to a second bracket 92 for moving the same through about a 90° vertical arc. It will be noted that the pusher 29 is mounted on the bracket 86 and when the bracket 86 has been pivoted 90° to the 86' position, that the pusher element 29 is aligned with the slot 93 in the top of the enclosure 67 and with the spout 94 on the bottom of the enclosure 67.

The final stage of operation is the depression of the pusher element 29. The elements of the machine responsible for this can be appreciated from a consideration of FIG. 10.

In FIG. 10 the bracket 86' which is affixed to the longitudinally extending shaft 87 is seen to carry a vertically reciprocable carriage 95 which rides upon a rod 96 provided as part of the bracket 86'. It is the carriage 95 which carries the pusher element 29. The carriage 95 is biased toward a pusher retracted position by means of a spring 96. The biasing of the spring 97 is overcome by the downward movement of an actuating block 98. The actuating block 98 is pushed downwardly by virtue of a linkage arrangement generally designated 99 and terminating in a rod 100. The rod 100 is pivotally connected to the block 98 as at 101. The block 98 engages a roller 102 carried by the carriage 95 which urges the same downwardly against the retracting force of the spring 97 so as to simultaneously fold and eject the once folded stack of bags from the enclosure 67 into the box 85. The machine is reconditioned for a subsequent cycle, i.e., filling another carton by retracting upwardly the block 98 which permits the carriage 95 to also retract upwardly under the urging of the spring 98. The cam system responsible for actuating the linkage system 89 then reverses itself so as to rotate the bracket 86' to the position seen in solid line in FIG. 9 and designated 86. The enclosures 67 and 67' are rotated back to their bag-receiving position and the actuator bar arrangement 75 is depressed so as to open the jawlike housings making up the enclosures.

Further details of the mechanism employed for ejecting the stacked bags from the enclosures 67 can be seen in FIG. 13. For example the block 98 is seen to be slidably mounted on vertical rods 103. Further, in FIG. 13, the carriage 95 and associated elements are all in the standby as contrasted to operational condition, viz, the pusher element being in the 29' condition.

We claim:

1. A machine for loading bags into cartons comprising means for delivering individual bags sequentially through a first path to form a stack, means in said first path to receive said bags and support the same in partially folded condition, means for advancing a partially folded stack along a second path generally normal to said first path, enclosure means in said second path for receiving said partially folded stack and confining the same to substantially fold said stack, and pusher means for ejecting said substantially folded stack from said enclosure means into a carton while again folding said substantially folded stack.
2. The machine of claim 1 in which means are provided for moving said enclosure means through about a 90° arc prior to engagement of said substantially folded stack by said pusher means.
3. The machine of claim 2 in which said enclosure means includes a pair of pivotally interconnected housing jaws, means connected to said enclosure means for positioning said jaws apart for receiving said partially folded stack and for closing said jaws prior to arcuate movement thereof, said jaws being equipped with slots for entry of said pusher means and for ejecting said substantially folded stack.

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4. The machine of claim 1 in which said delivering means includes a grooved vacuum roll adapted to carry bags sequentially on its periphery and packer fingers operatively associated with said roll for orbital movement relative to said grooves to strip bags sequentially from said roll and move said bags in said first path.

5. The machine of claim 1 in which said support means is equipped with a slot defining a portion of said second path, a

carrier operatively associated with said support means, and reciprocable means operatively associated with said carrier and movable into said slot for engaging a partially folded stack prior to conducting the same along said second path.

6. The machine of claim 5 in which said reciprocable means includes linkage means for changing the elevation of said carrier during the return stroke of each reciprocation.

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