

United States Patent

[11] 3,588,093

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 [21] Appl. No. **770,720**
 [22] Filed **Oct. 25, 1968**
 [45] Patented **June 28, 1971**
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[54] SUCTION FEEDER BAR FOR WARPED SHEETS 6 Claims, 5 Drawing Figs.

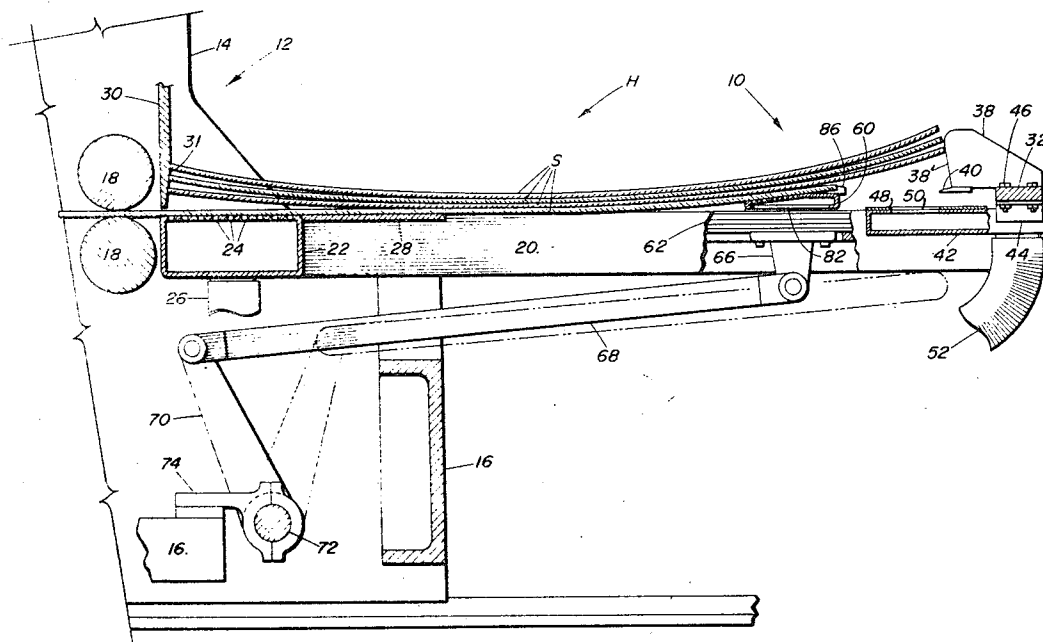
[52] U.S. Cl..... 271/32,
 271/44
 [51] Int. Cl..... B65h 3/08
 [50] Field of Search..... 271/44, 32

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ABSTRACT: A suction-type feeder system is provided for removing a sheet from the bottom of a stack which is mostly supported in air. The ends of the stack are engaged with narrow tapered members contacting the edges thereof. A feed bar, utilizing a vacuum, moves under the lowermost sheet of the stack and sucks it downwardly and moves it away from the adjacent tapered member into the nip of feed rolls. The feed bar is disconnected from the vacuum supply by a valve timed so as to discontinue its grip on the sheet at this later time.



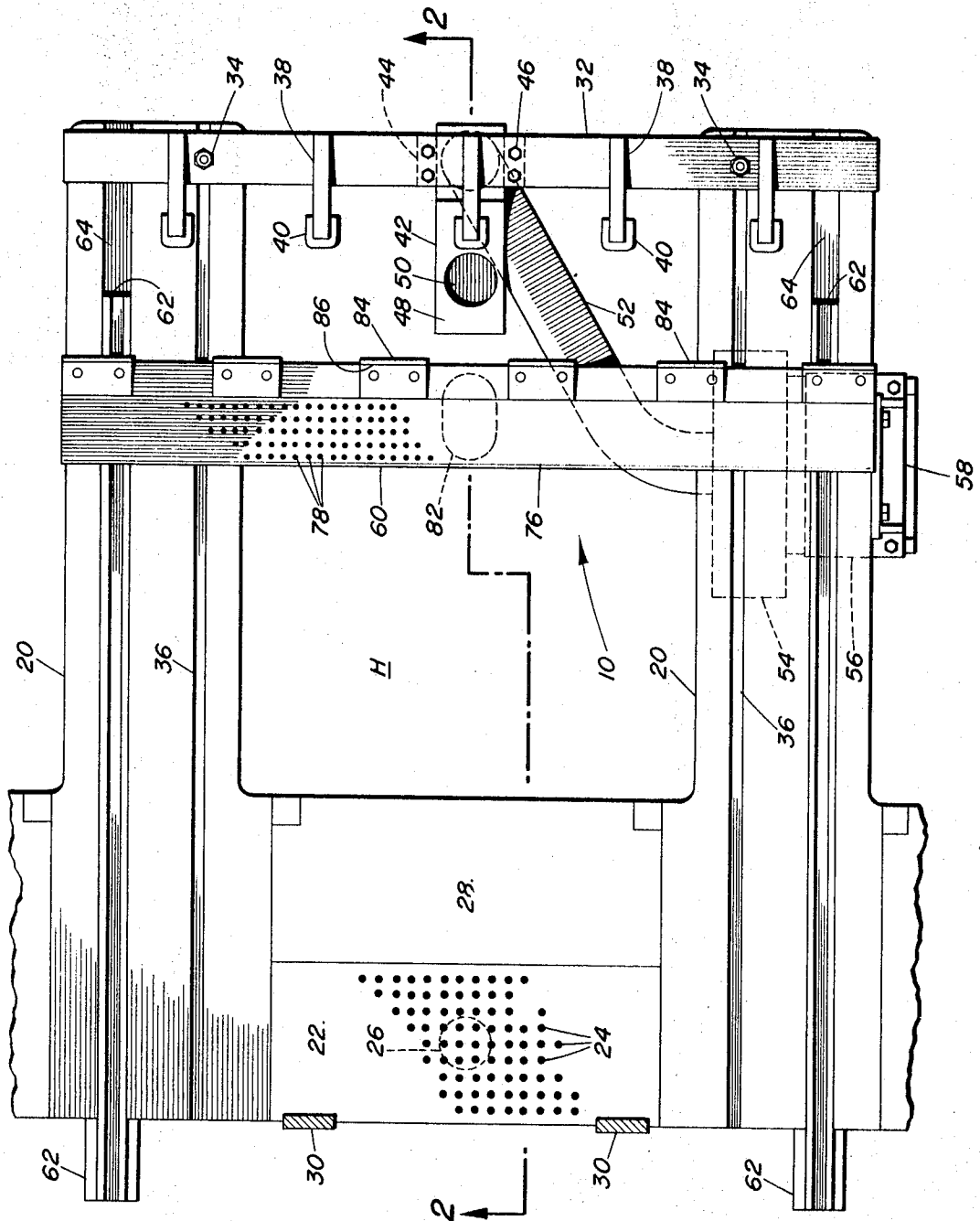


FIG. 1.

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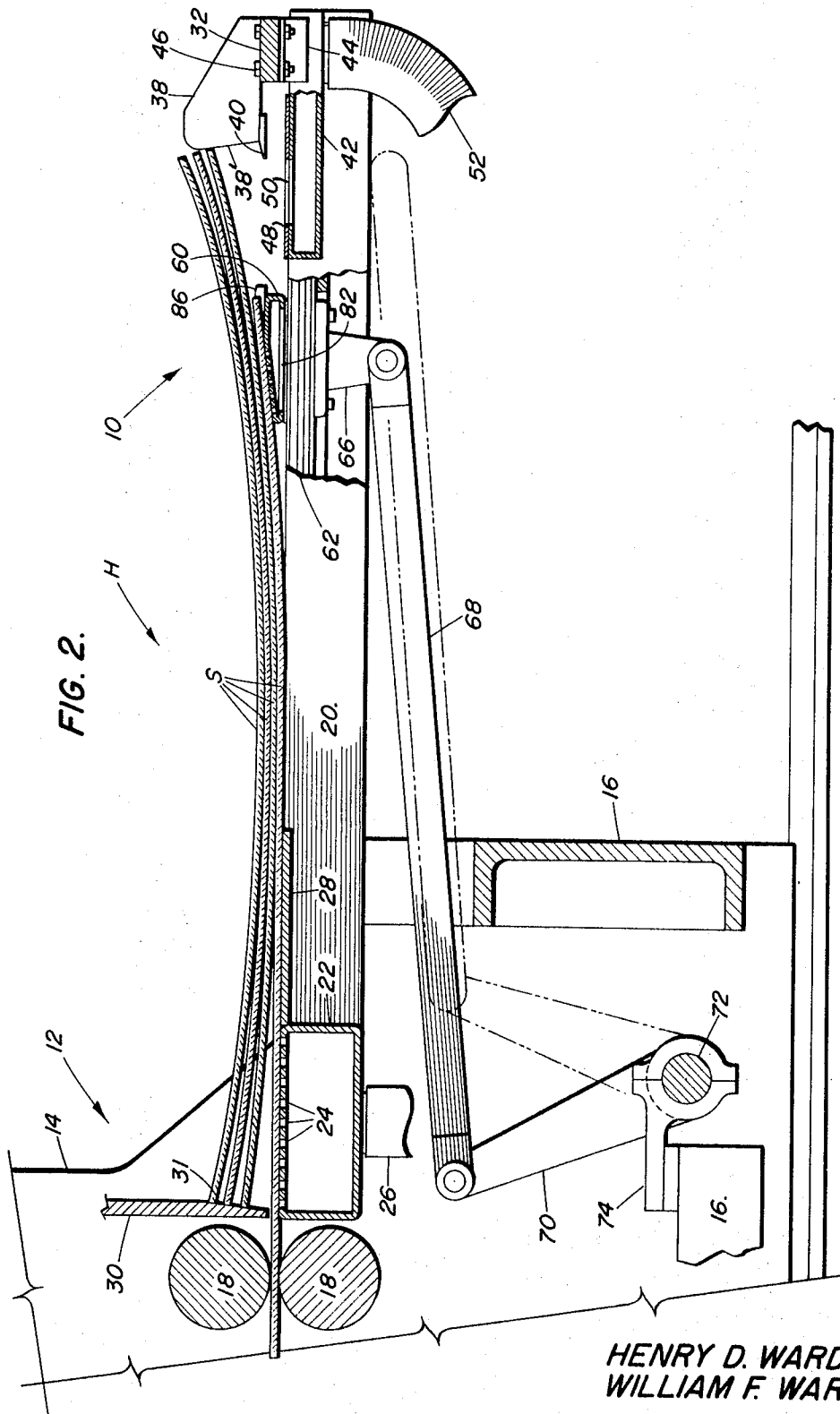


FIG. 2.

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SUCTION FEEDER BAR FOR WARPED SHEETS

This invention relates generally to machines for feeding individual sheets of cardboard from the bottom of a stack, and more particularly it pertains to a warped sheet-feeder bar system of the vacuum type.

Lightweight corrugated board, as encountered in Europe, the far East or in noncritical containers in the United States, is difficult to feed in blank form. This is because such liner sheets will not tolerate heavy pressure as they enter the feed roll.

It is an object of this invention, therefore, to provide a suction-type feeder system having a feed bar elevated above the table or normal line of travel of the board into the machine and therefore close to the normal expected trailing edge of a warped sheet.

Another object of this invention is to provide a feeder bar system of the vacuum type which applies full vacuum upon the start of its forward sweep and none at all at the termination of such stroke for more positive feed and disengagement of the sheet to the nip of feed rolls being supplied.

Other objects and attendant advantages of this invention will become more readily apparent and understood from the following detailed specification and accompanying drawings in which:

FIG. 1 is a plan view of the overall suction-type feeder system incorporating features of this invention;

FIG. 2 is a vertical section taken on line 2-2 of FIG. 1;

FIGS. 3, 4, and 5 are detail views of the feeder bar for the system illustrating successive portions of a feed stroke.

Referring now to the details of the invention as illustrated in the drawings, reference numeral 10 indicates generally a suction-type feeder bar system incorporating features of this invention. This feeder bar system 10 is shown in conjunction with a printer-slotter 12. However, this may be any machine for cardboard blanks such as a die cutter, printer, etc. Accordingly, the machine 12 is represented by its sidewalls 14, crossties 16, and feed rolls 18. The rolls 18 may be continuously rotating with a peripheral speed suited to the character of the subsequent operation and to match the speed of the feeder arrangement to be described.

A pair of feed table arms 20 extend in a rearward direction from the machine 12 and support between them a forward vacuum box 22 having a top perforated with a large number of apertures 24. An exhaust duct 26 communicates with the interior through the bottom and leads from a vacuum source which is not shown. A center bed 28 is coextensive with the top of the vacuum box 20 on the rearward edge. Vertical forward gate members 30 extend upwardly over the forward edge and are supported to clear the same by the approximate thickness of a sheet S of the material to be fed.

A backstop crossbeam 32 bridges the space between the feed table arms 20 being adjustably fastened thereon with bolts and nuts 34 slidable in inverted T-slots 36.

This crossbeam 32 mounts backstop bracket members 38 so that in conjunction with the previously mentioned forward gate members 30, a hopper H for a stack of sheets S is formed. The inner lower portions of the forward gate members 30 and of the backstop bracket members 38 are tapered downwardly at reference 31 and 38', respectively, approximately 6° to 8° from vertical to give an increasingly greater length to the effective hopper H for the bottommost sheets S of a stack therein.

Forwardly extending thinned fingers 40 are secured to the undersides of the backstop bracket members 38 and are supported considerably more than the usual sheet thickness for typical backstops above the plane extended of the center bed 28 or normal line of travel of the sheet. This is for the purpose of using a novel elevated feed bar of the vacuum type as will be related.

A rear vacuum box 42 is secured with clips 44 and fasteners 46 to the backstop crossbeam 32. A low friction member 48 of Teflon coats the top surface of the box 42 except for a hole 50 communicating with the interior thereof. An exhaust duct 52 of flexible hose depends from the bottom and leads to the in-

take of a blower 54 or other vacuum pump. The blower 54, together with its motor 56, may be mounted conveniently under one of the feed table arms 20 on brackets 58.

The arms 20 also are provided with ways 64 in which slide bars 62 are installed. A hollow feeder bar 60 is secured at its ends to the slide bars 62 and has a depending trunnion 66 as shown in FIG. 2 which is linked through a connecting rod 68 to an oscillating lever 70 on a shaft 72. This shaft 72 is journaled on a supporting fixture 74 on a crosstie 16 of the machine 12 and is driven by the motive source thereof. The resulting motion shown by the solid versus dot-dashed lines and representing the extreme positions of lever 70 with connecting rod 68 causes a fore and aft motion of the feeder bar 60.

The feeder bar 60 is provided with a portion of the forward upper wall 76 sloped forwardly downward and perforated with apertures 78. The lower wall 80 has a slot 82 in a position to register with the hole 50 of vacuum box 42 whenever the feeder bar 60 passes across the surface of the latter. The flat rear portion of the upper wall 76 has a plurality of pawls 84 of thin sheet metal each constructed with a sharply formed upstanding lip 86. These lips 86 are for the purpose of picking up the trailing edge of the sheet S and urge the sheet to the feed rolls 18.

It will be noted from FIG. 2 that the sheets S in the hopper H are somewhat crowded fore and aft so as to be supported frictionally by their edges. Thus oriented, they lie in a gentle depending curve. This tends to separate the edges of the sheet S because as the stack is depleted from the bottom, the sloping faces 31 and 38' lengthen the hopper H effectively at the bottom so the lowermost sheets S lie flatter than those above.

The hopper H is manually filled with sheets S by the operator. With the vacuum pumps operating, the leading edge of the lowermost sheet S is sucked down by the forward vacuum box 22. When the rear vacuum box 42 is covered by the feeder bar 60 and the slot 82 is in register with the hole 50, the trailing edge becomes sucked down against the sloping upper wall 76 and the tops of the fingers 40.

As shown in FIG. 3, this, the beginning of a forward feed stroke, initiates a cycle of operation. As the feed bar 60 moves in a forward direction, the lips 86 of the pawls 84 thereon engage the trailing edge of the lowermost sheet S and slide it off the supporting fingers 40.

Midway of the feed stroke, as shown in FIG. 4, the communication between slot 82 and hole 50 is cut off and the slot 82 vents to atmosphere. The trailing edge of the sheet S is no longer being sucked down now and the feed rolls 18 take over the feeding of the sheet which gradually advances over the top of the feed bar as the feed stroke come to completion as shown in FIG. 5. The feed bar 60 then returns over the rear vacuum box 42 to complete a cycle of operation.

It is essential that the suction force in the forward vacuum box 22 is more than that in the reciprocating feed bar 60. This means that the front box 42 under the gate will tend to lock the sheet S in position on the table and prevent it from following the feeder bar in its return stroke. In this way, the feeding lips 86 will pick up the sheet S whose motion is retarded by this suction force causing them to positively align the trailing edge and maintain this for a large part of the stroke.

Obviously many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

We claim:

1. In a sheet feeder system, having a sheet-feeding surface for receiving sheets of material stacked thereabove, a vacuum box having a perforation, a feeder bar having a perforation, an angled face adapted for conforming to a sheet, a sheet suction aperture therein connected with the perforation, a way movably supporting the feeder bar adjacently above said sheet-feeding surface and the vacuum box with said perforations in alignment, and means for reciprocating the feeder bar, thereupon cyclically opposing said perforations.

2. In a sheet-feed system as recited in claim 1 a pawl member upstandingly attached to the rear of the feeder bar and adapted to engage the edge of a said sheet.

3. In a sheet-feeder system as recited in claim 1, a second vacuum box at the opposite end of the sheet-feeding surface from the first said vacuum box, a backstop having a sheet-engaging surface adjacent the first said vacuum box, and a gate member having a sheet-engaging surface adjacent the second said vacuum box, said sheet-engaging surfaces being closer together than the length of sheets to be fed, a said sheet-engaging surface being at a downwardly opening angle with the other said sheet-engaging surface whereby the spacing between the said sheet-engaging surfaces is greater proximate said sheet-feeding surface than away from said sheet-feeding surface, thereby providing for constricting the length of sheets between said backstop and gate, producing a sag in the sheets to be fed, and contouring the trailing edges thereof with said feeder bar angled face.

4. In a sheet feed system as recited in claim 3, a downwardly tapered finger on the backstop offset from said feed bar pawl member and in the plane thereof.

5. In a sheet feeder system as recited in claim 3, said second vacuum box apertured surface lying in the plane of the sheet-feeding surface.

6. The method of advancing and releasing successive

uniform-length sheets of material to feed rolls and the like, comprising the steps:

- a. stacking uniform-length sheets of material;
- b. upwardly constraining the leading and trailing edges of said sheets of material, allowing the centers thereof to sag downwardly;
- c. applying downward force to the forward edge of the bottom sheet of material independently of the center and trailing edge of the bottom sheet of material, drawing it free of said constraint and securing it below and parallel to the length of the sheet material;
- d. applying a downward force to the trailing edge of the bottom sheet of material independently of the center and forward edge of the bottom sheet of material, thereby drawing it free of said constraint;
- e. pressing forwardly the trailing edge of the bottom sheet of material and concurrently reducing said downward forces thereby advancing the bottom sheet of material to withdrawing contact with the feed rolls and releasing it at that time to said rolls; and
- f. repeating in sequence the steps described, thereby advancing and releasing successive uniform-length sheets of material to the feed rolls.

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