

- [54] **PANEL BOARD FEEDING APPARATUS**
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[73] Assignee: **Marguip, Inc.**, Phillips, Wis.
[22] Filed: **Mar. 26, 1971**
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[52] U.S. Cl. **214/8.5 D, 271/11, 271/26 R, 294/64 R**
[51] Int. Cl. **B65g 59/04**
[58] Field of Search... **214/8.5 D, 6 FS; 271/11, 26 R, 271/57; 294/64 R**

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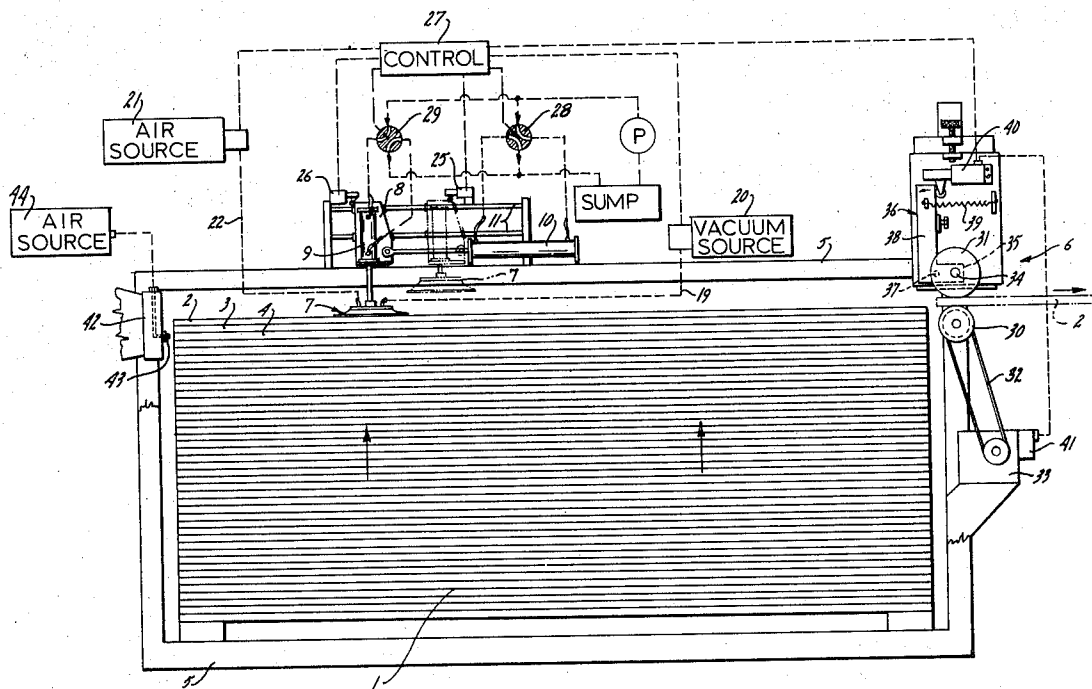
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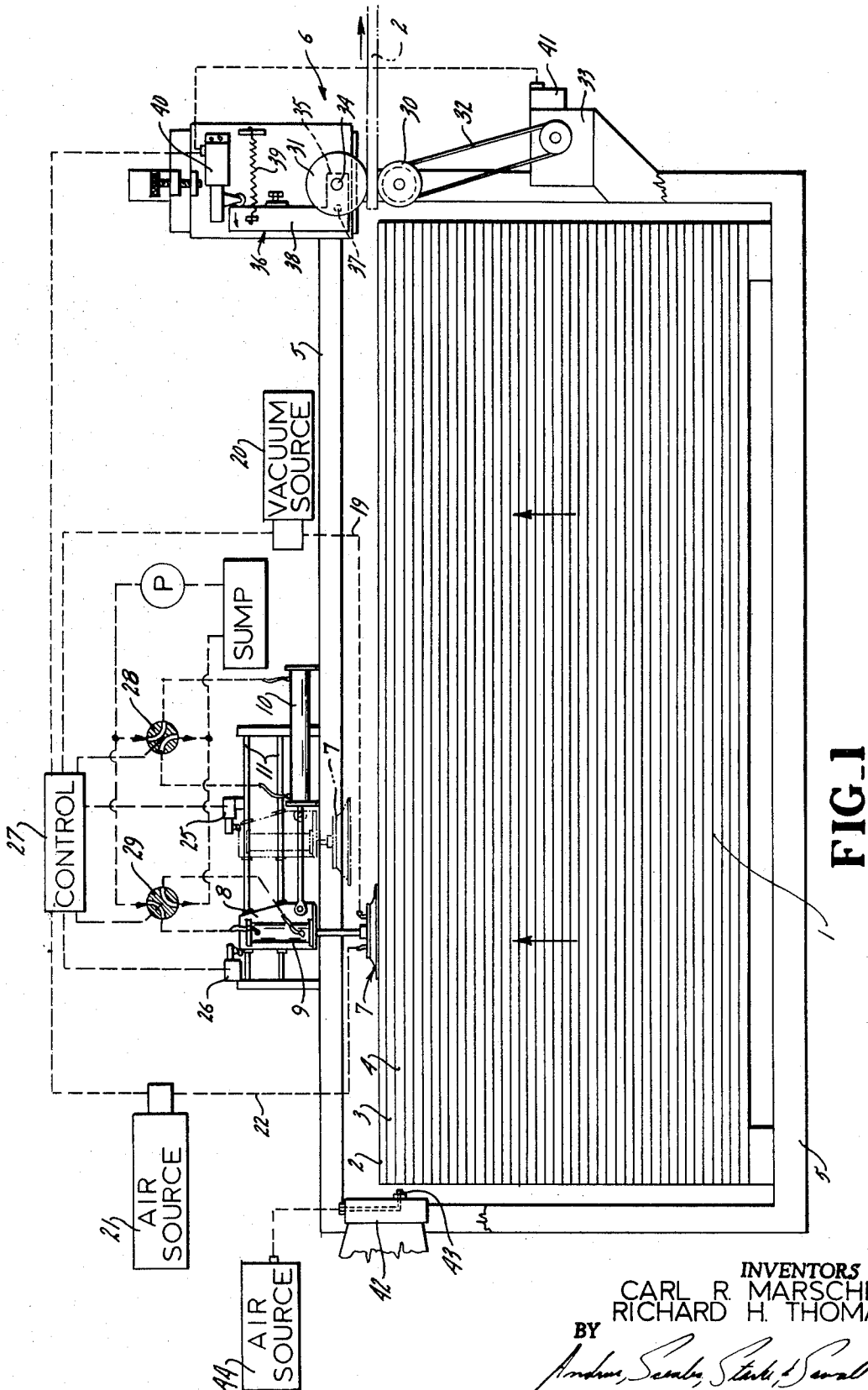
Primary Examiner—Robert J. Spar
Attorney—Andrus, Scales, Starke & Sawall

[57] **ABSTRACT**

A panel board feeding apparatus wherein a vacuum head having a convex board-engaging surface picks up the top board in a stack, causing the board to flex convexly so that it does not stick to the next adjacent board. The head is supplied with pressurized air as well as vacuum, which breaks any residual vacuum below the top when porous boards are used, and also sets up vibrations in the stack. The head feeds a board into a nip and, if more than one board is fed, the board drive automatically reverses and kicks them rearwardly where they engage a stop with high impact. The stop also includes an air jet which impinges on the stack edges.

7 Claims, 5 Drawing Figures





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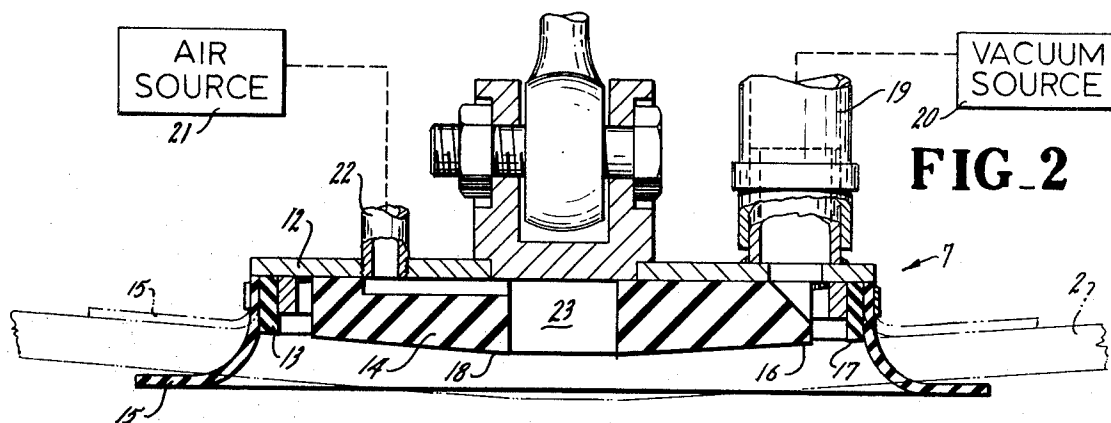


FIG. 2

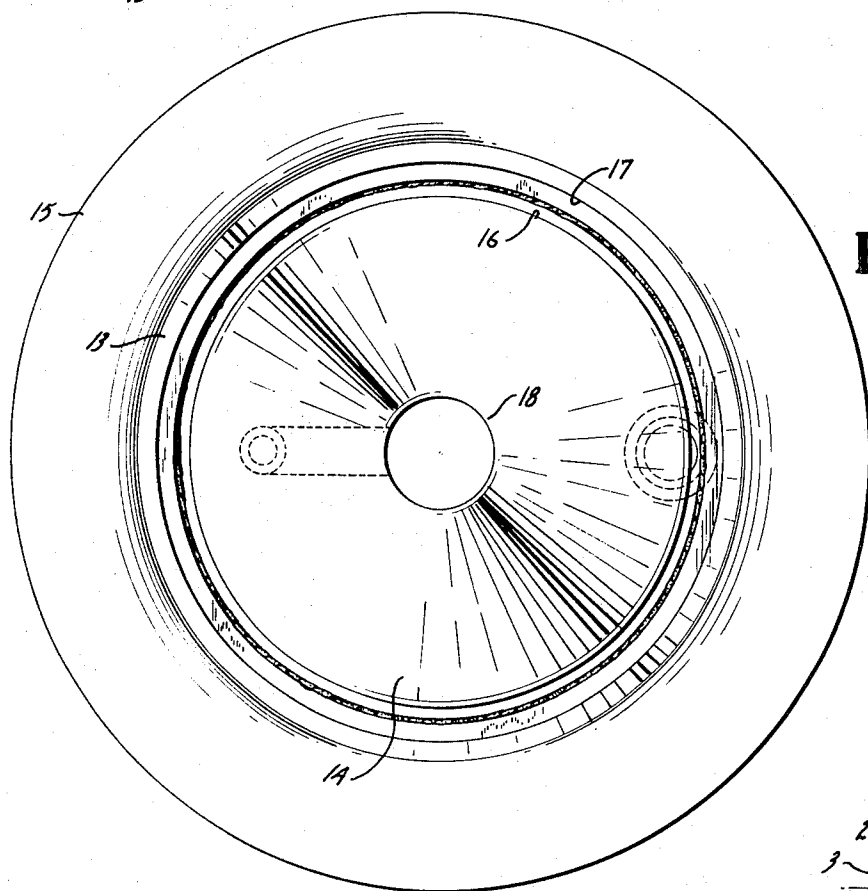


FIG. 3

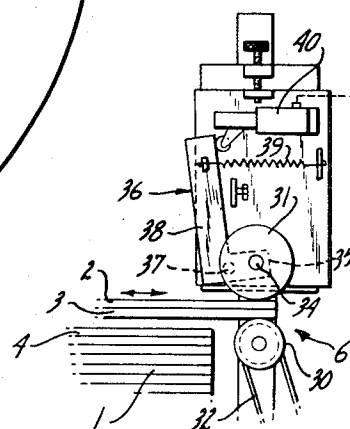


FIG. 4

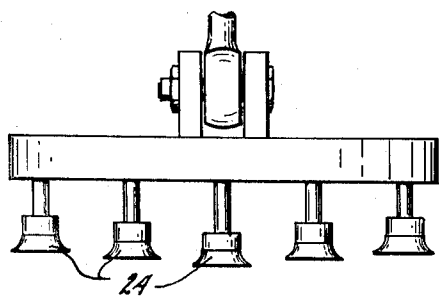


FIG. 5

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PANEL BOARD FEEDING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to a panel board feeding apparatus, and more particularly to a device for feeding panel boards or the like from a stack to other apparatus for further processing. The device of the invention could be used as an input for the machine disclosed in U.S. application Ser. No. 830,466, Filed June 4, 1969 by Carl R. Marschke, entitled "Automatic Panel Wrapping Machine," now U.S. Pat. No. 3,590,552, Issued July 6, 1971, and assigned to a common assignee.

Prior automatic panel board feeding devices have been subject to serious deficiencies in that from time to time they would feed more than one board into the processing line. Even if double panel feeding occurs only occasionally, extensive and costly damage can result to down-line equipment, and substantial production time can be lost.

SUMMARY OF THE INVENTION

The present invention is based on the discovery of some of the causes of double-board feeding, and solves this and other problems in a unique manner.

When the top flexible panel board is lifted vertically from a stack by a centrally positioned lifting device, the board tends to flex in a convex direction, when viewed from the top. It has been discovered that this tends to create a vacuum between the top and next adjacent board. Furthermore, it has been discovered that when a conventional vacuum pick-up device is used in conjunction with slightly porous boards, the effect of the vacuum applied to the top board extends downwardly through adjacent boards.

Generally in accordance with the invention, means are provided to pick up the top board in a stack by a centrally positioned lifting device in such a manner that at least a portion of the board tends to flex in a concave, rather than convex, direction as viewed from the top. In addition, an oscillatory or vibratory force is created which tends to break any other vacuum created in the stack.

More specifically, the inventive concept utilizes a pick-up means comprising a single or multi-unit vacuum head having a convex central board support portion. Furthermore, means are provided to inject air into the vacuum head, which causes a vibratory oscillation of the top board. When slightly porous boards are handled, the injected air penetrates downwardly through several boards.

The pick-up means feeds the panel into the discharge nip. In the remote event that more than one board is fed to the nip, sensing means are provided to automatically reverse the board drive and return the multiple boards to the stack. Upon return, they are subjected to an impact and high pressure air stream.

DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate the best mode presently contemplated by the inventors for carrying out the invention.

In the drawings:

FIG. 1 is a schematic side elevation of the board feeding apparatus, and showing the control circuitry therefor;

FIG. 2 is a vertical section through the board pick-up head;

FIG. 3 is a bottom plan view of the pick-up head;

FIG. 4 is a schematic showing of the reverse drive mechanism when a double board is fed to the nip; and

FIG. 5 is a schematic showing of a second embodiment of pick-up head.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown schematically in the drawings, the apparatus of the invention is adapted to feed single successive flat flexible panel boards from the top of a stack 1, and wherein the uppermost boards have been given reference numerals 2, 3 and 4. Stack 1 may be supported in any suitable manner, as by machine frame 5. As the stack diminishes, the stack is raised to maintain the level of the top board by any suitable mechanism, not shown.

Means are provided to lift top board 2 from stack 1 and deliver it to a discharge nip 6. For this purpose, a vacuum head 7 is suitably connected to a carriage 8 and is vertically movable, as by a pneumatic cylinder and piston assembly 9 mounted on the carriage. Head 7 is also horizontally movable toward and away from nip 6, as by a second pneumatic cylinder and piston assembly 10 connected between frame 5 and carriage 8. The latter moves on horizontal tracks 11.

In accordance with the invention, means are provided to pick up top board 2 centrally so that it flexes into a concave shape, thus substantially preventing the formation of a vacuum between boards 2 and 3. Dual board pick-up is thus substantially avoided. This is accomplished with vacuum head 7, and in the embodiment shown in FIGS. 1-3, head 7 is cup-like and comprises a circular base 12 of metal or the like, having an annular rim 13 of relatively firm hard rubber or the like extending therefrom. A generally planular circular support 14 of similar rubber-like material is disposed centrally of base 12 and, together with rim 13, from which it is spaced, forms a vacuum cap. A soft flexible rubber annular lip 15 disposed about rim 13 forms a seal when the head engages board 2.

The outer face portion 16 of support 14 is at approximately the same height as the bottom edge 17 of rim 13, and tapers to a central face portion 18 which extends beyond or below the level of edge 17. The cup is thus generally convex surfaced.

As shown in FIG. 2, engagement of head 7 with board 2 will cause the portion of the board beneath the head center to engage face portion 18, with a resultant rise of the board outwardly thereof into engagement with edge 17. The board thus flexes into a concave shape, when viewed from the top, which tends to break it away from board 3.

For purposes of picking up board 2, head 7 is supplied with vacuum through a line 19 between a vacuum source 20 and the periphery or lowest portion of the vacuum cup. When slightly porous boards are used, the vacuum applied to top board 2 may also have a residual effect below it. To overcome this effect, high pressure air is injected into the center of the vacuum cup at its highest portion, i.e., the center of support 14. The air is supplied from a suitable source 21, through line 22 and hence through a central port 23 in support 14. A por-

tion of this air, which is supplied simultaneously and continuously with the vacuum action, passes through porous board 2 and forms an air bearing between boards 2 and 3, and possible even beyond. The tendency of adjacent boards to stick together is thus reduced.

In addition, it has been found that a portion of the pressurized air injected through port 22 escapes outwardly in spurts through the interface between the board and support 14 and into the vacuum existing between portion 16 and edge 17, and hence travels thru line 19 to vacuum source 20. This is due to the build-up of air pressure within cavity 23, which is released by the spurts. A pneumatic oscillatory physical vibration is thereby set up in the top of stack 1, which also tends to break apart any stubbornly sticking adjacent boards.

A second embodiment of head 7 is shown in FIG. 5, wherein a plurality of conventional suction type vacuum cups 24 are mounted in generally convex fashion to form a central board support lower than the outer edge support. Vacuum and pressurized air may also be provided in this embodiment.

As shown in FIG. 1, the operation of pick-up head 7 may be controlled by fore and aft limit switches 25, 26 disposed at the extreme ends of travel of carriage 8. Actuation of limit switches 25, 26 feeds signals to an electrical control box 27 which, in turn, actuates suitable valves 28, 29 to move head 7 vertically and horizontally for board pick-up, feeding and board release. Control box 27 also operates air and vacuum sources 20, 21 in response to engagement of limit switches 25, 26 to provide vacuum and air for board pick-up and feeding and to cut them off at the time of board release.

After top board 2 has been lifted by head 7, carriage 8 is moved horizontally to carry the head and attached board forwardly to nip 6, which feeds the board through. For this purpose, lower and upper rubber covered nip rolls 30 and 31 respectively are provided. Lower roll 30 is driven, such as via belt 32 and reversible motor 33, and is on a fixed axis. Upper roll 31 constitutes an idler.

Although to the inventors' knowledge, vacuum head 7 has never failed to separate adjacent boards, a back-up system is contemplated in the event that more than one board is fed to nip 6. This might occur if two boards were glued together with paint. For this purpose, idler roll 31 is mounted on a movable axis 34, and one arm 35 of a lever 36 is also mounted on the axis. Lever 36 is mounted on the fixed pivot 37, and the other lever arm 38 is biased, as by a spring 39, against the limit switch 40. Switch 40 is connected to motor 33 via a suitable control circuit 41 of any well-known type, which, upon actuation of switch 40, reverses the motor.

In the normal situation shown in FIG. 1, wherein a single board 2 is fed into nip 6, limit switch 40 will cause motor 33 to drive roll 30 so that the board passes through. As shown in FIG. 4, if more than one board, such as boards 2 and 3, are fed to the nip, lever 36 will pivot and switch 40 will be activated to cause reversal of drive roll 30. This will kick the boards back to the closely adjacent stack.

If a plurality of boards are fed to nip 6, it is apparent that extreme measures may be necessary to separate them before attempting the next feed-through. For this purpose, means are provided to apply an impact to the

boards when they are kicked back from the nip. In the present embodiment, and as shown in FIG. 1, a vertical bar 42 is fixedly mounted on the machine frame closely adjacent the rear edge of stack 1. Bar 42 is positioned at the top of the stack so that, as the boards are kicked back, their rear edges will engage the bar with a shock-like impact.

If desired, bar 42 may incorporate a port 43 at its lower end which is connected to a source 44 of high pressure air. Air passing through port 43 at high velocity will impinge on the rear edge of the stack, causing individual boards to flutter and thus separate.

The concepts of the invention provide a substantially improved system for feeding single sheet-like panel boards disposed in a stack, and wherein there is substantially no chance that more than one board at a time will be discharged from the device.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

We Claim:

1. An apparatus for feeding flat flexible panel boards successively from the top of a stack of boards, comprising in combination:

a. pick-up means for engaging and lifting the top board from the stack in a manner so that said top board flexes concavely, said pick-up means comprising:

1. a vacuum head forming a cup having a firm convex-surfaced board-support portion spaced from a rim,
2. and means to provide a vacuum to said cup so that when the top board is engaged thereby, the board will become secured thereto and flex concavely to separate the board from the next adjacent board in the stack,

b. a nip including reversible drive means for feeding a board therethrough,

c. means to move said pick-up means and attached board horizontally to feed said board forwardly into said nip,

d. sensing means at said nip for reversing said drive means if more than one board is fed into said nip so that said boards will be kicked back onto the stack,

e. stop means disposed adjacent the rear stack edge for impact-like engagement by said kicked-back boards,

f. and means to create vibrations between said head and the board attached thereto to assist in separating said board from the next adjacent board in the stack, said lastnamed means comprising:

1. a flexible lip disposed about said rim and positioned to sealingly engage the said board,
2. and means to supply continuous pressurized air to within said cup so that spurts of air escaping through the interface between said head and the said board will create said vibrations.

2. The apparatus of claim 1 which is for use with slightly porous panel boards, and wherein said air supply means provides means to form a pressurized air bearing at least between the said top board and the next adjacent board in the stack.

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3. In an apparatus for feeding flat flexible panel boards in succession from the top of a stack of boards through a nip:

a. pick-up means for centrally engaging and lifting the top board from the stack in a manner so that said top board flexes concavely to thereby separate said top board from the next adjacent board, said pick-up means comprising:

1. a vacuum head forming a cup having a firm convex-surfaced board-support portion spaced from a rim,

2. and means to provide a vacuum to said cup so that when the top board is engaged thereby, the board will become secured thereto and flex concavely to separate the board from the next adjacent board in the stack,

b. and means to create vibrations between said head and the board attached thereto to assist in separating said board from the next adjacent board in the stack, said lastnamed means comprising:

1. a flexible lip disposed about said rim and positioned to sealingly engage the said board,

2. and means to supply continuous pressurized air to within said cup so that spurts of air escaping through the interface between said head and the said board will create said vibrations.

4. The apparatus of claim 3 which is for use with slightly porous panel boards, and wherein said air supply means provides means to form a pressurized air bearing at least between the said top board and the next adjacent board in the stack.

5. In an apparatus for feeding flat flexible panel boards in succession from the top of a stack of boards:

a. a vacuum head engageable with the top board in a manner to form a sealed space therebetween,

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b. means to provide a vacuum within said space so that when the top board is engaged by said head, the board will become secured thereto and flexingly separate from the next adjacent board in the stack,

c. and means to supply pressurized air to within said space in spurts to thereby create vibrations between said head and top board to assist in separating the latter from the next adjacent board in the stack.

6. In an apparatus for feeding flat flexible panel boards in succession from the top of a stack of boards:

a. a vacuum head having a rubber-like member engageable with the said top board to form an interface therebetween,

b. means for forming a sealed space between said head and said top board when they are in engagement,

c. means to provide a vacuum within said space so that when the top board is engaged by said head, the board will become secured thereto and flexingly separate from the next adjacent board in the stack,

d. and means to supply continuous pressurized air through said rubber-like member to said interface so that spurts of air escaping through said interface to said space will create vibrations between said head and top board to assist in separating the latter from the next adjacent board in the stack.

7. The apparatus of claim 6:

a. wherein a board-engaging rim spacingly surrounds said rubber-like member,

b. and wherein said member is convex-surfaced so that the said top board flexes concavely when engaged thereby.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,724,687 Dated April 3, 1973

Inventor(s) Carl R. Marschke et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet "[73] "Marguip, Inc." should read
-- Marquip, Inc. --.

Signed and sealed this 8th day of January 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents