Aug. 27, 1963 G. S. RHICARD ETAL 3,101,638

SHEET STACKING MACHINES

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Fig. 1.

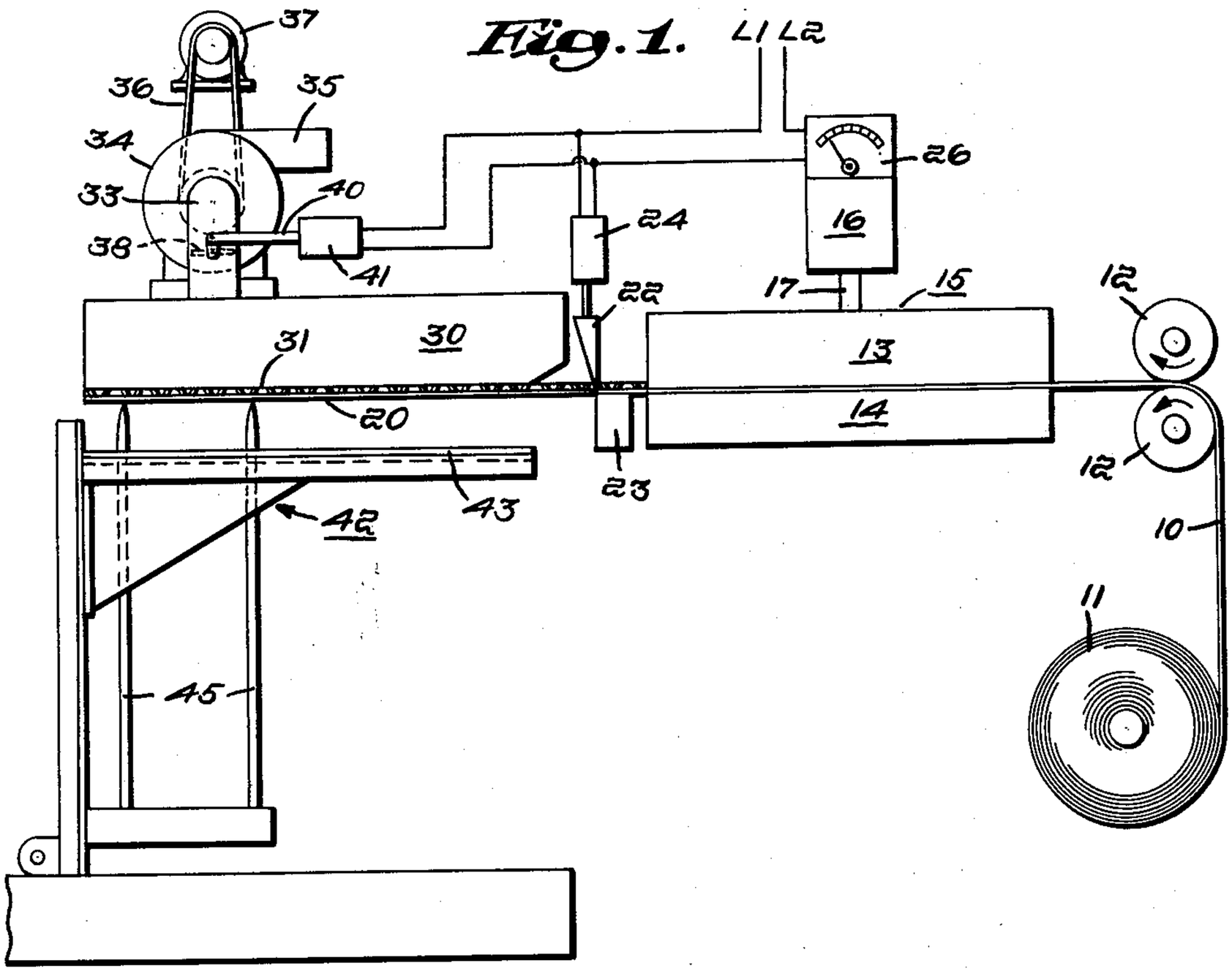

Fig. 2.

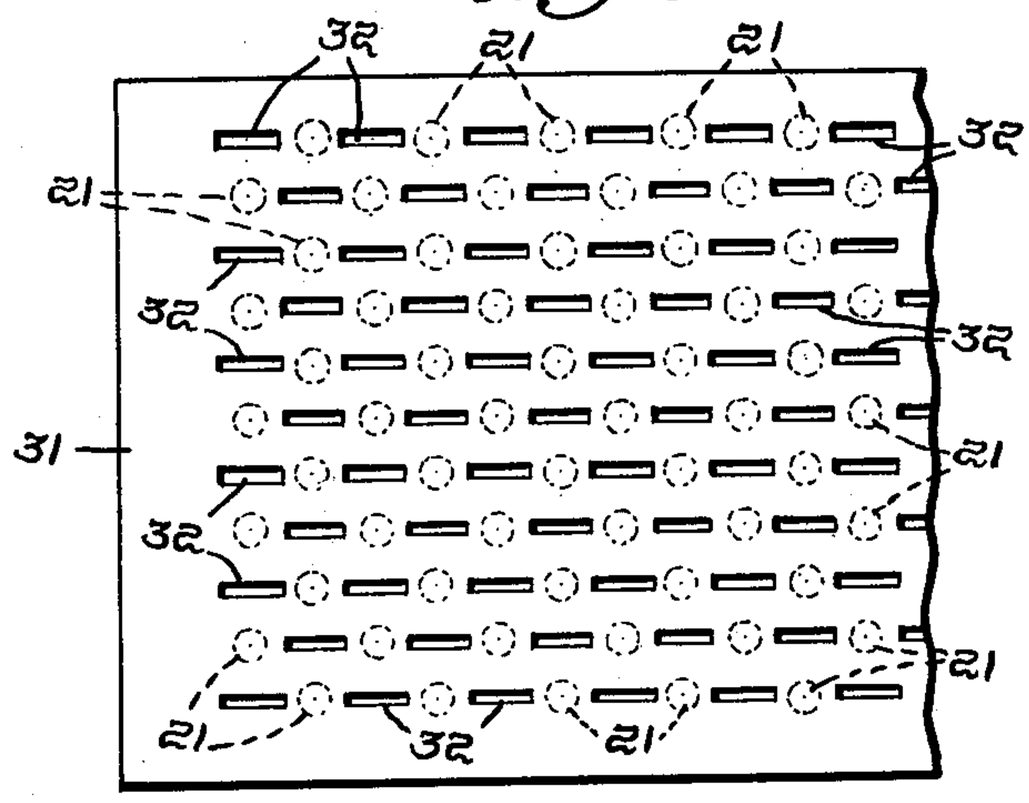

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Fig. 3.

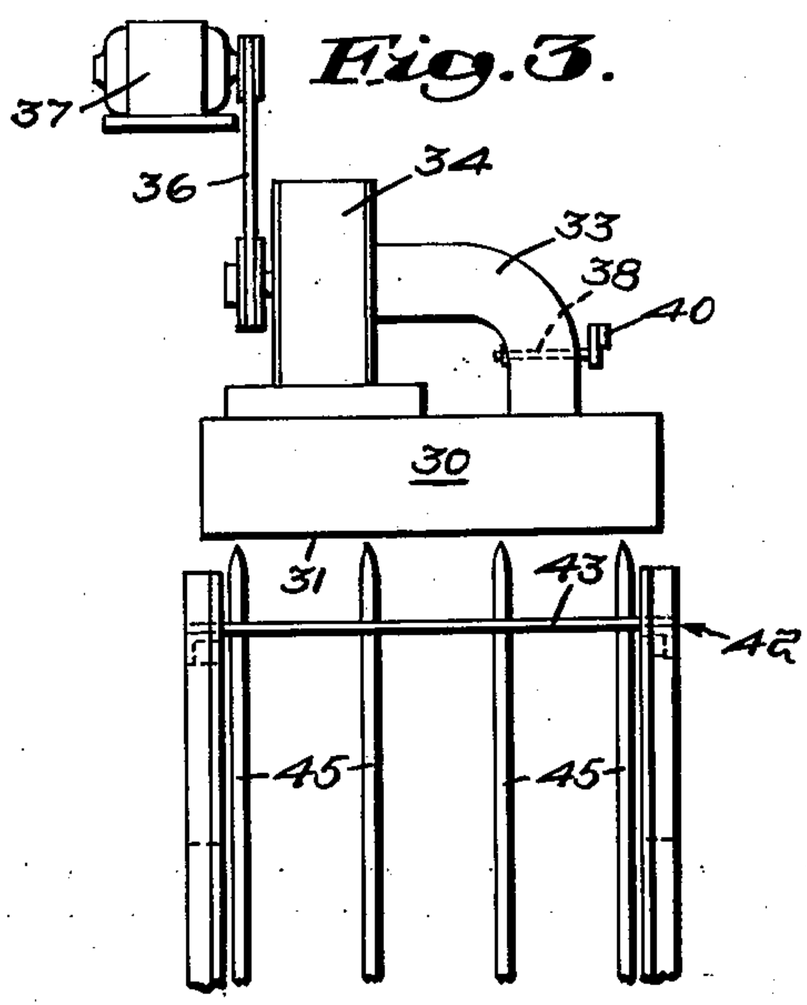


Fig. 4.

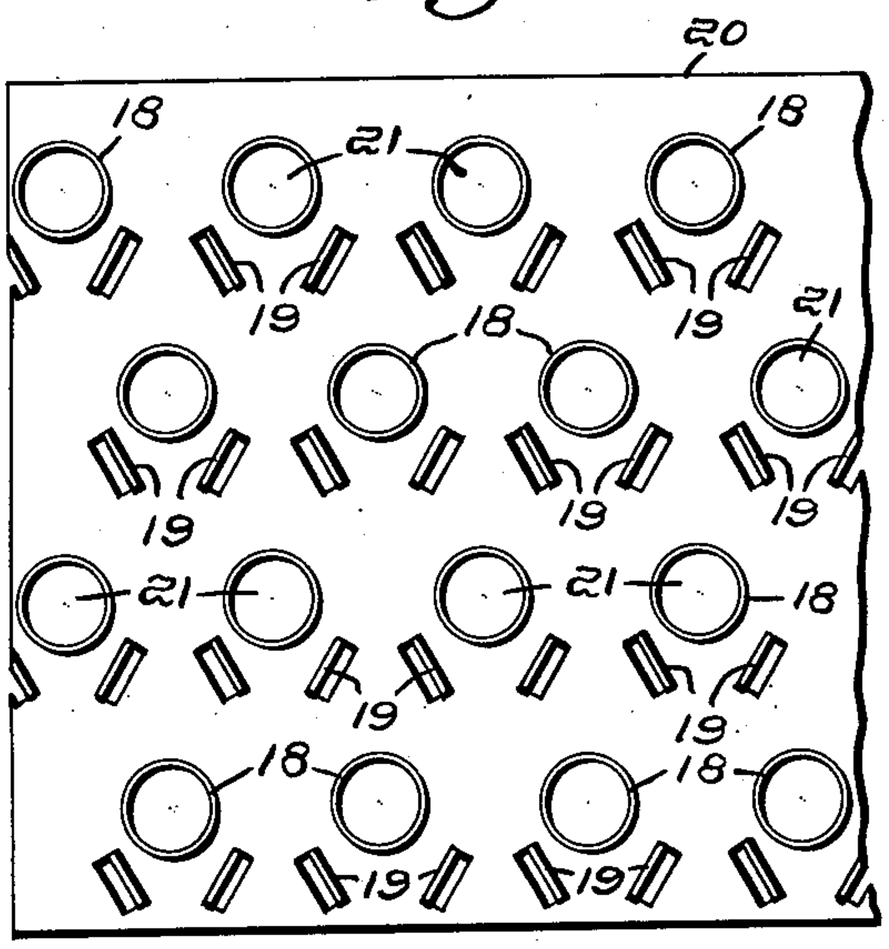
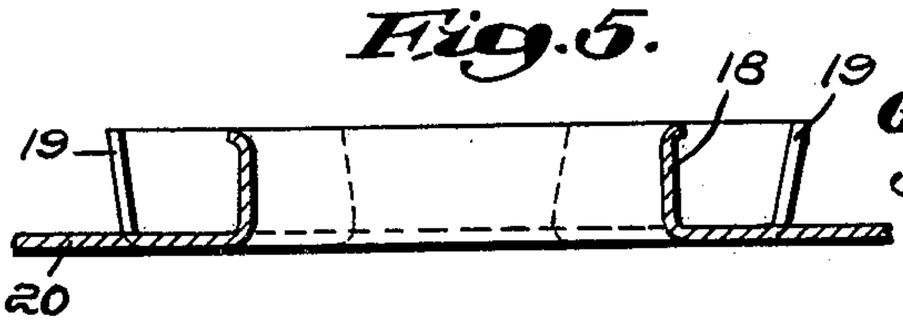


Fig. 5.



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SHEET STACKING MACHINES

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4 Claims. (Cl. 83—95)

This invention relates to machines for cutting off and stacking thin metal sheets from sheet stock as it emerges from punch presses.

What are generally known as "plate-type fins" are widely used in heat exchange coils, and are parallel, spaced-apart metal sheets in contact with the external surfaces of a group of spaced-apart, heat exchange tubes. Heretofore, such fins have been thick enough to possess sufficient strength and rigidity for handling and stacking prior to being assembled in coils. Recently, as disclosed in the co-pending application of Ancel L. Lee, Jr., filed concurrently with this application, it has been possible to greatly reduce the thicknesses of such fins without sacrifice in heat transfer. This has resulted, however, in the fins being so thin that they do not have sufficient rigidity for handling and stacking using the usual methods.

Our invention provides automatic stacking of such thin fins as they emerge from a press. In one embodiment of our invention, a suction box has a horizontally extending bottom with perforations therein which are staggered with respect to the perforations in the fin. A motor driven fan has its air inlet connected by a duct to the suction box for providing the necessary suction. A damper is provided in the duct for turning on and off the suction. As a fin emerges from the press, it passes under the suction box a predetermined distance while suction is applied to it to hold it in a horizontal path. At the end of its forward travel, a solenoid actuated knife cuts the fin from the sheet stock. Concurrently, a solenoid closes the damper, cutting off the suction, and permitting the fin to drop.

Below the suction box is a stacker having a plurality of vertically extending guide rods aligned with circular holes in the fin being held by the suction box. When a fin is released by the suction box, the guide rods maintain it in its proper position on the stacker so that it will be in alignment with other fins on the stacker.

An object of this invention is to automatically stack thin, heat exchange fins as they emerge from a press.

Another object of this invention is to apply suction to thin, heat exchange fins as they emerge from a press for holding them in position over a stacker.

This invention will now be described with reference to the annexed drawings, of which:

FIG. 1 is a side view of a machine embodying this invention;

FIG. 2 is a fragmentary bottom plan view of the bottom of the suction box of FIG. 1;

FIG. 3 is an end view of the suction box, and the upper portion of the stacker;

FIG. 4 is an enlarged, fragmentary top plan view of a fin which is produced and stacked, and

FIG. 5 is an enlarged, fragmentary sectional view of the fin, showing a sleeve and a pair of louvers formed in the fin.

Aluminum sheet 10 from a supply roll 11 is moved by motor driven rolls 12 between the upper die 13 and the lower die 14 of a punch press 15. The press has an air cylinder 16 connected by piston rod 17 to the upper die 13. The starting and stopping of the rolls 12 is controlled by a cam which is not shown, of the press. The dies 13 and 14 are designed to punch the sleeves 18 and louvers 19 on a fin 20 as shown by FIGS. 4 and 5. The

sleeves 18 have circular openings 21 therein. The tops of the sleeves and of the louvers are aligned.

At the output side of the press 15, the left side of FIG. 1, there is a fin cut-off knife above the punched fin stock, and an anvil 23 below the latter and the knife. The knife is adapted to be projected downwardly by a solenoid 24 which is energized from electric supply lines L1 and L2 when connected to the latter by a control 26 on the cylinder 16.

To the left of the knife 22 is a suction box 30 having a horizontally extending bottom 31 slightly above the path of the fin stock emerging from the press 15. The bottom 31 has a plurality of spaced-apart slots 32 extending therethrough. The slots 32 are arranged as shown by FIG. 2 to be out of alignment with the circular openings 21 in a fin 20 properly positioned under the suction box bottom.

The interior of the suction box 30 is connected by duct 33 with the air inlet of a fan 34 of the centrifugal type, having a tangential air outlet 35. The fan is driven through belt 36 by an electric motor 37. The duct 33 has a damper 38 therein which is connected to plunger 40 of a solenoid 41. The solenoid 41 is connected in shunt to the solenoid 24 so that both are energized and deenergized at the same time.

Below the suction box 30 is a stacker 42 having a horizontally extending, fin receiving shelf 43 which is adapted to be lowered by mechanism which is not shown, as fins dropped by the suction box 30 accumulate upon it. The stacker 42 has spaced-apart, vertically extending, guide rods 45 which are aligned with openings 21 in a fin being held by suction against the bottom of the suction box.

The machine of FIG. 1 is designed to produce fins having different lengths, and requiring different numbers of strokes of the press 15. An operator would set the control 26 to cause the solenoid 24 to be energized to actuate the knife 22 to cut-off a fin 20 from the punched stock, after a predetermined number of strokes of the press 15.

Operation

In operation, the rolls 12 advance sheet 10 from the roll 11 until stopped by the press 15. The press cylinder 16 raises and lowers the upper die 13 in a predetermined number of strokes set by the control 26, until a fin having the desired length has been produced and moved forwardly under the bottom 31 of the suction box 30. The fan 34 is in operation during this time so that suction is applied by the suction box to hold the punched sheet against its bottom. When the desired length of fin sheet has been moved forwardly, the control 26 energizes the solenoids 24 and 41. The solenoid 24 actuates the knife 22 to cut the fin from the punched sheet. The solenoid 41 adjusts the damper 38 in the fan duct 33 to closed position, cutting off the suction applied to the fin and permitting the cut-off fin to drop.

The guide rods 45 of the stacker 42 are aligned with corresponding openings 21 in the cut-off fin, and guide the latter onto the shelf 43. As the cut-off fins pile up on the shelf 43, the guide rods 45 maintain them in alignment.

The press 15 continues to operate until the stacker 42 has been loaded with fins. Shortly after the control 26 has energized the solenoids 24 and 41, it deenergizes them, so that the knife 22 is withdrawn, and the damper 38 is opened. The next punched fin sheet is moved under the suction box, and the cycle is repeated.

Although the tops of the sleeves 18 and louvers 19 on the fin contact the bottom of the suction box, and space the body of the fin from the suction box so that air can be drawn into the suction box in the space between its

bottom and the flat main body of the fin, the fan 34 has sufficient capacity to take in such by-pass air and still maintain sufficient suction to hold the fin against the bottom of the suction box until the damper 38 is closed.

What is claimed is:

1. In combination with a punch press having means for working on sheet metal stock, and having power driven rolls for passing said stock substantially horizontally through and beyond said press, a suction box having a substantially horizontally extending bottom above the path of the worked-on sheet as it emerges from said press, said bottom having a plurality of spaced-apart perforations extending therethrough, means for applying suction to the interior of said box for causing suction through said perforations to hold a worked-on sheet against said bottom, means between said press and bottom for severing a worked-on sheet from said stock, means for operating said severing means after said sheet is held against said bottom and means for concurrently disabling said suction applying means to permit the severed sheet to fall from said bottom.

2. In combination with a punch press having means for working on sheet metal stock, and having power driven rolls for passing said stock substantially horizontally through and beyond said press, means for counting the number of strokes of said press, a suction box having a substantially horizontally extending bottom above the path of the worked-on sheet as it emerges from said press, said bottom having a plurality of spaced-apart perforations extending therethrough, means for applying suction to the interior of said box for causing suction through said perforations to hold a worked-on sheet against said bottom, means between said press and bottom for severing a worked-on sheet from said stock, and means connected to said counting means for operating said severing means to sever the worked-on sheet from said stock and for disabling said suction applying means to permit the severed sheet to fall from said bottom.

3. In combination with a punch press having means for punching a plurality of spaced-apart, circular holes in sheet metal stock, and having power driven rolls for passing said stock through and beyond said press, a suction box having a substantially horizontally extending bottom above the path of the worked on sheet as it emerges from said press, said bottom having a plurality of spaced-apart perforations extending therethrough, means for applying suction to the interior of said box for causing suction through said perforations to hold a worked-on sheet against said bottom, means between said press and bottom for severing a worked-on sheet from said stock, a stacker under said box, said stacker having a plurality of substantially vertically extending rods aligned with the holes in a worked-on sheet held against said bottom, means for operating said severing means after said sheet is held against said bottom, and means for concurrently disabling said suction means to permit the severed sheet to fall onto said stacker with said rods guiding said severed sheet into position on said stacker.

4. In combination with a punch press having means for punching a plurality of spaced-apart, circular holes in sheet metal stock, and having power driven rolls for passing said stock through and beyond said press, a suction box having a substantially horizontally extending bottom above the path of the worked-on sheet as it emerges from said press, said bottom having a plurality of spaced-apart perforations extending therethrough, means for applying suction to the interior of said box for causing suction through said perforations to hold a worked-on sheet against said bottom, means between said press and bottom for severing a worked-on sheet from said stock, means for counting the number of strokes of said press, a stacker under said box, said stacker having a plurality of substantially vertically extending guide rods aligned with the holes in a worked-on sheet held against said bottom, and means connected to said counting means for operating said severing means to sever the worked-on sheet from said stock and for disabling said suction applying means for permitting the severed sheet to fall onto said stacker with said rods guiding the severed sheet into position on said stacker.

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