

July 19, 1960

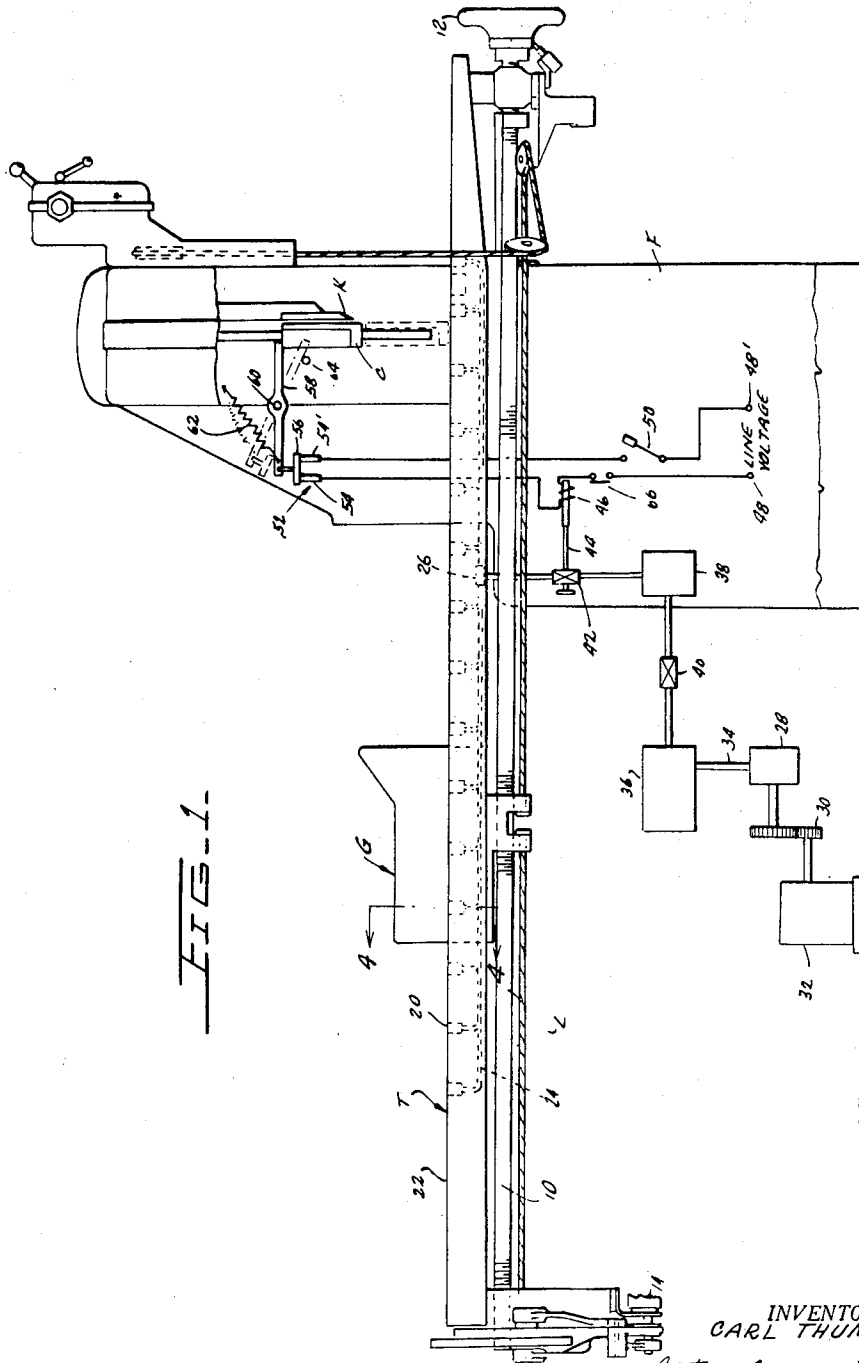
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2,945,600

CUTTING MACHINE AND TABLE THEREFOR

Filed Dec. 4, 1956

4 Sheets-Sheet 1



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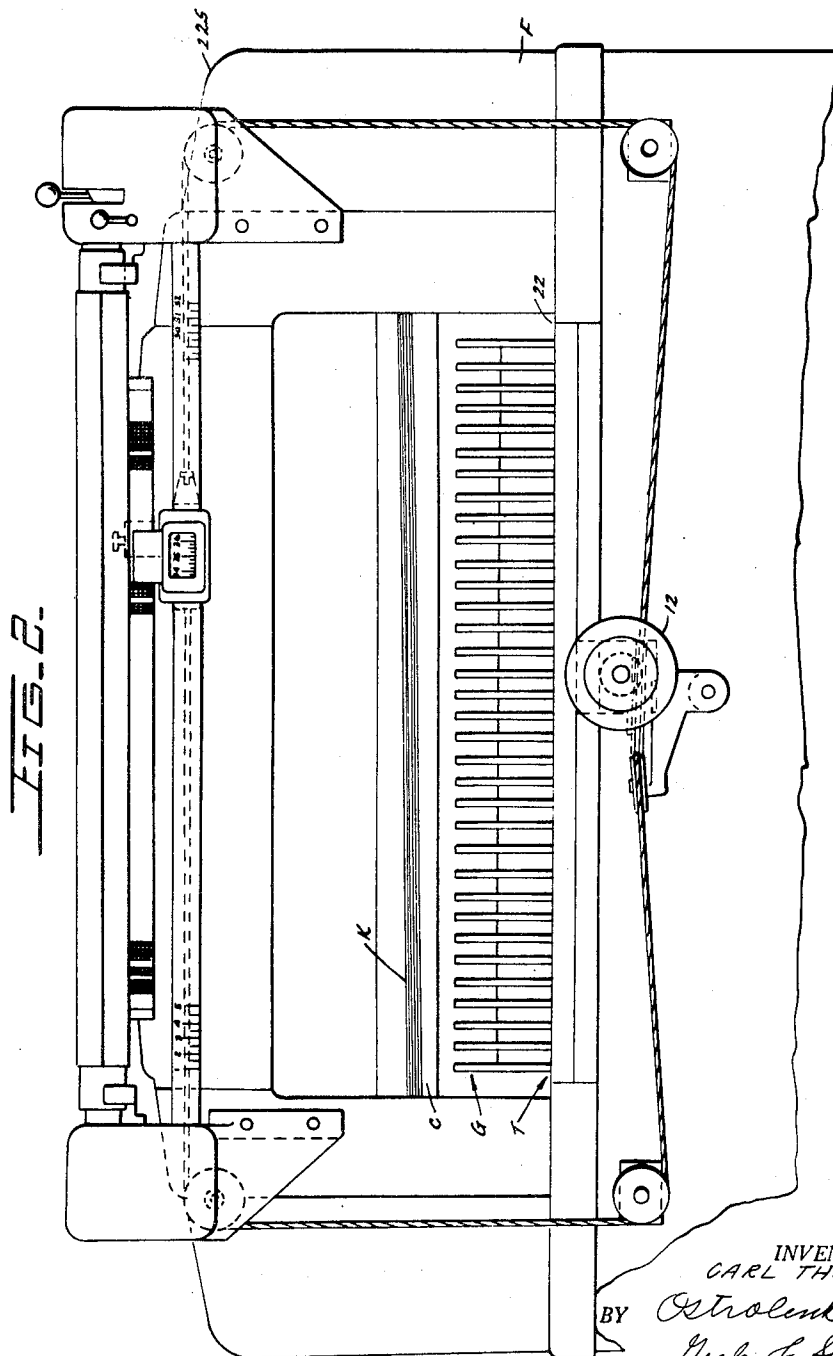
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CUTTING MACHINE AND TABLE THEREFOR

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4 Sheets-Sheet 2



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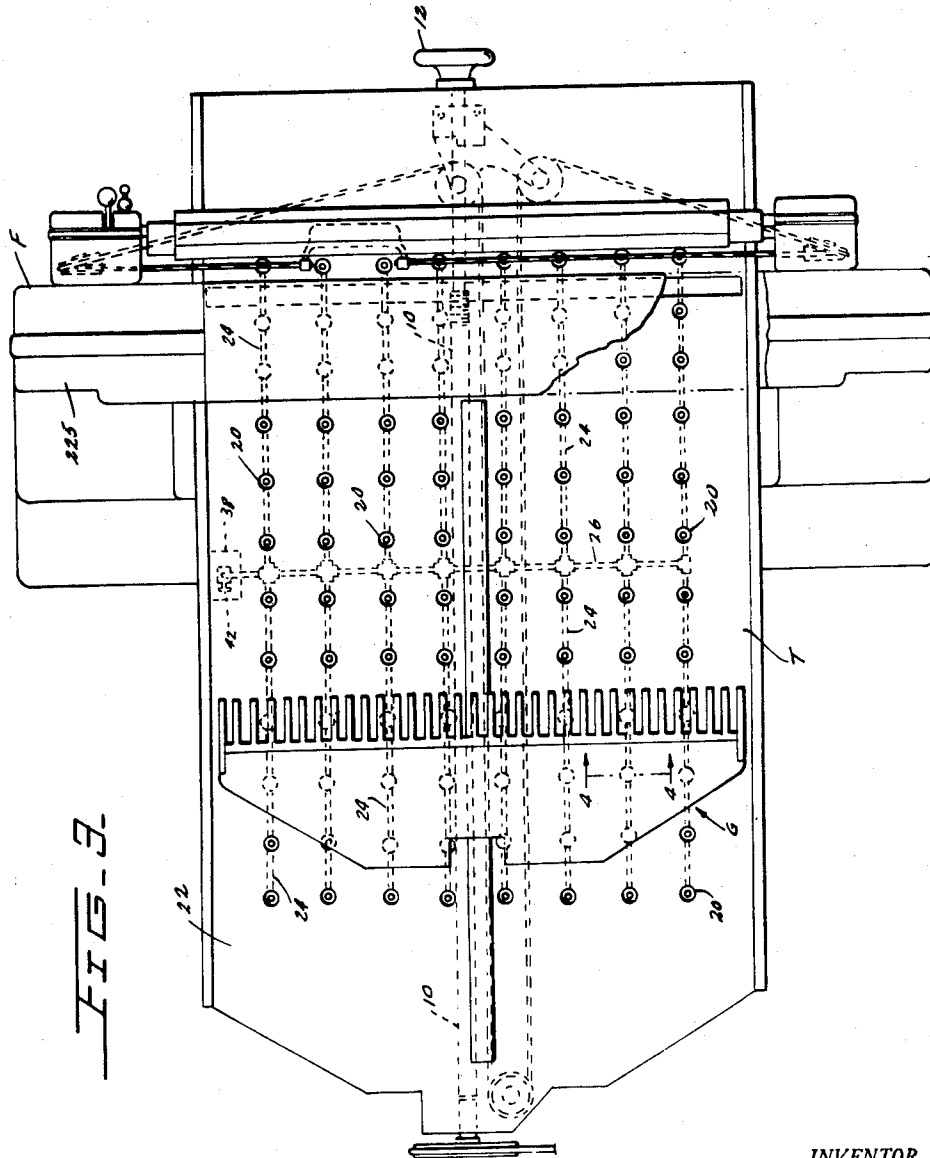
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CUTTING MACHINE AND TABLE THEREFOR

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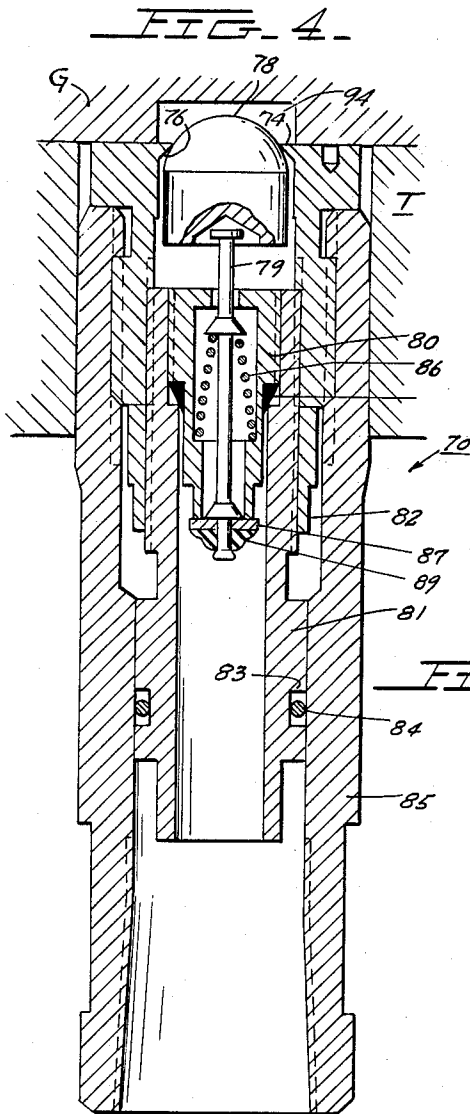
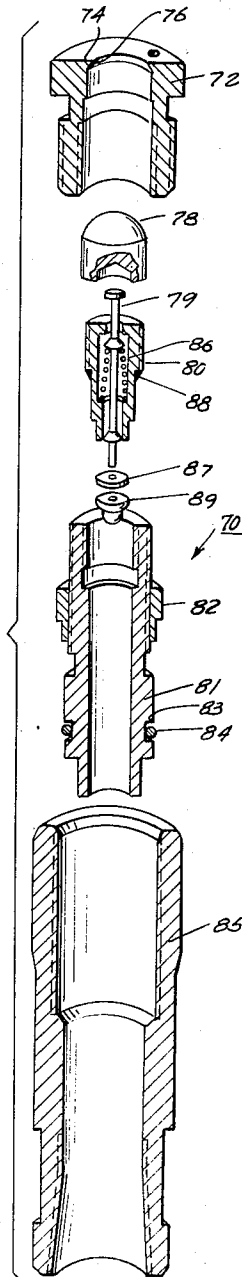
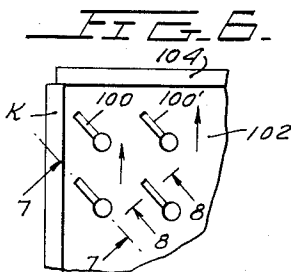
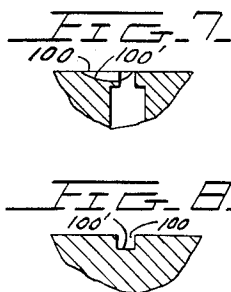
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4 Sheets-Sheet 4



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2,945,600

CUTTING MACHINE AND TABLE THEREFOR

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1 Claim. (Cl. 214-1)

My present invention is based on the disclosure of my application Serial No. 325,625 filed December 12, 1952, now Patent No. 2,771,948 and relates to a novel valve for use in an air film table for supporting heavy stacks of paper sheets for movement with respect to a guillotine type of paper cutter.

In general, when a stack of paper is to be severed at predetermined lines, each severance requires the entire stack to be moved by the back gauge. Since a stack of paper may weigh upwards of a hundred pounds or more, it will be readily apparent that maneuvering of the paper stack to locate it properly with respect to the back gauge or to remove it from the table is tiring to an operator.

My present invention is intended to reduce the force necessary for sliding or maneuvering a paper pile resting on a cutting machine table and has for its objects the provision of means which are easily manufactured and readily incorporated in a cutting machine.

A further object of my invention is to provide means for minimizing the force necessary to manually maneuver a pile of paper which means is of a relatively simple nature and usable with a minimum of operating expense as well as being rugged and dependable over a long period of time without maintenance and repair difficulties.

In particular, the object of the present invention is the provision of a novel valve actuated by the pressure of the paper stack thereon to control the flow of air to the table.

Briefly, my invention comprises the provision of a plurality of ports in the cutting table surface underlying paper normally stacked thereon. The ports are connected with a source of compressed air controllable either automatically or at the will of an operator and whereby a film of air is forced between the lowermost sheet of the pile and the table surface. The effect is analogous to placing a lubricant film between two heavily engaged surfaces. Thus, the entire pile, heavy though it may be, is much more readily shifted to predetermined positions for cutting purposes below the knife.

Specifically, my construction comprises ports arranged in a symmetrical pattern of generally, but not necessarily, rectangular configuration and having a few inches of spacing between them. Each port is provided with a valve operator element that protrudes slightly above the table surface. When a stack of paper is on the table, the weight thereof is sufficient to press down on the operator elements so as to permit egress of air from the respective ports. Thus, compressed air is fed only to ports covered by the paper stack and finds access there-through to the bottom surface of the paper stack for the purpose set forth.

My invention will now be described in conjunction with the accompanying drawings in which:

Figure 1 is a side elevational view of a novel paper cutting machine embodying features of the present invention.

Figure 2 is a front elevational view of the paper cutting machine of Figure 1 showing the back gauge, cable attachment and controlled carriage of the automatic spacer cutting machine.

Figure 3 is a plan view of the machine of Figure 1 showing such elements as are essential to an understanding of the present invention.

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Figure 4 is an enlarged fragmentary detail taken along line 4-4 of Figure 1.

Figure 5 is an exploded perspective view, with parts sectioned, of one of the valves used to control air to the plurality of ports.

Figure 6 is a fragmentary top plan view of a modified table top embodying further features of the present invention.

Figure 7 is a sectional view taken along line 7-7 of Figure 6 and looking in the direction of the arrows.

Figure 8 is a sectional view taken along line 8-8 of Figure 6 and looking in the direction of the arrows.

My present invention is illustrated as used in connection with devices of the type shown in Patents Nos. 2,649,912; 2,628,680; 2,570,873; 2,540,836 and 2,771,948.

Referring now to the drawings, there is shown as much of the construction of the above-identified cutting machine as is necessary to render the description of the present invention clear and lucid. Briefly, the illustrative cutting machine includes a main frame F carrying a horizontally extending cutting table T, a vertically displaceable cutting knife K, a paper clamp C arranged rearwardly of the cutting knife K and lowered against the paper lift with pressure prior to cutting and a back gauge G selectively positioned on the cutting table T to move the paper lift into position for cutting. The back gauge G is driven toward and away from the knife K by a lead screw 10 in threaded engagement with an integral head on the back gauge G, the lead screw 10 being coupled to a hand wheel 12 adjacent the forward end of the machine and to a drive motor 14 adjacent the rearward end of the machine.

The operating mechanism for generally moving the back gauge G, the clamp C and the cutting knife K form no part of the present invention and accordingly their description will be limited to features related to the present disclosure, for the purposes of clarity and simplicity.

In accordance with the present invention, the table T is provided with a plurality of rows of spaced ports or air exits 20, distributed uniformly about the paper supporting surface 22 of the table T. The number of ports 20 is selected in accordance with the floating action required as will subsequently become apparent. The respective ports are interconnected by internal tubes or passageways 24 in the table T to a common tube or inlet 26 adapted to be connected to a suitable source of air under pressure.

Specifically, an air pump 28 constructed and arranged in accordance with principles well understood per se is connected via appropriate gearing 30 to a drive motor 32. The high pressure outlet 34 of the pump 28 is connected to a high pressure reservoir 36 and then to a low pressure reservoir 38 via a reducing valve 40. The low pressure reservoir is connected to the air inlet 24 by an electrically operated three-way valve 42 normally closed and illustrated as a solenoid controlled valve having a solenoid plunger 44 arranged in controlled relation relative to the solenoid coil 46.

A suitable source of line potential 48, 48' is provided for the solenoid coil 46 which forms part of a control circuit arranged to coordinate the admission of air to the ports 20 in dependence upon operation of the back gauge G, the clamp C, and the cutting knife K. Specifically, when the clamp C is brought into contact with the paper prior to operation of the cutting knife K, it is undesirable to admit air to the inlet 24 via the normally closed air inlet valve 42, since this might result in sidewise displacement of the paper upon engagement therewith of the clamp C. Accordingly, in circuit with a manual operator's switch 50, the closing of which would normally complete the energizing circuit for the solenoid coil 46,

there is provided a circuit breaking switch 52 including fixed contacts 54, 54' and a movable bridging contact 56 supported on one end of a rocking lever 58 pivoted on a pin 60. A spring 62 is connected to the lever 58 and normally biases the same to the position indicated by the broken lines of Figure 1 wherein the switch 52 is open.

The end of the lever 58 remote from the connection to biasing spring 62 is arranged to overlie the pin 64. Therefore, as the clamp assembly moves from the inoperative or retracted position illustrated by the full lines of Figure 1 to the clamping or extended position illustrated by the broken lines, the lever 58 rocks in the clockwise direction due to the bias of spring 62 to open the switch 52. Since the clamp C moves downwardly just prior to a cutting operation, it follows that air supply to the ports 20 will be precluded during cutting as well as clamping. Of course, return of the clamp C to the retracted or inoperative position results in a closing of the switch 52 and return to control by the manual switch 50.

A further instance when it is necessary to preclude air supply to the ports 20 is when the back gauge G is in motion to position the paper relative to the knife C. At such times, floating of the paper might cause an overtravel of the paper relative to the adjusted position to which the paper is brought by the back gauge G. To obviate this difficulty, a further normally closed switch 66 is connected in the solenoid control circuit, this switch being connected in direct parallel relation to the back gauge motor 14, precluding the possibility of activating the solenoid coil 46 when the back gauge G is being adjusted as shown in my Patent No. 2,771,948 referred to above. As a further feature, the three-way valve 42 is arranged to open the air inlet 26 to the atmosphere whenever the supply from the low pressure reservoir 38 is cut off, thereby releasing any lifting pressure which might be available at the ports 20 of the table T as a result of prior introduction of air under pressure to the table T.

Reference will now be made to Figures 4 and 5 wherein the details of air release valves for the respective ports on air exits 20 are shown. The purpose of the valves 70 is to release air only under the paper stack, operation of the valves in predetermined areas of the table T being brought about by the paper being supported thereon. Specifically, each valve 70 is partially recessed upwardly in a complementary cut-out in the table T and includes an externally stepped bushing 72 having a circular open upper end 74 defining a port 20 and formed with a coaxial seat 76.

The valve actuator 78 is a cylindrical member having a part spherical surface resting in the seat 76. Valve actuator 78 is arranged when depressed to contact the plunger 79 of valve member 80. Valve member 80 will be hereinafter more specifically described; essentially, it permits air to flow through it when actuator 78 and plunger 79 are depressed and shuts off the air passage when members 78 and 79 are raised.

Hence, elements 78 and 76 are not specifically valves in the sense that they are not intended to control the passage of air.

Valve 80 is mounted in sleeve 81 which in turn is adjustably threadedly mounted in bushing 72. Valve 80 is adjusted so that when actuator 79 is fully extended by the spring of valve 80, member 78 does not contact seat 76 so that no interference with closing of valve 80 can occur. After the proper spacing is obtained, sleeve 81 is locked in position by lock nut 82. The lower end of sleeve 81 has an annular groove 83 in which is mounted O ring 84, thus shutting off all the air from the upper end of the system except that which passes through valve 80 when it is depressed by actuator 78.

The entire assembly is then placed in outer housing 85 which is mounted in the table.

The essential concept is that the flow of air is positively controlled by an internal valve 80 and the operat-

ing member 78, instead of being a valve which controls air, is an actuator. This reduces the cost of machining air-tight surfaces and makes possible the use of a valve 80 which may be a standard commercial valve.

Such valve may comprise: a spring biased valve stem 79 having an actuating head at one end, an enlarged section midway to act as a seat for biasing spring 86, and a valve disc 87 riveted to the other end backed up by metal washer 89; a bushing 80 having an internal shoulder to act as a seat for the spring 86, an annular valve seat to co-act with the valve disc, a threaded section to screw into support 81, and a yieldable washer 88 to form an air-tight joint when bushing 80 is screwed into support 81.

Accordingly, as the pile proper is brought into position over a predetermined area of the cutting table T, the weight of the pile will depress the operator elements 78 thereunder to release air through the open ports to achieve the desired cushioning effect.

As best seen in Figure 4, the back gauge G is longitudinally slotted in its under surface coextensive with the rows of ports 20, as indicated at 94, to preclude depressing the underlying actuator 78, thereby avoiding unnecessary loss of air at locations which are not immediately beneath the pile proper.

In Figures 6 to 8, inclusive, there is shown a modified table construction in which each of the ports 20 is provided with an air-directing or channeling slot 100 angularly related to the position of the cutting knife K and the direction of the cutting knife shear. In the illustrative arrangement of Figure 6, the slots 100, including inclined floors 100' merging into the table surface, are directed to the left at an acute angle relative to the direction of cutting shear indicated by the arrows 102. Since the cutting shear of knife K will always tend to push the paper against the adjacent side guard 104, there will be no waste of air which is likewise directed generally toward the guard 104 and the location of the cutting knife K'.

In the foregoing I have described my invention solely in connection with specific illustrative embodiments thereof. Since many variations and modifications of my invention will now be obvious to those skilled in the art, I prefer to be bound not by the specific disclosures herein contained but only by the appended claim.

I claim:

In a cutting machine, a paper support table, a plurality of ports in said table for admitting air to the surface of said table, each of said ports having a housing secured therein, a bushing threadedly carried in said housing, said bushing having a surface flush with the surface of said table and having a retaining lip surrounding a centrally disposed passage in said bushing, a sleeve carried in said housing, a lock nut threadedly secured to said sleeve and engaging said bushing, a threaded engagement between said sleeve and said bushing whereby said lock nut firmly positions said sleeve with respect to said bushing, a valve threadedly secured within said sleeve, said valve having an actuator extending upwardly in said bushing, resilient means urging said actuator to normally maintain said valve closed and an actuating element in said bushing and engageable with said valve actuator, said actuating element having a spherical surface protruding above the surface of said table and having a cylindrical body within said bushing and spaced from the walls thereof and engaged therewith, whereby said actuating element is restrained against rotation.

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