United States Patent

Cary

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[54] FLUID CONTROL SYSTEM LOUVER UNIT

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[52] **U.S. Cl.** **98/110**, 98/121

[51] **Int. Cl.** **F24f 13/00**

[58] **Field of Search** ..... 98/110, 40 V, 94 AC, 121 A, 98/121; 49/75, 81, 88, 77

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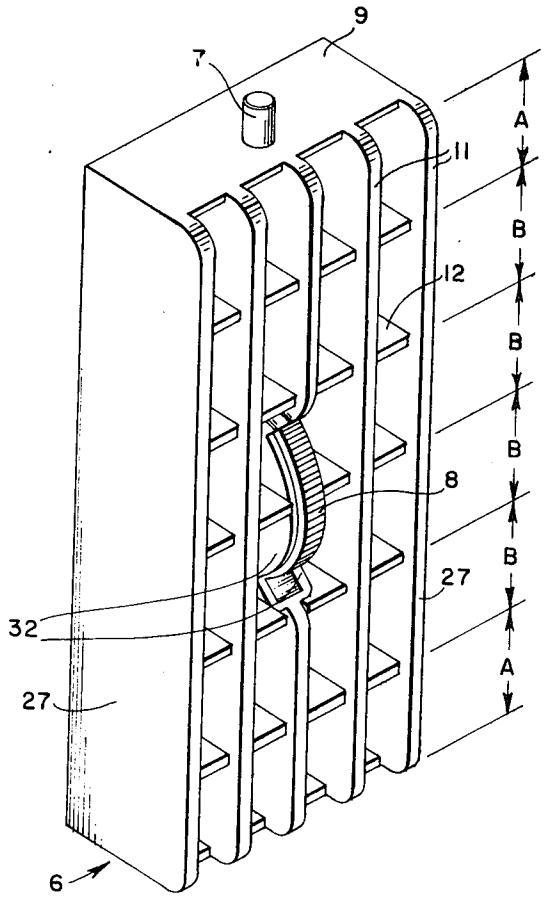
Primary Examiner—Meyer Perlin

Attorney—Thomas D. Copeland, Jr.

[57] **ABSTRACT**

A louver unit for controlling fluid flow, such as the cool air discharge from an air conditioning unit. The louver is tiltable in one plane and has a plurality of vanes that are tiltable in another plane transverse to the first plane. The louver and vanes are so constructed that the vanes will shut off the airflow and certain vanes will overlay other vanes in close juxtaposition to close any opening that might normally be present in the other vanes.

6 Claims, 7 Drawing Figures



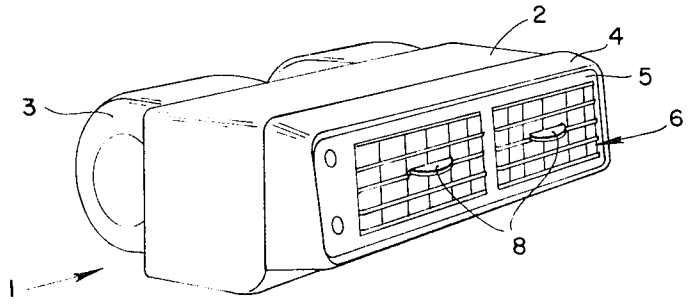


FIG. 1

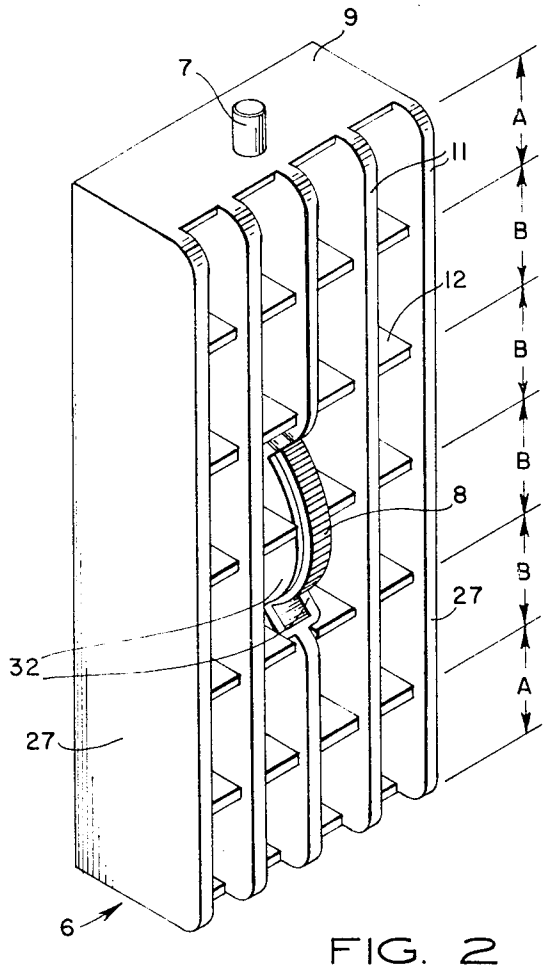


FIG. 2

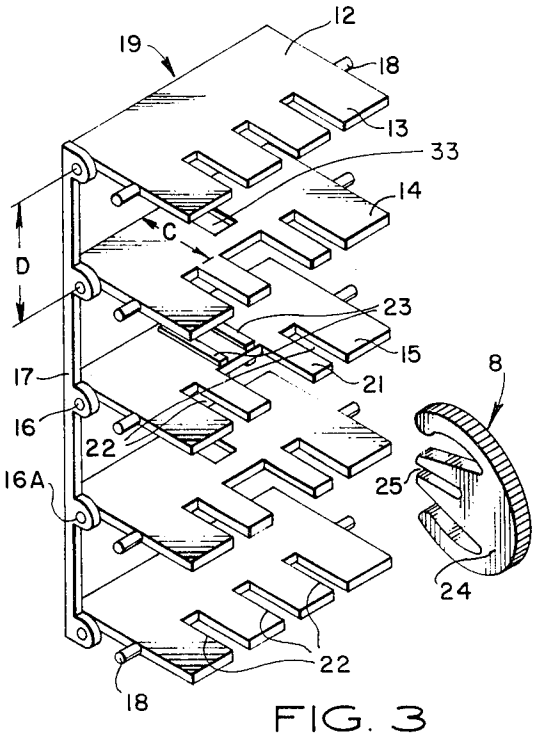


FIG. 3

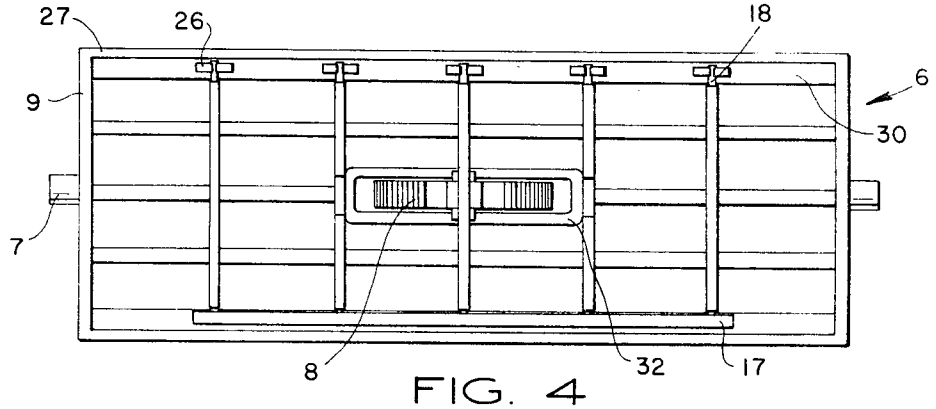


FIG. 4

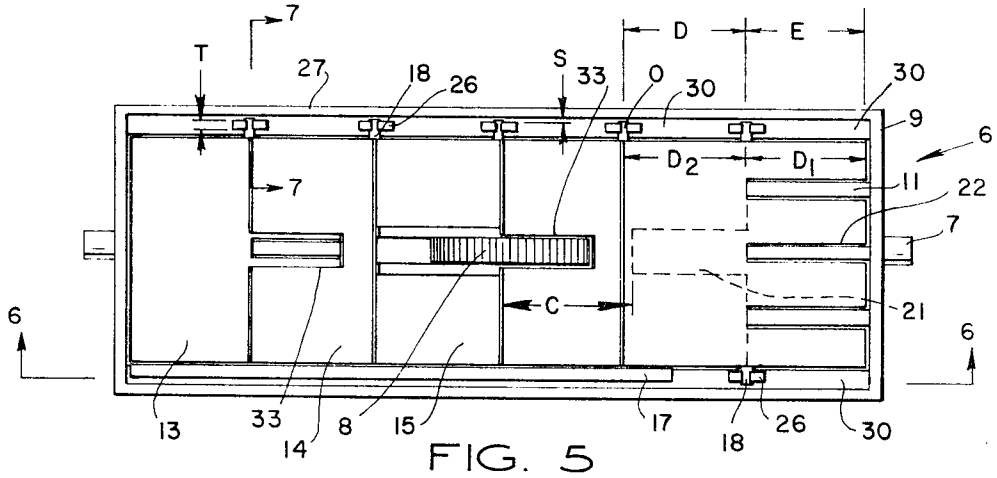


FIG. 5

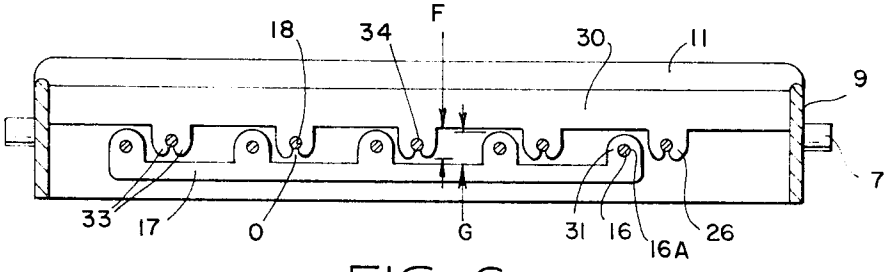


FIG. 6

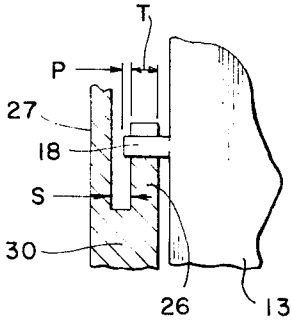


FIG. 7

FLUID CONTROL SYSTEM LOUVER UNIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to air-conditioning units, and more particularly to a novel louver unit that controls the airflow from an air conditioner.

2. Statement of the Prior Art

The prior art discloses the louver units that have vanes that pivot in one or more planes to give directivity to an air stream.

In one prior art embodiment, vertical vanes pivot from side to side at the front of an air conditioning air diffuser panel, and the horizontally mounted vanes pivot up and down in unison from an open to a closed position. However, in this embodiment the horizontal vanes are mounted completely behind the vertical vanes so that there is no cooperative mechanical interaction between the two sets of vanes.

Another prior art device utilizes two sets of vanes, each individually pivoted to a louver housing in such a way that each vane has individual independent movement, but no attempt is made to close off the entire air flow passage. The front vane moves in a V-shaped notch in the rearmost vane and has a range of travel of less than 90°, so that it is not possible for those vanes to lay flat or touch the next adjacent vane.

In another embodiment seen in the prior art, a second set of vanes is gang-mounted behind a first set and the second set is moved to a closed position by a remote control member. But again there is no interjacent cooperation between the two sets of vanes.

SUMMARY OF THE INVENTION

A principal object of this invention is to provide a louver unit for a fluid control system that may be used to direct the flow of fluid in all desired directions and may be used to cut off the flow entirely in either direction for all practical purposes.

Another object is to provide a louver unit having a series of stationary vanes rigid with the louver unit and a series of pivoted vanes transverse to the stationary vanes and interjacent thereto that cooperate with the stationary vanes to direct or cut off the fluid flow therethru.

And another object of this invention is to provide a louver unit having both rigid and pivoted airflow-directing vanes, wherein said pivoted vanes include an opening for an operating control wheel and wherein the dimensions of said vanes are moved in either direction to either extreme position of their travel, the openings provided for the control wheel are fully closed.

A still further object is to provide a louver unit structure that permits the associated pivoting vanes to fully close to a substantially flat position thru cooperating cutout constructions in both the structure to which the vanes are pivoted and the structure that actuates the vanes for movement.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 represents a perspective view of an automobile air conditioner in which the louver unit of the present invention may be employed.

FIG. 2 is a perspective view of the louver unit of this invention detached from the device of FIG. 1.

FIG. 3 is a pictorial view of the pivoting vane unit of FIG. 2.

FIG. 4 is a rear view of the louver unit of FIGS. 2 and 3 with all the vanes pointing straight ahead.

FIG. 5 is a view similar to that of FIG. 4, but in which the pivoted vanes have been moved to one extreme position.

FIG. is a cross-sectional view taken along the lines 6 6—6 of FIG. 5.

FIG. 7 is a fragmentary cross-sectional view taken along the lines 7—7 of FIG. 5.

DESCRIPTION OF ILLUSTRATED EMBODIMENTS

This invention is particularly adaptable to automotive air conditioners, as for example, the device shown in FIG. 1. This device, identified at 1, includes a case 2 including a curved rear section 3 to house a pair of squirrel cage blowers (not shown), and a trapezoidally shaped front section 4 which terminates at its forward end in a louver housing frame 5 in which are pivotally mounted louver units 6, seen detached in FIGS. 2, 4 and 5. The louver housing frame 5 is integral with and may be considered to be an extension of case 2.

The louver units 6 are manually moved up or down to pivot about horizontally mounted axles 7. The vertically extending vanes (to be described hereafter) are moved from side to side by rotation of thumb wheel 8. The combination of the two movements described will provide the driver operator with full control of the direction of the emerging cooled air from the air conditioner unit 1 over a large volume of an automobile interior.

Since automobile air conditioners are now well known at this date, full details of all operating and structural parts not described will be considered to be state of the art construction.

The portion of unit 1 relating to the novelty contained herein will be described in detail and may be seen principally in FIGS. 2–6 of the drawing. FIG. 2 shows the complete subassembly known as the louver unit 6, which includes a louver frame 9 having a series of parallel horizontally extending (when installed in operating position) members 11, and having a series of vertically extending blades or vanes 12 which move between and in cooperation with the horizontal members 11. Thumb wheel 8 is located centrally in each louver unit and transmits the force needed to tilt the vanes 12.

In conventional air conditioners, the vanes are provided with movement to varying degrees in the louver units. The applicants purpose is to provide full and complete movement of the vanes until they lay flat on and over one another (a "shingle" effect) and close off all air passages to thus substantially completely close all air passages at the endmost position of the vanes in either direction of movement.

FIG. 3 discloses the van operating construction to comprise a series of vanes 13–15, each pivoted by its pin 16 to a vane actuating bar 17. Each vane also includes a second set of pivot pins 18 which supports the vanes and in fact the entire vane operating unit 19 in the louver frame 9 in a manner to be described hereafter. The central vane 15 includes a large central slot 21 and a pair of narrow slots 22 on each side of the central slot 21 and aligned to surround and cooperate with certain horizontal members 11 of the louver frame. A pair of aligned and parallel ridges 23 extend from the bottom of slot 21 to the opposite end of vane 15. These spaced ridges (on both sides of the vane) cooperate with the parallel faces 24 of thumb wheel 8 so that the ridges actually guide and index the sides of thumb wheel 8 and this action together with the engagement of thumb wheel slot 25 (together with an adhesive) with vane 15 provides a holding action that retains thumb wheel 8 in place and permits it to transmit turning force from the operators finger to cause the vanes to pivot about the pins 18, and this pivoting is insured to be done in parallel unison by vane actuating bar 17. The end vanes 13 contain three parallel slots, each having substantially the width of its related horizontal member 11. The larger central slot 21 of vanes 14 & 15 corresponds in size to the width of thumb wheel housing 32, and slot 33 corresponds in size to wheel 8. This combination of these two slots cooperating with wheel 8 and housing 32 permits the vanes to avoid interference when moved to their flat or closed position. And the spacing B between vane bearings, and the spacing A between the end vane bearings and the housing are all equal and equal to each other. This dimensional arrangement will permit the vanes to lay flat in both directions of their movement. Also the dimensions C from the bottom of center slot 21 and to the end of the vanes 12 and 15 is such that when the vanes are lying flat no opening

will appear on the side not needed for the thumb wheel housing 32 (FIG. 5).

FIG. 4 shows a view of the louver unit 6 of FIG. 2 from the rear when the vanes are straight ahead to permit the full free flow of conditioned air thru the louver unit 6. FIG. 5 is a similar view to FIG. 4, after thumb wheel 8 has been rotated to cause the vanes to lay flat. In these two views and in FIG. 7 it will be seen that the vanes 13–15 are supported for pivotal movement by their pins 18 residing in bearing seats 26 which are relatively thin and are spaced away from the sidewall 27 of frame 9 to provide the flexibility required when the vane pins are snapped past the narrow throat opening 0. Having been forced thru, the pins will remain in their seats until deliberately removed. The spacing D between bearing seat 26 centers is equal the distances D_1 and D_2 and also the distance A to permit full closure of the center opening 21 when all the vanes are laid flat. The small slots 22 will be substantially filled with the horizontal members 11 so that no opening will appear and no airflow will occur thru these openings. All openings in the vanes are so dimensioned and so aligned and the vanes are so dimensioned that when the vanes are "shingled" no openings are exposed. The term "shingled," as the name applies here means that the vanes lay one on the other as shingles on a roof.

The mechanism to permit the vanes to all lay flat (in their shingled condition) is shown in FIG. 6. The undercut dimensions F and G in the bearing seat frame 30 and in the vane actuating bar 17 respectively are substantially equal and are sufficient to permit the bearing seats 26 to nest in the spaces G and to permit the pin bosses 31 to nest in the spaces F with the result that all of the vanes 13–15 attached to the bar 17 will lay flat and shingle adjacent vanes within the frame 9, and for the reasons previously given, all of the air passages will be closed when the vanes are moved to this extreme flat position. Due to manufacturing tolerances there will be a certain amount of "play" between the vanes when closed flat as above described. In view of this condition, if the vanes are not fully closed when the air pressure engages the back sides of the vanes they will be moved by this pressure into closer juxtaposition and the tightness of the seal will thereby be increased. A contributing factor in the manufacture of the economical louver unit of this invention entirely of lightweight plastics and yet capable of performing the desired function of a full 180° traverse of the vanes in the louver frame from one fully closed position to a fully closed position to a fully closed position in the opposite direction is the bearing seat construction of FIG. 7. In this view it will be seen that the bearing seats rest on and are molded integral with ledges 30 which are part of the outside longitudinal members 27 of the louver frame 9. A space S separates the seats from the body of member 27. Were this not so, it would be impossible for the ears 33 to flex outward and then return to normal position when pins 18 are forced past restricted openings O, and down into the seats proper. It will also be noted that ears 33 are not strongly braced laterally but have just enough body to hold pins 18 in place without either breaking, or breaking the pins during assembly. And one the pins are in place they will not be moved up and out of their seats by any force normally encountered in use. Prior art utilized a boxlike structure of great rigidity for this purpose, but difficulty is encountered in such a structure because of the unyielding nature of this type of construction.

By allowing proper clearances between the several parts of the louver, and by the method of assembly given below, the louver may be operated without danger of pins 16 and 18 becoming disengaged through lateral movement of the vanes or the actuating bar.

In assembly, wheel 8 is first cemented to center vane 15 and all the vanes are attached to actuating bar 17 by inserting pins 16 in holes 16A. The entire assembly is then lowered into frame 9 so that pins 18 are all resting on their respective bearing seat ears 33 and over restricted openings O. By the use of a suitable fixture, the vanes are forced down into frame 9 and all the pins snap into their respective bearing seats. As shown in FIG. 5, actuating bar 17 has just enough clearance to move without rubbing on frame member 27, so that once the unit is assembled it is impossible for pins 16 and 18 to move laterally our of the holes or bearing seats in which they are held.

I claim:

1. In a fluid control system, a louver unit, comprising:
   a. a main frame including a bearing seat frame,
   b. a series of parallel frame members in said frame,
   c. a series of vanes pivoted in said bearing seat frame and adapted to be pivotally moved in said frame and interjacent to said parallel frame members from a position of alignment with the desired airflow to a position transverse to said air flow and vice versa,
   d. one of said frame members defining an enlarged structure for housing a control element,
   e. a control element in said housing,
   f. said vanes defining openings therein to permit said vanes to be rotated in said frame without interference with the structure of said members, control element or control element housing,
   g. certain of said vane openings being on one portion of all said vanes relative to said pivotal mounting of said vane for cooperating with said frame members, other of said vane openings being on the other portion of certain vanes for cooperating with said control element, and another of said vane openings being on another portion of said last named vanes for cooperating with said control element housing, all of said openings being masked by a solid portion of an adjacent vane or by that structure with which it cooperates to provide closure of all said openings when said vanes are moved to their transverse positions.

2. A louver unit as in claim 1, comprising:
   a. a gang-connected vane actuating bar actuating bar having raised pin basses defining cutouts therebetween,
   b. said bearing seat frame having raised bearing seats defining cutouts therebetween,
   c. said pin bosses and said bearing seats each being so positioned and each operating in the same plane, whereby when said vanes are moved to either extreme position, said bosses and seats will each nest in the cutout area of the other structure to permit maximum closure between said bearing seat frame and said vane actuating bar, while avoiding air blockage through said frame.

3. In a fluid control system, a louver unit, comprising:
   a. a main frame including a bearing seat frame,
   b. a series of parallel frame members in said frame,
   c. a series of vanes adapted to be pivotally moved in said bearing seat frame and interjacent said parallel frame members from a position of alignment with the desired airflow to a position transverse to said air flow and vice versa,
   d. said vanes defining openings therein to permit said vanes to be rotated in said frame without interference with the structure of said frame members,
   e. one of said frame members defining an enlarged structure for housing a control element,
   f. a control element in said housing,
   g. certain of said vanes defining a specific openings to avoid interference with said control element housing when said vanes are rotated,
   h. means in said vane construction to permit closure of all said openings when said vanes are moved to their transverse position,
   i. coupling means to couple said vanes together to permit simultaneous movement of said vanes while maintaining said vanes in parallel relationship with each other,
   j. means in said bearing seat frame to cooperate with said coupling means and permit said vanes to shingle with each other and lay flat in said main frame and close said openings within said frame,
   k. said vanes including pivot pins,
   l. said bearing seat frame including bearing seats receiving said pins,

m. said coupling means comprising a vane actuating bar having raised pin bosses of certain height defining cutouts therebetween and said bar operating in the same plane as said bearing seat frame,
n. certain of said bearing seats nesting into the certain height area of said vane actuating bar when said bar is moved to either extreme position.

4. A louver unit as in claim 3, wherein:
a. said bearing seat frame comprises raised bearing seats of a certain height defining cutouts therebetween,
b. and wherein when said vanes are moved to an extreme lateral position, said raised pin bosses will occupy the cutouts in said bearing seat frame for permitting said vanes to shingle and lay flat in each extreme position of their movement.

5. In a fluid control system, a louver unit, comprising:
a. a main frame including a bearing seat frame,
b. a series of parallel frame members in said frame,
c. a series of vanes adapted to be pivotally moved in said frame and interjacent said parallel frame members from a position of alignment with the desired airflow to a position transverse to said airflow and vice versa,
d. said vanes defining openings therein to permit said vanes to be rotated in said frame without interference with the structure of said frame members,
e. and means in said vane construction to permit full closure of all said openings when said vanes are moved to their transverse position,
f. one of said frame members defining an enlarged structure for housing a control element,
g. a control element in said housing,
h. certain of said vanes defining specific openings to avoid interference with said control element housing when said vanes are rotated,
i. coupling means to control element housing when said vanes are rotated,
i. coupling means to couple said vanes together to permit simultaneous movement of said vanes while maintaining said vanes in parallel relationship with each other,
j. means in said bearing seat frame to cooperate with said coupling means and permit said vanes to shingle with each other and lay flat in said main frame and fill the openings within said frame,
k. said vanes including pivot pins,
l. said frame including bearing seats receiving said pins,
m. the spacing from the last bearing seat and the nearest end of the frame being equal to the spacing between the bearing seats,
n. and the total length of said vane being twice said spacing.

6. A louver unit as in claim 5, wherein:
a. means are included in said bearing seat frame to cooperate with said coupling means and permit said vanes to shingle with each other and lay flat in said main frame and become firmly closed one against the other under air pressure on the back side thereof.

* * * * *