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Schueler

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[54] **AIR FLOW CONTROL DEVICE**

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[52] **U.S. Cl.**.....**98/41 R,** 28/2.15, 137/610, 138/44

[51] **Int. Cl.** **F24f 13/06**

[58] **Field of Search**....98/41, 40 C, 40 D, 40 DL, 13, 98/14, 2, 14, 2.15, 9; 138/44, 45; 137/610

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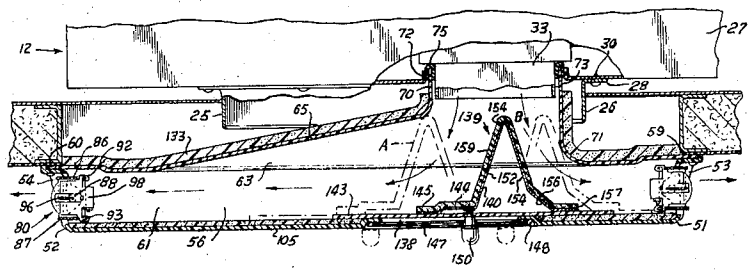
[57] **ABSTRACT**

A flow control device for directing air being delivered into a chamber in either of two different directions or to selectively direct part of the air being delivered in one direction and the other part in another direction. The flow control device may also include passage means through which air may be drawn from the chamber into a conditioning device, such as the evaporator of an air conditioning apparatus mounted on the roof of a vehicle, and then delivered back in cooled condition back into the chamber.

4 Claims, 8 Drawing Figures



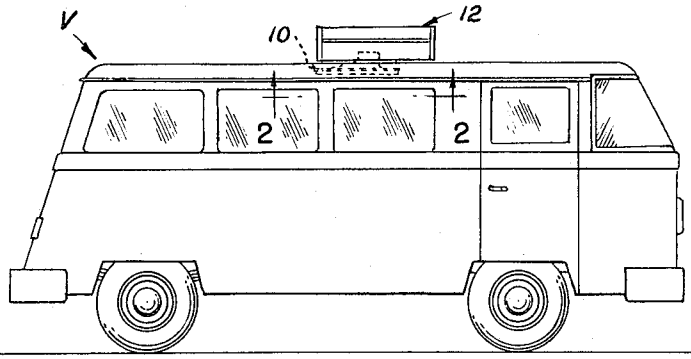


Fig. 1

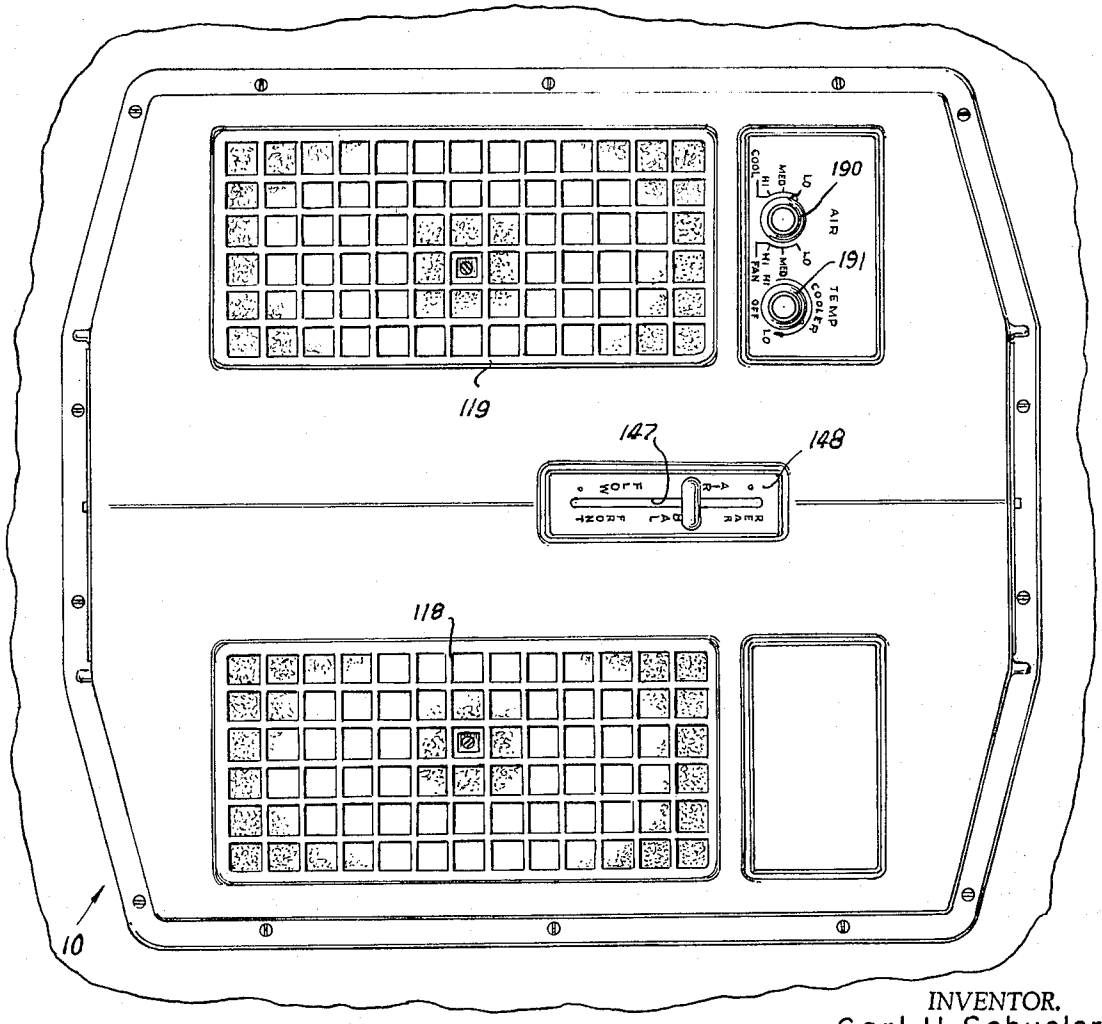


Fig. 2

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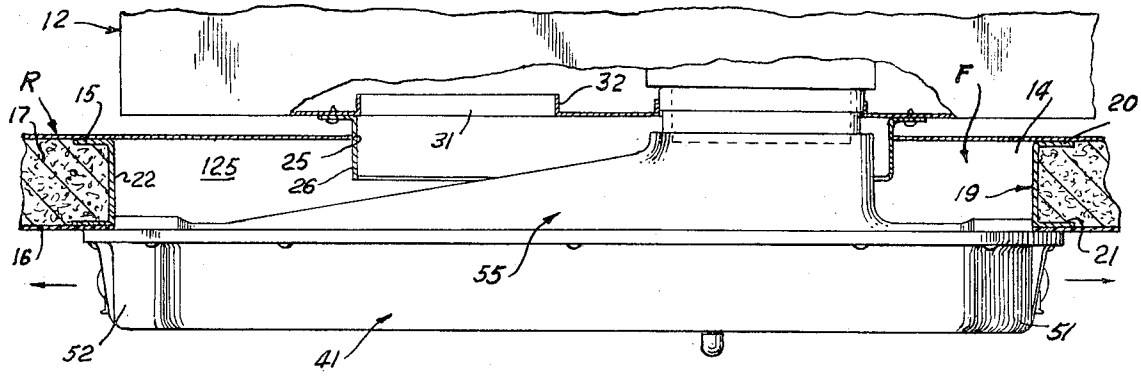

Fig. 3

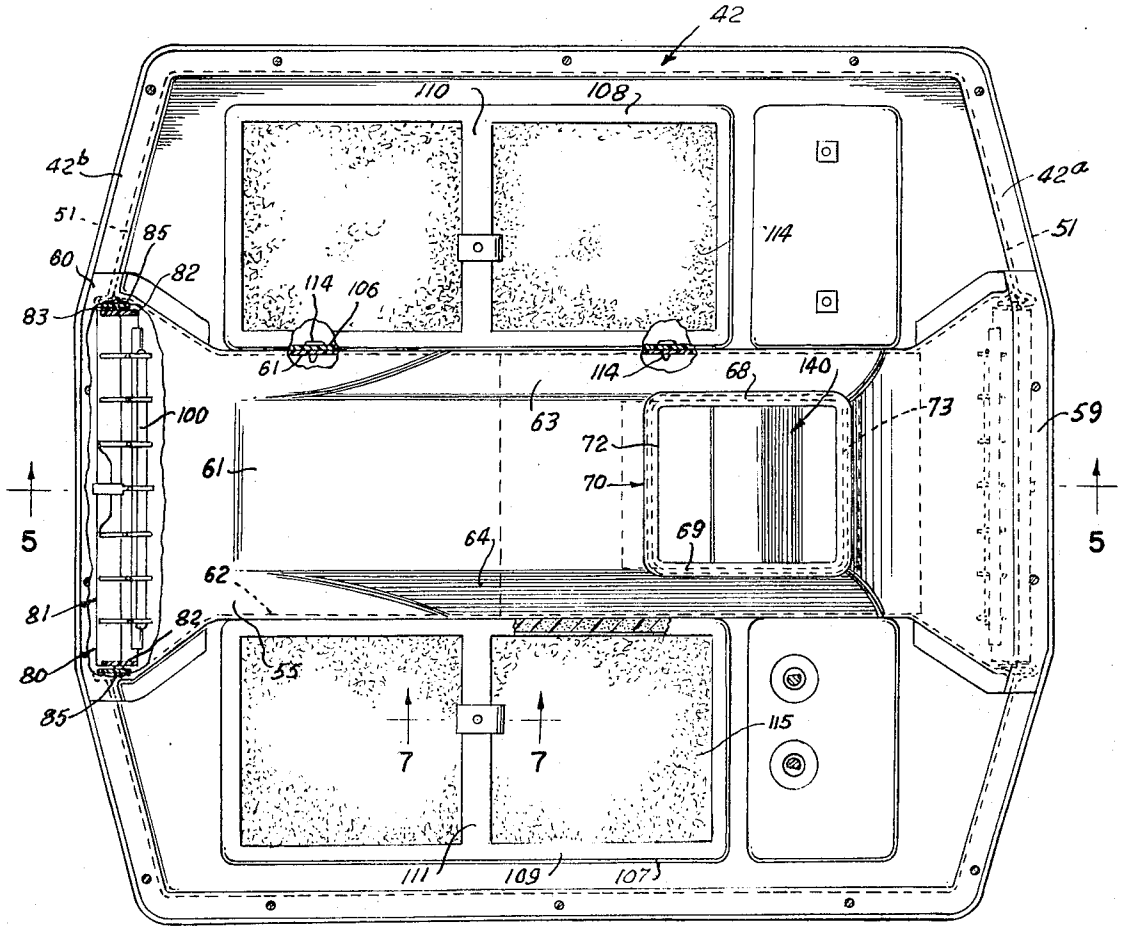

Fig. 4

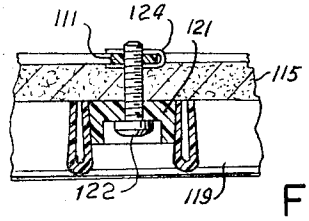

Fig. 7

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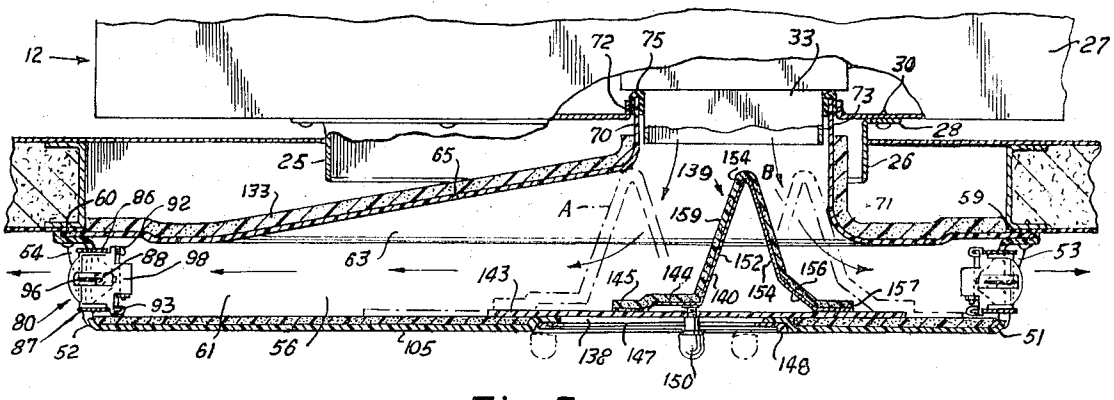

Fig. 5

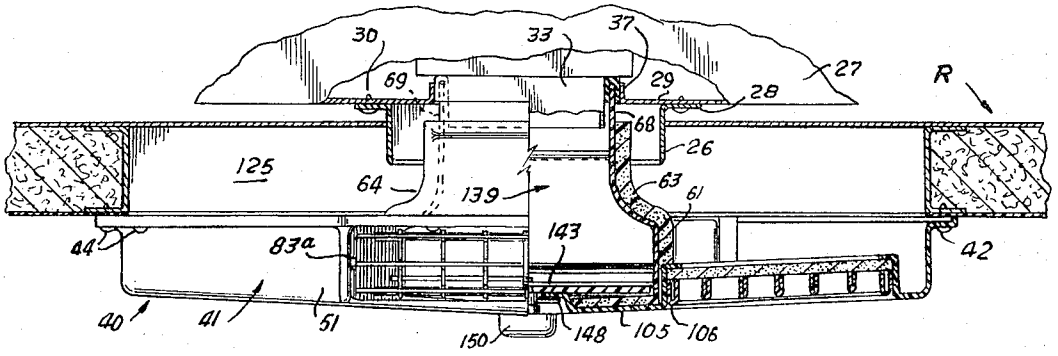

Fig. 6

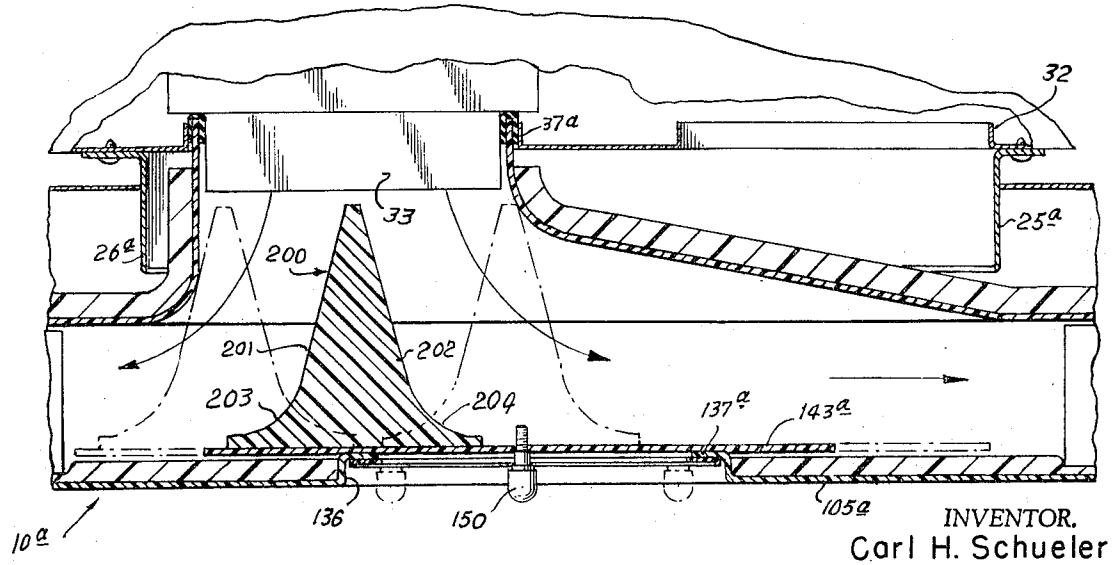

Fig. 8

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AIR FLOW CONTROL DEVICE

This invention relates to air flow control devices and more particularly to an air flow control device for controlling the directions and rates of flow of air in different directions.

An object of this invention is to provide a new and improved air flow control device for selectively and adjustably directing air delivered to an inlet of the device to either of two spaced outlets thereof.

Another object is to provide an air flow controlling device, securable to a structure, such as the roof of a vehicle, camper, boat or the like, for directing air into a chamber of the structure in either of two opposite directions.

Still another object of the invention is to provide an air flow control device of the type described which is of simple economical construction and which will protrude downwardly into a chamber a minumum distance from the roof.

A further object is to provide an air flow control device having an outlet passage through which air may be drawn from a chamber and directed to a conditioning device, such as the evaporator of an air conditioning apparatus, and an inlet passage to which the conditioned air from said conditioning apparatus may be delivered, the control device selectively and adjustably directing the flow of air to two spaced outlets of the device.

A still further object is to provide an air flow control device having a housing providing an inlet passage and a pair of spaced oppositely opening outlets, and an air splitter or divider slidably movable in the housing for directing the air to either of the two outlets and for adjusting the rates of simultaneous flow of the air through the two outlets.

Additional objects and advantages of the invention will be readily apparent from the reading of the following description of a device constructed in accordance with the invention, and reference to the accompanying drawings thereof, wherein:

FIG. 1 is a side view of a vehicle provided with an air conditioning apparatus and the flow control device embodying the invention;

FIG. 2 is a view taken on line 2—2 of FIG. 1;

FIG. 3 is a fragmentary view, with some parts broken away and with some parts in section, of the flow control device showing it mounted to the roof of the vehicle;

FIG. 4 is a top view of the flow control device with some parts broken away;

FIG. 5 is a sectional view taken on line 5—5 of FIG. 4;

FIG. 6 is a partly sectional front end view of the flow control device;

FIG. 7 is an enlarged sectional view taken on line 7—7 of FIG. 4; and,

FIG. 8 is a view similar to the FIG. 5 showing a modified form of the flow control device.

Referring now to FIGS. 1 through 7 of the drawings, the air flow control device **10** embodying the invention is shown mounted on the roof R of a vehicle V and used to control circulation of air from the interior or passenger chamber of the vehicle to an air conditioning device **12**, also mounted on the roof, and back to the vehicle chamber after being cooled by the air conditioning device **12**. The flow control device **10** is secured to the roof at the location of a substantially

rectangular aperture **14** thereof. The roof of the vehicle as illustrated may include outer and inner metal plates **15** and **16** and heat and a vibration and heat insulation substance **17** interposed between the plates. The roof is reinforced about the aperture opening **14** by a reinforcing frame F formed of a channel shaped member **19** having upper and lower horizontal flanges **20** and **21** which abut the inner surfaces of the top and bottom plates, respectively, and the vertical web **22**. The outer plate **15** of the roof extends inwardly over the frame F and has a substantially rectangular aperture **25** formed therein through which extends an outer rectangular duct **26** of the air conditioning housing **27** of the apparatus **12**. The housing is, of course, supported on the roof by suitable fastening means, not shown. The duct **26** has a horizontal external flange **28** which abuts the bottom wall **29** of the housing **27** and is secured thereto by any suitable means, as by self-tapping screws **30**. The bottom wall of the air conditioning apparatus has a rectangular inlet opening **31**, defined by a suitable vertical flange **32** of the bottom wall, which opens to the outer duct through which air is drawn into the air conditioning device for movement through the evaporator, not shown, and returned to an outlet duct **33** thereof which extends downwardly through an aperture of the bottom wall of the housing defined by the vertical flange **37** of the bottom wall.

The flow control device **10** includes a housing **40** having a bottom section **41** of substantially rectangular shape whose peripheral continuous horizontal outwardly extending flange **42** overlaps the inner portions of the inner plate **16** of the roof about the roof opening **14**. The bottom housing section is secured to the roof by means of screws **44** which extend through suitable apertures in the flange **42**, the lower roof plate and the lower horizontal flange **21** of the reinforcing frame F. The horizontal flange **42** is also provided with a vertical continuous peripheral flange **45** whose top edge abuts the bottom surface of the inner roof plate about the roof opening **14**.

The bottom housing section has front and rear vertical rear walls **51** and **52** which are provided with oppositely opening front and rear outlets **53** and **54**, respectively, which open to the longitudinal passage **56** of the housing defined by its bottom and top sections **41** and **55**, respectively.

The top housing section includes a front transverse horizontal portion **59** which extends over the front portion **42*a*** of the horizontal flange **42** of the bottom housing section and a rear transverse horizontal section **60** which extends over the rear portion **42*b*** of the flange **42**. The top housing section also has vertical side walls **61** and **62**, side portions **63** and **64** which slope upwardly from the side walls **61** and **62** to an upwardly and forwardly extending rear portion **65** thereof and to the portions **66** and **61** thereof which define the sides **68** and **69** of a rectangular inlet duct **70**. The rear top portion **65** and a front top portion **71** extend convergently upwardly from the rear and front horizontal portions **61** and **59**, respectively, to the rear and front sides **72** and **73**, respectively, of the inlet duct **70**. It will be apparent that the top section is moulded of a suitable plastic substance.

A U-shaped seal member or grommet **75** is positioned about the upper edges of the portions of the top

section defining the inlet duct **70** and is interposed between the walls of the rectangular outlet or delivery duct **33** of the air conditioning apparatus and the vertical flange **37** of the bottom wall of the housing **27**.

A flow directing assembly **80** mounted in the rear aperture **54** of the rear wall of the housing includes a rectangular frame **81** whose end walls **82** are provided with pins **83** which extend rotatably in suitable apertures in the bottom housing section flanges **84** and **85** defining opposite ends of the aperture **54**. The frame is pivotal about the horizontal axis of the shafts **83**.

The frame also includes top and bottom members **86** and **87** and an intermediate member **88** which extend between the end walls and are integral therewith. A plurality of vertical spaced louvers are mounted on the frame by means of top and bottom pivot pins **92** and **93** which are received in suitable slots of the top and bottom frame members **86** and **87**, respectively. The louvers are provided with slots **96** in which the middle reinforcing member **88** of the frame is received and inner extensions **98** which have lugs **99** received in suitable apertures of a connector bar **100** mounted on the lugs. When anyone of the louvers is pivoted about the axis of its pins **92** and **93**, the coaction of the pins of the other louvers with the connector bars causes the other louvers to pivot accordingly.

The particular louver assembly **80** illustrated and described forms no part of this invention and has been illustrated merely to show a suitable flow directing means in the opening **54** which may serve to direct the air flowing through the outlet **54**, either upwardly or downwardly into the vehicle chamber by tilting the frame either upwardly or downwardly about an axis of its shafts **83** or laterally in one direction or the other by pivoting the louvers about their pins **92** and **93**.

A similar louver assembly **80** is mounted in the front opening **53** of the housing **40** and, accordingly, its elements have been provided with the same reference numerals, to which the subscript *a* has been added, as the corresponding elements of the flow directing assembly **80**.

The vertical side walls **61** and **62** of the top housing section extend downwardly to the bottom wall **105** of the bottom housing section inwardly of the upwardly extending rectangular flanges **106** and **107**. The rectangular walls are provided at their top portions with inwardly extending continuous flanges **108** and **109**, respectively, and central transverse reinforcing portions **110** and **111**, respectively. The abutting portions of the side walls **61** and **62** of the top housing section and the walls **106** and **107** may be secured to one another by self tapping screws **114**. Porous filter pads **115** and **116** are disposed between the flanges **108** and **109** and the grills **118** and **119**, respectively, which are telescoped within the rectangular walls **106** and **107** and secured therein by any suitable retaining means, such as (FIG. **7**) rectangular inserts **121** which are secured in any one of the square openings of the grills by bolts **122** which extend through the apertures of the inserts, strip **110** or **111**, and clip **124** which are telescoped over the central strips **110** and **111**.

Air may move from the interior of the vehicle through the openings of the grills **118** and **119** and the filter pads into an outlet passage **130** defined by the housing **40** and the roof and thence through the ducts **26** and **31** into the air conditioning apparatus **12**.

Suitable insulating means, such as a sheet **133** of plastic foam may be disposed about the top housing section and also along the bottom wall **105** of the bottom housing section to minimize or prevent condensation of moisture thereon.

The bottom housing section also has an upwardly extending substantially rectangular wall **136** and a raised horizontal portion **137** which is provided with a longitudinally extending slot **138** which opens to the longitudinal passage **56**. The raised portion **138** provides a support or slide surface for an air splitter or divider **139** which, as shown in FIG. **6**, may be formed of a metal member having a rear horizontal portion **141** which rests on and is secured, as by an adhesive, to a slide plate **143** which rests on the raised portion **137** of the bottom housing section, and a raised horizontal portion **144** to which a bolt **145** is secured in any suitable manner. The bolt extends through a suitable aperture in the slide plate and the longitudinal aligned slots **138** and **147** in the raised portion and a plate **148** secured to the bottom surface of the portion **137**. A knob **150** is screwed on the bottom end portion of the screw. The splitter member **149** also has a rear portion **152** which extends anglarly and upwardly and forwardly from the front edge of the portion **144** to a top curved or bight portion **154**, downwardly and forwardly extending front portions **155** and **156**, and a front horizontal portion **157** which abuts the slide plate and is rigidly secured thereto by an adhesive or the like. A layer **159** of a resilient plastic foam is disposed over the surfaces of the metal body **140** and is secured thereto in any suitable manner, as by an adhesive.

The air splitter **139** extends transversely across the longitudinal passage **56** and upwardly into the inlet duct **27** with its side edges being disposed closely adjacent to the side walls **61** and **62**, the curved portions **63** and **64** and the sides of the inlet duct **70**.

It will be apparent that if the air splitter is moved to the rearmost position A indicated by broken lines in FIG. **5**, the top portion of the air splitter will move into close engagement with the portion **65** of the top housing section and will effectively prevent any air from flowing rearwardly through the longitudinal passage **56** to the rear opening or outlet **54** of the housing. The downwardly and forwardly sloping front surfaces of the air splitter will now direct the air downwardly to the front opening **53** with a minimum of turbulance and noise. As a result all of the air being moved into the passage **56** from the apparatus **12** will flow into the vehicle through the front opening or outlet **53**.

If the air splitter is moved to an intermediate position, as the full line position illustrated in FIG. **5**, some of the air will be directed by the outwardly and rearwardly sloping air surfaces of the divider to the rear opening **54** and the rest of the air will be directed by the forwardly and downwardly sloping surfaces of the air splitter to the front opening **53**.

Finally, if the air divider or splitter is moved to the extreme forward position B, illustrated by the broken lines in FIG. **5**, the front surfaces of the splitter will engage the portion **73** of the top housing section and will thus prevent any air from flowing through the front opening **153** while the downwardly and rearwardly sloping surfaces of the splitter will direct all of the air being delivered to the rear opening **54**. The air splitter is held by friction and its own weight in any position to which it is moved.

It will now be seen that a new and improved air flow control device has been illustrated which is of very simple structure and which selectively and adjustably directs air to front and rear outlets or openings of the housing.

It will further be seen that the flow control device projects downwardly a very short distance into the interior of the vehicle to which it is mounted which is of importance in vehicles, boats, campers and the like which may have relatively little head room.

The control members **190** and **191** for controlling the upper portion of the air conditioning may of course be mounted on a upwardly displaced portion **192** of the bottom housing section. One of such controls may control the operation of the air moving means of the air conditioner, which is a fan or squirrel cage blower, and the other knob may control the degree of cooling to be imparted to the air as it flows through the evaporator by regulating the rate of flow of the refrigerant fluid through the coils of the evaporator thereof.

Referring now particularly to FIG. **8** of the drawing the flow control **10*a*** is similar in all respects to the flow control device **10** and, accordingly, its elements have been provided with the same reference numeral, to which the subscript *a* has been added, as the corresponding elements of the flow control device **10**.

The flow control device **10*a*** differs from the flow control device **10** merely in that its air splitter or divider **200** is a solid piece of expanded plastic material which is secured to the slide plate **143*a*** in any suitable manner, as by an adhesive and has a forwardly and downwardly sloping front surface **201** and a downwardly and rearwardly sloping rear surface **202** which extend divergently downwardly to the curved surfaces **203** and **204** thereof to provide a smooth path of flow to the air flowing thereover. It will be apparent that the divider **200** functions in the same manner as the divider **139**.

It will now be apparent that the air flow control device is especially adapted for use to control the circulation of air within a confined space such as the interior or passenger compartment of a vehicle, camper, boat or the like. As illustrated in the drawings, the air flow control device is shown as used to selectively control the flow of circulation of cooled air either to the front or driver portion of the vehicle passenger compartment as when the vehicle is being driven over the road and no passengers are present in the rear portion of the compartment; or to circulate the cooled air both forwardly to the driver portion and rearwardly to the rear portion of the passenger compartment at the same or different rates of flow through two outlets **53** and **54** as determined by the adjusted position of the air splitter or divider; or if the vehicle is at rest and all occupants are in the rear portion of the vehicle compartment, the air splitter may be moved to its forward portion to close the front outlet **53** and prevent any flow of air therethrough and thus direct all of the air to the rear opening **54** to the rear portions of the compartment.

It will thus be apparent that the air flow control device may be used to maintain the temperature in a desired portion of the chamber or compartment at a lower temperature than another portion by circulating the cool air to such desired portion of the compartment.

The foregoing description of the invention is explanatory only, and changes in the details of the construction illustrated may be made by those skilled in the art, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed and desired to be secured by Letters Patent is:

1. An air flow control device connected to the roof of a structure for closing an opening through the roof, said control device including: a housing connected to the roof extending about the roof opening and having a bottom substantially horizontal wall spaced below the bottom of the roof, spaced side walls and spaced end walls extending upwardly from said bottom walls, each of said end walls having an outlet, said housing having passage means defining therewith a longitudinal passage extending between said outlets, said passage means having inlet means intermediate said outlets providing an inlet opening downwardly into said passage through which air may be moved downwardly from exteriorly of the roof; and an air splitter mounted on said housing and positioned in said passage having oppositely facing curved air deflector surfaces extending convergently upwardly toward said inlet from adjacent said bottom wall for deflecting air moved downwardly through said inlet in opposite directions to said outlets, said air splitter being movable in said housing and cooperable with said passage means for selectively preventing flow of air from said inlet to one of said outlets and allowing flow of air to the other of said outlets when in one extreme position in said housing and for allowing flow of air to said one of said outlets and preventing flow of air to other of said outlets when in a second extreme position.

2. The device of claim **1**, wherein said air splitter is positionable in adjustable intermediate positions between said extreme positions for adjusting relative rates of simultaneous flow of air through said outlets.

3. The device of claim **2**, and air flow directing means operatively associated with said outlets for varying the direction of flow of air from said outlets.

4. The device of claim **3**, wherein said housing has an outlet opening spaced from said passage through which air may be withdrawn upwardly from said structure and through the roof aperture.

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