Aug. 6, 1968 R. M. WARREN, JR., ET AL 3,395,633

AIR MIXING DEVICE

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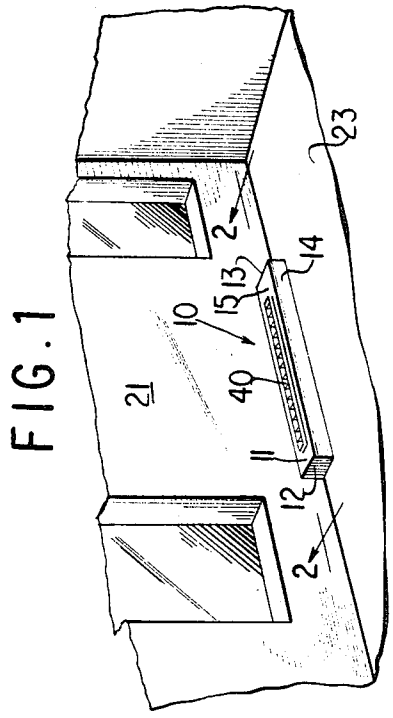



FIG. 1

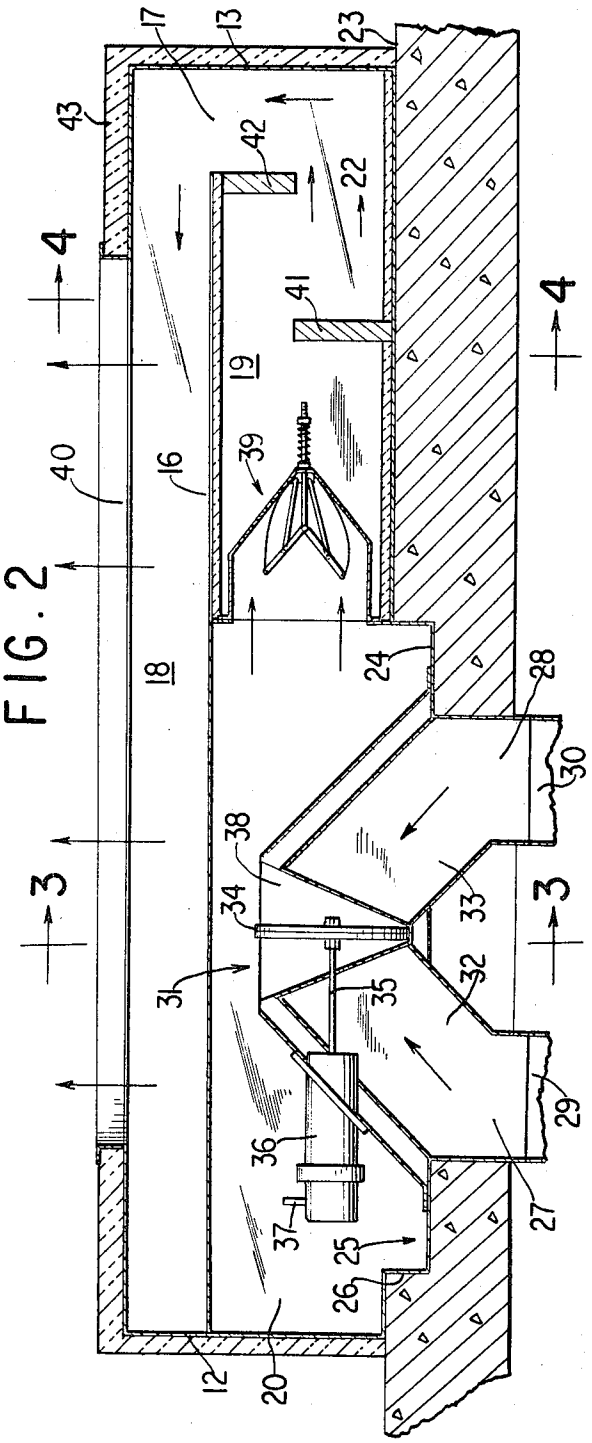



FIG. 2

INVENTOR
ROBERT M. WARREN, JR
MARK H. KORNHAUSER
BY
Smyth & Moore
ATTORNEYS

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FIG. 3

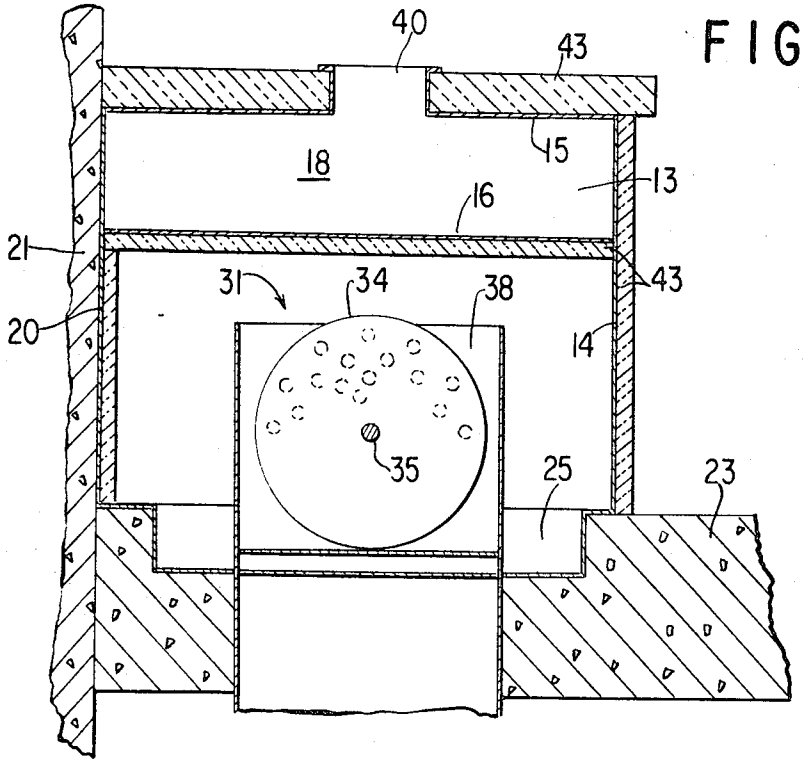
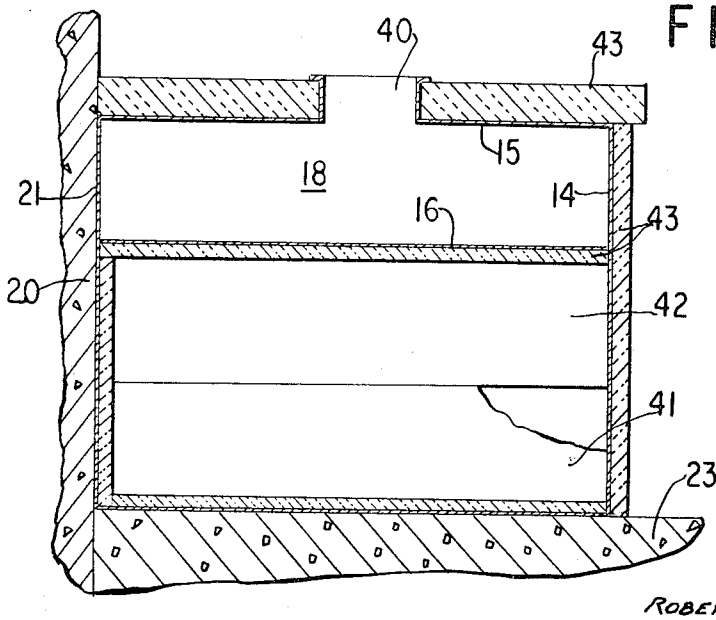



FIG. 4




INVENTOR
ROBERT M. WARREN, JR.
MARK H. KORNHAUSER
BY
Smythe & Moore
ATTORNEYS

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# AIR MIXING DEVICE

Robert M. Warren, Jr., Lincroft, N.J., and Mark H. Kornhauser, Rockaway Beach, N.Y., assignors to Buensod-Stacey Corporation, New York, N.Y., a corporation of Ohio

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6 Claims. (Cl. 98—38)

## ABSTRACT OF THE DISCLOSURE

An air conditioning unit of the low silhouette type having an upper and lower compartment, whereby the hot and cold incoming air is mixed then diverted laterally in the lower compartment through a volume control thence through the partition leading to the upper compartment and subsequently to the outlet.

The present invention relates to a high pressure air conditioning system, and more particularly to a room unit for the distribution of air in such a system wherein the unit includes both a valve for mixing warm and cold air and a constant volume unit so arranged in the unit that the height of the unit is low.

High pressure air conditioning systems employ air ducts of comparatively small size which require considerably less space than the relatively large air ducts of the more conventional low pressure air conditioning systems. In such systems, a unit is provided in each room with the unit mixing warm and cold air streams and then distributing the mixed air streams within the room. Since this conditioned or mixed air, which is discharged directly into the room at a high velocity, tends to create drafts which are objectionable to occupants, various structures for units have been devised in an attempt to thoroughly mix and uniformly distribute the air. Up to the present time, such room units have tended to be rather large in size and hence presented problems in the decorating and arranging of furnishings in the room. Further, any reduction in the size of the unit tended to decrease the uniformity of distribution within the room of the conditioned air.

It is an object of the present invention to provide a high pressure air conditioning unit which thoroughly mixes warm and cold air streams and then effectively distributes the conditioned air within the room.

A further object of the invention is to provide a high pressure air conditioning unit constructed to have a low silhouette but which effectively mixes and distributes air within the room.

In one aspect of the invention, the high pressure air conditioning unit includes a housing mounted on the floor of a room. There is a horizontal partition within the housing extending between the end walls thereof and the front and rear of the housing. An opening is provided in one end of the partition to form a communicating passage between the upper and lower horizontal passages formed by the partition. A mixing valve is positioned within the lower horizontal passage and has its inlets connected to warm and cold air ducts. The mixed air is discharged from the valve to flow along the lower horizontal passage to a constant volume control unit which maintains constant the volume of air to be distributed within the room regardless of the proportions mixed of the warm and cold air. The conditioned air is then discharged from the constant volume control unit and flows upwardly through the partition opening to the upper horizontal passage. An elongated opening is provided in the top wall of the housing through which the mixed air is distributed into the room.



Other objects, advantages and features of the invention will be apparent from the accompanying description and drawings which are merely exemplary.

In the drawings:

FIG. 1 is an overall perspective view of the unit of the present invention mounted in a room;

FIG. 2 is a longitudinal sectional view of the unit taken along the line 2—2 of FIG. 1;

FIG. 3 is a transverse sectional view of the unit taken along the line 3—3 of FIG. 2; and

FIG. 4 is a transverse sectional view of the unit taken along the line 4—4 of FIG. 2.

Referring to the drawings wherein like reference symbols indicate the same parts throughout the various views, one specific embodiment of the invention will be described in detail.

As may be seen in FIGS. 1 and 2, the unit of the invention is indicated generally at **10** and comprises a housing **11** having end walls **12** and **13**, a front wall **14**, and a top wall **15**. Within the housing is a horizontal partition **16** extending from the front to the rear of the housing and from end wall **12** to a point just short of end wall **13** so as to define an opening **17**. The horizontal partition defines upper horizontal passage **18** and lower horizontal passage **19**.

The housing **11** is also provided with a rear wall **20** which rests against wall **21** of the enclosure or room in which the unit **10** is located. The housing **11** is also provided with a bottom wall **22** which rests upon the floor **23** of the enclosure.

One end of the housing bottom wall **22** is depressed as indicated at **24** and defines a pan **25** which fits into a corresponding recess **26** formed in the floor **23** of the enclosure. The pan **25** is provided with downwardly extending ducts **27** and **28** which are connected to warm and cold air ducts **29** and **30** leading from the central air conditioning unit.

Mounted upon the pan **25** is an air mixing unit indicated generally at **31** and comprising passages **32** and **33** which are connected to the pan ducts **27** and **28**, respectively. The passages **32** and **33** extend upwardly at angles, as illustrated in FIG. 2, and the valve member **34** is pivotally mounted at the intersection of these passages. Valve member **34** is pivotally connected to a rod **35** which extends from an actuator **36**. The actuator **36** provides for automatic control of the proportions of warm and cold air mixed and is connected to a thermostat through connection **37** so as to be temperature-responsive to conditions within the room.

The mixed air is discharged through valve opening **38** and flows through the lower horizontal passage **19** to a constant volume control unit **39**. The unit **39** is of the type illustrated and described in U.S. Patent 2,890,716 issued on June 16, 1959. Essentially, the unit **39** is responsive to upstream pressures of the conditioned air discharged from mixing valve **31** so as to maintain with stability the flow of air within the unit for distribution within the room.

The top wall **15** of the housing is provided with an elongated outlet **40** for distributing the conditioned air within the room.

If necessary for the proper operation of the unit, baffles **41** and **42** may be provided in the lower horizontal passage **19**. To improve the efficiency of the unit, the lower horizontal passage **19** may be provided with insulation as indicated at **43** in FIG. 4.

The entire unit **11** is airtight in view of the high pressure and high velocity of the air streams passing therethrough.

In the operation of the present unit, warm and cold air streams are mixed together in the mixing valve in the proper proportions as determined by the tempera-

ture responsive actuator **36**. The mixed or conditioned air then flows horizontally through the lower horizontal passage of the unit to the constant volume control unit **39**. This unit, which is responsive to the upstream air pressures, maintains stable the volume of air which is admitted to the upper horizontal passage **18** through the opening **17** for distribution within the room through the outlet **40**. Thus, the conditioned air is flowed horizontally in one direction, then upwardly through the partition opening **17** and its direction reversed to flow horizontally in the upper horizontal passage **18** from which it is distributed to the room through outlet **40**.

The horizontal flow of the mixed air in reversed directions enables the entire height of the unit to be considerably lower than conventional units and at the same time provides for an effective distribution of the conditioned air within the room. Further, the horizontal positioning of the air mixing valve and the constant volume control unit permits effective control and regulation of the conditioned air while the air is flowing in a horizontal direction within the unit prior to the distribution of the conditioned air into the room. The distribution of the air into the room from its horizontal flow in the upper horizontal passage greatly decreases the occurrence of drafts in the room which might prove objectionable to occupants.

It is pointed out that the horizontally flowing air stream which is moving at a high velocity is not discharged directly into the room through the outlet in the top wall of the unit but that this air must move at right angles from the direction of the air stream to pass outwardly through the unit outlet.

It is to be understood that changes can be made in the various details of construction and arrangement of parts without departing from the spirit of the invention except as defined in the appended claims.

What is claimed is:

**1**. In a high pressure air conditioning unit, the combination of a housing having a low silhouette mounted on the floor of an enclosure and having front, top and end walls, a horizontal partition within said housing between said end walls and spaced below said top wall to define upper and lower horizontal passages, a mixing valve within said lower horizontal passage and having inlets adjacent one end of said housing adapted for connection to warm and cold air ducts, and a constant volume control unit in said lower horizontal passage in the same flow path with said valve, there being an opening in said partition at one end on the side of said control unit away from said mixing valve and communicating between said lower and upper passages, said top wall having an elongated outlet therein.

**2**. A high pressure air conditioning unit according to claim **1** wherein said opening is at one end of said partition, said mixing valve being at the other end of said lower horizontal passage, and the elongated outlet in said top wall being inwardly of said partition opening.

**3**. A high pressure air conditioning unit according to claim **1** and further including a pan at the bottom of said housing projecting downwardly therefrom and having two openings therein for connection to warm and cold air ducts.



**4**. A high pressure air conditioning unit according to claim **1** and further including warm and cold air ducts extending upwardly and angularly into said housing from the bottom thereof, said mixing valve being connected to said ducts at the upper ends thereof and having its outlet directed upwardly whereby the mixed air is directed against said horizontal partition and diverted laterally through and to one end of said lower horizontal passage and upwardly through said partition opening, and thence reversely through said upper horizontal passage to be discharged through said outlet.

**5**. In a high pressure air conditioning unit the combination of an enclosure having a low silhouette and front, top and end walls, means communicating with the bottom of said housing adjacent one end of said enclosure for introducing vertically flowing warm and cold air streams, means within said enclosure for mixing said warm and cold air streams, mixing valve means within said housing for flowing the mixed air horizontally toward one end of said housing, a constant volume control unit in said horizontally flowing air in the same flow path as said valve means, means within said housing for reversing the direction of flow of said horizontal air stream from said one end and guiding said reversed air stream above said first horizontally flowing air stream, and outlet means in said top wall intermediate the ends thereof for distributing the reversed horizontal air flow outwardly of said enclosure.

**6**. In an arrangement for high pressure air conditioning having a low silhouette, the combination of an enclosure including a floor and a wall upstanding therefrom, warm and cold air ducts extending upwardly through said floor, adjacent said wall, there being a recess in said floor surrounding said ducts, an elongated housing with front, top and end walls mounted against said wall with one end of said housing being over said floor recess, a mixing valve within said housing connected to said warm and cold air ducts, a constant volume control device within said housing between said mixing valve and the other end of said housing and in the same flow path as said control, means within said housing for guiding the flow of air from said mixing valve horizontally to said constant volume control device to said other end of the housing, means within said housing for reversing the flow of the horizontally flowing air, and outlet means in said top wall for distributing the reversed horizontal flow of mixed air upwardly from said housing.


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ROBERT A. O'LEARY, *Primary Examiner.*

W. E. WAYNER, *Assistant Examiner.*