Nov. 17, 1953 E. J. KUREK 2,659,292

PRESSURE-DISPLACEMENT VENTILATING APPARATUS FOR ARCHITECTURAL STRUCTURES

Filed June 23, 1950 2 Sheets-Sheet 1

Fig. 1

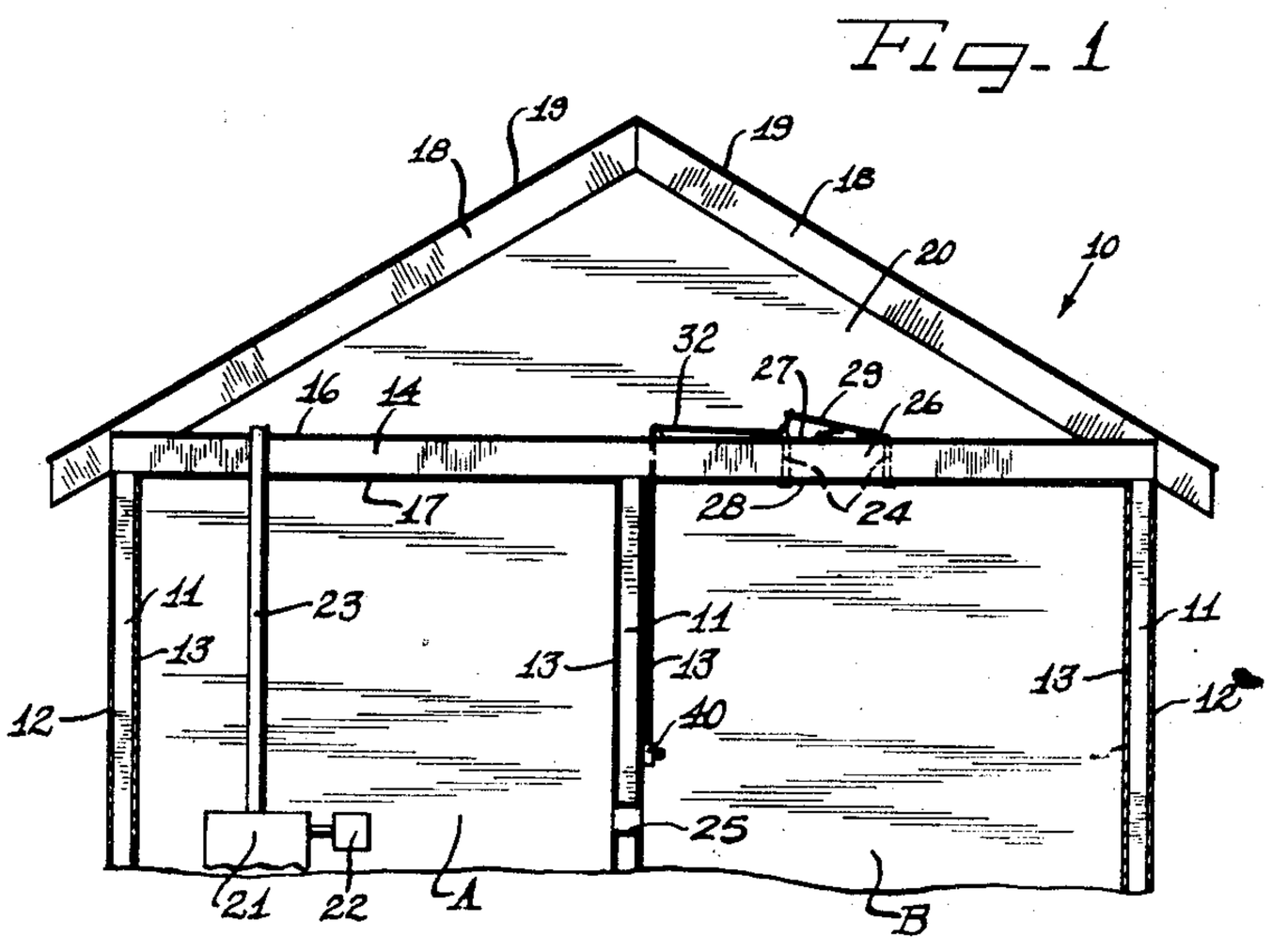

Fig. 4

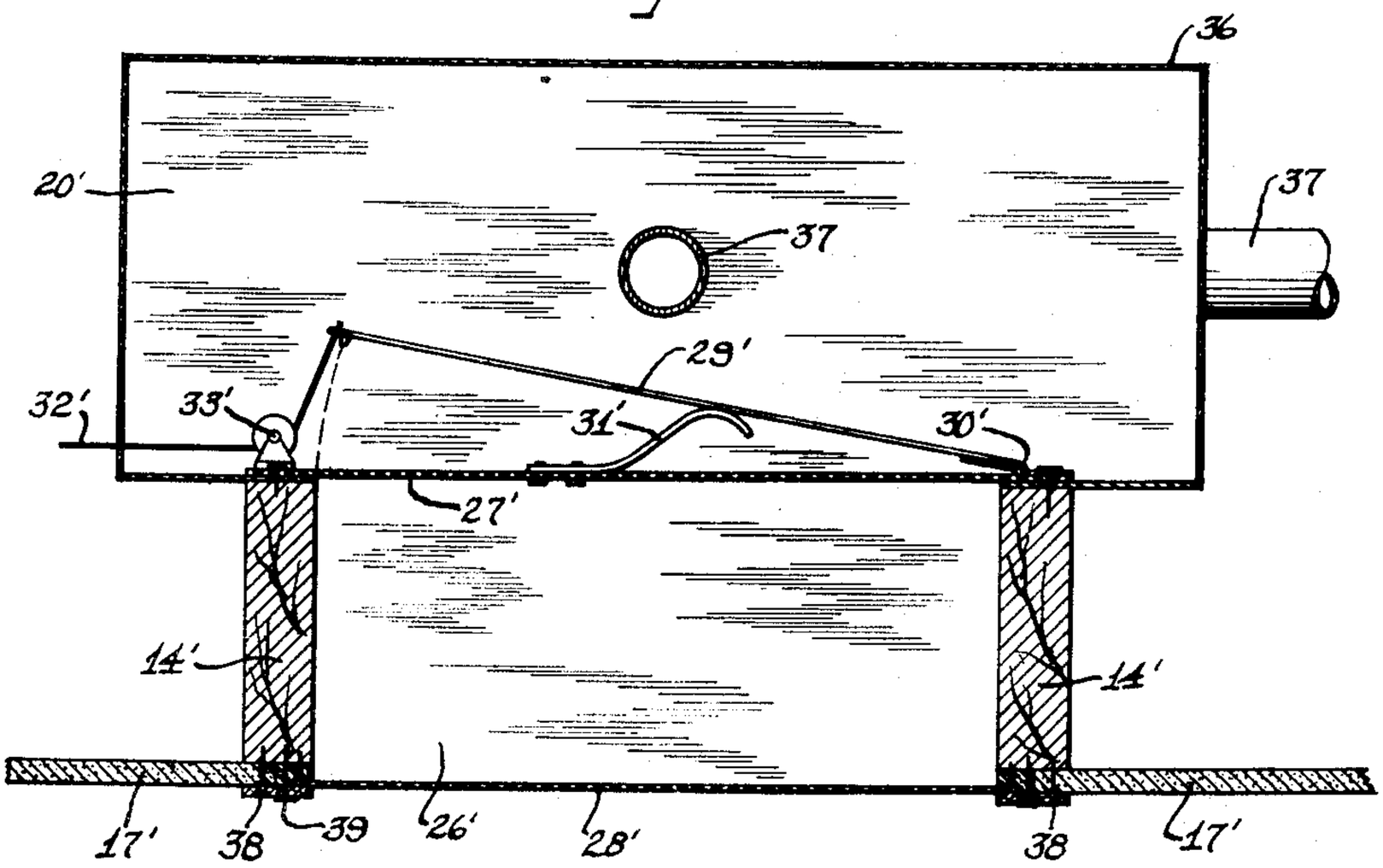

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Fig. 2

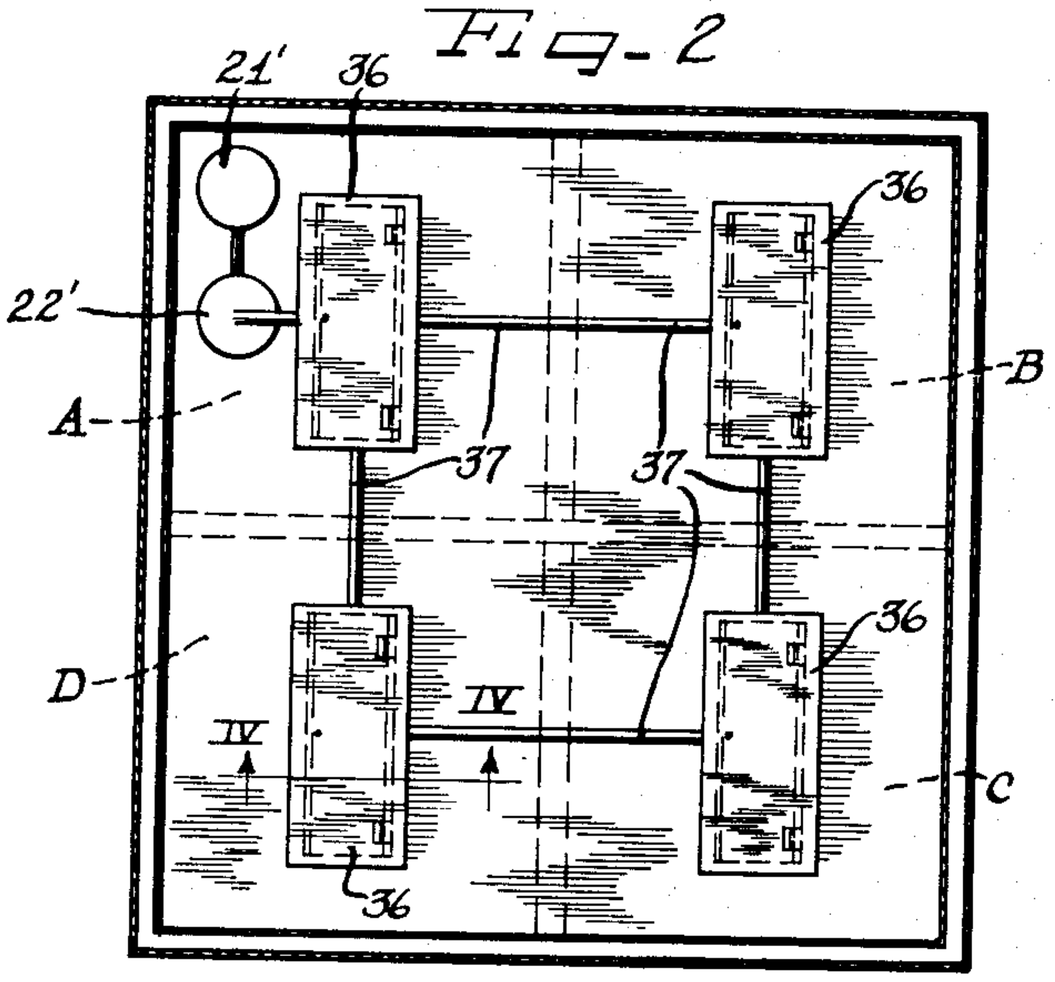
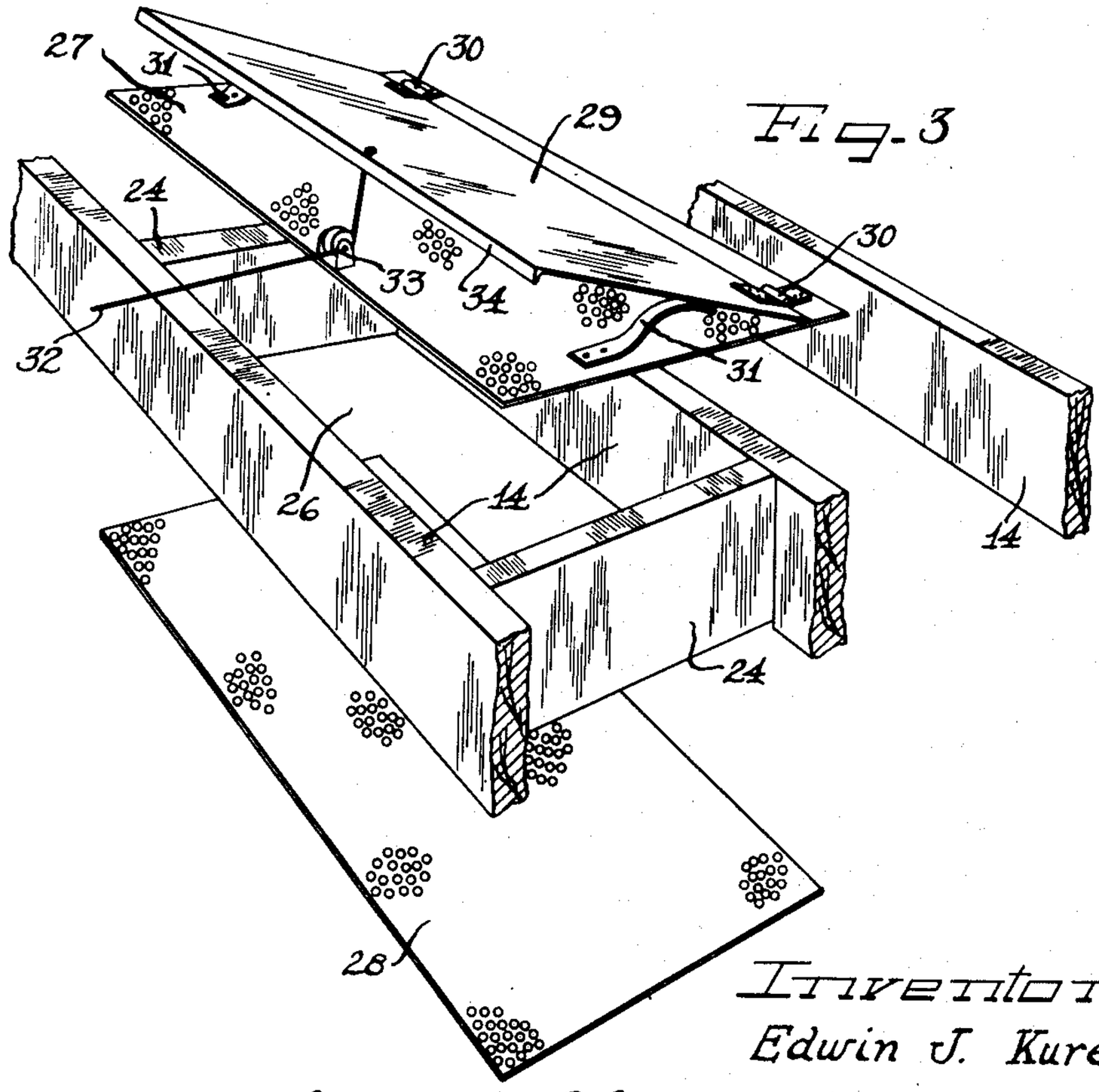


Fig. 3



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PRESSURE - DISPLACEMENT VENTILATING APPARATUS FOR ARCHITECTURAL STRUCTURES

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2 Claims. (Cl. 98—33)

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This invention relates generally to ventilating apparatus and more particularly to an improved structure for a ventilating apparatus operable on the so-called pressure-displacement principle which includes certain frame members of an architectural structure as an integral portion of the ventilating apparatus or ventilating system.

According to the general principles of the present invention, an architectural structure such as a pre-fabricated home is provided in which a plurality of studs having the usual wall covering thereon form a plurality of spaces to be temperature conditioned. The studs support a plurality of conventionally spaced ceiling joists and means including the ceiling joists define a secondary plenum chamber between each of the spaces to be ventilated and a primary plenum chamber adapted to carry pressurized temperature conditioned air.

According to the present invention, the primary plenum chamber may conveniently comprise the attic of the architectural structure, such attic insofar as its function as a chamber is concerned being formed by the ceiling of the plurality of spaces to be ventilated and the roofing structure of the pre-fabricated house.

The covering on the ceiling joists includes a control plate portion comprising a perforated plate having a predetermined per centum open area and forming a common partition between the secondary plenum chamber and the attic of the house or the primary plenum chamber and further includes a distribution plate portion which comprises a perforated plate having a predetermined per centum open area which forms a common partition between each of the secondary plenum chambers and a corresponding one of the spaces to be ventilated. Control valve means cooperable with the control plate portion are provided to regulate the flow of air between the primary and secondary plenum chambers.

A temperature conditioning apparatus may be provided as well as a pressurizing means so that pressurized temperature conditioned air is delivered into the attic or primary plenum chamber for controlled and regulated flow into the secondary plenum chamber at reduced pressure and velocity, whereupon the air in the secondary plenum chamber will be further diffused outwardly through the perforated distribution plate into each of the spaces to be ventilated. Thus, ventilation and temperature conditioning is effected within each of the spaces to be ventilated under substantially draft-free conditions.

It is an object of the present invention, therefore, to provide a novel and improved pressure-

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displacement type ventilating apparatus for an architectural structure which includes at least some of the structural members of the architectural structure as an integral portion of the ventilating apparatus.

Another object of the present invention is to provide an economical and easily produced ventilating apparatus which will effect substantially draft-free temperature conditioned ventilation of an architectural structure such as a pre-fabricated home.

Many other features, advantages, and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description which follows and the accompanying sheets of drawings in which a preferred embodiment of a structure embodying the principles of my invention is shown.

On the drawings:

Figure 1 is a fragmentary cross-sectional view with parts in elevation of an architectural structure incorporating a pressure-displacement type ventilating apparatus according to the principles of the present invention;

Figure 2 is a plan view of an alternative embodiment of an architectural structure including a pressure-displacement type ventilating apparatus according to the principles of the present invention;

Figure 3 is an isometric exploded view showing additional details of construction of portions of the ventilating apparatus provided in accordance with the present invention; and

Figure 4 is a cross-sectional fragmentary view taken on line IV—IV of Figure 2.

As shown on the drawings:

An architectural structure such as a pre-fabricated house 10 is shown in Figure 1 as including a plurality of studs 11 covered by sidings 12 and interior wall covering 13, the covered studs 11 being arranged to define a plurality of spaces to be ventilated indicated in Figure 1 by the reference characters A and B.

A plurality of ceiling joists 14 are supported by the studs 11 and are appropriately covered by a flooring 16 and a ceiling covering 17 so as to form a ceiling for each of the plurality of spaces A and B.

The pre-fabricated house 10 further includes a plurality of roof beams 18 covered by roofing 19 and supported by the outside studs 11 in spaced relationship to the ceiling structure built around the joists 14 so as to define an attic 20 above the spaces to be ventilated.

A temperature conditioning mechanism 21,

such as a furnace or a refrigerator mechanism, equipped with a suitable pressurizing member 22 such as a motorized fan furnishes pressurized temperature conditioned air to the attic 20 through a duct 23 so that the attic 20 comprises, in effect, a primary plenum chamber. The temperature conditioning mechanism 21 is shown in the space A, however, it will be understood that it can be located in any conventional relation to the spaces A and B, provided the usual return air system is employed to place the mechanism 21 in communication with the spaces A and B.

For example, a conventional return air passage 25 may be provided in the inside partitions between the spaces to communicate return air to the temperature conditioner 21. As may be seen in greater detail in Figure 3, cross members 24 together with the conventionally spaced joists 14 form a secondary plenum chamber 26 between each of said spaces to be ventilated A and B and the primary plenum chamber formed by the attic 20.

A portion of the attic flooring 16 for the joists 14 includes a control plate portion 27 which comprises a perforated plate having a predetermined per centum open area, the control plate portion 27 forming a common partition between each of the secondary plenum chambers 26 and the primary plenum chamber formed by the attic 20.

A portion of the ceiling covering 17 of the joists 14 includes a distribution plate portion 28 which comprises a perforated plate having a predetermined per centum open area, the distribution plate portion 28 forming a common partition between each of the secondary plenum chambers 26 and the spaces to be ventilated A and B.

Control valve means cooperable with each of the control plate portions 27 are provided to regulate the flow of pressurized temperature conditioned air from the primary plenum chamber formed by the attic 20 into the secondary plenum chamber 26. As may be clearly seen in Figure 3, the control valve means comprises a valve plate 29 of substantially the same area as the control plate portion 27, a pair of hinges 30 being provided between one edge of the valve plate 29 and the control plate portion 27 so that the valve plate 29 may be pivotally connected for relative positioning between a wide open position and a progressively closer closed condition with respect to the control plate portion 27.

A pair of resilient band springs 31 may be firmly connected on opposite ends of the control plate 27 to normally bias the valve plate 29 upwardly.

Positioning means may be provided to adjust the position of the valve plate 29 such positioning means comprising a cable or cord 32 threaded through a pulley 33 and firmly connected to the valve plate 29.

It will be noted that one edge of the valve plate 29 may be flanged as at 34 to lend additional rigidity thereto.

In the embodiments of Figures 2 and 4, separate primary plenum chambers are provided in order that the entire attic 20 need not be employed as a primary plenum chamber. Thus, a plurality of box-like casings 36 interconnected by suitable duct means 37 are positioned superjacent each of the spaces to be ventilated A and B, C and D, and are supported by the joists 14' immediately adjacent the secondary plenum chambers 26', the bottom portion of the casings 36 being open so that the control plate portion 27' will form a common partition between the primary plenum chamber 20' defined by the casings 36 and the secondary plenum chambers 26'.

As is shown in Figure 4, the ceiling covering 17' on the joists 14' includes a distribution plate portion 28' which forms a common partition between each of the secondary plenum chambers 26' and the spaces to be ventilated A, B, C and D. The distribution plate portion 28' may be retained in place by suitable furring strips 38 secured to the joists 14' by appropriate fasteners 39.

The control valve means of the embodiment of Figures 2 and 4 is similar to that shown in Figure 3 and like reference numerals are applied to the same parts. It will also be understood that a suitable temperature conditioning mechanism such as shown at 21' equipped with a pressurizing member 22' will furnish pressurized temperature conditioned air to the duct means 37 for distribution to the various casings 36, as shown in Figure 2.

In order that the control valve means may be regulated from a locale remote from the actual plate location or if the plate is to be regulated by a thermostat, the positioning means shown as including the cord or cable 32 may be connected to control elements 40 which are operatively accessible at a location remote from the valve plate, for example, in each of the spaces to be ventilated A, B, C and D (see Figure 1).

In operation, pressurized temperature conditioned air will be forced at rather high pressures into the primary plenum chamber 20 or 20' after which a regulated supply of the pressurized temperature conditioned air will be diffused through the control plate portions 27 and 27' into the secondary plenum chambers 26 and 26' for further diffusion outwardly through the perforated distribution plates 28 and 28' into the spaces to be ventilated A, B, C and D. Thus, each of the spaces to be ventilated will be supplied with properly conditioned air without the adverse effects of draft or whistle noises since the air entering the spaces will be moving at very low velocity but at sufficiently high volume to adequately accommodate the heat losses in the spaces.

It will be readily appreciated that the ventilating arrangement described herein completely eliminates the necessity of providing a bulky secondary plenum chamber unit for the architectural structure since the ceiling joists are effectively employed not only to form a part of the ceiling structure but to form the side walls of the secondary plenum chamber. With the present arrangement, therefore, it is possible to acquire all of the numerous advantages of a genuine pressure-displacement type ventilating apparatus with the use of a control plate, a distribution plate and a control valve means cooperable with the control plate, each of these elements being especially constructed for cooperation with conventionally spaced ceiling joists in an architectural structure.

Although I have resorted to detail in the description of the subject matter of my invention for the sake of clarity, it should be understood that I wish to embody within the scope of this patent all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. In combination, a room wall having spaced structural forms, a perforated distribution plate forming a portion of the wall surface exposed to the interior of the room, a perforated second plate coextensive in area with said distribution

plate and forming a back wall surface in spaced relation to said distribution plate, means providing a primary plenum chamber behind said room wall concealed from the interior of the room and having said second plate as one wall thereof, means for supplying pressurized ventilating air to the primary plenum chamber, said second wall together with said structural forms and said distribution plate forming a secondary plenum chamber inside of said room wall, said distribution plate and said second plate each providing air flow diffusion passages between the plenum chambers and the room, and flow control means between said primary and secondary plenum chambers including a valve plate coextensive in area with said second plate and hinged at one margin for adjustment towards and away from obstructing relation with respect to the air flow diffusion passages through said second plate to admit air at reduced velocity and pressure into said secondary plenum chamber for further diffusion through said distribution plate into the room.

2. In a compartment to be ventilated, a wall skeleton including spaced structural forms, wall covering on one face of said wall skeleton including a perforated distribution plate extending across one pair of said forms and providing a portion of wall surface with diffusion air flow passages therethrough communicating the interior of the compartment to the space between said one pair of forms, a second perforated plate on the opposite face of said skeleton and extending between said pair of forms to form together therewith and with said distribution plate a secondary plenum chamber in the space between said forms, means providing a primary plenum chamber adjacent said opposite face of said forms, said second plate forming a common wall between said primary and secondary plenum chambers and providing a plurality of air flow passages extending between said chambers, a valve plate substantially coextensive in area with said second perforated plate and pivotally hinged along one margin to said structural forms, spring means between said second plate and said valve plate biasing said valve plate toward a maximum open position, and control means connected to said valve plate and accessible in said compartment to adjust said valve plate towards obstructing relation with respect to said air flow passages in said second plate thereby to regulate the flow of air from said primary plenum chamber at reduced pressure and velocity into said secondary plenum chamber for diffusion outwardly through said distribution plate into the compartment.

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