

April 22, 1941.

E. A. SIPP ET AL

2,239,508

AIR-DISTRIBUTING APPARATUS FOR VENTILATING SYSTEMS

Filed Dec. 15, 1938

3 Sheets-Sheet 1

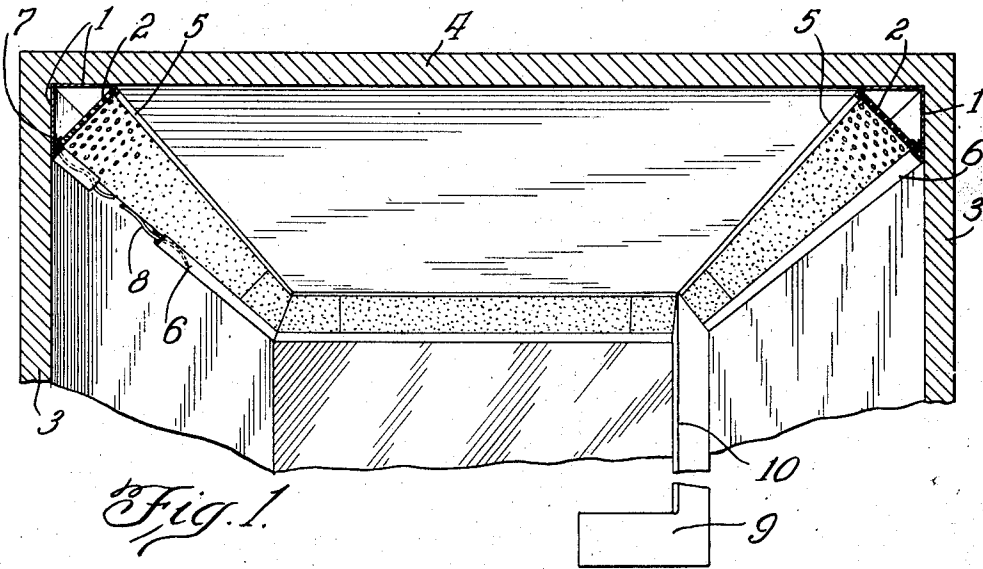


Fig. 1.

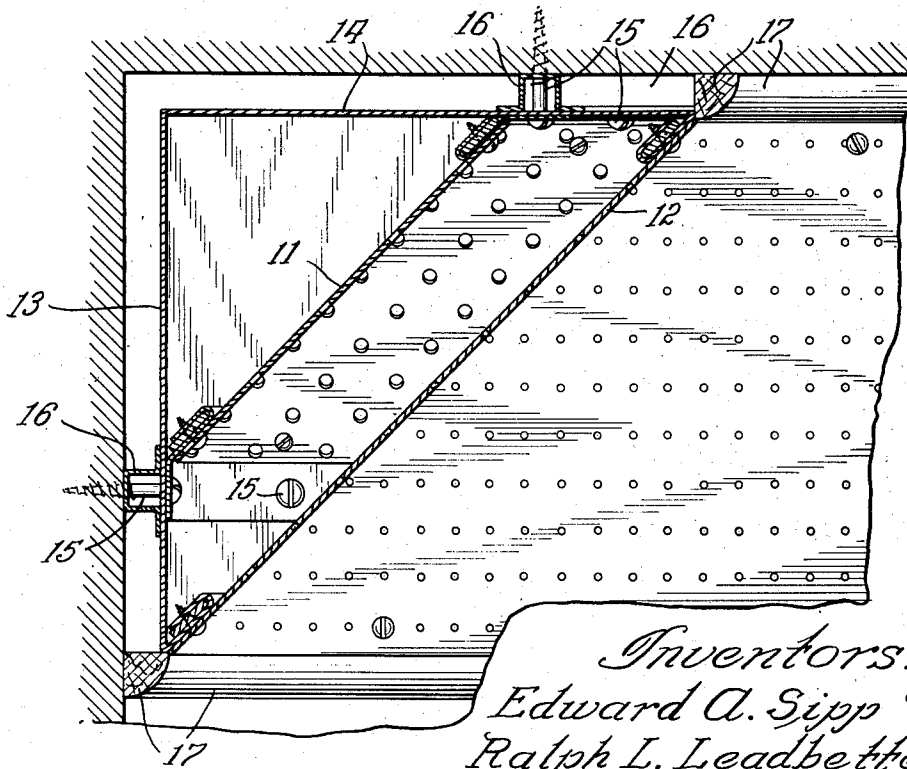


Fig. 2.

Inventors:
Edward A. Sipp &
Ralph L. Leadbetter
By: - *Trench and Darbo Attys.*

April 22, 1941.

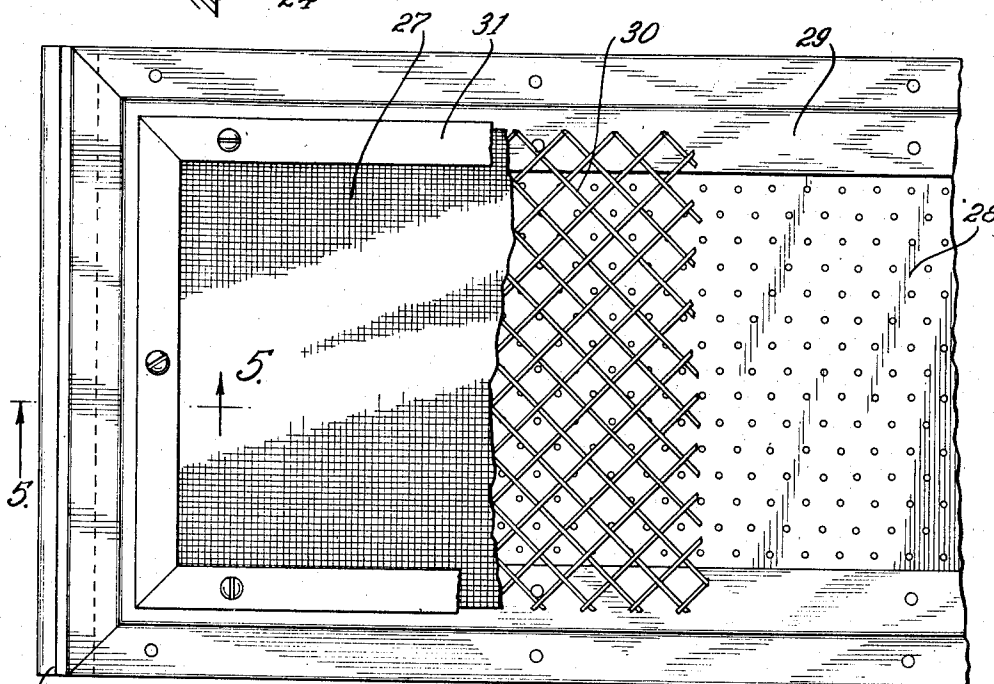
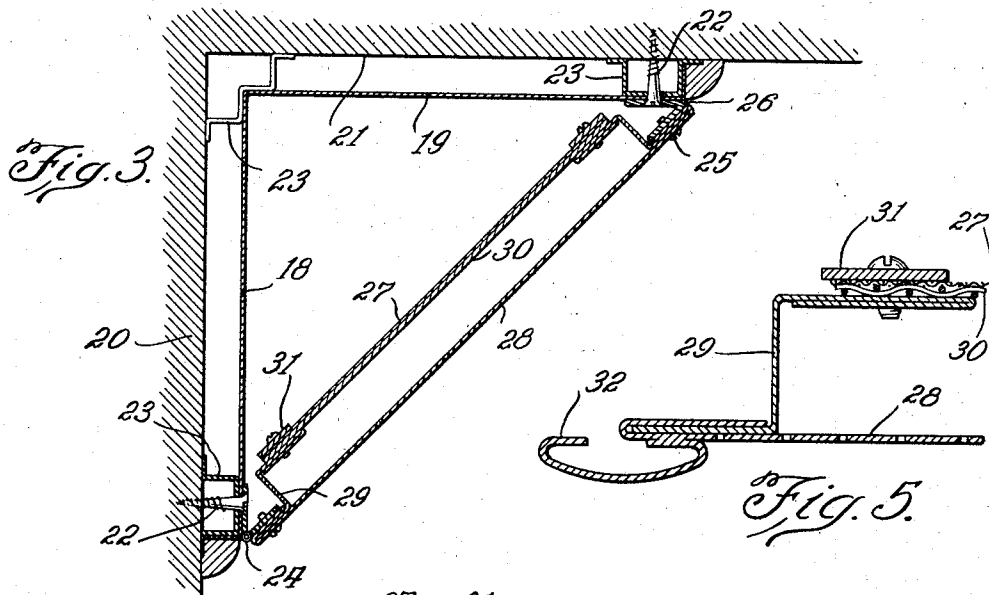
E. A. SIPP ET AL

2,239,508

AIR-DISTRIBUTING APPARATUS FOR VENTILATING SYSTEMS

Filed Dec. 15, 1938

3 Sheets-Sheet 2



32

Fig. 4.

Inventors
Edward A. Sipp and
Ralph L. Leadbetter
By: -
Resch and Danbo. atty's

April 22, 1941.

E. A. SIPP ET AL

2,239,508

AIR-DISTRIBUTING APPARATUS FOR VENTILATING SYSTEMS

Filed Dec. 15, 1938

3 Sheets-Sheet 3

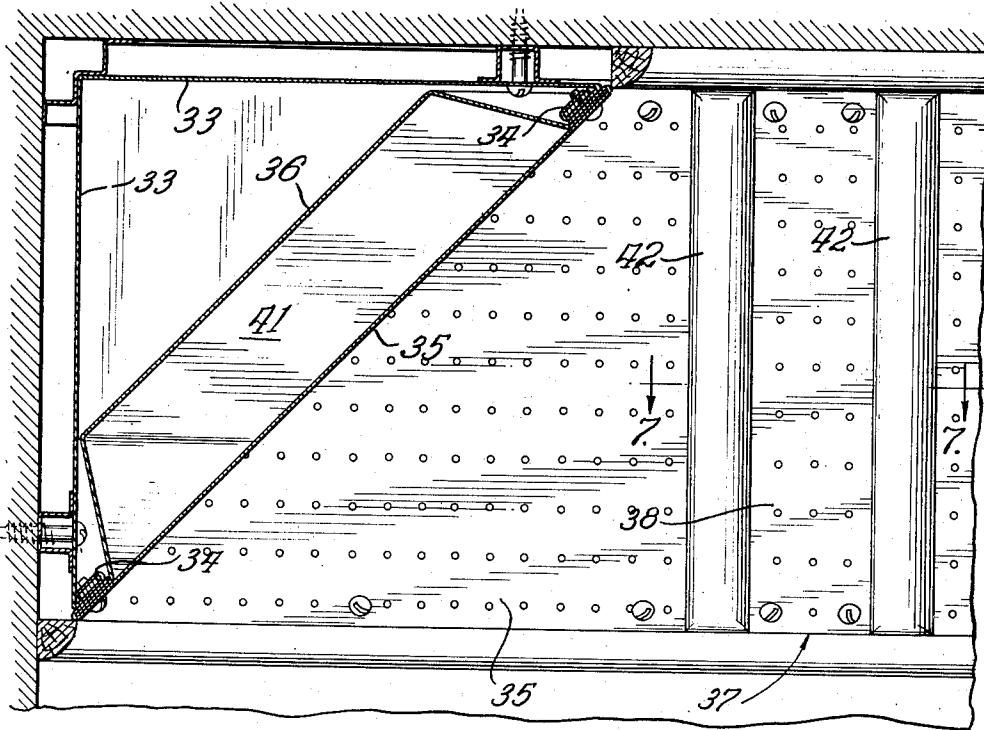


Fig. 6.

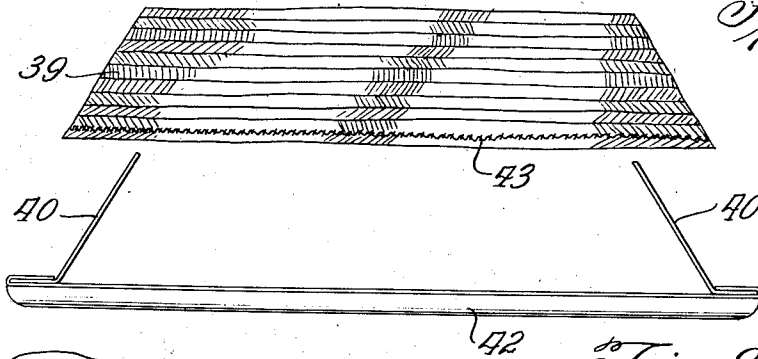


Fig. 8.

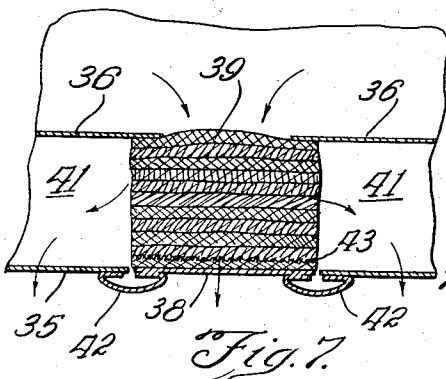


Fig. 7.

Inventors:
Edward A. Sipp &
Ralph L. Leadbetter

By:-

Tesch and Darbo

Attys.

UNITED STATES PATENT OFFICE

2,239,508

AIR-DISTRIBUTING APPARATUS FOR
VENTILATING SYSTEMS

Edward A. Sipp, Oak Park, and Ralph L. Leadbetter, Wheaton, Ill., assignors, by mesne assignments, to Burgess Battery Company, Chicago, Ill., a corporation of Delaware

Application December 15, 1938, Serial No. 245,942

1 Claim. (Cl. 98-40)

This invention concerns the distribution of ventilating air into enclosures.

The manner of introduction of the air into an enclosure to be ventilated has an important bearing on the suitability of every ventilating system. A number of factors must be considered and much ingenuity has heretofore been applied in the solution of the many problems involved in this operation. The difficulties to be overcome have been greatly multiplied by the advent of air conditioning whereby the ventilating air is cooled when required to maintain the desired conditions within the enclosure. An ideal air-distributing arrangement is one which delivers conditioned ventilating air into the enclosure in sufficient quantities without concomitant formation of sensible drafts and which will maintain uniformity within the enclosure with respect to temperature, humidity and wholesomeness of the air.

Divers forms of apparatus have been developed and commercially adopted which are capable of more or less satisfactorily distributing the air into an enclosure. The most desirable forms, however, are expensive and occupy space which would otherwise be available for use by the persons or materials within the enclosure. Some of these forms are not adapted for installation in completed buildings.

It is an object of this invention to provide air-distributing apparatus which will distribute a predetermined quantity of ventilating air into an enclosure without drafts and which will operate to so distribute the air that uniform conditions of temperature, humidity and wholesomeness will obtain within the space. Further objects include the provision of such apparatus in a simple and inexpensive form which occupies only a negligible part of the space of the enclosure and which is readily adapted to use in completed buildings or vehicles as well as installation in the course of erection of the structure.

In the accompanying drawings,

Fig. 1 is a perspective view, partly in section, illustrating a room equipped with one form of the invention;

Fig. 2 is a detailed view showing in section and elevation a different embodiment of the invention;

Fig. 3 is a detailed sectional view of a further embodiment of the invention;

Fig. 4 is a fragmentary plan view of the distributor of Fig. 3;

Fig. 5 is a detailed sectional view taken at 5-5 of Fig. 4;

Fig. 6 is a detailed view showing in section and elevation a further embodiment of the invention;

Fig. 7 is a sectional view taken at 7-7 of Fig. 6 and showing the air-diffusing element; and

Fig. 8 is another view of the air-diffusing element of Fig. 6.

An installation embodying the simplest form of the invention is illustrated, installed, in Fig. 1. A triangular duct is formed of sheet metal duct walls 1 and air-distributing element 2. The duct is arranged as a cornice at the junction of the walls 3 with ceiling 4 of the room, the air-distributing element 2 being angularly disposed with respect to the walls and the ceiling and being exposed to the interior of the room. An artificially perforated thick material, such as 1/2 inch Nu-Wood or Masonite, is used as the air distributor in this embodiment of the invention. Sheet metal walls 1 of the duct are bent inwardly to form retaining flanges 5 and 6 for holding the distributing element 2 in position. Any suitable means may be used to hold it in position, it being convenient to install the sheet metal and thereafter insert the distributing element. In the particular embodiment shown a guide strip 7 is soldered to the metal duct wall 1 and, in assembling, the lower edge of distributing element 2 is inserted between this strip and flange 6. Sufficient clearance is allowed to permit the upper edge of the distributing element to clear the edge of flange 5 as it is slipped into place, spring members 8 then urging distributor 2 upwardly behind flange 5.

Ventilating air is supplied to the cornice duct at one or more points, the number of supply points depending upon the size of the enclosure to be ventilated and the length of the distributing ducts. The supply duct may connect with the distributing duct through wall 3 and sheet metal duct wall 1 if the source of supply is outside of the room, or, if a unit conditioner 9 located within the room is used, ventilating air may be supplied to the distributing duct by means of connecting duct 10. Since it is desirable to have the air introduced into the room in a direction substantially perpendicular to the surface of the distributor, a material having a substantial thickness is preferably used for air-distributing element 2 because of its ability to turn the rapidly flowing air in the duct and direct it into the room. If perforated sheet metal or other thin material were used, the air, after passing through the perforations of the distributor, would tend to travel

in the same direction as the air is traveling within the distributing duct. This is undesirable because of the non-uniform distribution resulting.

It is desirable to balance the volume of air supplied to the distributing ducts against the total open area of the distributor in order to maintain an appreciable static pressure within the distributing duct whereby substantially uniform distribution of air is obtainable throughout the length of the distributing ducts. This relationship is fully discussed in Germonprez co-pending application Serial No. 184,763, filed January 13, 1938. As a general rule, the velocity of air within the ducts should not exceed about 2,000 feet per minute in view of excessive noise caused by higher velocities.

In the embodiment of the invention illustrated in Fig. 2, a triangular distributing duct system similar to that above described is used in conjunction with an air-distributing element of a different construction. Two spaced perforated sheet members 11 and 12 comprise the distributing element. The inner perforated sheet 11 is mounted angularly between sheet metal duct walls 13 and 14 by suitable means, such as the clips and screws illustrated. These clips are fastened to the duct walls by screws 15 which latter also serve to hold the entire assembly in place against the wall and ceiling of the room. Spacers 16 are used to hold the duct walls away from the wall and ceiling of the room as generally required by fire hazard ordinances. Perforated member 11 is perforated a limited amount only whereby a slight static pressure will be maintained within the distributing duct as above described. Ventilating air from the distributing duct passes through the perforations in member 11 and, after the air streams have somewhat diffused in the space between members 11 and 12, the air is introduced into the enclosure through the perforations in the latter at uniform, relatively low velocity.

After the assembled ducts have been installed, moldings 17 may be used for trimming the job and covering the dead air spaces between the duct and the walls and ceiling of the room.

The construction illustrated in Figs. 3-5 is similar to that of Fig. 2 in that the distributing element is composed of spaced, apertured sheet-like members. The sheet metal walls 18 and 19 of the triangular duct are fastened in spaced relation to the wall 20 and ceiling 21 of the room to be ventilated by means of screws 22 and spacing clips 23. The air-distributing element is supported by the walls 18 and 19 of the duct by means of piano hinge 24 at the lower edge of the distributor, the upper edge being fastened by means of screws 25 and clips 26. This demountable arrangement is intended to provide ready access to the inside of the distributing assembly for cleaning and adjustment.

The details of construction of the air-distributing element are shown in Figs. 4 and 5. It consists, essentially, of a sheet of muslin or similar fabric 27 and the perforated, self-supporting sheet facing 28. The latter is exposed to view from within the room and may be made of sheet metal or a suitable hard-board material, such as tempered Masonite. The muslin is stretched on a suitable frame 29, being supported thereon by a stiff, open-mesh material, such as hardware cloth 30, and fastened by battens 31 screwed to the frame. The muslin is upstream of the hardware cloth so that sagging of the muslin due to

air pressure within the duct will be resisted by the supporting material.

These air-distributing elements are conveniently fabricated in panels as indicated in the plan view of Fig. 4. These panels may be arranged end-to-end to form the complete distributor. Suitable moldings, such as 32, may be provided to cover the joints between adjacent panels.

The air-distributing element of Figs. 3-5 operates to filter the air as well as to distribute it evenly into the room. The panels may be readily dropped and the filter-diffuser element 27 cleaned with a small vacuum cleaner. If desired, the fabric may be removed, laundered and replaced. A material should be selected which is sufficiently closely woven to cause a slight static pressure to be maintained within the duct and which is readily cleanable.

A further embodiment of the invention is illustrated in Figs. 6-8. A distributing element which functions as a filter as well as diffuser is again provided. Duct walls 33 having fastening flanges 34 are supported at the juncture of a wall and the ceiling of a room as above described. The perforated facing 35 is entirely covered in the inside by imperforate channel member 36. Units comprising the coextensive perforated facing and imperforate channel are made up in lengths of about 4 feet. These units appear in the finished assembly in spaced end-to-end relation, the filter-diffuser element 37 being inserted between adjoining ends of the units. These filter-diffuser elements may conveniently be about 3 inches wide and include a perforated sheet facing 38 which matches perforated facing 35, a filter cartridge 39, and a frame 40 adapted to receive the filter cartridge. The frame members 40 are angularly disposed with respect to perforated facing 38 to match the angle of the side members of channel 36. As indicated in Fig. 7, the imperforate channel member 36 extends slightly beyond the ends of perforated facing 35 so that the frame members 40 will seat upon the sides of channel 36 and the filter cartridge will overlap the ends of the channel member to thereby prevent leakage of air from the duct into space 41 past the filter cartridge 39.

The particular filter-diffuser cartridge 39 illustrated is composed of a number of superposed layers of expanded fibrous sheet material, coated with a suitable tacky substance, as described in Walton Patent No. 2,070,073, dated February 9, 1937. Although the invention is not limited to the use of this particular material, and other materials, such as spun glass or hair, serve the purposes of the invention, it is preferred because of its high filtering efficiency and because of the advantageous diffusing effect of the multiplicity of angularly disposed deflecting surfaces of which the layers of the filter are composed. The cartridge may be made up with beveled ends and slipped into frame 40 from one side. The filter-diffuser element assembly may be readily removed for the purpose of replacing the cartridge. Moldings 42 may be used to cover the joints at the edges of facing 38. It is sometimes desirable to include a layer of relatively air impervious material, such as tightly woven cloth 43 on the side of the filter cartridge adjacent the perforated facing 38 in order to prevent too great a flow of air into the room at this area. The air is then caused to flow through the filter into the spaces 41 and thence into the room through the perforations in facing 35. A slight static pressure is maintained

in the duct by reason of the limitations of the areas between the ends of imperforate channel members 35 through which the air must pass from the duct. The result is a uniform flow through all of these openings and a well distributed, gentle flow of the air through the perforated facings into the room.

As stated in connection with Fig. 1, ventilating air may be supplied to the ducts of the various forms of the invention from an air-conditioning unit located either without or within the room. The air is uniformly distributed throughout the volume of the room by means of the invention. The ducts may be arranged on one side of the room only, or may be installed on more or all sides. Also, the portions of the wall and ceiling adjacent their juncture may themselves form two walls of a triangular duct, the sheet-metal being thus dispensed with. It is obvious that numerous modifications may be made without departing from the fundamental features of the invention as embodied in the particular forms herein illustrated and described.

We claim:

In a ventilating system for an enclosure, a duct of right-triangular cross section arranged at the ceiling and wall juncture of the enclosure with

the hypotenuse side thereof exposed to the enclosure, said hypotenuse side of said duct comprising a facing panel exposed to said enclosure and having a multiplicity of apertures distributed therein, a channel member of imperforate sheet material extending lengthwise of said duct and engaging said facing panel and enclosing a space between said channel and said facing panel, said channel having openings in its web portion at spaced intervals along the length of said duct, means for continuously supplying ventilating air to said duct, and a filter-diffuser cartridge arranged at said opening in said channel whereby air passing from said duct into the space between said channel and said facing panel and thence into said enclosure is caused to pass through said filter-diffuser cartridge, said facing panel having removable sections opposite said openings in said channel, each of said removable sections having a cartridge-supporting frame attached thereto including filter-diffuser cartridge retaining elements, each of said filter-diffuser cartridges reposing in one of said frames and being removable with said removable section.

EDWARD A. SIPP.
RALPH L. LEADBETTER.