Nov. 19, 1935. F. P. WALSH 2,021,437

AIR CONDITIONING APPARATUS

Filed March 20, 1934

Fig. 1.

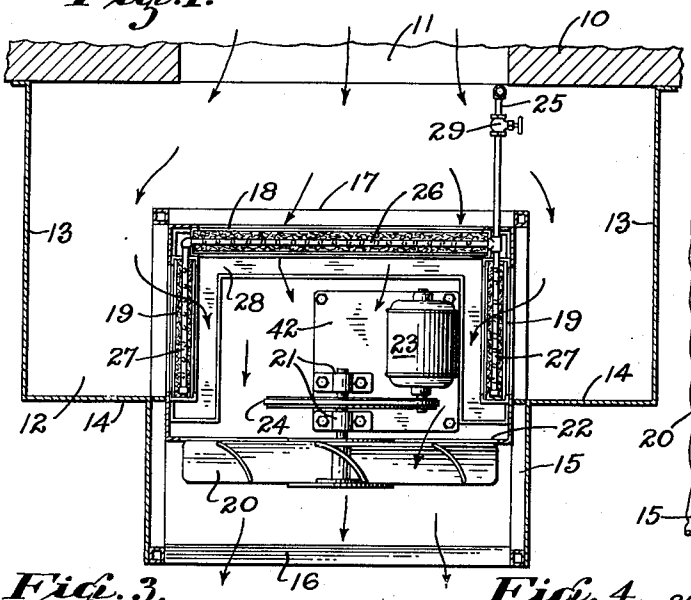



Fig. 2.

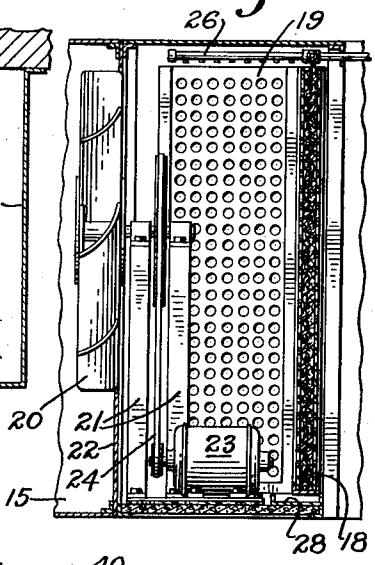



Fig. 3.

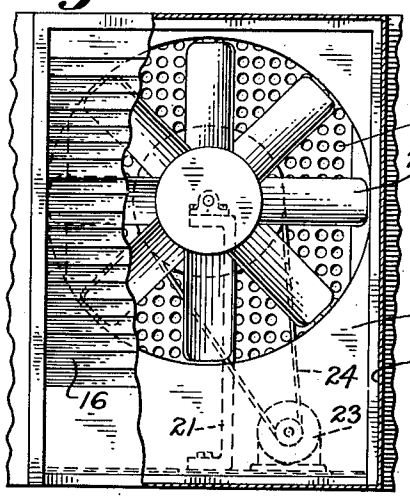



Fig. 4.

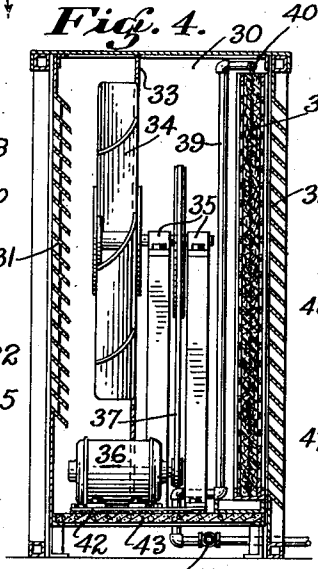



Fig. 6.

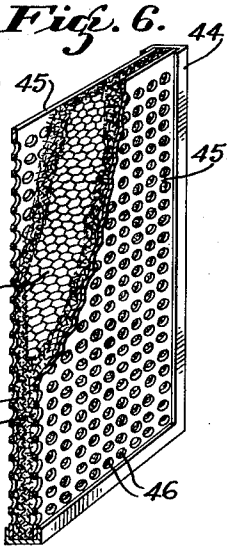



Fig. 5.

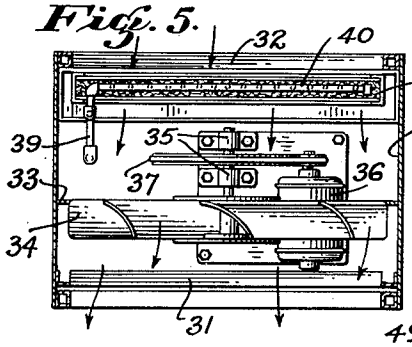



Fig. 8.

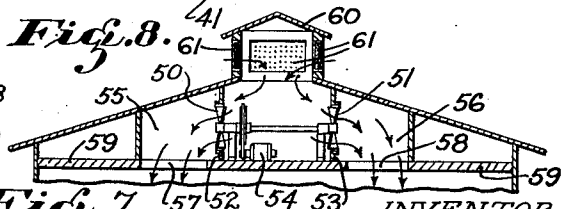
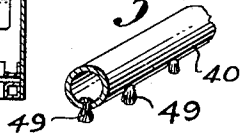



Fig. 7.




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# UNITED STATES PATENT OFFICE

2,021,437

## AIR CONDITIONING APPARATUS

Frank P. Walsh, Berkeley, Calif.

Application March 20, 1934, Serial No. 716,452

3 Claims. (Cl. 261—103)

This invention relates to air conditioning apparatus and more particularly to apparatus wherein the humidity of the air is increased by circulation and/or recirculation through a moisture containing filter unit.

An object of the invention is to provide an improved moisture containing contact unit air conditioning apparatus which is practical, efficient and simple in construction.

Another object of the invention is to provide a moisture introducing and distributing means for air conditioning apparatus that can be cheaply manufactured and which will function in an efficient and effective manner.

In conditioning air it is well known that mere circulation alone is insufficient to produce comfortable and desirable conditions in a room. It is also necessary, particularly in hot and dry climates, to introduce a certain amount of moisture into the circulating air in order to produce the proper degree of humidity. In the past, the introduction of moisture has been accomplished by circulating air through sprays and/or through wet sheets and the like. In the first instance it often happened that the air became too moist and in the latter instance the character of the sheets greatly retarded the circulation of air. It is therefore a further object of this invention to provide a contact moisture imparting device through which the circulating air may flow freely without requiring any great velocity or pressure, and at the same time provide for a uniform distribution of the moisture throughout the entire area of the contact unit.

With the above and other objects in view, the invention resides in the construction, combination and arrangement of parts substantially as will be hereinafter described and more particularly defined by the appended claims.

For a better understanding of the invention reference should be had to the accompanying drawing wherein there are shown, by way of illustration and not of limitation, prefered embodiments thereof.

In the drawing;

Figure 1 is a plan view, in section, showing apparatus of the character contemplated by the present invention installed over an opening, for instance, a transom or window in the wall of a building,

Figure 2 is a fragmentary side elevation, in section, showing the essential elements of the apparatus illustrated in Figure 1,

Figure 3 is a fragmentary front view of the apparatus illustrated in Figure 1, with parts broken away to show the interior details thereof,

Figure 4 is a side elevation, in section, showing apparatus suitable for use in circulating and recirculating the air within a room,

Figure 5 is a plan view, partly in section, of the apparatus illustrated in Figure 4,

Figure 6 is a fragmentary view showing the construction of a preferred form of the air moistening and filtering unit,

Figure 7 is a fragmentary view showing a detail of the filter moistening means contemplated by this invention, and

Figure 8 is a schematic diagram showing a modified form of the invention.

In Figures 1, 2 and 3 of the drawing, 10 designates the wall of a building having an opening 11 therein. This opening 11 may be a transom, a window or an opening formed especially for use in connection with the air conditioning apparatus. Secured upon the wall 10, there is a sheet metal housing 12 having end walls 13 and a front wall 14 which, together with the top and bottom of the housing, serve to form a flue that conducts the air drawn in at the opening 11 to the air conditioning apparatus to be hereinafter described. Projecting outwardly from the wall 14 of the housing 12 is an air discharge outlet 15 having louvers 16 across the open end thereof. Disposed in alignment with the outlet 15 and projecting rearwardly into the housing 12, there is a suitable frame 17, to which is secured a large filter unit 18 and two smaller filter units 19. The filter units 19 are arranged at the ends of the unit 18 and are disposed at a right angle thereto so that the three filter units form a continuous surface, through which air entering at the opening 11 will be required to pass before it is discharged at the louvered end of the outlet 15. A fan 20, for creating a circulation of air from the opening 11 through the filter units 18 and 19, is mounted upon bearing pedestals 21 and disposed in a baffle 22 which extends across the outlet 15. This fan 20 is driven at a slow speed by a small fractional horsepower motor 23 through a belt 24 which is accommodated by suitable pulleys upon the fan and motor shafts. When the fan 20 is in operation it will create a gentle circulation of air from the opening 11 through the filter units 18 and 19 to the louvered end of the outlet 15. Since one of the functions of the filter units 18 and 19 is to supply moisture to the incoming air, a water supply pipe 25 is mounted immediately thereabove. The water supply pipe 25 has portions 26 and 27 which are disposed respectively and centrally over the filter

units 18 and 19. These latter portions 26 and 27 of the water supply pipe 25 have spaced perforations along their lower surfaces, through which the water will be uniformly distributed over the total horizontal length of each of the filter units. Operating in conjunction with the water supply system, to carry off any excess water, is a drip pan 28 which extends beneath the filter units 18 and 19. This drip pan 28 can be provided with an overflow drain pipe. However, under normal operating conditions it is intended to so regulate the water feed that no more water than can be taken up by the incoming air will flow to the filter units. A valve 29, for regulating the flow of water, is provided in the water supply pipe 25. This valve 29 is shown as located within the housing 12 but, if desired, it may be located at any other convenient point.

Before describing further details of the construction, illustrated in the above figures of the drawing, reference is now made to Figures 4 and 5 of the drawing which show a modified form of apparatus for circulating and recirculating the air within a room without requiring a supply of fresh air from the outdoors. The apparatus illustrated in these figures of the drawing comprises a rectangular housing 30 having louvered openings 31 and 32 located respectively in its front and back walls. Located between the louvered openings 31 and 32 is a transversely extending baffle 33 having an opening in which a fan 34 operates. The fan 34 is shown as mounted upon pedestal bearings 35 and as driven by a suitable motor 36 through a belt 37. Extending across the louvered opening 32 in the rear wall of the housing 30 is an air filtering and moistening unit 38, through which the incoming air must pass. A water supply pipe 39, having a perforated end 40 and a regulating valve 41, cooperates with the filtering and moistening unit 38 to provide the proper amount of water.

In order to provide for rigidity in the apparatus, above described, each of the fans 20 and 34, together with its driving motor and supporting pedestals, is mounted upon a suitable metallic bed plate 42, and the bottom of each of the housings 12 and 30 is formed of a slate or concrete slab 43. A layer of felt or other yielding material is then disposed between the bed plate 42 and the slate or concrete slab 43. With this arrangement all vibration produced by the fan and its driving motor will be damped out and as a result the apparatus will operate silently. An advantage obtained by the use of a concrete slab, in the latter described air conditioning apparatus, is that a low center of gravity is produced and as a result the apparatus will be rendered more stable.

Figure 6 of the drawing illustrates an arrangement which has been found very satisfactory for a filter unit. The filter unit, here shown, has a U-shaped frame 44 which holds a pair of perforated plates 45 in spaced relation. The plates 45 are composed of sheets of metal having perforations 46 located in spaced relation throughout their entire surfaces. These plates 45 can be made in other ways, for instance, they may be constructed of heavy wire screening. Lightly packed between the plates 45 is a layer of fibrous material 47. A preferred type of fibrous material is excelsior, such as is used in packing glassware and the like. Wood shavings and other fibrous material can also be used for this purpose. The principal function of the fibrous material 47 is to impart moisture to the air. Therefore, it is important, in using excelsior or other coarse moisture absorbing fibrous material, that the material be lightly packed between the plates 45 so that it will not interfere with the free circulation of air therethrough. While the filter units are illustrated in the drawing as of a relatively small dimension in thickness, it is to be understood that the thickness may be increased depending upon the air velocity and the amount of moisture to be absorbed. To prevent a settling of the fibrous material and maintain an even and loose distribution thereof between the plates 45, there is a piece of galvanized chicken wire 48 with which the fibrous material interlocks. A settling of the fibrous material between the plates 45 can also be prevented by threading short lengths of wire through the perforations 46 from one plate 45 to the other at different levels throughout their areas. The top of the frame 44 is left open so that the water which is supplied to the fibrous material, to moisten the incoming air, may drop directly upon the fibrous material and then travel downwardly until all of the material has become saturated.

When the filter unit, illustrated in Figure 6 of the drawing, is disposed in its operating position, with the perforated water supply pipe extending along the upper edge thereof, the flow of water can be regulated so as to supply only that amount of moisture which the air passing through the filter can absorb. The operation of such a filter unit will require very little water and, therefore, means must be provided which will produce a slow and uniform drip of water upon the fibrous material throughout its horizontal length. Where the discharge pipe is merely perforated, it has been found that some of the holes will become stopped and others, because of a difference in pressure due to the length of the pipe, will drop too much water. This is remedied, in accordance with the present invention, by placing a small wick 49 in each of the apertures formed in the discharge pipe. Such an arrangement is illustrated in Figure 7 of the drawing.

The apparatus described above is primarily intended for the conditioning of air in a relatively small room and, while one unit may ordinarily be sufficient, more than one unit can be provided in a single room, if required. The important feature of the above described apparatus is that the air circulating fan operates at a relatively slow speed and, therefore, the fibrous material of the filter units must be supported loosely between the plates 45 so that it will not interfere with a free circulation of air therethrough. In other words, when properly designed, the circulating fan should produce no more than a gentle breeze at the discharge outlet of the apparatus.

By using a slow speed fan of large diameter and providing a large area of loosely packed and moistened fibrous material, as described above, it will be possible to effectively reduce the temperature of air, having a relative humidity of from twenty per cent (20%) to thirty per cent (30%), ten or twelve degrees in a cheap and efficient manner. A reduction in temperature of twelve degrees (12°) in air having the above relative humidity can be accomplished if only one and one half (1½) grains of water are taken up by every cubic foot of air passing through the filter unit.

As shown in Figure 8 of the drawing, the present invention can also be used for conditioning

the air of a large auditorium by embodying the above described elements of the apparatus in the building structure. As shown in this view of the drawing, the numerals 50 and 51 designate the two opposed fans which are disposed in baffles 52 and 53 and are driven by a motor 54. The baffles 52 and 53 are shown as arranged in the loft of a building beneath the roof. Extending from the baffles 52 and 53 there are conduits 55 and 56 which lead to suitable outlets 57 and 58 formed in a ceiling 59 of the building. Disposed between the fans 50 and 51 and communicating with the space between the baffles 52 and 53, there is a cupola 60 having filter units 61 located in the sides thereof. These filter units 61, like the filter units 18, 19 and 38, are also provided with a water supply system which will keep them in a moist condition. With this arrangement the air will be drawn in through the filter units 61, moistened, and discharged by the fans 50 and 51 through the outlets 57 and 58 into the room or auditorium, over which the ceiling 59 extends.

It is believed that the operation of the air conditioning apparatus contemplated by this invention will be clearly understood from the above and, therefore, no further description is thought necessary.

While I have, for the sake of clearness and in order to disclose the invention so that the same can be readily understood, described and illustrated specific devices and arrangements, it is to be understood that the invention is not limited to the specific means disclosed but may be embodied in other ways that will suggest themselves to persons skilled in the art. It is believed that the invention is broadly new and it is desired to claim it so that all such changes as come within the scope of the appended claims are to be considered as part of the invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In a device of the character described, the combination of spaced vertically disposed supports through which air may freely circulate, a large mesh wire screen located centrally between said supports and a loosely packed mass of excelsior completely filling the space between said supports and interlocking with said wire screen to prevent a settling thereof between said supports.

2. In a device of the character described, the combination of a pair of vertically disposed perforated plates, a wide mesh wire screen located centrally between said plates, and a layer of excelsior located between said screen and plates, said excelsior being loosely packed in position and stuffed through and interlocking with said screen to prevent settling of the excelsior.

3. In a device of the character described, the combination of spaced vertically disposed supports through which air may circulate freely, wire screening located between said supports, a filler of excelsior loosely and evenly packed between said supports and being stuffed through and in interlocking engagement with the wire screening to prevent settling and compacting of the excelsior.

FRANK P. WALSH.