

July 28, 1936.

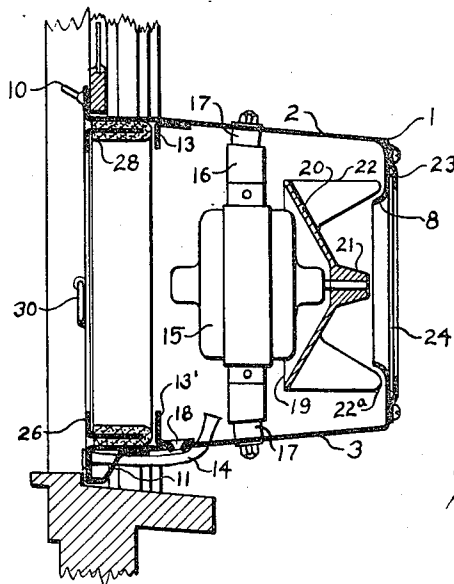
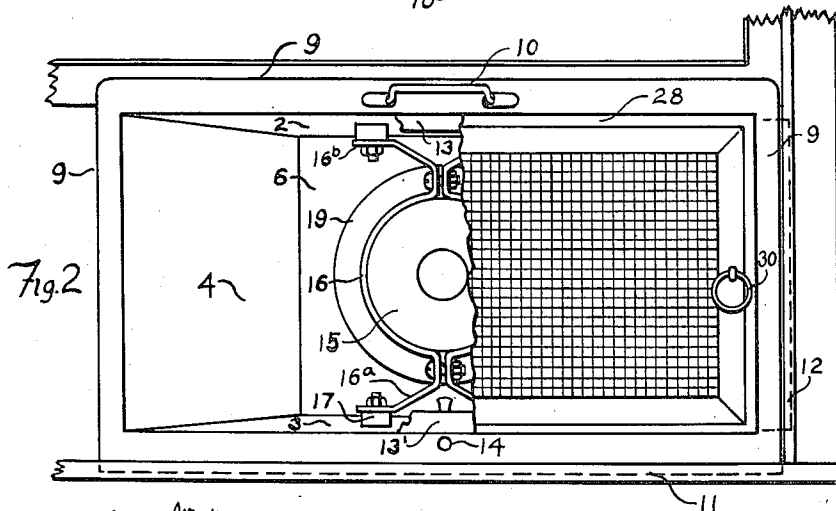
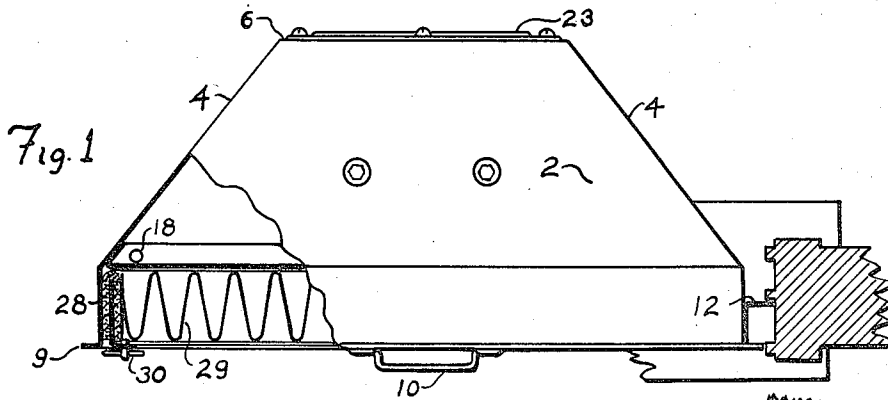
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2,048,911

AIR FILTERING DEVICE

Filed Feb. 12, 1934

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

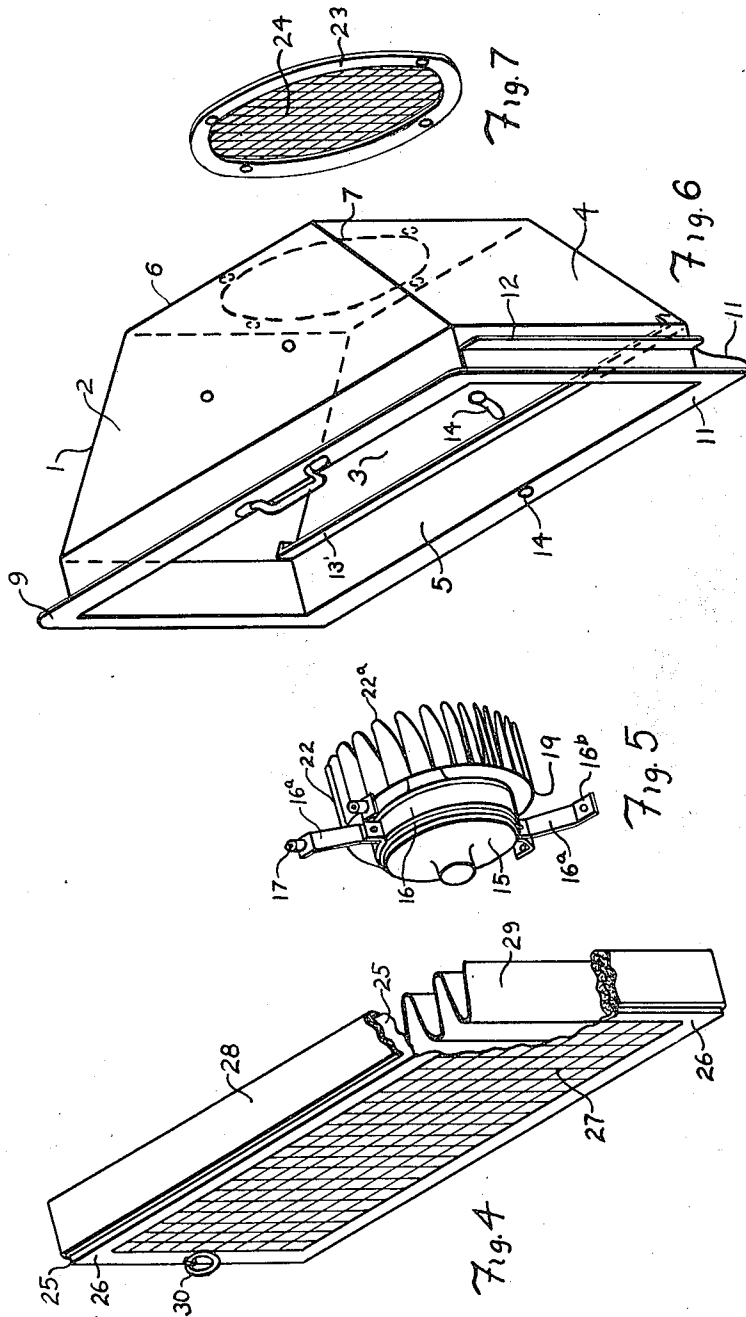


Fig. 4

Fig. 5

Fig. 7

Fig. 6

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AIR FILTERING DEVICE

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3 Claims. (Cl. 98-94)

This invention relates to an improvement in air filtering devices.

One of the principal objects of the invention is to provide a device which is easily portable and readily installed in windows without the use of screws, bolts or clamps and so installed to provide forced ventilation with filtered air in office, home or hospital rooms.

Another object of the invention resides in the production of a simplified, quietly operating and comparatively inexpensive unit for forcing filtered air into closed rooms and building up a slight pressure to force out used air through the cracks around windows and doors, thus being available to the average sufferer from hay fever and for practical use in sooty, dusty and noisy districts.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings, forming a part of this specification, and in which:

Figure 1 is a plan view showing an air filtering device embodying the present invention located in a window frame;

Figure 2 is a view in front elevation of the device shown in Figure 1, parts being broken away to reveal the interior;

Figure 3 is a sectional view in side elevation of Figure 2, parts being shown in elevation for the sake of clarity; and

Figures 4, 5, 6, and 7 are perspective views of the disassembled units showing respectively first, the filter screen frame and filter, second, the motor and fan unit with supporting brackets, third, the casing or housing comprising the plenum chamber, and fourth, the intake opening screen.

Referring now more particularly to the accompanying drawings, 1 indicates the housing, the interior of which defines a funnel shaped plenum chamber having a longitudinal air passage between openings in opposite ends. The side walls 4 and the top and bottom plates 2 and 3 define at one end a rectangular outlet opening 5. Converging from the opening 5 the side walls and top and bottom plates terminate in an end plate 6. The end plate 6 has a circular intake opening 7 therein, the edge of this opening being bent inwardly to provide an inwardly directed flange 8. Projecting laterally from the forward top and side edges of the out-

let opening 5 is a flange 9 in which is suitably mounted a handle 10. Along the forward bottom edge of the outlet opening 5 is a supporting flange 11 which extends downwardly from the opening a suitable distance and then extends rearwardly and upwardly to the bottom plate 3 to form a rigid support. Rearwardly of the flange 9 and along one side of the outlet opening 5 is a laterally projecting flange or gripper 12 which projects beyond the outer confines of the flange 9. These flanges constitute the means for positioning the device operatively within the frame of an opened window as will hereinafter be particularly pointed out. Within the outlet opening 5 and spaced rearwardly from the forward edge thereof is an abutting flange 13 extending along the top of the opening and a similar flange 13' extending along the bottom of the opening. These flanges project into the outlet opening only a distance sufficient to accomplish a service of positioning the filtering unit. A tube 14 for carrying lead-in wires extends from the forward face of flange 11 rearwardly beneath the bottom plate 3 to a point behind the abutting flange 13' and thence upwardly through the bottom plate and terminates within the housing substantially above the bottom plate. Punched out from opposite corners of the bottom plate 3 rearward of and adjacent to the flange 13' are drain holes 15.

A motor 16 is supported within the housing at a point between the intake and outlet openings. A pair of oppositely related brackets 16 have suitable portions embracing the motor and radially extending supporting arms 16^a. The brackets are suitably clamped together to confine the motor between them. The ends of the supporting arms 16^a are provided with feet 16^b having drilled openings therein. The feet 16^b are secured to the top and bottom plates 2 and 3 by means of flexible rubber mountings 17 suitably secured to said plates.

A centrifugal fan 19 is secured with a driving connection to the motor 16. The fan consists of a conical backing plate 20 provided with a suitable hub 21. Mounted on the backing plate is a series of tapered blades 22 having free ends 22^a. The pitch of each blade varies from the free end to the point of mounting on the backing plate. The motor with fan attached is positioned so that the free ends 22^a of the blades 22 encircle and overlap the flange 8 adjacent its outer side thus making an effective air seal. The fan is positioned with its rotational axis substantially paralleling the longitudinal axis of the plenum cham-

ber or center line of the air passage between outlet and inlet openings. So positioned it discharges radially into the small end of the funnel shaped plenum chamber. The flow of air as it leaves the fan being substantially lateral of said longitudinal air passage. The air flow strikes the walls of the plenum chamber and is deflected toward the filter and outlet opening. This deflection causes the kinetic energy imparted to the air by the fan to be transformed into pressure energy. Pressure energy is needed to cause an adequate penetration of the filter. The air flow thus deflected also circumvents the motor lessening its tendency to cause resistance and destructive eddies.

An intake screen (Figure 7) having a mounting ring 23 and mesh screen 24 secured thereto is mounted in a suitable manner on the end plate 6 to protect the intake opening 7.

An air filtering screen unit (Figure 4) is removably fitted within the outlet opening 5. The unit comprises a rectangular frame 25 having at its forward edge an inwardly projecting flange 26. Secured to the inner side of this flange is a protecting mesh screen 27. The frame 25 is covered inside and outside with felt 28 or some other suitable sealing material. Behind the mesh 27 and substantially within the confines of the felt covered frame 25 is positioned in an accordion plaited manner a suitable air filtering material. The filter 29 has a surface area much greater than the area defined by the frame 25. Due to the manner of plaiting the filter it effectively closes the opening in the frame and still presents a large filtering surface. The edges of the filter 29 are in contact with the felt 28 on the inner surface of the frame 25 thus providing an effective air seal. The filter 29 is a commercial product and may be obtained in various weights and consistencies depending upon the desired amount of air clarifying required. The filter is of the class defined as dry screen filter and the filtering action is that of straining from the air particles larger than the openings in the filter material. When the filter screen unit is fitted within the outlet opening 5, its rear edges abut against the flanges 13 and 13', which also coact with the filtering material 29 to hold it in proper position. It is proposed to attach to the flange 26 of the frame 25 suitably placed handles 30 to conveniently aid in removing the filtering unit which is held in place within the outlet opening 5 by the frictional resistance between the felt 28 and the inner surfaces of the outlet opening. This frictional fit also provides an effective air seal.

The operation of the device is as follows: The window in which the device is desired to be positioned is opened. By grasping the handle 10 the device can be easily lifted and placed so that the supporting flange 11 rests on the outer sill of the window and against the inner sill (see Figure 3). The device is then moved sidewise till the gripper flange 12 is inserted in front of the window sash guide (see Figures 1 and 2). In this position the face of the outlet opening is substantially flush with the plane of the window. The tendency of the device to fall outside the window under the influence of its own weight is overcome by the reaction of the supporting flange 11 and gripper flange 12 with the window parts thereby securely locking the device in position. The window sash is now lowered till it rests on the top of the outlet opening behind the flange 9, which further aids in holding the device in position. The flange 9 adjacent the gripper flange 12 being so related di-

mensionally to the gripper flange and the standard window is substantially flush with the frame of the window. As windows vary in width it may be necessary to fill up the space between the device and the window frame on the side opposite the gripper flange by inserting a properly cut piece of metal or cardboard. The device when so positioned completely closes off the window opening.

Current is supplied to the motor in the usual manner, the lead-in wires entering through the tube 14. When the fan reaches the designed operating speed air is brought in from the outside through the intake opening 7. The fan 19 discharges directly into the plenum chamber. This eliminates the use of a scroll housing.

The convergent slope of the walls 4 and top and bottom plates 2 and 3 is designed to deflect the flow of air as discharged from the fan and spread it over the surface of the filter 29 at the same time transforming its kinetic energy into pressure energy as previously described.

The motor, suspended from the top and bottom plates 2 and 3 by means of the brackets 16 and cushioning pads or flexible rubber mountings 17, produces very little vibration and so placed does not interfere with the desired air flow. Such vibrations as the motor causes are radiated from opposite walls of the plenum chamber. Those vibrations radiating inwardly tend to offset each other and thus dampen the noise within the chamber while those radiating outwardly are dispersed in the atmosphere outside of the room being filtered. It is to be noted that operation during rainy weather has no ill effects. The motor is protected by the conical backing of the fan. The flow of the air is not direct to the filtering means and excessive moisture is collected in the bottom of the plenum chamber where flange 13' prevents it from coming in contact with the filter 29 and from there drains outside the window through the drain holes 18.

The air discharged from the fan also builds up a pressure within the plenum chamber. The result is a steady discharge through all portions of the filter screen into the room. The large effective filtering area obtained by the filter 29 cleans the air by removing particles of dust, pollen, etc. The filter frame unit (Figure 4) is readily removed and the filter 29 removed by compressing the accordion plaits. A new filter can then be similarly installed and the filter frame unit replaced.

In actual operation for the treatment of hay fever or the like, the device is continually allowed to discharge the outside air after removing the pollen, etc., from it into the room. A pressure is created in the room which is relieved by the passing or air out of the room through cracks in the doors, windows, etc. A sealing of these openings to the outside air is thereby effected. The working parts of the device being all disposed outside the room, any noise created thereby is effectively dissipated and the device can be left running without disturbing a sleeper.

By raising the window sash the device will not fall as previously indicated and it is only necessary to grasp the handle and remove the device to some other required place.

Although but one specific embodiment of the invention is herein shown and described, it is to be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of the invention or the scope of the subjoined claims.

The invention claimed is:

5 1. A portable air filtering device comprising a casing defined by convergent walls, said walls defining along one edge thereof a rectangular opening, a plate intersecting said walls at the convergent ends thereof and opposite said outlet opening, said plate having a circular intake opening therein, a motor and centrifugal fan mounted within said casing, said fan being operatively
10 related to said intake opening and discharging toward said convergent walls, and a dry screen filter removably fitted in said outlet opening, said casing being provided with flanges adjacent said outlet opening whereby with said device
15 positioned in an open window said flanges will engage the window casing, sill and sash and influenced by the overhanging weight of said device securely lock said device outside the window and with said outlet opening substantially flush therewith.
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2. An air filtering device comprising a plenum chamber having sloping walls, said chamber defining at one end thereof a rectangular outlet opening, a dry screen filter in said outlet opening, a plate having a circular intake opening
25 therein forming a part of said chamber and positioned opposite said outlet opening, a centrifugal fan mounted within said chamber and operatively related to said intake opening, said plate and said fan having inter-related portions form-

ing an air seal said fan discharging directly into said chamber and against said sloping walls whereby the discharged air from said fan is deflected by the sloping walls of said chamber and dispersed over the areas of said filter screen, and
5 a motor having a driving connection with said fan.

3. A portable air filtering device comprising a tapered plenum chamber, wall members defining
10 said chamber diverging from one end thereof to define a chamber increasing in cross-sectional area from one end to the other thereof, said chamber being provided with an intake opening in the small end thereof, a centrifugal fan operatively related to said intake opening and positioned to discharge air directly against the inner
15 surface of said divergent wall members, a motor for driving said fan, said chamber being provided with a discharge opening positioned substantially at the point of maximum divergence
20 of said wall members, a filter member for said discharge opening, and means extending beyond the ends of said divergent wall members for supporting said filter member, said last mentioned means defining an extension for the tapered
25 chamber of substantially uniform cross-section adapted to be positioned within an opening for operatively supporting said device.

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