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54 **Ceiling mounted air cleaner.**

57 A conveniently installed, light weight, modular ceiling mounted air cleaner featuring frame-and-chassis construction which may be flush mounted or surface mounted on a ceiling. Optional decorative panels provide flexibility of decor.

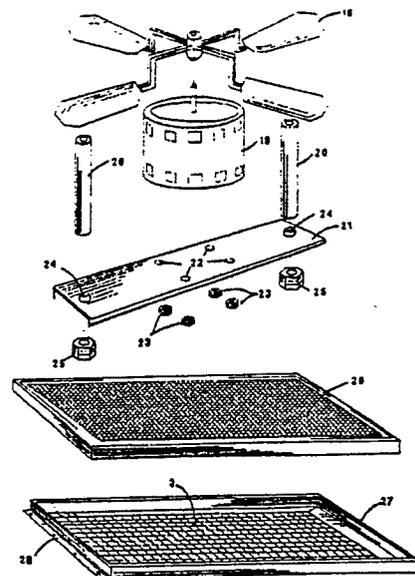


FIG. 4 B

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CEILING MOUNTED AIR CLEANER.

The present invention relates to ceiling mounted air cleaners and in particular to a novel ceiling mounted air cleaner of modular construction which is easily installed by an unassisted individual.

Background of the Invention

Ceiling mounted air cleaners are known and currently available as either flush mounted or surface mounted units. The surface mounted units generally comprise box-shaped structures having an air intake on the surface remote from the ceiling and a plurality of air exhaust ports on the sides of the unit. They are mounted directly on the ceiling surface and most currently available models are relatively large and bulky. The flush mounted units are generally used for suspended ceiling installations, the unit being mounted to the surface which supports the ceiling so that the bottom surface of the unit either arrives flush with the suspended ceiling or projects slightly beyond it. Both the intake and exhaust ports in the known flush mounted air cleaners are located in the bottom surface of the unit.

Both of the known types of ceiling mounted air cleaners described above have certain disadvantages. In general, they are heavy and require two or more people for their installation. They are expressly manufactured for either flush or surface mounting, requiring suppliers to maintain a stock of both types. In addition, the aerodynamic design of these units is generally poor, resulting in the creation of considerable turbulence within their airflow paths. This turbulence is responsible for the generation of high levels of noise and makes the units undesirable for use in relatively quiet environments. The present invention largely overcomes these disadvantages of the prior art.

Summary of the Invention

The ceiling mounted air cleaner in accordance with the invention is of light weight, modular construction permitting it to be disassembled and installed by an unassisted person.

A ceiling mounted air cleaner in accordance with the invention may be installed as either a flush mounted or a surface mounted unit, optional decorative panels being provided to match the decor of the environment if the unit is surface mounted.

It is an especial advantage of the present invention that the turbulence in the airflow path is reduced, thereby minimizing the noise generated

by the unit and making it satisfactory for use in relatively quiet environments.

In general terms, the present invention comprises a ceiling mountable air cleaner comprising:

- 5 an outer shell having top and side surfaces;
- an inner shell having top and side surfaces, the top surface being provided with an opening having a shroud which projects inwardly from said surface;
- 10 spacer means to retain the top surfaces of said outer shell and inner shell in a parallel, spaced apart relationship;
- air outlet means communicating with said space between said outer and inner shells;
- 15 a fan subassembly located within said inner shell, said subassembly comprising a fan having a plurality of fan blades radiating from a central hub and located within said shroud, means for turning said fan blades and means for supporting said fan;
- an air filter subassembly comprising an air filter and means for supporting said air filter while providing for the inlet of air, said subassembly being attached to the open side of one of said inner shell or said outer shell; and
- 20 a skeleton frame for supporting said outer shell, said inner shell and said fan subassembly in the aforesaid relationships.

Brief Description of the Drawings

A preferred embodiment of the invention will now be explained by way of example only and with reference to the following drawings wherein:

Fig. 1 is a perspective view of an air cleaner in accordance with the invention showing the air cleaner with the decorative panels detached;

Fig. 2 shows the air cleaner of Fig. 1 surface mounted on a ceiling;

Fig. 3 illustrates the air cleaner of Fig. 1 flush mounted in a suspended ceiling;

Fig. 4a illustrates a schematic perspective view of the outside shell, the skeleton frame, and the inside shell of the air cleaner of Fig. 1;

Fig. 4b illustrates a schematic view of the fan, the air filter and the air filter subassembly of the air cleaner of Fig. 1; and

Fig. 5 is a schematic cross sectional view of the air cleaner of Fig. 1.

Detailed Description of the Preferred Embodiment

Referring to the drawings, in Fig. 1 a ceiling mounted air cleaner in accordance with the inven-

tion is generally referred to by the reference 1. Optional decorative panels 2 are provided for surface mounted applications. A grill or screen 3 covers the air intake opening in the air filter unit. Louvres 4 provided on each lower edge of the unit provide the air outlet passages for the air cleaner.

Fig. 2 illustrates the air cleaner 1 surface mounted on a ceiling. The decorative panels 2 are installed to provide an aesthetically pleasing appearance. Decorative panels 2 are optionally provided in a variety of colours and textures to match the decor of the environment. They are attached to the sides of outer shell 5 with an adhesive such as velcro strips (not illustrated) or sliding engagement fasteners (not illustrated).

Fig. 3 illustrates the air cleaner 1 flush mounted in a suspended ceiling. When flush mounted, only the air outlet louvres 4 and the air intake grill 3 are exposed below the ceiling surface.

Referring now to Fig. 4a, the housing of the air cleaner 1 comprises an outer shell generally referred to by the reference 5, a supporting skeleton frame generally referred to by the reference 7, and an inner shell generally referred to by the reference 15. The outer shell 5 comprises a box-shaped structure closed on its top and sides and open on its lower surface. A short lip 5a projects outwardly along the bottom edges of outer shell 5. The projecting lip 5a contacts the upper edges of louvres 4 as will be explained hereinafter. The outer shell 5 is preferably constructed of light weight sheet metal or a durable molded plastic. The sturdy skeleton frame 7 is preferably constructed of aluminum or steel and supports all of the components of the air cleaner. The inner shell 15 comprises a box structure provided with a circular opening in the center of its top surface which is surrounded by an inwardly projecting shroud 17. The bottom edges of the inner shell 15 are turned outwards and upwards to provide the louvres 4 which act as the outlets for air cleaned by the unit. The inner shell 15 is likewise preferably constructed of light weight sheet metal or molded plastic.

Referring now to Fig. 4b, the air cleaner further comprises fan blades 18 which are powered by an electric motor 19. Electric motor 19 is attached to a support plate 21 with threaded nuts 23. The connection of support plate 21 to the skeleton frame 7 will be explained hereinafter in detail. An air filter 26 rests in an air filter frame 27 which is provided with a grill or screen 3 as previously described.

Fig. 5 illustrates a cross-section of the assembled air cleaner in the configuration for flush mounting in a ceiling as illustrated in Fig. 3. A pad of sound insulating material 29, of open celled plastic foam, or the like, is permanently attached to the upper inside surface of outer shell 5. The pad 29 helps to absorb sound generated by fan blades

18 as will be explained below in greater detail.

Referring again to Figs. 4a and 4b, the details of the construction and assembly of the air cleaner 1 will now be described in detail.

The outer shell 5 (see Fig. 4a) is provided with four holes 6 positioned in each corner region of its upper surface. The skeleton frame 7 is provided with four complementary holes 12. Screw fasteners or lag bolts (not illustrated) are driven through holes 12 and complementary holes 6 to attach the unit to a ceiling or some adequate support surface above a ceiling. Four studs 8, 9, 10 and 11 respectively project downward from skeleton frame 7. Stud 8 and 11 support the inner shell 15 while studs 9 and 10 support the fan bracket 21 (see Fig. 4b). Once outer shell 5 and skeleton frame 7 are simultaneously anchored to a support surface by screw fasteners as described above, spacers 13 are placed on studs 8, 9, 10 and 11 and inner shell 15 is raised into position and secured by a pair of threaded nuts 14 which engage the threaded ends of studs 8 and 11 respectively. Spacers 13 retain outer shell 5 and inner shell 15 in a spaced apart relationship to provide a passageway for the output of air cleaned by the unit (see Fig. 5). The outturned edges 5a of the outer shell 5 rest atop the upper edges of air outlet louvres 4 of the inner shell 15 when the shells are in their assembled condition (Fig. 5).

Referring now to Fig. 4b, fan motor 19 is attached to fan support bracket 21 by threaded nuts 23. Spacers 20 are slipped over studs 9 and 10 respectively (see Fig. 4a) followed by fan support bracket 21 which is secured in place by threaded nuts 25. The filter frame 27 is secured to the lower edge of inner shell 15 by a hinge 28. The air filter 26 is supported inside the upturned edges of the filter frame 27. The filter frame is secured in its closed position by latches or friction fasteners (not illustrated) permitting filter 26 to be changed by unlatching filter frame 27 and rotating the free end of the frame downwards to expose the air filter.

Referring again to Fig. 5, the ceiling mounted air cleaner 1 operates in the following manner. Fan blades 18 are turned by an electric motor 19. The longitudinal front edges of fan blades 18 are in close proximity to the sound absorbing planar surface 29. Shroud 17 closely surrounds the tips of the fan blades 18. The fan blades 18 thereby act as centrifugal impellers, drawing air into the unit through the grill or screen 3 and the filter 26 and ejecting it outwardly and downwardly between the outer sides of the inner shell 15 and the inner sides of the outer shell 5 and through the louvres 4 along the upturned outside edges of the inner shell 15. The shroud 17 and the restricted space between inner shell 15 and the outer shell 5 prevent the backflow of cleaned air into the low pressure area

created within the inner shell 15 by the action of the fan. Since the backflow of air around the fan blades is practically eliminated, there is a minimum of air turbulence within the air cleaner and the noise generated by air turbulence in the airflow paths of the prior art air cleaner units is practically eliminated, providing an air cleaner of exceptionally quiet and efficient operation.

Changes and modifications in the specifically described embodiments can be carried out without departing from the scope of the invention which is intended to be limited only by the scope of the appended claims.

Claims

1. A ceiling mountable air cleaning unit comprising:

an outer shell having top and side surfaces; 20
 an inner shell having top and side surfaces, the top surface being provided with an opening having a shroud which projects inwardly from said surface;
 spacer means to retain the top surfaces of said outer shell and inner shell in a parallel, spaced 25
 apart relationship;
 air outlet means communicating with said space between said outer and inner shells;
 a fan subassembly located within said inner shell, said subassembly comprising a fan having a plurality of fan blades radiating from a central hub and located within said shroud, means for turning said fan blades and means for supporting said fan; 30
 an air filter subassembly comprising an air filter and means for supporting said air filter while providing for the inlet of air, said subassembly being attached to the open side of one of said inner shell or said outer shell; and 35
 a skeleton frame for supporting said outer shell, said inner shell and said fan subassembly in the 40
 aforesaid relationships.

2. An air cleaner as in claim 1 further provided with a pad of sound absorbing material attached to the inside top surface of said outer shell.

3. An air cleaner as in claims 1 or 2 wherein 45
 the longitudinal front edges of the blades of said fan are supported in close proximity to the inside top surface of said outer shell.

4. An air cleaner as in claim 1 mounted on a ceiling surface. 50

5. An air cleaner as in claim 2 mounted on a ceiling surface.

6. An air cleaner as in claims 4 or 5 further provided with decorative panels (2) for covering the exposed sides of said outside shell (5). 55

7. An air cleaner as in claims 1 or 2 wherein the means (3) for supporting said air filter (26) is provided on its one edge with hinge means (28) to facilitate access to said air filter.

8. The air cleaner as in claim 1 wherein the sides of said outer (5) and inner (15) shells are spaced apart to provide a passage for the outlet of air.

9. The air cleaner as in claim 8 wherein the bottom edges of said inner shell (15) are outturned to contact the bottom edges of said outer shell (5) and provided with air outlet means (4).

10. The air cleaner as in claims 1 or 2 wherein said outer shell (5), said spacer means (13), said inner shell (15) and said fan subassembly are adapted to be assembled in sequence on said skeleton frame (7).

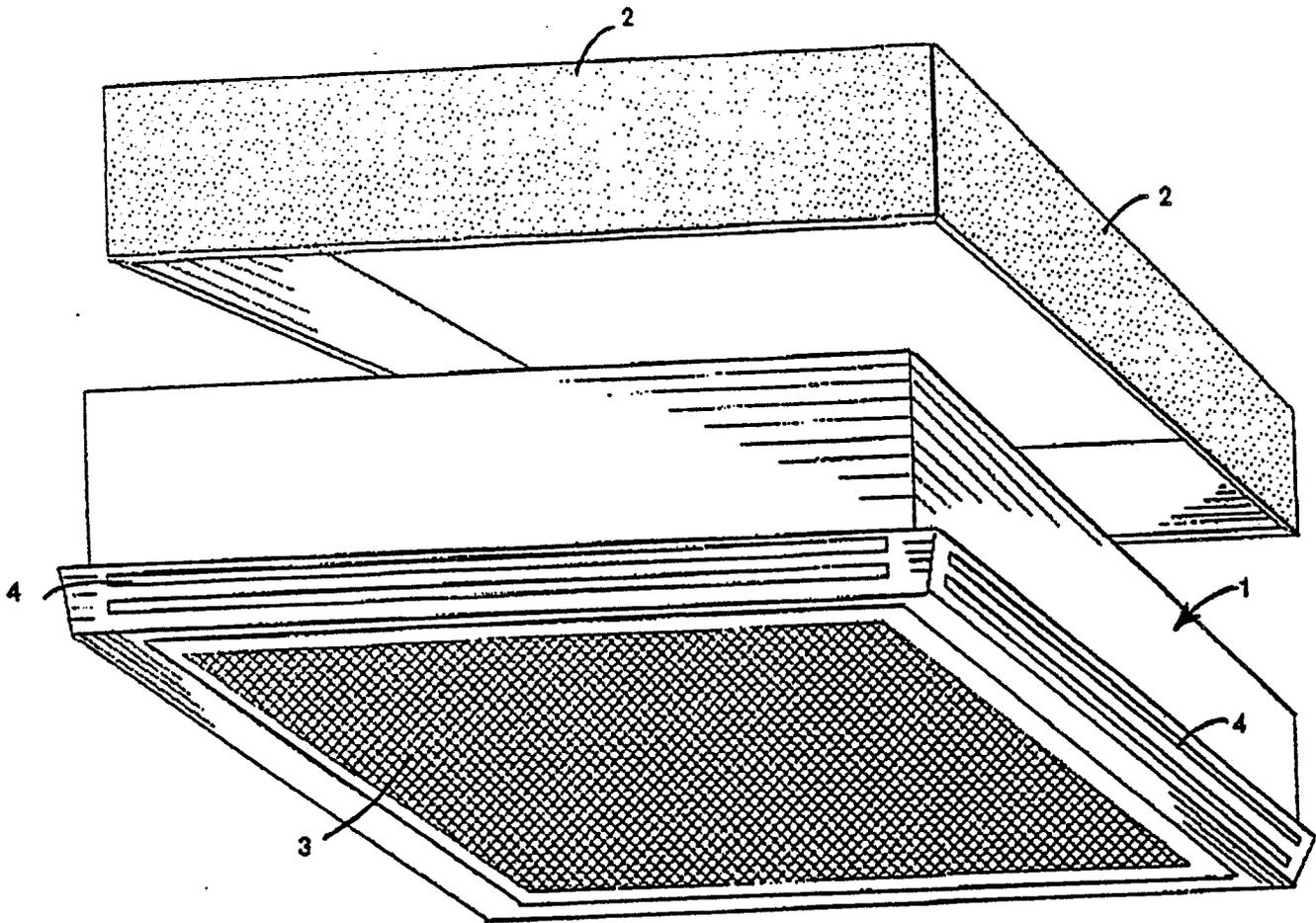


Fig. 1

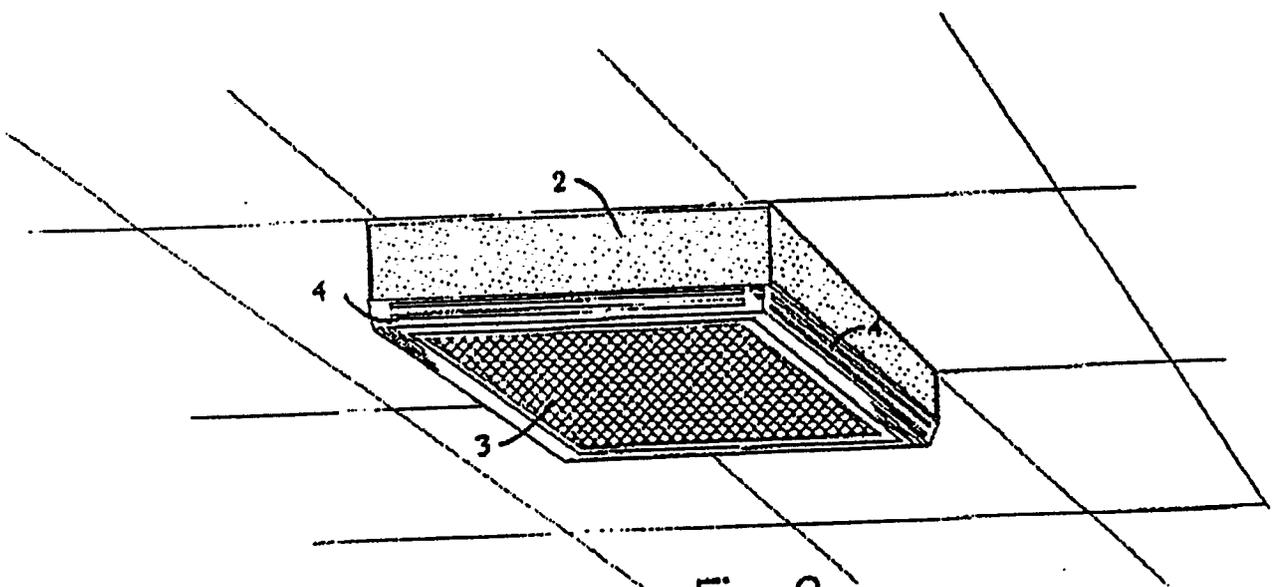


Fig. 2

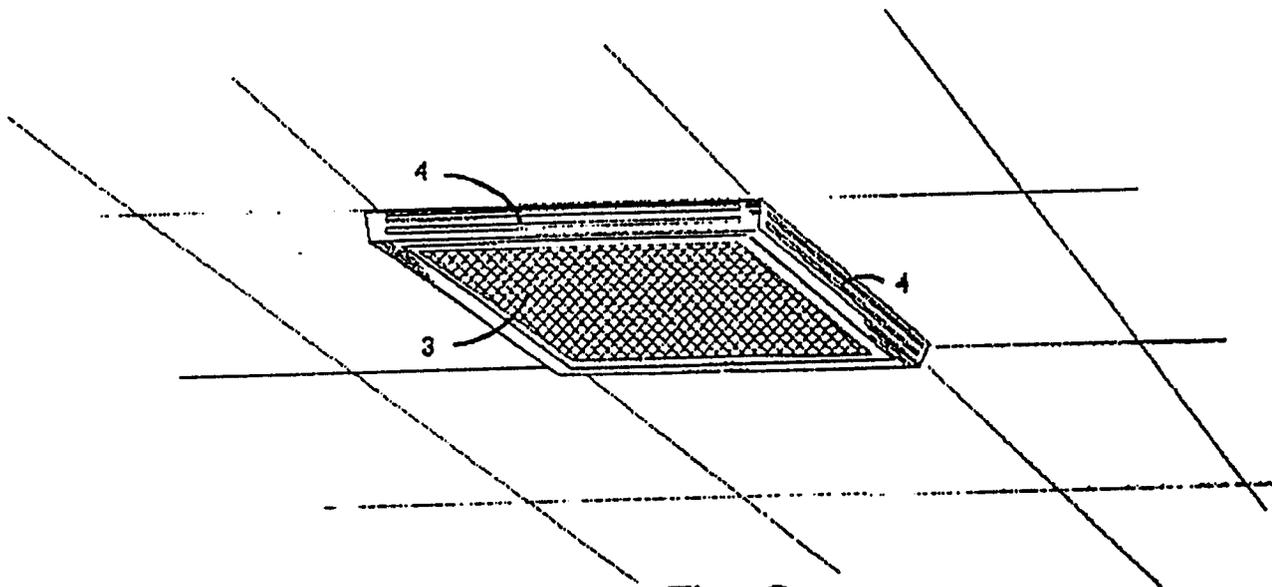


Fig. 3

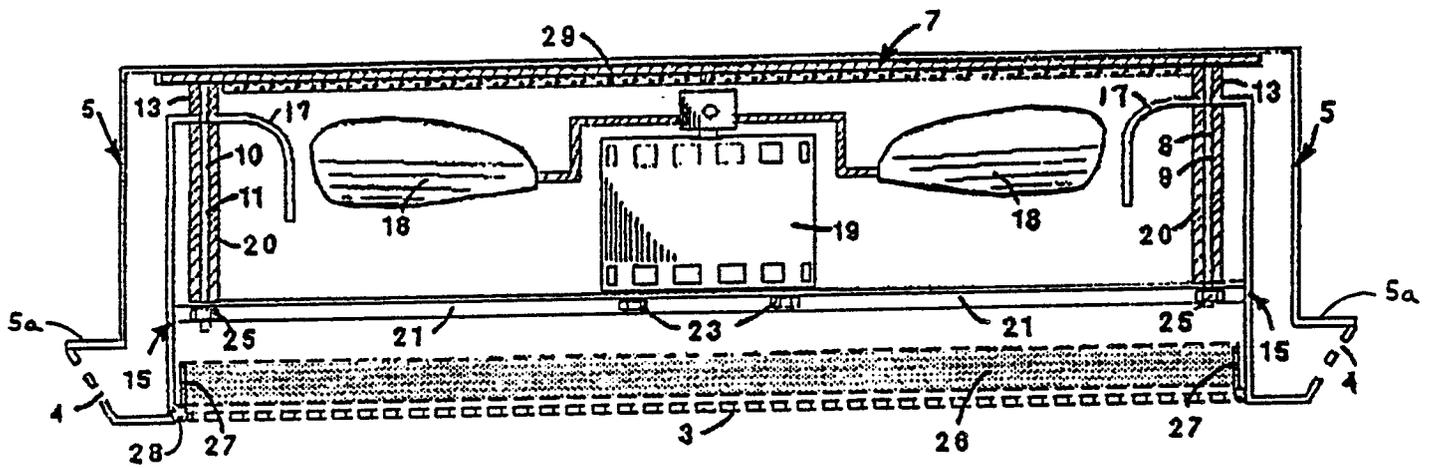


FIG. 5

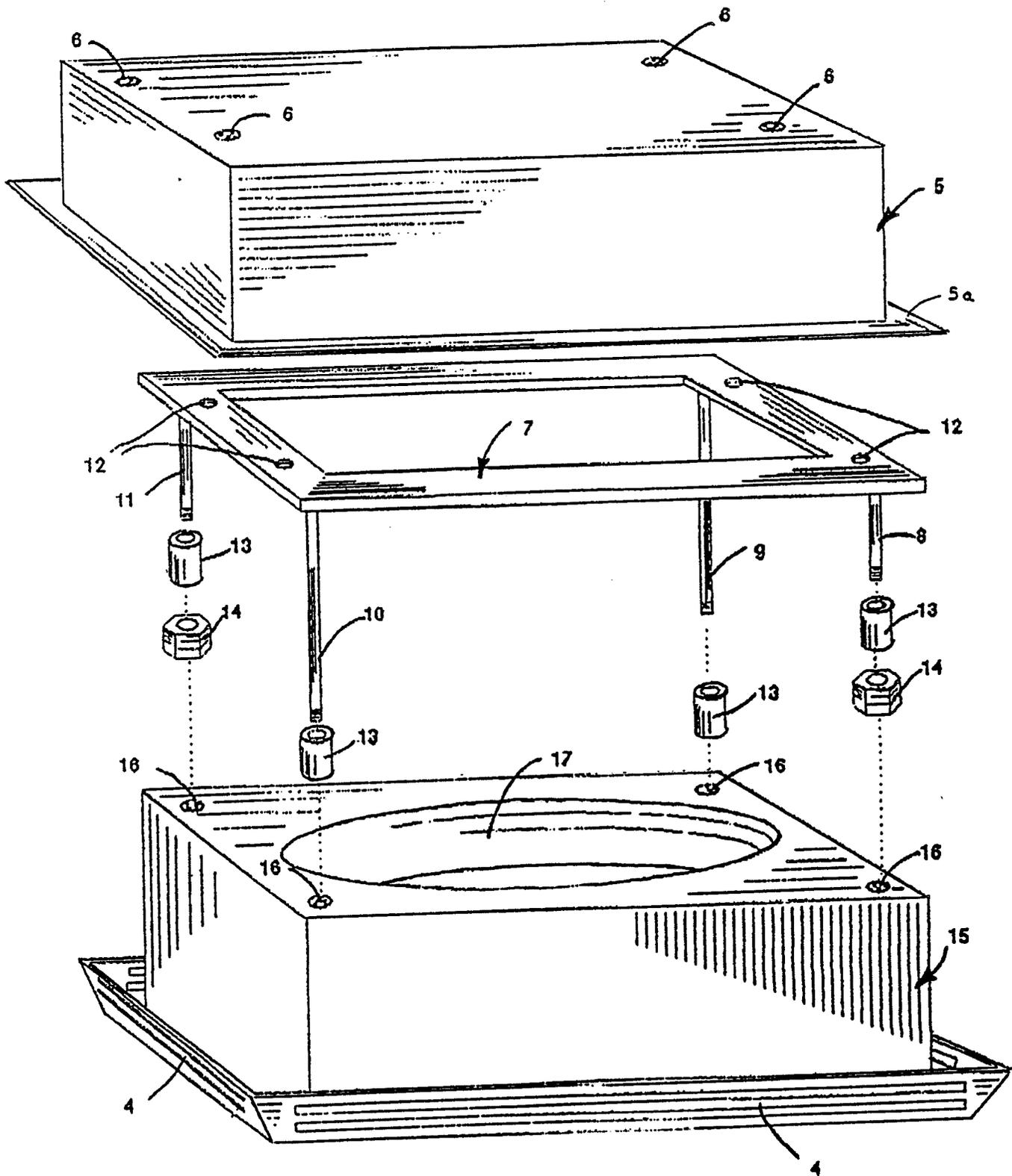


FIG. 4 A

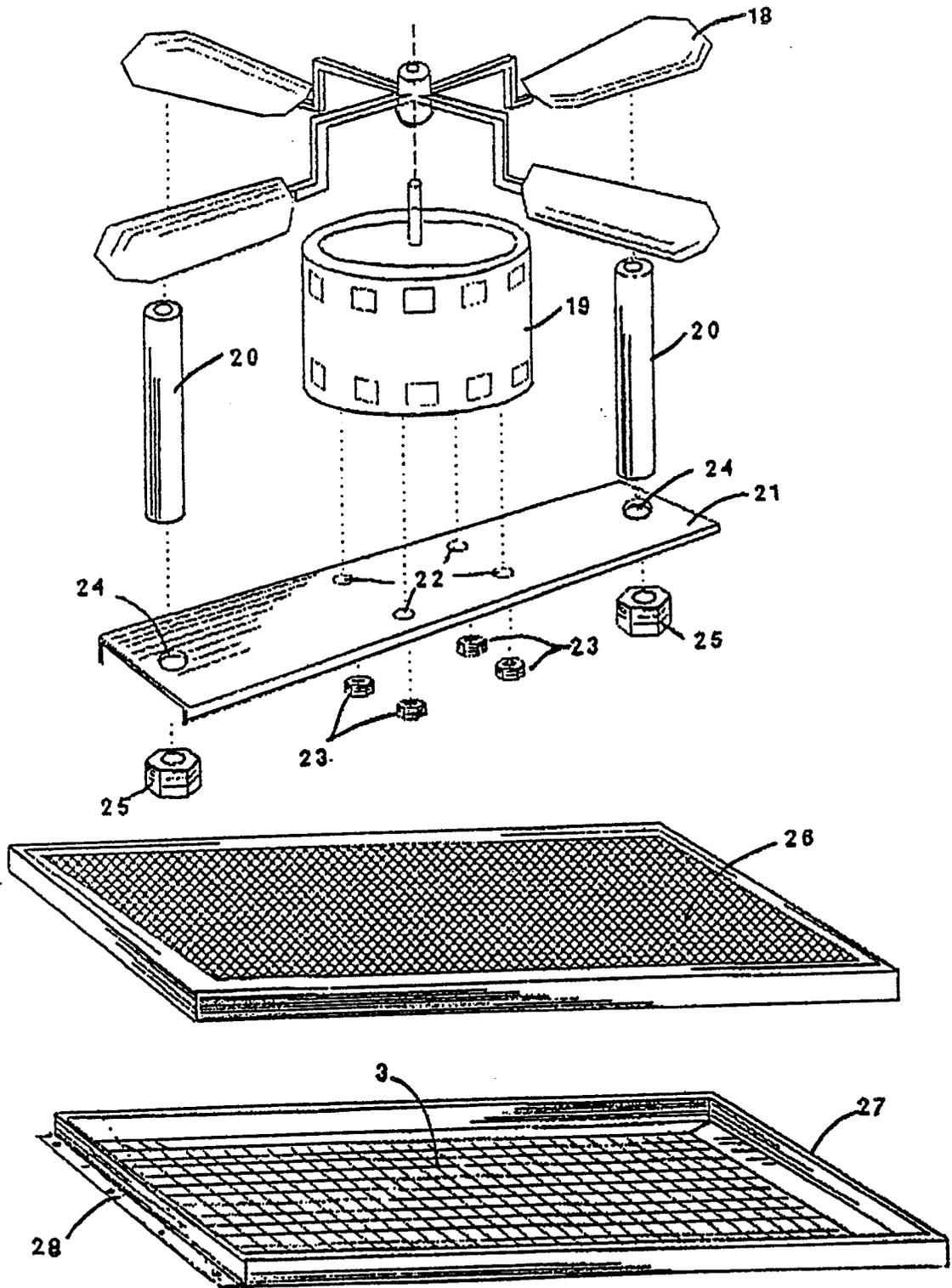


FIG. 4 B