

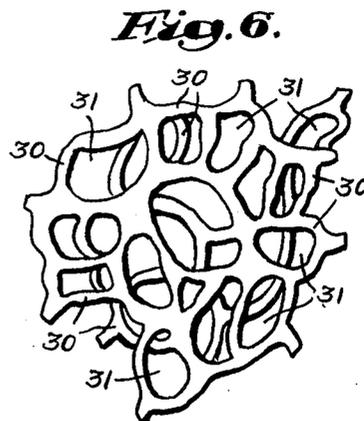
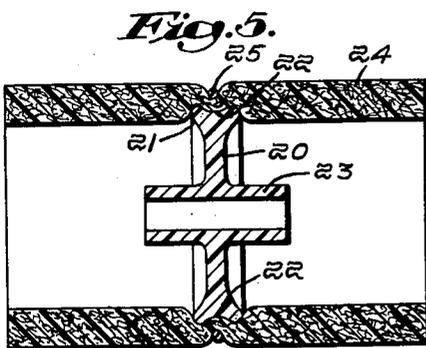
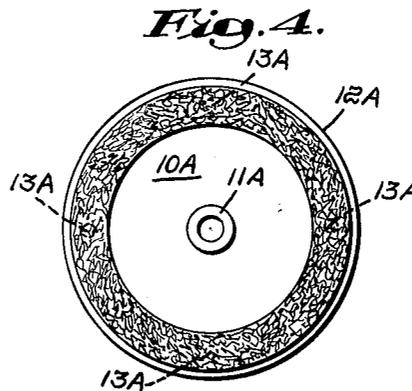
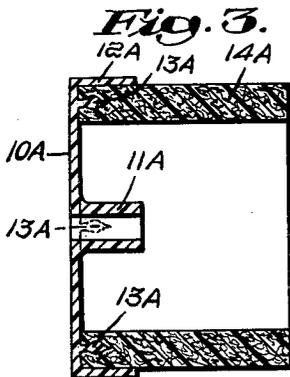
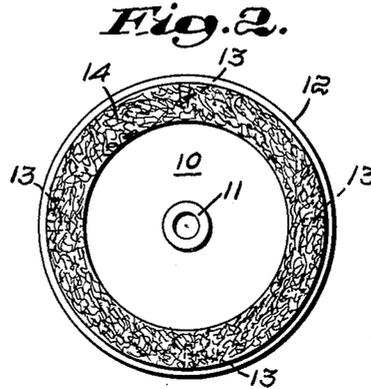
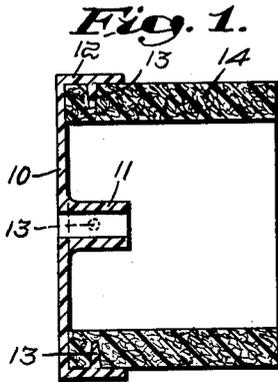
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CAPILLARY FANS

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3,128,940

**CAPILLARY FANS**

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This invention relates to capillary fans in which the movement of air is produced by rotating rings of fibrous material.

In air conditioning and other air handling units using centrifugal fans for moving air, and in which quietness of operation is more important than efficiency, it has been proposed to use rings of fibrous material such as so-called "glass wool" or "fibre glass" on the rotors of centrifugal fans instead of the usual fan blades, and to support such rings along their entire axial lengths.

This invention uses as the air moving element of a centrifugal fan, an annular ring of sponge-like foamed plastic. By sponge-like is meant a three dimensional network of skeletal strands integrally joined together and forming therebetween voids which occupy the major portion of the volume air space of the foamed plastic. A preferred material is polyurethane foam, the advantages of which are its low cost, its being easily removable from a fan rotor when it has become clogged with dirt, its being easily cleaned and replaced on the rotor, its lack of break-up during handling and use, and its having sufficient stiffness, while it is resilient, to be largely self supporting. An advantage over well known, so-called "open cell" urethane foam is that there are no membrane-like windings connecting the strands, and which would offer increased resistance to air flow, and would prevent desired change of direction of air flow.

This invention also reduces the costs of such rotors for single-inlet fans by greatly reducing their axial lengths, and by using spikes formed on the rotors, embedded in the inner end portions of fibrous rings for holding the rings on the rotors.

This invention also reduces the costs of such rotors for double-inlet fans by supporting annular rings of fibrous material on the centerplates only of the rotors.

An object of this invention is to improve capillary fans.

Another object of this invention is to reduce the costs of capillary fans.

Another object of this invention is to use sponge-like foamed plastic formed in annular rings as the air moving elements of centrifugal fans.

Another object of this invention is to use annular rings of polyurethane foam as the air moving elements of centrifugal fans.

This invention will now be described with reference to the annexed drawings, of which:

FIG. 1 is a side view, in section, of a rotor of a single-inlet centrifugal fan embodying this invention;

FIG. 2 is an end view looking at the air inlet end of FIG. 1;

FIG. 3 is a side view, in section, of another rotor of a single-inlet centrifugal fan embodying this invention;

FIG. 4 is an end view looking at the air inlet end of FIG. 3;

FIG. 5 is a side view, in section, of a rotor of a double-inlet centrifugal fan embodying this invention, and

FIG. 6 is a greatly enlarged view showing the three dimensional network of skeletal strands integrally joined together, and the voids therebetween, of polyurethane foam which preferably is used on the rotors of FIGS. 1-5.

Referring first to FIGS. 1 and 2 of the drawings, a backplate 10 of cast plastic has a hub 11, and an outer

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cylindrical ring portion 12 around and concentric with the hub. The inner surface of the ring portion 12 has formed thereon radially extending spikes 13 which extend into the inner portion of an annular ring 14 of polyurethane foam. The length of the ring 14 in the direction of the axis of the rotor is many times that of the ring portion 12, since the stiffness of the ring 14 is sufficient to prevent its requiring support along its entire length as in the case of prior rotors which support annular rings of fibrous material. Thus, the supporting structure for the annular ring is simpler and less expensive than prior basket-like structures which extend the full lengths of their associated annular rings, and the annular rings are easier to remove and replace than in prior constructions.

The rotor of FIGS. 3 and 4 is similar to that of FIGS. 1 and 2 except that its backplate 10A has spikes 13A which have axes parallel to the axis of the rotor extending into the inner portion of ring 14A of polyurethane foam, the rotor having a ring portion 12A at its rim similar to the ring portion 12 of FIGS. 1 and 2 except that it is free of spikes, and having a hub 11A. The rotor of FIGS. 3 and 4 has the same advantages as that of FIGS. 1 and 2.

The rotor of FIG. 5 is for a double-inlet fan, and has a centerplate 20 with an enlarged rim 21 having a central inwardly curved outer edge 22, and has a hub 23. An annular ring 24 of polyurethane foam having an inner diameter smaller than the distance between diametrically opposite portions of the edge 22, is placed at its longitudinal center on the edge 22, and a plastic snap-ring 25, circular in section, is placed around the longitudinal center of the ring 24, deforming the latter so that its inner surface at the edge 22 is forced against the latter, and forming the sole means for supporting the ring 24 from the centerplate 20. The snap-ring 25 and the annular ring 24 are easily removable and replaceable.

While it is preferred that the rotors of FIGS. 1-5 use annular rings of polyurethane, they could support annular rings of other fibrous materials.

FIG. 6 shows the skeletal structure of the polyurethane rings which preferably are used on the rotors of FIGS. 1-5. It has strands 30 which extend in three dimensions, which are integrally joined at their ends with other strands 30, and which form therebetween voids 31 which occupy the larger portion of the air volume of the foam.

The strands 30 of the annular rings of polyurethane foam on the rotors change the direction of the air they impact in the direction of rotation of the rotors, and cause air flow in the usual centrifugal action.

The centerplate of a double-inlet rotor is, of course, the backplate of each rotor section.

What is claimed is:

1. A rotor for a centrifugal fan comprising a circular backplate having a hub around its axis, an annular ring of sponge-like foamed plastic having one end in contact with said backplate, said ring being concentric with said backplate, said backplate having an annular rim portion extending around the end portion of said ring at said end and having its inner surface in contact with the outer surface of said end portion, the other end of said ring being spaced from said rim portion a distance large than the distance said rim portion extends from said backplate, and a plurality of spikes extending from said backplate into said end portion of said ring.

2. A rotor for a centrifugal fan comprising a circular backplate having a hub around its axis, an annular ring of polyurethane foam having one end in contact with said backplate, said ring being concentric with said backplate, said backplate having an annular rim portion extending around the end portion of said ring at said end and having its inner surface in contact with the outer surface of

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said end portion, the other end of said ring being spaced from said rim portion a distance larger than the distance said rim portion extends from said backplate, and a plurality of spikes extending from said backplate into said end portion of said ring.

3. A rotor for a centrifugal fan comprising a circular backplate having a hub around its axis, an annular ring of sponge-like foamed plastic having one end in contact with said backplate, said ring being concentric with said backplate, said backplate having an annular rim portion extending around the end portion of said ring at said end and having its inner surface in contact with the outer surface of said end portion, the other end of said ring being spaced a distance from said rim portion larger than the distance said rim portion extends from said backplate, and a plurality of spikes extending from said rim portion into said end portion.

4. A rotor for a centrifugal fan comprising a circular backplate having a hub around its axis, an annular ring of polyurethane foam having one end in contact with said backplate, said ring being concentric with said backplate, said backplate having an annular rim portion extending around the end portion of said ring at said end and having its inner surface in contact with the outer surface of said end portion, the other end of said ring being spaced a distance from said rim portion larger than the distance said rim portion extends from said backplate, and a plurality of spikes extending from said rim portion into said end portion.

5. A rotor for a centrifugal fan comprising a circular backplate having a hub around its axis, an annular ring of fibrous material having one end in contact with said backplate, said ring being concentric with said backplate, said backplate having an annular rim portion extending

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around the end portion of said ring at said end and having its inner surface in contact with the outer surface of said end portion, the other end of said ring being spaced a distance from said rim portion larger than the distance said rim portion extends from said backplate, and a plurality of spikes extending from said backplate into said end portion.

6. A rotor for a centrifugal fan comprising a circular backplate having a hub around its axis, an annular ring of fibrous material having one end in contact with said backplate, said ring being concentric with said backplate, said backplate having an annular rim portion extending around the end portion of said ring at said end and having its inner surface in contact with the outer surface of said end portion, the other end of said ring being spaced a distance from said rim portion larger than the distance said rim portion extends from said backplate, and a plurality of spikes extending from said rim portion into said end portion.

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