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3,123,286

FIBROUS CENTRIFUGAL BLOWER

Filed Oct. 12, 1962

FIG. 1

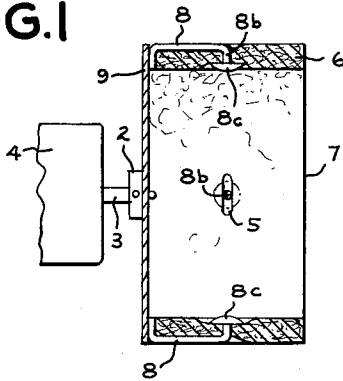


FIG. 2

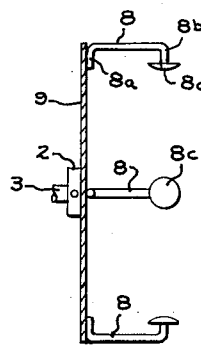


FIG. 3

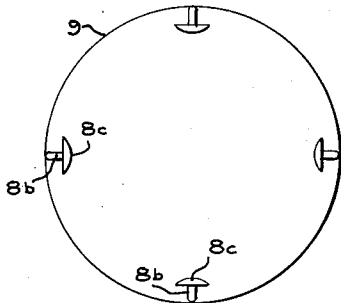


FIG. 4

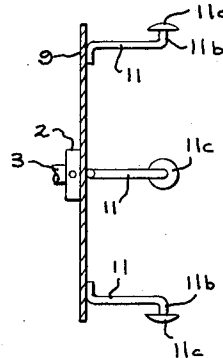
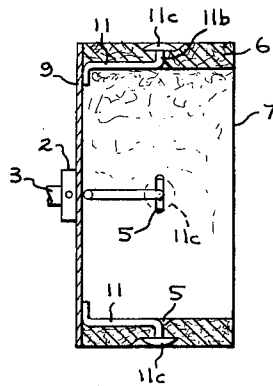


FIG. 5



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FIBROUS CENTRIFUGAL BLOWER

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The present invention relates to a centrifugal blower having an impeller wheel formed by flexible fibrous material and more particularly to an improved arrangement for supporting the flexible, impeller wheel in spaced alignment with respect to its drive shaft.

The present invention is an improvement over my previous application Serial No. 190,917 filed April 30, 1962, and assigned to the General Electric Company, the assignee of the present application.

In the aforementioned prior application there is disclosed a fibrous or porous blower comprising an annular impeller wheel or ring of porous material having a multiplicity of randomly oriented passages through which air is impelled in a manner similar to a centrifugal blower. The impeller wheel is rotated by a rotatable shaft through means interconnecting between the impeller wheel and the shaft and retained by these means against centrifugal force exerted thereon during rotation of the wheel. The present invention is directed to an improved arrangement for retaining the porous impeller wheel in coaxial alignment with respect to the rotatable shaft.

It is, therefore, an object of the present invention to provide an improved retainer arrangement for supporting a flexible porous impeller wheel in coaxial alignment with respect to its drive shaft.

It is another object of the present invention to provide an improved retainer means for the flexible porous impeller which permits easy disassembly of the impeller from its retaining means for cleaning or replacement purposes.

Further objects and advantages of the invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In carrying out the objects of the present invention, there is provided a flexible porous impeller wheel that is retained in coaxial position with respect to a rotatable drive shaft by means of a plurality of spaced apart arms drivingly connected for rotation by the shaft. The porous wheel is provided with a plurality of longitudinal slots extending through the wheel at spaced points around the circumference of the wheel in the central portions thereof. The arms extend outwardly adjacent the flexible impeller wheel and have their ends turned through the longitudinal slots of the porous wheel. On the end of each of the outwardly extending arms there is provided a disc-shaped section which may be passed in "button-like" fashion through a longitudinal slot in the wheel. The discs cooperate with the arms to retain the flexible wheel substantially in coaxial alignment with respect to the shaft during rotation. The button type attaching means makes the flexible porous wheel easily removable from the supporting arms for cleaning or replacement purposes.

For a better understanding of the invention reference may be had to the accompanying drawing in which:

FIGURE 1 is a front elevation view showing the fibrous wheel assembled onto the supporting arms;

FIGURE 2 is a side elevation view of the impeller supporting means of the present invention;

FIGURE 3 is a front view illustrating a backing supporting disc connecting with the supporting arms;

FIGURE 4 is a front elevation view showing a second embodiment of the invention; and

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FIGURE 5 is a side elevation view showing a flexible impeller assembled onto the supporting arms of FIGURE 4.

As may be seen in FIGURE 1, the centrifugal blower of the present invention comprises a hub 2 which is adapted to be connected to a rotatable shaft 3, extending from a motor 4. Disposed at a distance outwardly from the hub 2, for impelling air in a manner similar to a centrifugal bladed blower, is an annular impeller member or wheel 6 of porous or fibrous material. As disclosed in my aforementioned application Serial No. 190,917 the impeller wheel is formed of a porous or fibrous material, which terms are used interchangeably, and are meant to include those materials having a multiplicity of randomly oriented flexible fibers or yielding membranes which provide a multitude of interconnecting air passages through the material. Thus, the porous wheel may be composed of discrete flexible fibers arranged in randomly oriented interentangled relation, or of a cellular foam-like or sponge-like form defining a plurality of flexible membranes having their central portions etched away to define a multiplicity of interconnected passages through which air may flow. Foamed polyurethane plastic, which is commonly used as a washable filter sold under the trademark "ScottFoam" by the Scott Paper Company, is an example of the membrane or cellular-type, porous material suitable for the impeller wheel. Spun glass or spun nylon are examples of fibrous-type, porous material from which the impeller wheel may be constructed. Other porous materials found suitable for the impeller wheel are the polyester fibers, such as "Dacron" sold by the E. I. du Pont de Nemours & Company, and the acrylic fibrous plastic material sold by the Carbide and Carbon Chemicals Company under the tradename "Dynel." Metal wool, such as steel wool or aluminum wool, is also a fibrous material which may be utilized for the impeller wheel. It should be understood that the fibers, membranes, or cellular structures are similar in operation in the centrifugal blower member and are hereinafter all referred to under the common term porous material in this specification and claims annexed hereto.

These material are usually very flexible in nature and, when used as an impeller wheel, must be supported in substantial coaxial alignment with respect to the drive shaft of the blower. The porous materials readily pass air therethrough and have long been used in the filtering field for filtering a circulating air stream. The flexibility of the materials makes them very easy to handle and facilitates removal and replacement of the impeller wheel in the particular blower application.

The porous material is formed into an annular or cylindrical shaped wheel, as in the illustrated assembly of FIGURE 1, and is provided with at least one open end 7 through which air may enter the interior of the wheel. The impeller wheel has arranged around the central portion thereof a plurality of longitudinal slots 5 which extend completely through the porous member and resemble a button hole. The longitudinal slot may be reinforced by means such as heat sealing or threaded supporting fibers at the edge of the slot to prevent tearing of the porous material. The slots are spaced around the periphery of the impeller wheel adjacent the central portion thereof and cooperate with means extending from the shaft for supporting the porous wheel in coaxial relation with respect to the shaft.

Means are provided for supporting the impeller wheel and for rotating the wheel during rotation of the shaft. These means comprise a plurality of spaced arms 8, which are drivingly connected so that they are rotated by the shaft. The arms of the disclosed embodiments are formed of wire rod material and are preferably fair-

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ly substantial to provide support for the wheel. In the preferred embodiment of the invention, the arms 8 are attached to a disc 9 connected to the hub 2 and rotated thereby. The disc serves as a connecting means between the shaft and the arms and is approximately the same diameter as the porous wheel 6. While the most desirable connection means incorporate the use of the disc 9, it should be understood that the arms 8 could be directly attached to the shaft 3 or hub 2 and could extend radially outward therefrom.

In the embodiment shown in FIGURES 1, 2 and 3 the supporting arms are attached to the outer periphery of the circular panel or disc member 9 in any manner well known in the art. For example, the ends 8a of the arms in FIGURE 2 may be welded to the circular panel 9 and are solidly supported therefrom. The arms extend outwardly over the outer surface of the fibrous wheel 6 to a point in juxtaposed relation with the slots 5. At the outer extremity of the arms there are provided inwardly turned end sections 8b which extend through the longitudinal slots 5 formed in the porous impeller wheel 6.

The tips of the arms 8 are provided with disc sections 8c which are passed in "button-like" fashion through the longitudinal slots 5 of the flexible blower wheel. The disc-shaped ends 8c protrude into the interior of the cylindrical wheel and, like a button, prevent movement of the porous wheel 6 with respect to the arms 8 thereby retaining the wheel in coaxial alignment with respect to the shaft 3. While the discs 8c are preferably round, it will be understood that this is not absolutely essential. The only essential feature is that the discs 8c must, of course, have one dimension less than the length of the longitudinal slots 5 which will permit the flexible material to be easily assembly in "button-like" fashion over the disc sections 8c for easy replacement and removal of the porous wheel. Arms 8 not only retain the impeller wheel in position around the shaft but also impart a force to rotate the wheel during rotation of the shaft.

Preferably, the arms 8 extend parallel to the surface of the porous wheel and to the shaft 3 and the discs 8c squeeze the porous material between the abutting surface of the disc 8c and the arms 8. As mentioned previously, the porous impeller is flexible in nature and may sag or assume a non-circular configuration when the rotation of the wheel is stopped. However, the wheel assumes a generally circular or cylindrical configuration during rotation of the shaft because the wheel is supported at equal spaces around the periphery thereof by the arms 8 and the discs 8c attached to the arms. During rotation of the shaft, air enters the impeller wheel through the open end 7 thereof and is captured or forced to flow through the passages in the porous material of the wheel where it discharges tangentially somewhat in the same manner as air is delivered by an impeller having conventional-type blades around the outer periphery thereof. As air flows through the passages provided between the membranes or fibers of the porous impeller wheel, dirt particles in the air impinge against the membranes or fibers and attach thereto and the porous wheel, therefor, acts as a filter in addition to centrifugally impelling an air stream.

When the porous wheel becomes clogged with particles, all that is required, in order to clean the blower wheel, is to unfasten or "unbutton" the flexible wheel 6 by slipping the longitudinal slots 5 over the discs 8c thereby removing the flexible wheel from its supporting means. In most applications, the blower or impeller member will be mounted in a blower scroll of the type normally used for centrifugal blowers and removal and replacement of the flexible impeller wheel 6 may be easily accomplished through the scroll opening merely by "unbuttoning" or "buttoning" the discs 8c through the longitudinal slots 5.

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Referring now to FIGURE 4, there is shown another embodiment of the present invention in which the arms 11 are shown attached to a circular panel 9 which is, in turn, attached to a hub 2 rotated by the shaft 3. Arms 11, similarly to the arms 8 in the previous embodiment, are attached to the circular panel 9 by welding or other means well known in the art. The arms 11 extend outwardly generally normal to the panel 9 and pass adjacent and preferably parallel to the inner surface of the porous member 6. These arms have their end sections 11b turned outwardly through the slots 5 spaced around the central portion of the flexible, porous wheel 6. At the outer tips of the arms 11, there are provided button sections or disc sections 11c which are passed in "button-like" fashion through the longitudinal slots 5. Disc-shaped sections 11c hold the outer surface of the porous wheel 6 with respect to the arms 11 and prevent movement of the wheel with respect to the arms 11. During rotation of the shaft, the arms 11 and disc-shaped sections 11c cooperate to retain the blower wheel in substantially coaxial alignment with respect to the shaft and, when rotation ceases, the parallel arms 11 support the flexible porous material and prevent it from collapsing within the mounting arrangement.

While, in accordance with the patent statutes, there has been shown and described what at present is considered to be the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and it is, therefore, the aim of the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A centrifugal blower assembly comprising a support and a flexible annular blower member of porous material supported thereon, said support comprising a hub adapted to be mounted on a drive shaft and a plurality of spaced arms connected to said hub and parallel to and spaced equal distances from said shaft, said arms having radially extending end portions terminating in disc-shaped tips, said blower member having a plurality of slots therein adapted to pass over and to be removably received on said end portions of said arms in button-like fashion whereby said tips anchor said blower member on said arms, said arms including the radially extending end portions and tips providing the sole means for supporting and rotating said blower member in coaxial alignment with said shaft.

2. A centrifugal blower assembly comprising a support and a flexible annular blower member of porous material supported thereon, said support comprising a hub adapted to be mounted on a drive shaft and a plurality of spaced support members connected to said hub, said support members including longitudinal portions parallel to and spaced equal distances from said shaft and radially extending end portions terminating in disc-shaped tips, said annular blower member having a plurality of slots therein adapted to be removably received on said end portions of said support members for anchoring said blower member between said longitudinal portions and said tips of said support members, said support members providing the sole means for supporting and rotating said blower member in coaxial alignment with said shaft.

3. The assembly of claim 1 in which the radially extending end portions extend outwardly and said tips engage the outer surface of said blower member.

4. The assembly of claim 1 in which the radially extending end portions extend inwardly and said longitudinal portions of said arm engage the outer surface of said blower member.

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