Aug. 20, 1940. E. NEWNHAM 2,212,072

FAN HUB AND BLADE STRUCTURE

Filed Sept. 16, 1936

Fig. 1.

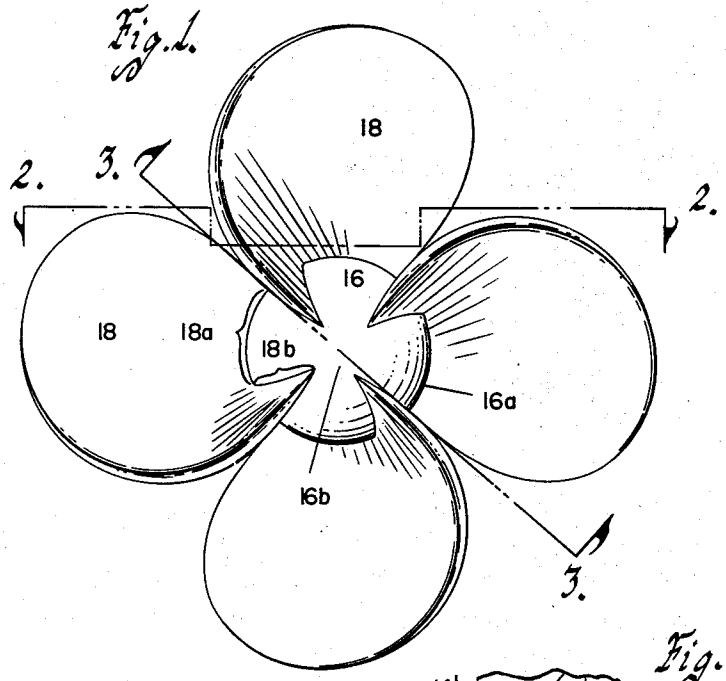


Fig. 4.

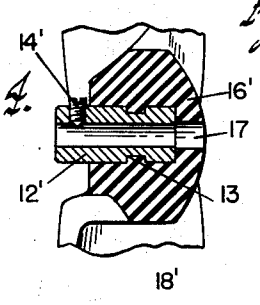


Fig. 3.

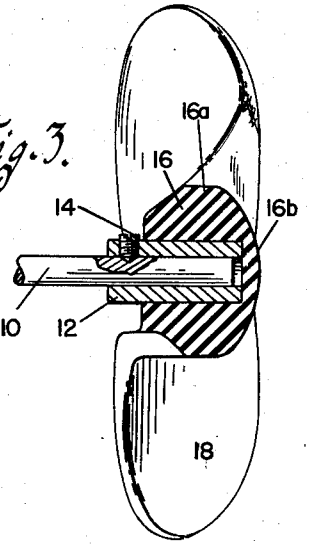
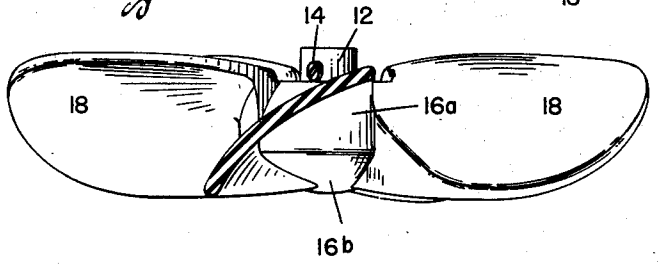


Fig. 2.



Witness
H. L. Murrenmaier

Inventor
Eugene Newnham
By Baird, Freeman & Sinclair
Attorneys

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FAN HUB AND BLADE STRUCTURE

Eugene Newnham, St. Louis, Mo., assignor to Knapp-Monarch Company, St. Louis, Mo., a corporation of Missouri

Application September 16, 1936, Serial No. 101,139

2 Claims. (Cl. 170—173)

One object of my invention is to provide a fan hub and blade structure of simple, durable and inexpensive construction, the present application being a continuation in part of my co-pending application Serial Number 54,698, filed December 16, 1935.

A further object is to provide a fan structure including blades of rubber or similar semi-rigid and at least semi-flexible material, which are integrally secured to a hub preferably of the same material, the hub and blades being moulded or otherwise suitably formed.

A further object is to provide a fan hub and blade structure of the character disclosed which eliminates the necessity of a guard over the blades, since the blades upon striking a person's hand or other object can bend backwardly without injury to the object or blades, the blades, after clearing such object, being projected to their normal position due to the stiffness of the material of which they are composed and/or due to the action of centrifugal force.

A further object is to provide a fan structure in which the blades and a hub for supporting them are integrally formed of material sufficiently flexible so that the blades may be formed relatively thin and will have sufficient inherent flexibility that, upon being struck, they will bend and of themselves resume their original position without permanent distortion, yet have sufficient rigidity to maintain their pitch angle for effective air delivery.

A further object is to provide a fan comprising a hub and a plurality of fan blades radiating therefrom, the hub and blades being of similar material, such material being flexible, the hub being of such thickness, however, that it is form-maintaining during operation, and the blades being relatively thin so that, although they normally retain their proper position and pitch angle relative to the hub, they can strike an object and bend under the impact thereof without permanent distortion, the blades returning to their original position after passing the object.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawing, in which:

Figure 1 is a front elevation of a fan hub and blade structure embodying my invention.

Figure 2 is a partial plan view of same, a portion of the uppermost blade being shown in cross section on the line 2—2 of Figure 1.

Figure 3 is a sectional view on the line 3—3 of Figure 1; and

Figure 4 is a similar sectional view showing a slightly modified construction.

On the accompanying drawing I have used the reference numeral 10 to indicate the shaft of a motor or the like for driving my fan structure. A sleeve 12 fits on the shaft 10 and may be secured thereto for simultaneous rotation therewith in any suitable manner. By way of illustration I show a set screw 14 for this purpose.

The sleeve 12 is embedded in a moulded hub 16 which has integral fan blade elements 18 extending radially therefrom and arranged at the desired pitch angle. Each blade 18 is relatively wide with reference to its length and is secured integrally to the hub 16 throughout the entire area or length of its root or base, for the purpose of effectively maintaining the pitch angle of the blade and affording a substantial anchorage for the blade to the hub.

The hub has a cylindrical portion 16*a* and a rounded end 16*b*, while each blade is secured to the hub and substantially spans the cylindrical portion as well as the rounded portion. The base or root of each blade is integrally secured as indicated at 18*a* and 18*b* to the portions 16*a* and 16*b* respectively of the hub 16, as indicated in Figure 1, thus providing anchorage for the entire base of the relatively wide blade.

The hub and blades are integrally formed of some suitable flexible material such as rubber, whereby during rotation the blades will substantially maintain their pitch angle against the tendency of the air they propel to somewhat flatten the angle. The blades, however, upon striking an object will bend so as to not damage the object or the blades. Thus the fan can be used without a guard without danger of injury to a person's hand or the like when assuming a position within the arc of rotation of the blade tips. Other material having similar characteristics obviously can be used.

Besides the tendency of the rubber itself to maintain the proper pitch angle, centrifugal force aids in such maintenance. Any twisting of the blade out of alinement brings many points in the twisted portion to a position closer to the axis of rotation, whereas centrifugal force tends constantly to urge all points as far as possible from the hub. It is obvious, therefore, that the material of the blade can be quite flexible without resulting in the pitch angle being flattened

out to an undesirable degree, and in practice the pitch angle to which the blades are moulded can be increased to compensate for such tendency.

It is preferable to provide an open end for the sleeve 12 and hub 16b, so that these parts can be easily balanced and the hub 16 may have either a closed end, as shown in Figure 3, or an open end, as shown in Figure 4. The closed end is indicated at 16b and conceals the sleeve 12, while the hub 16' in Figure 4 has an opening 17 which facilitates holding the hub on the sleeve. The opening 17 also facilitates removal of metal from the sleeve 12' for balancing purposes, and is an aid in reaming the bore of the sleeve for the motor shaft. The sleeve 12' in Figure 4 is illustrated as having an annular groove 13 to afford a better grip of the material of the hub moulded on the sleeve.

From the foregoing description it will be obvious that I have provided a fan structure having flexible fan blades of a material sufficiently stiff to retain the proper pitch for air delivery, and yet flexible or pliable enough to preclude hand or body injury when the fan is used without a guard. Any number of blades, of course, may project from the hub. Various means may be provided for mounting the hub on a rotary shaft of an electric motor or the like, thus providing a fan which does not need a guard, yet which is safe to use.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. A fan comprising a hub of flexible material, a sleeve inserted in said hub for connection with a motor shaft and a plurality of radiating fan blades integral therewith and comprising the same flexible material, said hub having an end extending over the end of said sleeve and an opening in said hub end in alinement with and substantially the same size as the bore of said sleeve.

2. In a hub and fan blade structure, a hub insert having a bore for a shaft, a unitary hub and relatively flexible fan blades formed of material sufficiently flexible to permit bending of the blade portion thereof upon the blades striking an object and of sufficient rigidity to substantially maintain their pitch angle upon rotation for effective air delivery, a shaft extending into the bore of said hub insert, said hub having an end over the end of said insert, said hub end having an opening in alinement with said bore and of sufficient size to permit the shaft to extend therethrough for balancing purposes.

EUGENE NEWNHAM.