April 21, 1942. M. W. HUMPHREYS 2,280,090

FAN

Filed Nov. 16, 1938

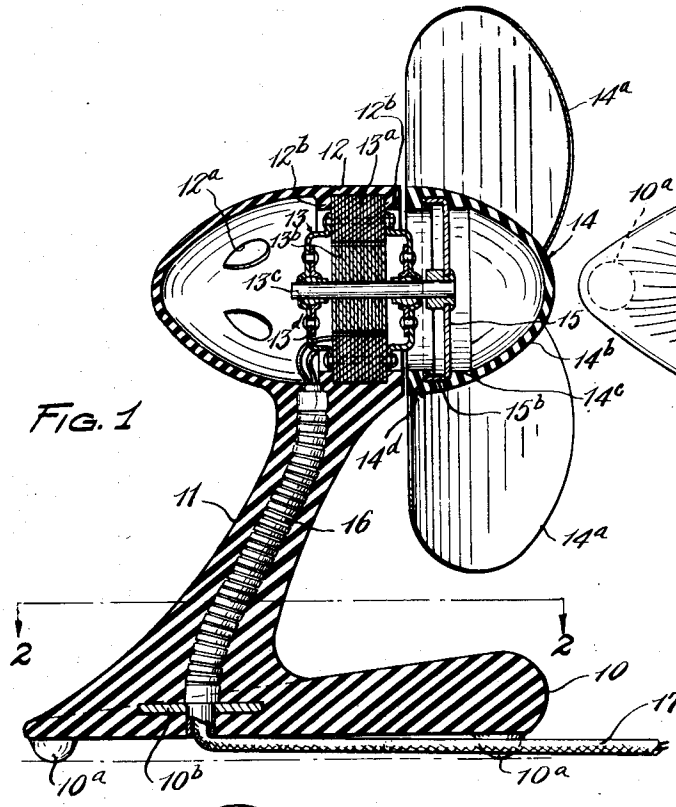


FIG. 1

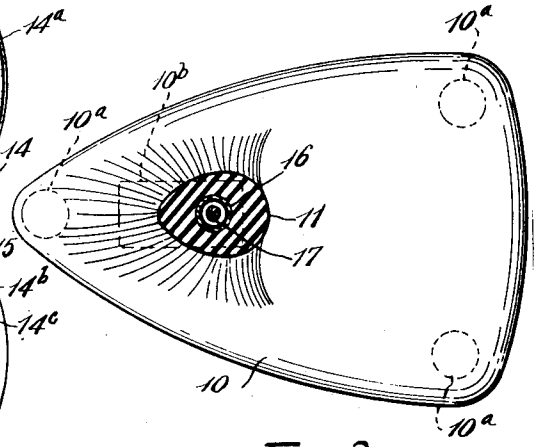


FIG. 2

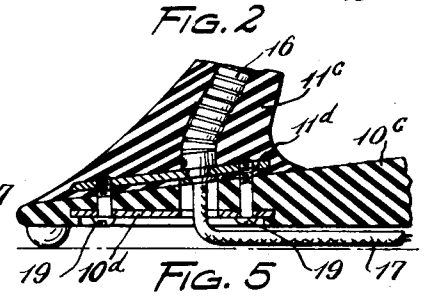


FIG. 5

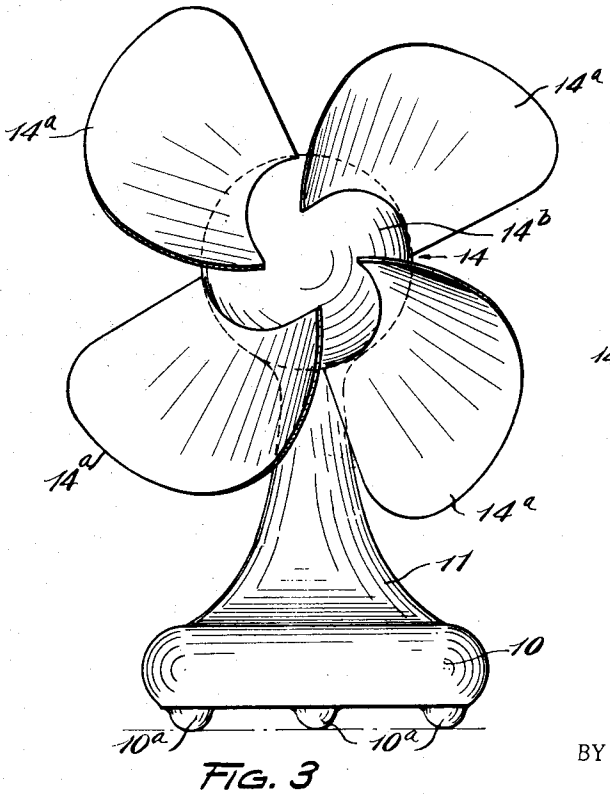


FIG. 3

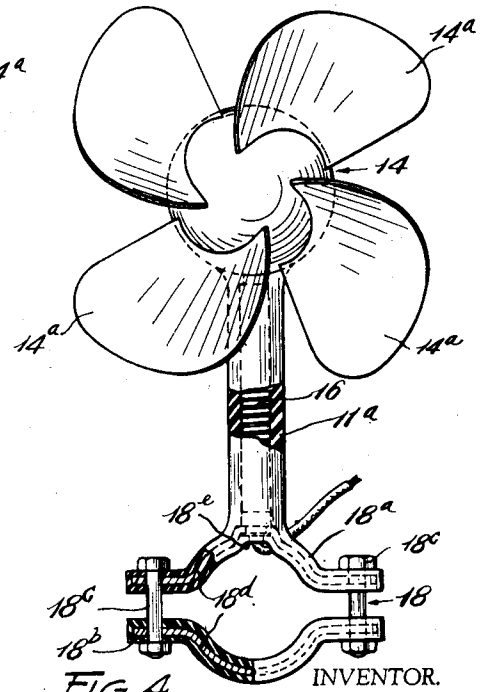


FIG. 4

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4 Claims. (Cl. 170—173)

This invention relates to fans and particularly electric fans for household, office, automobile and analogous uses.

Among the objects of the invention are, first, to reduce the assembly expense and therefore the cost of the completed fan; second, to provide greater flexibility for variously positioning the motor and fan to vary the direction in which the air currents are propelled and to accomplish this with a construction which is more pleasing in appearance than is the case with the adjustable fans in use at the present time; third, to minimize the transmission of mechanical and sound vibrations from the motor and fan proper to the part on which the fan is mounted or secured; fourth, to reduce the likelihood of marring a support such as a table and also the likelihood of marring the fan itself should it be tipped over; fifth, to eliminate the necessity of painting or enameling and thus reduce the expense of the finished fan; sixth, to provide greater facility for carrying the current conductors to and from the motor without the cord being visible at any point between the fan base and the motor; and, seventh, to provde a more satisfactory rubber or flexible blade unit wherein the several blades and a suitably shaped blade carrier are molded in one unit and readily applied to the rotary element of the motor in a manner such that assembly expense for this part of the fan is minimized.

The above and other objects are attained by the present invention which may be here briefly summarized as consisting in certain novel details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheet of drawing, showing two slightly different embodiments of the invention,

Fig. 1 is a vertical sectional view through a household or office type of fan embodying the invention;

Fig. 2 is a transverse sectional view substantially along the line 2—2 of Fig. 1;

Fig. 3 is an end view looking toward the blade unit of Fig. 1;

Fig. 4 is a view similar to Fig. 3, showing the invention embodied in a so-called defroster fan adapted to be mounted on the steering post of an automobile; and

Fig. 5 is a fragmentary sectional view through the lower part of the fan and showing a slight modification.

Referring first to Figs. 1, 2 and 3, it is an important feature of the construction here illustrated that the base 10, the standard 11 and the housing 12 for the motor are formed of semi-soft, flexible insulating material such as rubber and are preferably molded in one piece from rubber or equivalent plastic which, when cured, has the desired semi-soft flexible insulating characteristics with many advantages referred to herein. This part of the fan and also the blade unit to be referred to presently can be readily molded from rubber or rubber-like material such as artificial rubber, with the rubber pigmented in a manner such that the article will have the necessary artistic and pleasing appearance, thus doing away with the necessity of painting or enameling.

The lower side of the base 10 may have integral feet or lugs 10*a* formed thereon so as to space the base proper from the table and provide room beneath it for the cord enclosing the current-carrying conductors for the motor. The motor-enclosing housing 12 and the associated carrier for the blades of the fan unit are hollow and preferably, though not necessarily, oval shaped, as clearly illustrated in Fig. 1. The housing 12 is spaced slightly from the blade carrier of the fan unit and is annular in cross section with an end portion in this instance projectile-shaped to correspond with the similar shape of the blade carrier of the fan unit. If desired, the housing may have openings 12*a* formed therein to provide for ventilation of the motor.

The motor 13 is small and compact and is preferably of the squirrel cage induction type. For the smaller fans a two-pole motor is sufficient and for the large fans the motor may have four or more poles. The details of the motor are not material to the present invention as induction motors of the squirrel cage type used for this purpose are well known. For the sake of clearness the field winding of the stator is not illustrated. This motor 13 includes a laminated stator core 13*a* and a laminated rotor core 13*b*, the latter being mounted on a shaft 13*c* rotatably supported in bearing brackets 13*d*, the outer ends of which may be secured by rivets or otherwise to the stator core 13*a*.

It is an important feature of the present invention that the motor does not include a metal housing employed almost universally in motor fans, but is mounted and frictionally held in the rubber or other molded housing 12 between a pair of inwardly projecting flanges 12*b*, molded in-

tegrally with and projecting inwardly from the inner wall of the housing adjacent its open end next to the blade unit. The housing 12 has sufficient flexibility and elasticity that this part of the housing can be readily flexed or stretched and snapped over the outer annular part of the stator core 13a.

The blade unit 14 is also molded in one piece from semi-soft rubber or equivalent flexible or elastic material and includes a plurality of radially projecting blades 14a which are preferably cup-shaped and at their inner ends are formed integral with the blade carrier 14b, which, like the housing 12, is hollow and in this instance is tapered or projectile-shaped. To further minimize the assembly expense, in accordance with the present invention, the open end of the blade carrier 14b is stretched over and snapped onto and is then frictionally held to the peripheral portion of a rotating element in the form of a disc 15 which is secured to one end of the shaft 13c which projects from the open end of the housing 12 into the adjacent open end of the blade carrier 14b. In this instance, the disc 15 has a laterally and inwardly projecting flange 15b and one side of the disc bears against a shoulder 14c formed integral with the inner wall of the blade carrier 14b while at the open end of the carrier 14b, next to the end of the motor housing 12, there is a thickened portion 14d formed on the inner wall of the blade carrier 14b, this portion being grooved to provide a flange which overlaps the inner periphery of the angularly disposed flange 15b of the disc 15, thus insuring against spreading and dislodgment of the blade carrier 14b under the action of centrifugal force.

In accordance with the present invention means is provided for affording maximum adjustability of the motor and fan end of the device to vary the direction in which the air currents are propelled, without requiring use of a swivel or universal joint commonly employed in fan structures at the present time. This maximum and in fact universal adjustability is accomplished by reason of the flexibility of the standard 11 and further by molding into the standard a hollow flexible tube 16, this tube, while flexible, having sufficient stiffness to hold the standard 11 in any position to which it may be bent. The tube 16 is preferably formed of spirally wound metal strip and is of the form commonly employed as a flexible drive shaft. This hollow flexible tube 16, which extends from substantially the lower side of the base 10 to substantially the housing 12 provides a convenient and satisfactory means for carrying the cord 17 which encloses the current carrying conductors for the motor 13 from the lower side of the base through the standard 11 for its full length and to the cavity within the housing 12. Thus the cord is not exposed at any point, which I believe is not the case with electric fans having metal standards equipped with swivel or universal joints to afford adjustability.

If desired, a plate 10b may be embedded in the base 10 while the base-standard-housing unit is being molded and if so the lower end of the flexible tube 16 may be suitably fastened to the plate as by a force fit between the plate and lower end of the tube or otherwise. In this instance the lower end of the tube has a nipple fitted into and extending through an opening in the plate 10b.

It will be seen from the construction described above that the objects or advantages stated in the early part of the specification are attained to a high degree. These need not be here repeated or enlarged upon except that it might be pointed out that in the entire device, from its lower end to its upper end, there are no exposed metal parts so that there is no likelihood of damage either to the fan or to the support upon which the fan is mounted, should the fan be tipped over. Furthermore, the lack of a metal supporting connection between the motor and the base not only reduces the transmission of mechanical vibrations to the table or other support but the molded unit including the base, standard and housing (which latter receives and encloses the motor) acts also as a noise insulator so that the fan is quieter than those of common construction, and, of course, affords protection as an electrical insulator. In this connection it might be stated that the insulating properties of the molded unit against the transmission of mechanical vibrations and sound vibrations are not adversely affected by the use of the inner embedded flexible tube 16.

The construction illustrated in Fig. 4 is similar in all respects to the construction illustrated in Figs. 1, 2 and 3 except that, instead of the base 10, the flexible standard which is here designated 11a and which corresponds to the standard 11 of Fig. 1 has at its lower end a two-part clamp 18, composed of a part 18a formed integral with the standard and an independently formed part 18b, which, in this instance, is adapted to be secured by clamping bolts 18c around a suitable supporting element, such as the stearing post of an automobile as when the fan is used for the purpose of directing air currents onto the windshield to keep it clear of fog and the like, fans of this kind being commonly called defrosting fans. The two clamping parts or elements 18a and 18b are preferably of semi-soft rubber with metal reenforcing plates 18d embedded therein, as shown at the lower end of Fig. 4. It will be understood that the flexible standard 11a, the motor housing corresponding to the housing 12 of Fig. 1, and the clamping part or element 18a (with its metal reenforcement 18d) will, as in the first instance, be molded in one unit from semisoft rubber or equivalent material. It will be understood that there is embedded in the standard 11a a flexible tube 16 similar in construction and purposes to the tube 16 of the first described construction. Likewise, it will be understood that the motor is applied and supported and the blade unit is constructed and applied as in the first instance. To provide space for leading the current-supplying conductors into the tube 16 from the inner side of clamping element 18a, the inner central part of the clamping element opposite the lower end of the tube 16 is preferably offset upward slightly as indicated at 18e.

Although I have not shown a switch in the drawing, it will be understood of course that a suitable switch may be provided in the motor circuit for controlling the operation of the fan.

I have stated above that the housing, the standard, and the base are preferably molded in one piece, and that construction has been illustrated. However, the one-piece construction might require a rather expensive mold and, if so, they may be molded in two parts. In the latter case I prefer that the housing and the standard be molded in one piece and that the base be separately molded and attached to the lower end of the standard. One way in which this may be done is illustrated in Fig. 5, wherein the standard is designated 11c and the base 10c. To con-

veniently fasten the parts together there is molded into the lower end of the standard a metal plate 11*d* and on the lower side of the base 10c a metal plate 10*d*, which plates are designed to be secured together by screws 19. In this instance the lower end of the hollow flexible tube 16 is fastened to the plate 11*d*, and provision will be made in the base 10c and the plate 10*d* for passing the conductors up from the lower side of the base into the tube 16.

Certain features disclosed but not claimed herein are disclosed and claimed in a companion application Serial No. 320,766, filed February 26, 1940.

While I have shown the preferred embodiments and described the preferred materials, I do not desire to be confined to the precise construction and materials described but aim in my claims to cover all modifications which do not involve a departure from the spirit and scope of the invention.

Having thus described my invention I claim:

1. A fan comprising a motor having a blade-rotating element and a blade unit comprising a plurality of blades and a tapered hollow blade-carrier molded in the form of a unit from flexible material, the hollow blade-carrier having adjacent its larger end an annularly grooved thickened portion receiving and frictionally held to the rotating element.

2. A fan blade unit for mounting on a rotatable disk-like element, comprising a blade-carrier and a plurality of projecting blades molded from flexible material, the blade-carrier being a tapered rounded thin walled body open at the back thereof and having an engaging portion on said open back for frictional engagement with the periphery only of said disc-like element for clamping the fan blade unit for rotation with the disc-like element.

3. An impeller for a fan or the like, comprising a disk-like member having means adjacent the center thereof for mounting the same on a shaft and also having an angularly disposed circumferential flange, a plurality of blades, and a carrier for the blades comprising a tapered rounded thin walled body molded from flexible material with an open back adapted to be flexed over said disk-like member for mounting the carrier thereon, said carrier having a continuous circumferential groove thereon arranged to receive the flange of said disk-like member.

4. An impeller for a fan or the like, comprising a disk-like member having means adjacent the center thereof for mounting the same on a shaft and also having an angularly disposed circumferential flange, a plurality of blades, and a carrier for the blades comprising a tapered rounded thin walled body molded from flexible material with an open back adapted to be flexed over said disk-like member for mounting the carrier thereon, said carrier having a continuous circumferential groove thereon arranged to receive the flange of said disk-like member and a shoulder engageable with a face of the disk-like member for retaining the flange in said groove.

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