W. H. KEMPTON AND O. F. ROWE.

FAN.

APPLICATION FILED DEC. 30, 1918.

1,430,561. Patented Oct. 3, 1922.

Fig. 1.

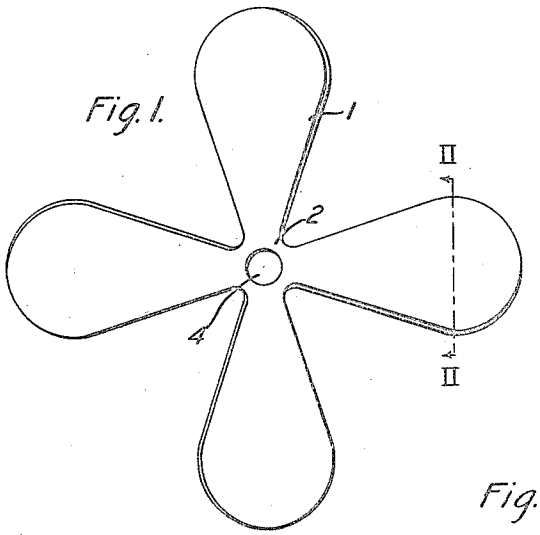


Fig. 2.

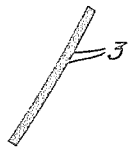


Fig. 4.

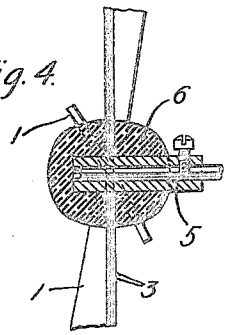


Fig. 5.

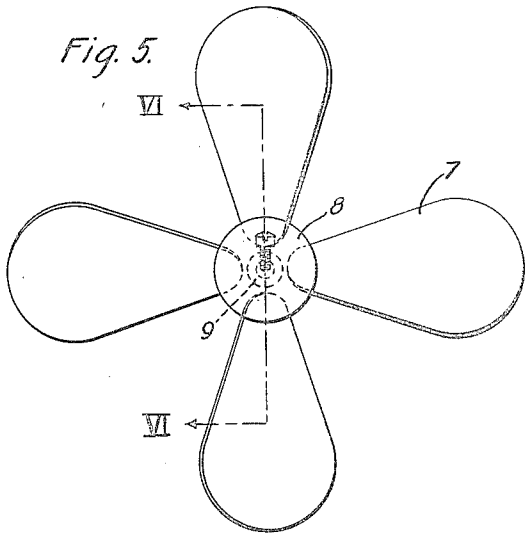


Fig. 3.

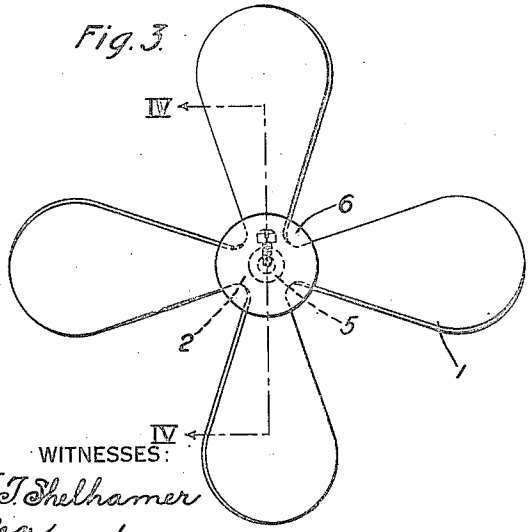
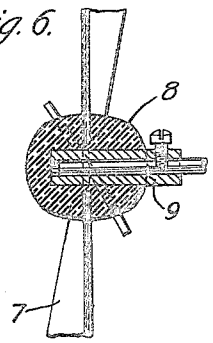


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLARD H. KEMPTON AND ORVIS F. ROWE, OF WILKINSBURG, PENNSYLVANIA, ASSIGNORS TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

FAN.

Application filed December 30, 1918. Serial No. 268,825.

To all whom it may concern:

Be it known that we, WILLARD H. KEMPTON, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, and ORVIS F. ROWE, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Fans, of which the following is a specification.

Our invention relates to fans or blowers and it has for one of its objects the provision of an improved fan structure through the employment of moldable materials both for the fan blades and the hub in which the blades are secured.

A copending application of C. W. Johnson, filed Dec. 30, 1918, Serial No. 268792 and assigned to the Westinghouse Electric and Manufacturing Company, discloses fan blades formed of fibrous material impregnated with a suitable hardened binder, such as a phenolic condensation product. Such blades possess numerous advantages over the brass and steel blades now commonly employed, being much quieter in operation, less liable to injury and also less liable by reason of defects in their construction to injure a motor employed for driving them. Furthermore, such blades offer but little air resistance and may be readily colored to present a neat, ornamental and attractive appearance.

The primary object of our present invention is to provide a fan structure comprising blades of the character disclosed in the above-referred-to application together with a hub of a novel and improved type which will co-operate with the blades to enhance the value and efficiency of the fan as a whole.

Another object which we have in view is the provision of a fan structure of such character as to materially decrease the cost of labor for assemblage and at the same time avoid substantially all likelihood of defects, through faulty workmanship.

Our invention also contemplates a fan of increased efficiency by constructing both the supporting hub, or spider, and the blades of materials having substantially the same period of vibration and of materials having a period of vibration far lower than those of metals previously employed for corresponding fan parts.

With these and other objects in view, our invention will be more fully described, illustrated in the drawings, in the several views of which corresponding numerals indicate like parts, and then particularly pointed out in the claims.

In the drawings, Fig. 1 is a front elevation of a multiple-blade fan-blank formed in accordance with our invention; Fig. 2 is a sectional view of one of the blades taken on the line II—II of Fig. 1; Fig. 3 is a front elevation of a complete fan embodying our invention; Fig. 4 is a sectional view of a portion of the fan taken on the line IV—IV of Fig. 3; Fig. 5 is a front elevation of a slightly modified embodiment of our invention and Fig. 6 is a sectional view of a portion of the fan shown in Fig. 5, the section being taken upon the line VI—VI thereof.

In practicing our invention, we may form a multiple-blade fan-blank from superimposed layers of fibrous sheet material, impregnated with a suitable binder which may be permanently hardened, such as a phenolic condensation product. A suitable bushing may be passed through the spider or hub portion of the blank, which serves to connect the blade portions, and a hub proper, consisting of a suitable molding composition, such as any desirable, finely divided, or comminuted filler, impregnated with a phenolic condensation product, may be formed about the central or web portion of the blank. The entire fan may then be cured in any suitable manner, such as by subjecting it to the action of heat and pressure in a mold.

On the other hand, our invention may be followed by providing a plurality of separate blade-blanks, of the same or equivalent material as the multiple blade-blanks, imbedding the inner ends of the blanks, together with a suitable bushing, in a hub of moldable composition, of the character previously specified, and then curing or molding the thus assembled fan by the application of heat and pressure or by any other means which may be suitable or indicated by the nature of the binder employed.

Referring more directly to the drawings, Fig. 1 discloses a multiple-bladed fan-blank comprising a plurality of blades 1 and a common web or hub portion 2 formed integrally with and connecting the blades. This blank, as best indicated in Figs. 2 and 4 of the drawings, comprises a plurality of superimposed layers of fibrous sheet material 3 impregnated with a binder, of proper character, which may preferably be in an inactive state but which is capable of being rendered active and hardened by suitable curing means. To assemble such a blank, we may impregnate a fibrous sheet material, such as paper, cloth, cotton batting or other fabricated sheets, with a binder of the desired character, such as a phenolic condensation product in solution, and we may then dry the sheets to such an extent as to drive off all or substantially all of the solvent without affecting the moldable properties of the binder. From the dry sheets thus treated, we may stamp out or otherwise remove blank-forming sheets of the proper shape and size and superimpose them upon each other to form a body of the desired thickness, or we may superimpose a plurality of the treated sheets and stamp assembled blanks therefrom.

In any event, the assembled blank, of the form shown in Fig. 1 having a bearing or bushing receiving opening 4, is provided and a tubular bearing or bushing 5, which may preferably be of steel, is passed through the opening 4, after which a suitable molding composition is positioned against opposite sides of the web portion 2 of the blank and about all but one end of the bushing to provide material for the formation of a substantially ellipsoidal shaped hub 6.

With the fan-forming elements thus assembled, the entire structure may be finished or cured in any preferred manner. For example, if the sheets are impregnated with a phenolic condensation product and the hub-forming material comprises a suitable comminuted filler, such as wood flour, asbestos or the like, impregnated with a corresponding binder, the entire structure may be positioned in a mold of suitable character and there subjected to the application of heat and pressure to properly shape, compact and solidify the parts.

Preferably, as shown in Fig. 3 of the drawings, the hub 6, of moldable composition, may be of such dimensions as to not only fully cover the web portion of the fan blade-blank but also to be disposed, to a certain extent, between the several blades of the blank so that there is no possibility of loosening of the blank, relative to the hub, or of separating the front and rear portions of the hub from each other.

It will, of course, be obvious that this stamping of a multiple-blade fan-blank, as a single part, together with the simultaneous molding of it, and a hub and its enclosed bushing, thereto, removes the necessity for substantially all steps of assembly, such as are now required, and eliminates the chief opportunities for the appearance of defects, occasioned by faulty workmanship.

In addition to these advantages, it should be noted that both the material constituting the blades and that constituting the hub have substantially the same period of vibration, which is an extremely low one, as compared with those of metals now commonly used in fan constructions, such as brass and steel, so that there is a marked decrease in the noise caused by the fan in operation and the rupturing strains now imposed upon fans as now constructed, due to different periods of vibration of the various parts employed, are eliminated.

It should be noted that inasmuch as the entire fan, with the exception of its bushing, is formed of material impervious to moisture, weak acids and oils, it may be employed for industrial purposes where fans, as now constructed, would be very short lived.

In Figs. 5 and 6, we have shown a modified embodiment of our invention in which the blade-blanks 7 may be formed in the same manner as the multiple-blade fan-blanks 1, the sole difference being that each blade comprises a separate blank free of all connection with the other blades. The blades thus formed have their inner ends imbedded in the hub 8 about a bearing sleeve or bushing 9, in the same manner in which the web portion of the blank shown in Fig. 1 is secured, and the fan body, thus assembled, is cured in any suitable manner, such as that previously described.

It will be clear that the finished products resulting from these slightly modified methods of manufacture are substantially identical and that the properties and advantages possessed by one are also inherent in the others. Inasmuch, however, as it is clearly possible to employ any one of several slightly modified methods of manufacture, it will be appreciated that our invention is not to be limited in scope, in any way, except such as may be indicated in the claims.

We claim as our invention:

1. A fan or blower comprising a molded hub and blades, the hub comprising a comminuted filler and a hardened binder and the blades comprising superimposed layers of fibrous sheet material and a corresponding binder.

2. A fan or blower comprising blades formed of superimposed layers of fibrous sheet material, impregnated with a phenolic

condensation product and a hub, formed of a comminuted filler impregnated with a phenolic condensation product, imbedding portions of the blades, the materials of the hub and blades being hardened and compacted by heat and pressure.

3. A fan or blower comprising a multiple-bladed blank of superimposed layers of fibrous material impregnated with a binder, a bushing disposed through the central portion of the blank and a hub molded about the bushing and enclosing the central portion of the blank.

4. A fan or blower comprising a multiple-bladed blank of fibrous sheet material impregnated with a phenolic condensation product, a bushing disposed through the central portion of the blank, and a hub of comminuted material impregnated with a phenolic condensation product enclosing the bushing and adjacent portions of the blank, the blank and hub being consolidated and hardened by the application of heat and pressure.

5. A fan or blower comprising a molded hub and a plurality of molded blades of fibrous material partially imbedded in the hub.

6. A fan or blower comprising a plurality of blades of superimposed fibrous sheet material impregnated with a phenolic condensation product, a bushing in proximity to the inner ends of the blades and a hub of comminuted material and a phenolic condensation product as a binder imbedding the bushing and adjacent portions of the blades, both the hub and blades being hardened by heat and pressure.

7. A method of forming a fan or blower which comprises forming a multiple-bladed fan-blank of superimposed layers of fibrous sheet material impregnated with a binder, mounting a bushing centrally of the blank, disposing moldable material about the bushing and against opposite faces of the blank and subjecting the body thus assembled to heat and pressure to cure the blank and molding mixture and shape the latter to provide a hub.

8. A method of forming a fan or blower which comprises forming a plurality of separate fan-blade blanks of fibrous sheet material impregnated with a phenolic condensation product, imbedding the corresponding ends of the blanks and a bushing in a body of moldable material with the blanks radiating from the bushing and subjecting the moldable material and blades to heat and pressure to cure the blades and consolidate the moldable material to provide a hub anchoring the blades in proper position relative to the bushing.

In testimony whereof, we have hereunto subscribed our names this 21st day of Dec., 1918.

WILLARD H. KEMPTON.
ORVIS F. ROWE.