May 13, 1930. D. B. REPLOGLE 1,758,062

CENTRIFUGAL FAN AND METHOD OF MAKING THE SAME

Filed July 28, 1928

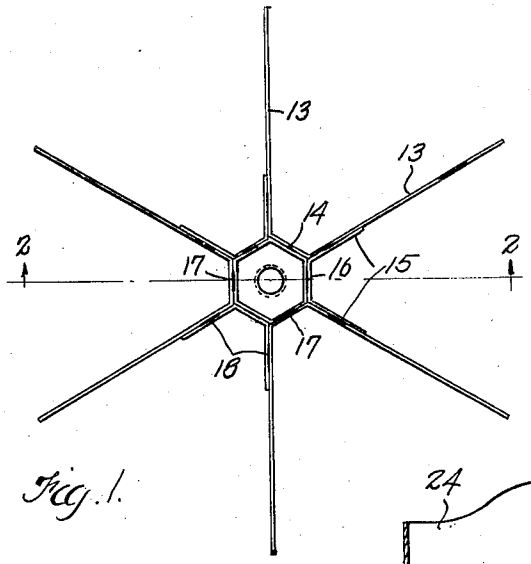


Fig. 1.

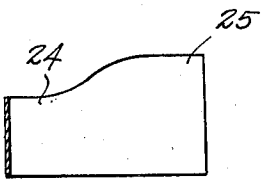


Fig. 3.

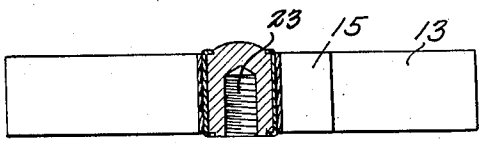


Fig. 2.

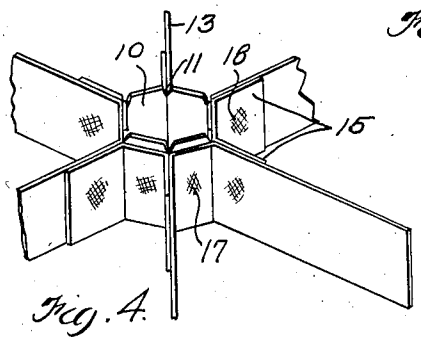


Fig. 4.

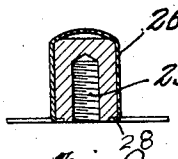


Fig. 9.

Fig. 5.

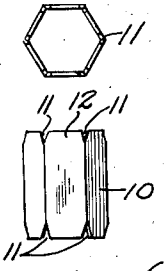


Fig. 6.

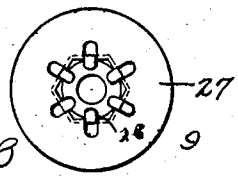


Fig. 8.

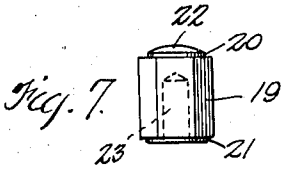


Fig. 7.

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Patented May 13, 1930

1,758,062

UNITED STATES PATENT OFFICE

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CENTRIFUGAL FAN AND METHOD OF MAKING THE SAME

Application filed July 28, 1928. Serial No. 296,074.

The invention relates to centrifugal fans of the unshrouded type, and to the method of making the same. Fans made in accordance with this invention may be used for various purposes, but are particularly intended for use with suction cleaners and like devices, in which a very high speed of rotation is employed, running often as high as 20,000 revolutions per minute. In devices of this character it is essential that the fan be balanced dynamically as well as statically, and for this reason the shrouded type of fan has been found unsuitable as it is practically impossible to maintain the dynamic balance in a fan of the shrouded type, besides shrouds furnish unnecessary air resistance.

Heretofore it has been customary in making centrifugal fans of the unshrouded type to secure the blades to a solid hub by means of screws, but with such method of fastening there is danger of the screws being jarred loose during operation of the fan. Attempts have also been made to weld the blades to a central hub of substantially greater thickness than the blades, but this has proved impractical owing to the uneven heating of the heavy metal of the hub and the thin metal of which the blades are composed. Centrifugal fans are also made by casting, but the disadvantage of this method of manufacture lies in the fact that the blades of cast metal fans are often found to be of non-uniform density or thickness and this defect destroys the dynamic balance of the fan.

The object of my invention is, therefore, to provide a non-shrouded centrifugal fan of rigid construction, in which the parts are evenly balanced both statically and dynamically and in which there is no tendency for the blades to work loose during the rotation of the fan. A further object of the invention is to provide a simple and inexpensive method of making and securing together the parts of the fan.

Broadly stated the method consists in the attachment by spot welding of a plurality of vanes to a central open tube or like hollow member, then inserting a hub within the hollow member and securing the hub in place.

The invention may be more readily understood by reference to the accompanying drawings in which:—

Fig. 1 is a plan view of the fan, showing the vanes, central tube and hub, and indicating the spot welding attachment of the vanes to the central tube.

Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1, the vanes being shown in elevation.

Fig. 3 is a detail fragmentary view showing a different form of vane from that disclosed in Fig. 2.

Fig. 4 is a perspective view showing the vanes attached to the central tube, but the hub not yet in place.

Fig. 5 is a plan view of the central tube.

Fig. 6 is an elevation of the central tube.

Fig. 7 is an elevation showing the hub which is to be secured within the central tube.

Fig. 8 is a plan view of a modification showing the hub assembled within a thimble-shaped hollow hexagonal blade supporting member, the blades not being shown.

Fig. 9 is a central vertical section on line 9—9 of Fig. 8.

Referring to the embodiment of the invention disclosed in Figs. 1–7, and particularly to Figs. 5 and 6, the fan includes a central hollow flat sided tube 10, preferably hexagonal in shape, which may be formed by suitably bending a single sheet of metal about a mandrel. The metal used is of material which lends itself readily to spot welding, and is preferably sheet steel. Notches 11 are preferably formed between adjacent sides of the hexagonal tube, thereby forming tabs, lips, or flanges 12 at the ends of the tube which serve to bind the tube to a solid hub to be inserted after the vanes have been secured to the tube.

The vanes or blades 13 of the fan are preferably made up in pairs or units, with a flat connecting base member 14 between the diverging vanes. These vane units are composed of sheet metal of substantially the same thickness as the central tube 10. For a six-bladed fan three of these units are employed.

In addition to the blade units a plurality of short supplemental units are employed having a contour similar to that of the blade

units, these units each comprising wing members 15 and a base member 16. The blade units and the supplemental units are secured to the central tubular member 10 by spot welding, the blade units and the supplemental units being alternately arranged about the central tube with the base members 14 and 16 in contact with the sides 10 of the tube.

The welding is accomplished by inserting in the tube an electrode (not shown) conforming in shape to the interior of the tube, and pressing another electrode against one of the base members 14 or 16 thereby producing a spot weld 17. In this manner each of the blade units and supplemental units is secured to the central tube. The adjacent sides 13 and 15 of the respective blade and supplemental units may be spot welded to each other as at 18, thus firmly and rigidly holding the parts of the fan in assembled position. The welding may be controlled so as to be substantially uniform in character due to the thinness and uniformity of the parts to be welded together.

In order to complete the fan it is only necessary to apply a central hub member by means of which the fan may be rotated on a suitable shaft. A hub suitable for this purpose is shown in Fig. 7, and comprises a hexagonal body member 19 conforming in size and shape to the interior of the tube 10. At the upper and lower portions of the hub the material is cut away as at 20 and 21, the depth of the cuts being the same as the thickness of the metal of which the tube 10 is composed. The top of the hub may be rounded as at 22, and the interior is hollowed out as at 23 for the reception of a screw or the like (not shown) to connect to the shaft of the fan motor (not shown).

The hub is fitted within the central tube 10 and is secured in place by means of the tabs or flanges 12, which are bent over into the cut away portions 20, 21 of the hub.

Obviously the invention is subject to modifications. The form of the blades may be varied as desired. A blade is shown in Fig. 2 which is narrow near the center as at 24 for attachment to the central tube and supplemental units, and which widens out farther from the center as at 25. If desired six blade units, each consisting of a single blade and a base, may be employed in place of the three blade units each carrying two blades and a base. Also it is obvious that the number of sides of the central tube, and the number of blades may be varied as desired.

An alternative form of the hollow central blade supporting member is shown in Figs. 8 and 9. According to this modification a hexagonal thimble 26 is stamped out of a sheet of metal, leaving a flange 27 surrounding the base of the thimble, and with a plurality of small tabs or lips 28 formed integral with the thimble and adapted to be bent over the cut away portion 21 of the hub 19 to hold the hub in place, in the same manner as the flanges 12 of the hollow tube 10.

Obviously other modifications may be resorted to without departing from the spirit of the invention.

What I claim as new and desire to secure by Letters Patent is:—

1. The method of making a centrifugal fan which consists in spot welding to a central hollow metal member a plurality of blades of substantially the same thickness as the central member, then inserting a hub within the hollow member and securing the hollow member and hub together.

2. In the method set forth in claim 1, the step which consists in spot welding a plurality of supplemental reinforcing units to the central hollow member and to adjacent blades.

3. A centrifugal fan comprising a hollow metal member, a plurality of radial blade units having base portions welded to the central hollow member and a central hub secured within the hollow member.

4. A centrifugal fan comprising a hollow flat sided metal member, a plurality of blade units each including a radial blade and a base bent at an angle thereto, the bases of the blade units being welded to alternate sides of the central hollow member, a plurality of supplemental reinforcing units conforming in shape to the blade units, each having a base of the same size as the bases of the blade units, but having shorter vanes, the bases of said supplemental units being welded to the central tube intermediate the blade units and the vanes of the supplemental units being welded to the blades of the blade units.

In testimony whereof I affix my signature.

DANIEL B. REPLOGLE.

CERTIFICATE OF CORRECTION.

Patent No. 1,758,062. Granted May 13, 1930, to

DANIEL B. REPLOGLE.

It is hereby certified that the above numbered patent was erroneously issued to the inventor said "Replogle", as owner of said invention, whereas said patent should have been issued to "The Commerce Guardian Trust & Savings Bank, Trustee, of Toledo, Ohio", as assignee of the entire interest in said invention, as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of July, A. D. 1930.

(Seal)

Wm. A. Kinnan,
Acting Commissioner of Patents.