Nov. 6, 1923. 1,473,066

M. R. WELLS

FAN FOR AUTOMOBILE RADIATORS OR THE LIKE

Filed March 20, 1922

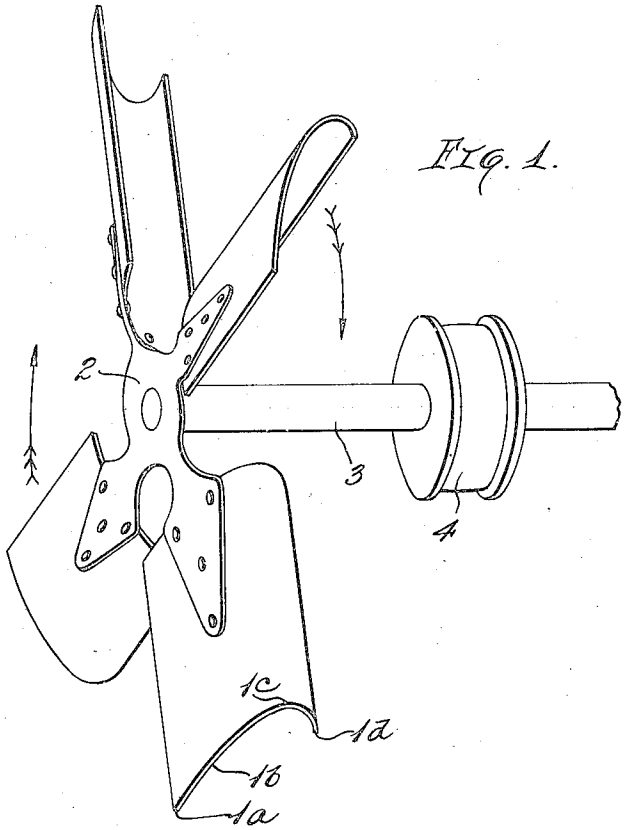


Fig. 1.

Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7.

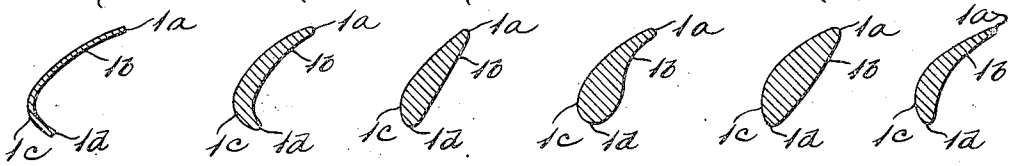
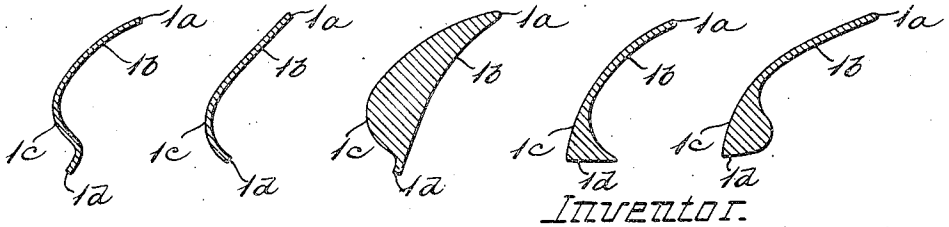


Fig. 8. Fig. 9. Fig. 10. Fig. 11. Fig. 12.



Inventor.
Merritt R. Wells
By Brockett & Hyde
Attys.

Patented Nov. 6, 1923. 1,473,066

UNITED STATES PATENT OFFICE.

MERRITT R. WELLS, OF CLEVELAND, OHIO.

FAN FOR AUTOMOBILE RADIATORS OR THE LIKE.

Application filed March 20, 1922. Serial No. 545,170.

To all whom it may concern:

Be it known that I, MERRITT R. WELLS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Fans for Automobile Radiators or the like, of which the following is a specification.

This invention relates to improvements in the construction of fans of the so-called propeller or screw type wherein the air or fluid passing through the fan, flows along lines which are approximately parallel to the axis rather than radial or tangential as may be true in a centrifugal fan.

The object of the invention consists in so shaping the vanes or blades as to induce, to a greater degree, the production of cavitation or negative pressure over the trailing face of the blades and so varying this negative pressure that it is greater near the trailing edge of the blade than at the leading edge. Thus it is the object of this invention to produce a negative pressure over the trailing face which will promote the flow of air or fluid to and through the fan and which will operate in addition to the positive urging force or action which takes place over the leading face of the blade, thereby greatly increasing the capacity of the fan.

My preferred means for producing this cavitation or negative pressure over the trailing face of the blades, consists in so curving or shaping one or both of their faces that the angle between the same and the axial plane not only decreases to zero from the leading edge towards the trailing edge but actually reverses or becomes negative over a portion of the rear or trailing face of the blade. This reversal need not extend completely to the trailing edge. In fact under certain conditions it may be advisable to give the face a second reversal so that its portion near the trailing edge lies in a zero plane or makes a positive angle with respect to the axial plane. Heretofore, the idea seems to have prevailed that the angle referred to might decrease to zero but should never become negative.

In order to obtain the full advantage of the cavitation mentioned, the leading face of the blade should be made approximately parallel to the trailing face. For structural reasons, however, as for instance where the blades are cast and of considerable thickness, it is apparent that the edges should be thinned to a certain extent and the leading face given a contour different from that of the trailing face. In such a case, the leading face may even present a convex surface. That portion of the leading face nearest the trailing edge may be varied considerably and either curved forward, backward or left straight depending upon the relative importance of large capacity, maximum efficiency and high or low difference of pressure between the two faces of the fan.

On the accompanying drawings, Fig. 1 shows a perspective view of a fan constructed according to my invention; Figs. 2 to 12 inclusive are cross sections taken through various forms of blades which can be used in carrying out my invention.

In the drawings the fan is composed of four blades of the type referred to, suitably attached to a spider 2 and shaft 3 with pulley 4 for driving the fan in the direction indicated by the arrows. In Fig. 1 the blades have been formed from rectangular sheets of material and are set approximately radial to the shaft. It is obvious that the blades may, if desired, be formed integral with the spider, that the blades may be tipped away from the radial position, that the number of blades, their outline or contour can be altered and various other modifications resorted to without departing from the spirit of the invention.

In Fig. 1 the leading edge is indicated by reference numeral 1^a, the leading face by reference numeral 1^b, the trailing face by numeral 1^c and the trailing edge by reference numeral 1^d. The other various forms of blades have corresponding portions and edges.

Figs. 2, 8 and 9 show different forms of blades made from sheet material while Figs. 3 to 7 and 10 to 12 show different forms of blades which are cast.

Fig. 3 shows a blade generally similar to that shown in Fig. 2 as regards contour of the leading and trailing faces but differs as to thickness of the blade wall, thereby necessitating variation of the two faces from parallelism. The variation between parallelism of the two faces is more marked in Fig. 4. Indeed, in this view the leading face is a plane surface. In Fig. 5 the leading face has both concave and convex por-

tions and also the angularity of the leading face is not reversed, or in other words, does not go beyond the zero plane. Fig. 6 shows a form generally similar to Fig. 4, but the leading face is curved beyond a plane surface and has become convex. In Fig. 7 the plane is generally similar to that in Fig. 3, but again, the angularity of the leading face does not reverse. Fig. 8 is like Fig. 2 except that the trailing edge has a second reversal as to both of its faces. In Fig. 9 the blade is quite similar to that in Fig. 2 but toward its leading edge the blade has a straight portion, whereas that in Fig. 2 is curved from edge to edge. In Fig. 10 the second reversal occurs only on the trailing face. In Fig. 11 the reversal occurs on the leading face and in Fig. 12, two reversals occur on the leading face, while in both views there is no reversal of the trailing face as distinguished from all other views.

It has been found from experience that fans or blades constructed according to this invention are much more efficient or have greater capacity for the production of air movement than prior blades for the same purpose. While the invention may be used for any purpose where it is desired to cause the movement of air or other fluids, it has been tested in practice for certain special uses, such as for fans for automobile radiators. In this connection the improved results of the invention were demonstrated by a test as follows:

An automobile was driven over a prescribed course with a definite load and for two trips during one of which it was equipped with an ordinary fan and during another of which it was equipped with a fan embodying this invention. During the two trips, the load, speed and other conditions were identical and the ground travelled was the same. The conditions were intentionally aggravated so that during both trips the automobile operated with the radiator steaming. In other words, the duty was unusually high. It was found from this test that when the automobile was equipped with a fan embodying the present invention the production of steam was at least cut in half, if not further reduced. Other tests have also demonstrated in practice that fans embodying this invention produce greater flow of air or fluid pressure than other fans for the same purpose.

While the drawings show quite a number of different forms of blade, it will of course, be understood that the invention is not limited to the forms shown, but is capable of considerable modification within the scope of the appended claims.

What I claim is:

1. A fan of the propeller or screw type for circulating air or other fluids, having one or more blades, the trailing face of each blade being so shaped that the angle between the same and the axial plane decreases to zero from the leading edge towards the trailing edge and reverses so as to become negative over a portion of such face.

2. A fan of the propeller or screw type for circulating air or other fluids, having one or more blades, the leading face of each blade being so shaped that the angle between the same and the axial plane decreases to zero from the leading edge towards the trailing edge and reverses so as to become negative over a portion of such face.

3. A fan of the propeller or screw type for circulating air or other fluids, having one or more blades, the leading and trailing faces of which are so shaped that the angle between the same and the axial plane decreases to zero from the leading edge towards the trailing edge and then reverses so as to become negative over a portion of such face.

4. A fan of the propeller or screw type for circulating air or other fluids, having one or more blades, the trailing face of each blade being so shaped that the angle between the same and the axial plane decreases to zero from the leading edge towards the trailing edge, then reverses so as to become negative over a portion of such face and again reverses adjacent to the trailing edge.

5. A fan of the propeller or screw type for circulating air or other fluids, having one or more blades, the leading face of each blade being so shaped that the angle between same and the axial plane decreases to zero from the leading edge towards the trailing edge, then reverses so as to become negative over a portion of such face, and again reverses adjacent to the trailing edge.

6. A fan of the propeller or screw type for circulating air or other fluids, having one or more blades, the leading and trailing faces of which are so shaped that the angle between the same and the axial plane decreases to zero from the leading edge towards the trailing edge, then reverses so as to become negative over a portion of the rear or trailing half of such faces, and again reverses adjacent to the trailing edge.

In testimony whereof I hereby affix my signature.

MERRITT R. WELLS.