April 15, 1952 R. B. BERANEK 2,592,851

FAN WHEEL

Filed April 10, 1950

Fig. 1

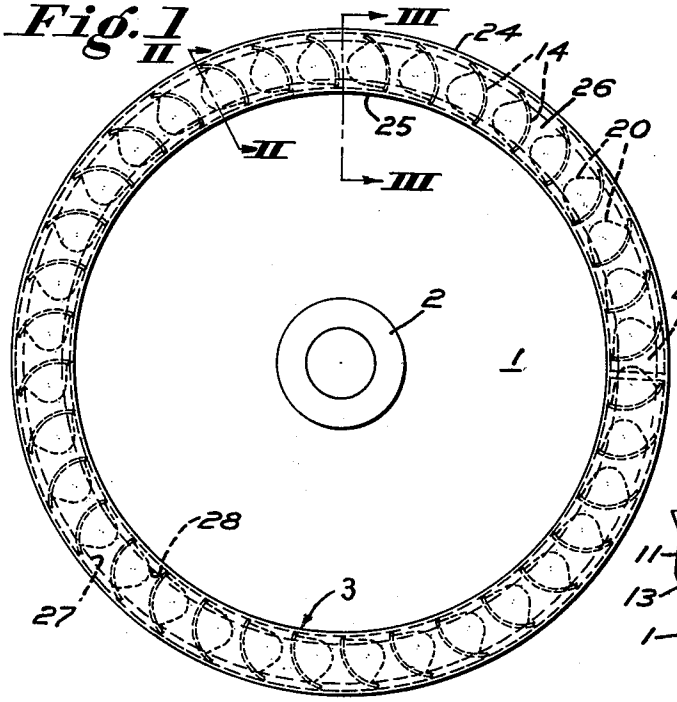


Fig. 3

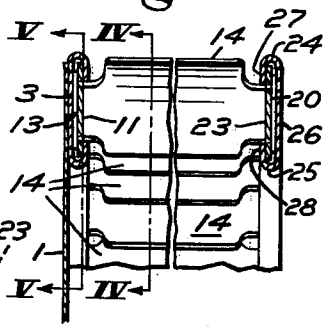


Fig. 4

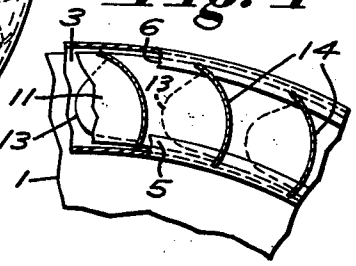


Fig. 2

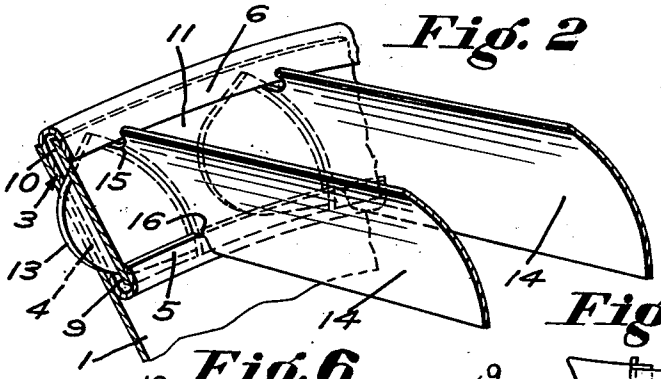


Fig. 5

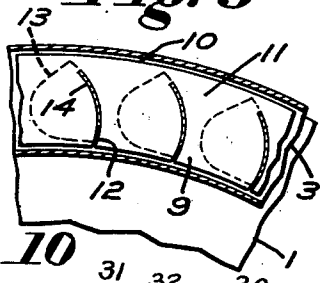


Fig. 10

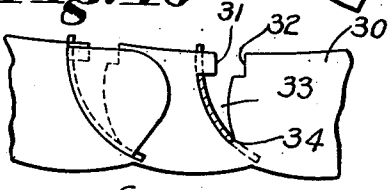


Fig. 6

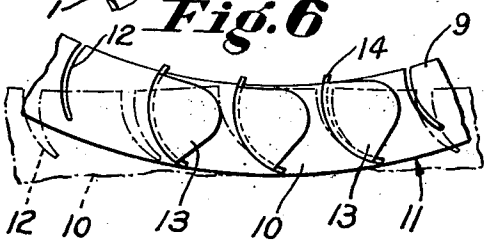


Fig. 7

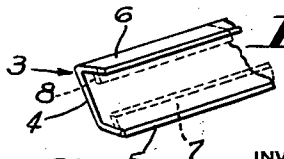


Fig. 8

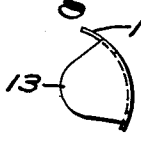
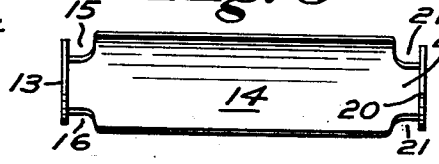


Fig. 9



INVENTOR

Rudolph Bruce Beranek

By: Andrew K. Foulds

his ATTORNEY

Patented Apr. 15, 1952

2,592,851

UNITED STATES PATENT OFFICE

2,592,851

FAN WHEEL

Rudolph Bruce Beranek, Columbus, Ohio, assignor to American Blower Corporation, Dearborn, Mich., a corporation of Delaware

Application April 10, 1950, Serial No. 154,989

3 Claims. (Cl. 230—134)

1

This invention relates to new and useful improvements in rotors of the type having blade members cooperable with a fluid medium and relates more particularly to a fan or blower wheel for movement of air or gases.

An object of the invention is to provide a blower wheel of novel construction which may be easily and readily fabricated in quantity production.

Another object is to provide a blower wheel which may be completely assembled from sheet material parts, such as steel, and which will be durable and rigid in its proper usages.

Another object is to provide a novel and rapid method of constructing a rotor wheel having fluid contacting blade members.

This invention consists in the improved structure and cooperative arrangement of parts of the rotor wheel and in the method of construction thereof, all to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawings, to be taken as part of this specification, there are fully and clearly illustrated several preferred embodiments of the invention, in which drawings:

Figure 1 is an end view of a fan wheel embodying the invention,

Fig. 2 is a detail view, partly in section and enlarged with respect to Fig. 1, taken on the line II—II of Fig. 1,

Fig. 3 is a view in section, also enlarged, taken on line III—III of Fig. 1.

Fig. 4 is a view in section on the line IV—IV of Fig. 3, but with parts broken away to better show the structure,

Fig. 5 is a view on the line V—V of Fig. 3,

Fig. 6 is an enlarged detail view of a blade member spacing and locking plate with several blade members in position and showing in dash-dot lines the plate configuration in strip form prior to receiving the blade members and being bent into an annulus or ring,

Fig. 7 is an enlarged detail view of a portion of one of the carrying or rim members for supporting the blade members, shown in its wheel assembling stage and showing in dash-dot lines its completed blade member supporting stage,

Fig. 8 is an enlarged end view of one of the blade members,

Fig. 9 is an enlarged view of a blade member in rear or side elevation, and

Fig. 10 is a detail view of another preferred form of spacing and locking plate before being bent into annular form but having blade members set in assembled position, one blade member being in section for clarity.

2

Referring to the drawings by characters of reference, 1 designates a supporting plate or disk member to which a shaft receiving hub member 2 is rigidly secured. The peripheral portion of the supporting member 1 has rigidly secured thereto an annular carrying or rim member 3 which is concentric with the hub 2. The carrying member 3 has a flat annular body portion 4 with inner and outer peripheral portions or flanges 5, 6, respectively, which, as seen in Fig. 7, extend originally substantially normal or at right angles to the body portion 4 to receive other parts of the wheel assembly. These portions 5, 6 in their final stage of assembly are directed toward each other in overlying relation to the body portion 4, as by bending, so that the portions 5, 6 cooperate with the portion 4 to provide opposed facing channels 7, 8. Received in the channels 7, 8 are the inner and outer marginal portions 9, 10, respectively, of a blade member locking and spacing ring or annular plate member 11 having equispaced curved slots 12 therethrough with open inner ends and extending inward across the plate member from its inner periphery. Positioned between the plate member 11 and the body portion 4 are the end flanges 13 of the air or gas moving blade members 14. The upper and lower flange edges adjacent the blade members underlie the flanges or peripheral portions 5, 6 such that they extend into the channels 7, 8. The slots 12 are designed to have a final shape which will conform to the blade members 14 which may be flat or have a backward or forward curvature as is well understood in the art. The blade members 14, as shown, have a curvature transverse to their length such as to conform to the final curvature of the slots 12, which also permits sliding movement of the blade members thereinto. At the flanges 13 each of the blade members 14 has a neck portion of reduced width formed by upper and lower edge recesses 15, 16, respectively, providing receiving spaces for the flange or peripheral portions 6 and 5, respectively. The flange or peripheral portions 5, 6 are clamped or stressed tightly upon the marginal portions 9, 10, respectively, of the spacer member 11 to hold it and the flanges 13 rigidly against the body portion 4 and to the rim or carrying member 3. The flanges 5, 6 also seat at their edges against the blade members and particularly the bottom of the recesses 16 and 15, respectively, so as to position the blade members longitudinally of their receiving slots and transversely of the rim 3.

The other ends of the blade members 14 are provided with flanges 20 which are similar to the flanges 13 and which are spaced from the upper and lower edges of the blade members by recesses 21 similar to the recesses 15, 16. These other blade member end portions 22 are received in conforming slots in a locking and spacing ring or annular member 23 similar to the annular member 11 and its slots. The annular member 23 and flanges 20 are received in opposed facing channels 24, 25 in an annular carrying or rim member 26 similar to the member 3. The member 26 has inturned flanges or peripheral portions 27, 28 which are similar to and serve as do the flanges 5, 6 to stress and clamp the marginal edges of the plate member 23 and the flanges 20 against the body portion of the rim member 26.

The method of assembly or construction of this fan wheel permits of rapid and easy fabrication which is a highly desirable feature. The blade members 14 are preferably stamped and bent, or may be otherwise fabricated from the sheet material, such as steel, to the form and configuration desired, such as is shown in Figs. 2, 8 and 9, each having the transverse end flanges 13 and 20 and having the blade member end recesses. After the ring or carrying members are stamped and cut or otherwise formed from the sheet metal to the configuration of the dash-dot lines of Fig. 6, a pair of them are positioned in a substantially horizontal plane in spaced relation with the open slot ends directed upward. The blade members are then positioned or set in these slots, resting at the bottoms of their recesses 15 against the closed slot ends. The carrying members 11 and 23 are then bent or rolled into concentric circular form with a resultant closing of the slots upon the blade members or such that the slots have substantially parallel side edges as in the full line showing in Fig. 6. This partial assembly is then seated in the oppositely positioned carrying or rim members 3 and 26 and against the oppositely positioned and spaced body portions thereof, while the flange portions 5, 6 and 27, 28 are in open position, as shown in full line Fig. 7. These flange portions 5, 6, 27 and 28 are then bent over and stressed against the inner and outer peripheral edges of their respective spacer plate members 11 and 23 which clamps the blade member flanges 13 and 20 tightly between their respective body portions 4 and 26 and their respective carrying members 11 and 23, thus tightly holding the ends of the blade members 14 in position, as above described. The rim or carrying member 3 may then be secured by any suitable means, such as spot welding or the like, to the hub plate 1 or to a hub plate secured to the blade members intermediate their ends, so that the member 3 is concentric with the hub member 2.

In Fig. 10, the annular plate or carrying members of Fig. 6 have their blade member receiving slots of a somewhat different form. Each of the locking and spacing ring or plate members, designated 30, in Fig. 10 has a locking means for closing the slot open ends and comprising cooperable flange and recess portions 31, 32 formed at the inner marginal portions of the plate members 30. In this form, Fig. 10, the length of the slots 33 between the flange portion 31 and the slot inner end 34 is of substantially the same arcuate length as the width of the blade members between the recesses 15 and 16, note the sectioned blade member in Fig. 10. Accordingly, upon forming the plate members 30 into an annulus, each flange portion or ear 31 passes through its blade member recess 15, locks over its blade member and extending circumferentially therebeyond locks or fits into the recess portion or socket 32, so that none of the blade members can be slid out of its receiving slot. This locking of the blade members in their slots occurs during the bending of the plate members 30 into circular form, so that the blade members which are carried with the plate member end portions into the top position of the wheel can not drop downward in or out of their slots during the final stage of forming the wheel blade sub-assembly. The wheel structure thus partially formed is then positioned in the facing channels of the opposed concentric rim members 3 and 26 and clamped therein as above described in connection with the carrying members 11 and 23.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent of the United States is:

1. A rotor for cooperating with a fluid medium, comprising a supporting member adapted for concentric mounting on a rotary shaft, an annular carrying member having a body portion secured concentrically to said supporting member, a plurality of fluid medium contacting blade members extending normal to the plane of said carrying member and each having an end flange lying against said carrying member, an annular locking member having a plurality of blade member spacing slots therethrough of greater length than the depth of said blade members and receiving said blade members, said locking member seated against and holding said flanges to said supporting member, said blade members having upper and lower edge recesses at said end flanges, said carrying member having inner and outer peripheral portions extending toward each other in overlying relation to said body portion to provide channels, said locking member and said flanges extending into said channels, said peripheral portions extending into said recesses and engaging said blade members to position said blade members longitudinally of said slots and said peripheral portions clamping said locking member and said flanges to said carrying member.

2. In a fan wheel, concentric laterally spaced annular plate members, each having a body portion and inner and outer circumferential portions extending toward each other to form channels with said body portion, blade members curved transversely of their length and extending in length between said plate members, each of said blade members having a blade portion and having end flanges of less width than said blade portion, one at each blade member end, extending transversely to its length and seating against its respective body portion, each of said blade members having upper and lower edge recesses at its opposite ends between said blade portion and said flanges and forming a neck portion of reduced width, annular blade member spacing and locking plates lying one against each of the opposite sets of flanges, said locking plates and said flanges extending into said channels, said locking plates each having blade member spacing slots therethrough conforming to blade member curvature and of greater length than said blade member neck portion, said slots opening through the inner peripheral edges of said locking plates, said circumferential portions of said spaced concentric plate members extending into said blade member recesses and engag-

ing said blade members to position said blade members longitudinally of said slots, said circumferential portions rigidly clamping said locking plates and said flanges to said concentric plate members, and said blade member edge recesses being of a depth and width substantially equal to the length of said channels so that the channels may be formed over the locking members and edge flanges after initial assembly without damaging the blade portions.

3. In a fan wheel, a plurality of blade members, each having a blade portion of predetermined width, and flanges of less width than said blade portion and extending transversely thereto, and upper and lower edge recesses at opposite ends forming a neck portion of reduced width between said blade portion and said end flanges, annular channel shaped blade supporting members, one at each end of said blade members and receiving said end flanges, annular spacer members co-operating one with each of said channel shaped members and having spacer slots receiving said neck portions for spacing said blade members, said spacer members being wider than said end flanges, said channel-shaped members having their channel flanges bent inward over the edges of said spacer members and said end flanges to hold the same compressively in position, and said edge recesses being of a width and depth greater than the length of the inwardly bent channel flanges to permit the inward bending of the same upon initial assembly without damaging said blade portions.

RUDOLPH BRUCE BERANEK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,637,652	Ness	Aug. 2, 1927
1,700,017	Bender	Jan. 22, 1929
2,293,512	Levy	Aug. 18, 1942
2,315,407	Evans	Mar. 30, 1943
2,357,618	Swift	Sept. 5, 1944
2,470,966	Abbott	May 24, 1949
2,496,179	Schwarz	Jan. 31, 1950