Jan. 6, 1942. W. ZELLWEGER 2,269,049

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Filed May 27, 1940 2 Sheets-Sheet 1

Fig. 1

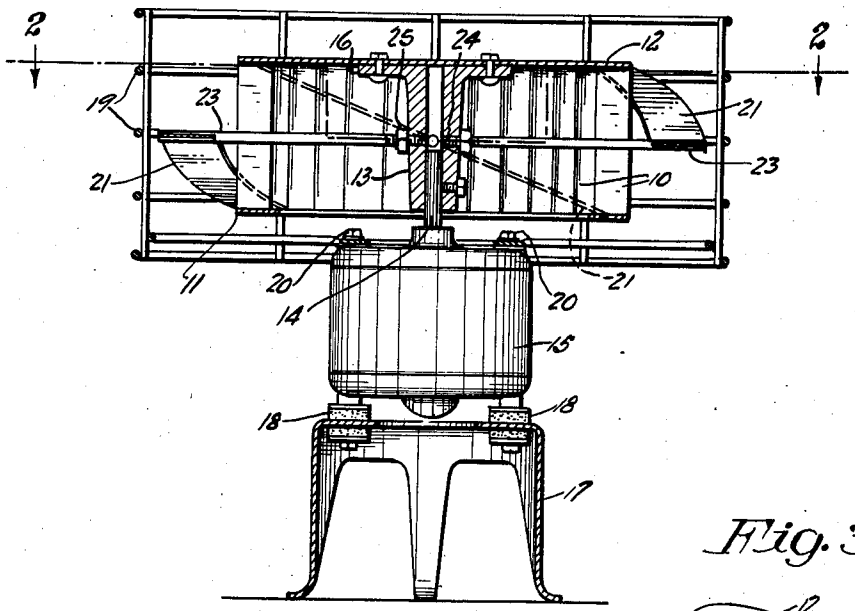

Fig. 3

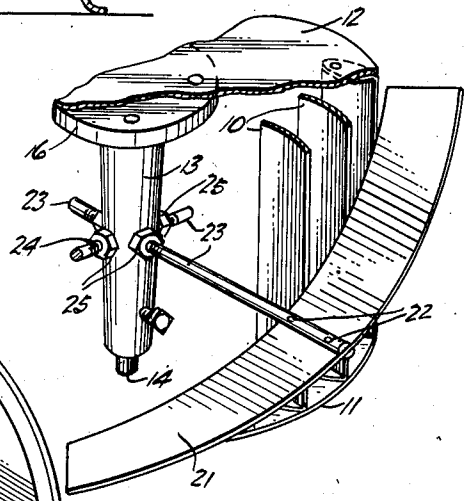

Fig. 2

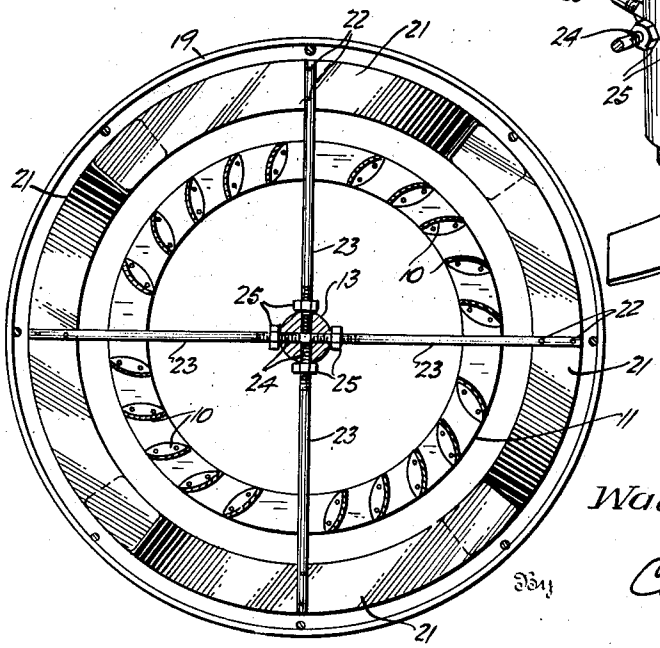

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Fig. 4

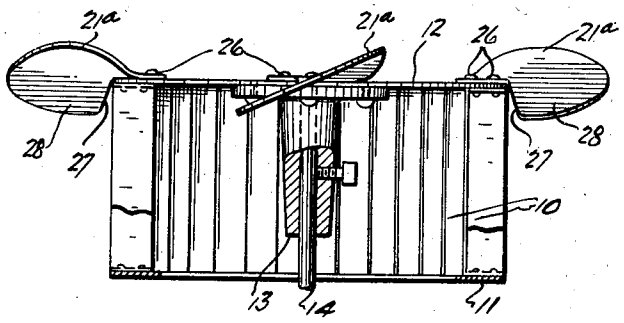


Fig. 5

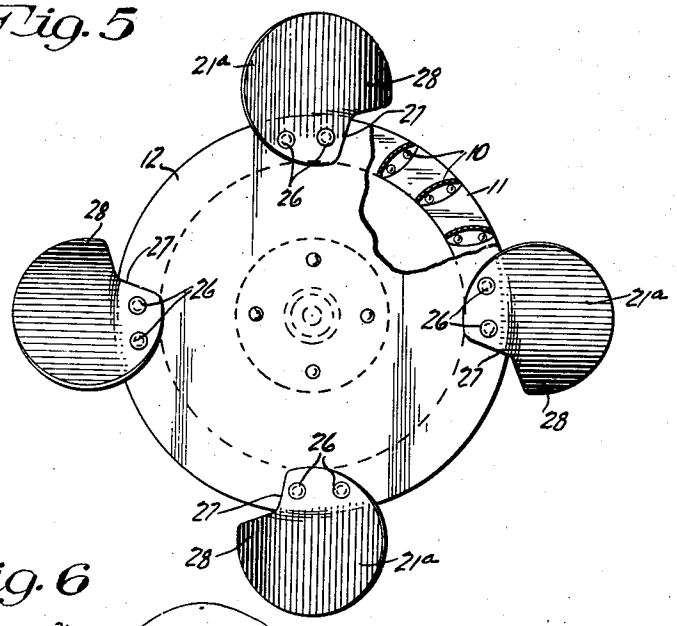
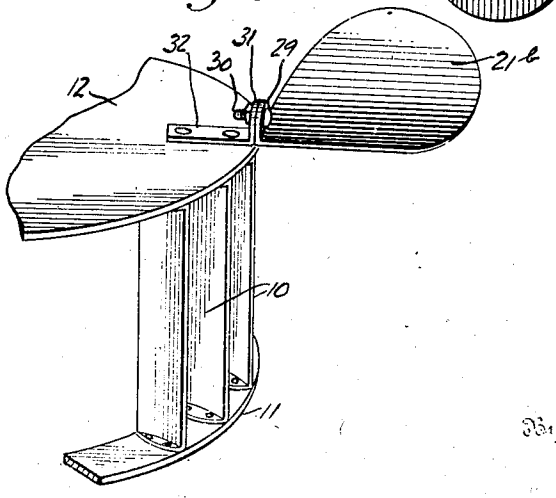


Fig. 6



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Patented Jan. 6, 1942 2,269,049

UNITED STATES PATENT OFFICE

2,269,049

FAN

Walter Zellweger, St. Louis, Mo.

Application May 27, 1940, Serial No. 337,376

6 Claims. (Cl. 230—45)

This invention relates to improvements in air circulating fans.

The primary object is to provide a blower type or centrifugal fan having deflecting or propelling vanes or blades so arranged as to guide the air currents discharged from the fan at any selected angle relative to the axis of rotation. Another object is to provide a fan having the usual blower vanes positioned to discharge the air centrifugally and with outward deflector vanes arranged to rotate with the fan about a common axis and to deflect and direct the discharged air at desired angles. A further object is to provide a fan assembly of this type in which the deflecting vanes are readily adjustable according to the angle and direction in which it is desired to direct the air.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

Fig. 1 is a vertical cross sectional view through a fan constructed in accordance with my invention.

Fig. 2 is a horizontal section substantially along the line 2—2 in Fig. 1, the motor and supporting parts being omitted.

Fig. 3 is a fragmentary perspective view of the blower fan and one deflecting vane or blade.

Fig. 4 is a side elevation, partially in section, showing a blower fan and a modified type of deflecting vane or blade mechanism.

Fig. 5 is a plan view of the structure shown in Fig. 4, a section of the upper plate being broken away.

Fig. 6 is a fragmentary perspective view of a blower fan showing still another modification of the deflecting vane or blade.

Referring now more particularly and by reference characters to the drawings, I show a centrifugal or blower type fan which in itself may be of any usual form and construction. This fan, with reference particularly to Figs. 1–3 of the drawings, comprises a series of vanes 10 set up between a flat lower mounting ring 11 and upper mounting plate or disk 12 and disposed at angles such that, when rotated around an axis centered with respect to the circle on which the vanes are mounted, they will draw in air at the center through ring 11 and discharge the air centrifugally or radially outward. The fan may of course be mounted and supported in any position, but as here shown it operates on a vertical axis and is mounted by a hub 13 on the shaft 14 of the driving motor 15. The hub 13 is rigidly mounted by an upper diametrically enlarged flange 16 on the underside of the top plate 12.

The motor 15 may of course be supported in any suitable manner and as here shown is secured upon a floor base or stand 17 by shock absorbing mountings 18. A guard 19 encloses and protects the fan and is mounted at 20 on the motor in the illustrated structure. This guard is considerably larger diametrically than the fan itself in order to afford clearance for the deflecting or guide members of my invention.

These guide members, in the embodiment shown in Figs. 1–3, take the form of elongated, relatively narrow blades or vanes 21 which, viewed from above, are arcuate in shape and curved on a radius somewhat greater than that of the fan 10. Centrally these blades, as they will be hereinafter generally termed, are secured at 22 to elongated mounting shafts or spoke rods 23 which are extended radially inward between adjacent fan vanes 10, at equally spaced points, and are threaded at their ends 24 into radial tapped sockets in the fan hub 13. Lock nuts 25 threaded on the inner ends of the shafts 23 allow these shafts to be rigidly locked with respect to the hub and it is therefore possible to adjust the blades 21 to any angle or pitch relative to the plane of rotation and lock them at the selected angle. As herein shown four of such blades are used, although this number may be varied as required or desired, and preferably the length of the blades is such that they substantially overlap each other at the ends as viewed from above. See Fig. 2.

The blades 21 so mounted are of course rotatable with the fan 10 and as the air is discharged radially, tangentially or centrifugally from the fan, the blades are in position to contact the air stream and deflect or guide the same at any desired angle relative to the axis of rotation. This angle may be controlled at will by variation of the pitch or angle of the blades. The rotating blades serve to compress and pitch the air stream after it leaves the blower fan and therefore can throw the largest volume of air a considerable distance, whether at a ninety degree angle to the axis, substantially parallel therewith, or at intermediate angles. The kinetic energy of the air stream is lessened very little by the action of the rotating deflectors and certainly less than is the case with stationary deflectors, due mainly to the fact that the direction of flow need not be changed as much by the rotating blades. The fan thus can work against

a relatively great resistance and will operate with good efficiency in combination with such auxiliary equipment as air filters, air washers, heaters and duct work of all kinds.

For summer use in room cooling the fan is preferably located near the floor so that the horizontally moving air stream entering the fan will be picked up from the relatively cool lower strata of air and then, by use of my guide members, this air may be distributed at any desirable angle to the fan axis. The continued recirculation of the air in this manner will thus provide the maximum of comfort to users of the room. The discharged air stream may be distributed at the desired angle without changing the elevation or location of the fan, simply by properly adjusting the pitch of the deflector blades.

In the structure shown in Figs. 4 and 5 the blower fan is of the same construction as that previously described and has the vanes **10** set between the ring **11** and plate **12** and the hub **13** for connection to the motor drive shaft **14**. The guide members, deflector vanes, or blades **21***a* in this case, however, are substantially circular members of sheet material and they are secured by fasteners **26** to the outer upper margins of the fan plate **12**. Notches **27** cut in the members permit them to be twisted or angled bodily with respect to the rigidly mounted portions and provide downwardly and tangentially inclined wing portions **28**.

These members **21***a* thus are so disposed that as they rotate with the fan, they will effect the distribution of the discharged air and deliver the same upward at any desired angle. The delivery angle may be varied by bending these members to the desired pitch. Obviously the members might be mounted as well upon the lower edge of the fan, particularly in the case of an overhead installation, while the combination of deflector or guide members on both upper and lower edges will result in an air distribution over a wider zone than is possible with only upper or lower mounting. Such variation and combinations are held to be within the scope of my present invention.

In Fig. 6 the deflector or guide member **21***b* is substantially like the members **21***a* in Figs. 4 and 5, but has an ear or lug **29** at its inner side adapted for pivotal mounting by a bolt **30** upon the end **31** of a bracket **32** secured to either the upper plate **12** of the blower fan as here shown, or to the lower ring **11** thereof. This type of mounting permits a possibly more convenient adjustment of the pitch angle and the operation is otherwise the same.

It is obvious that any suitable number of the guide members may be used, and any combination of the various mountings may be assembled in order to best meet the exigencies of any particular installation.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. A fan mechanism comprising a blower type fan having vanes disposed to discharge air outwardly from the axis of rotation, and elongated arcuate blades supported outwardly of the fan for rotation therewith to control the direction of flow of the air discharged by said vane, the said blades being supported for adjustment to various pitch angles relative to said axis of rotation.

2. A fan mechanism comprising a blower type fan having vanes disposed to discharge air outwardly from the axis of rotation, and elongated arcuate blades supported outwardly of the fan for rotation therewith, the said blades being supported for adjustment about center points on axes at right angles to the axis of rotation, and said blades acting upon the air discharged from said vanes to control the direction of flow thereof.

3. A fan mechanism, comprising the combination with a blower fan having vanes for discharging air outwardly with respect to the axis of rotation, and a hub for supporting the fan, of a series of deflector blades of arcuate shape disposed outwardly of the fan in the path of the air discharged therefrom and operative to impel said air in a desired direction, shaft members secured to the blades and extended inwardly radially therefrom, and the said shaft members being adjustably connected with the fan hub for pitch adjustment of the blades with respect to the axis of rotation of the fan.

4. A fan mechanism comprising, the combination with a blower type fan having centrifugally discharging vanes set between upper and lower mounting members, of guide members secured by their margins to one mounting member and notched adjacent said secured margin whereby outer portions of the guide members may be adjusted to pitch angles with respect to the axis of rotation of the fan, said guide members being adapted to guide and direct air discharged centrifugally from the vanes.

5. A fan mechaniism comprising, the combination with a blower type fan having centrifugally discharging vanes set between upper and lower mounting members, of guide members arranged outwardly of one mounting member and pivotally connected at inner margins thereof for adjustment to pitch angles with respect to the axis about which the fan rotates, the said guide members being adapted to act upon and guide the flow of air discharged from said vanes.

6. Air guiding means for a centrifugally discharging blower type rotary fan, comprising flat elongated blades disposed around the outer circumference of the fan and having rounded inner edges to closely follow the curvature of the fan, the said blades being overlapped at their ends and being adjustably supported at their medial portions whereby they may be secured at selected pitch angles relative to the axis of rotation of the fan.

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