April 16, 1946. W. L. KISLING 2,398,380

DEFLECTOR FOR AIR CIRCULATING UNITS

Filed April 8, 1943

FIG. 1.

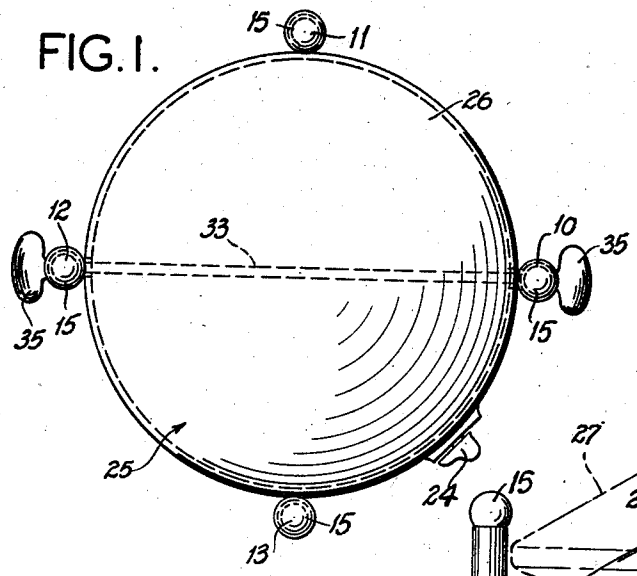


FIG. 3.

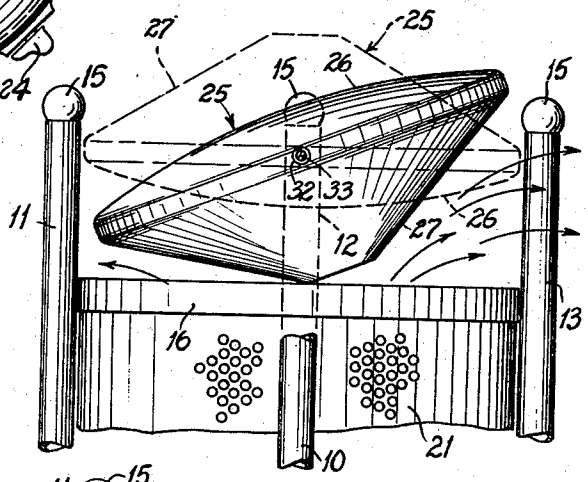


FIG. 2.

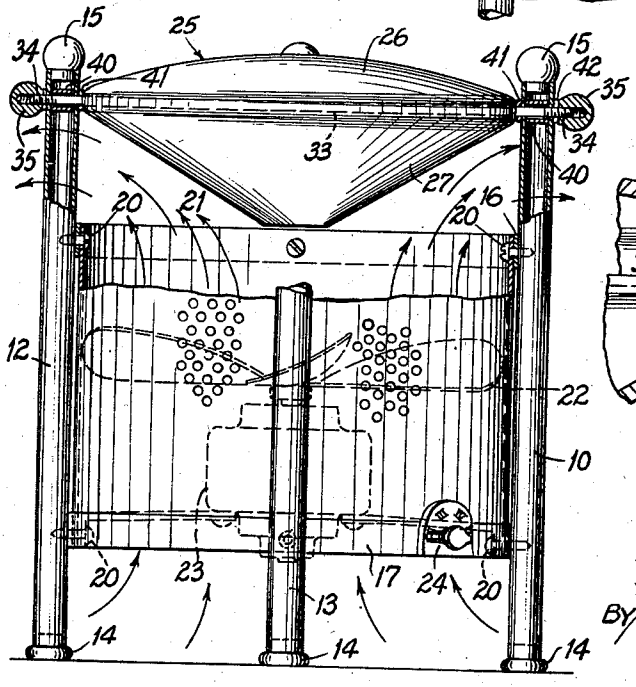
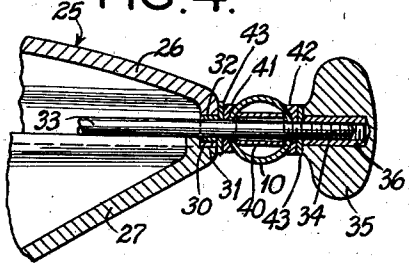


FIG. 4.



INVENTOR;
WILLIAM L. KISLING
BY Robert B. Terry
ATTORNEY

Patented Apr. 16, 1946

2,398,380

UNITED STATES PATENT OFFICE

2,398,380

DEFLECTOR FOR AIR CIRCULATING UNITS

William L. Kisling, St. Louis County, Mo.

Application April 8, 1943, Serial No. 482,354

12 Claims. (Cl. 230—274)

This invention relates to improvements in deflectors for air circulating units, and more particularly to improved agencies for varying the direction and characteristics of air stream delivered by air circulating units of baffle type. Although for brevity of title and description, such units are herein referred to as circulating units, they are sometimes, and more aptly, designated as air recirculating units.

Baffle type air circulating units have come to be widely utilized for room air circulation and personal cooling purposes, and prevalently consist of portable or semi-portable assemblies each embodying a fan, driving motor therefor, and a baffle or deflector located in the discharge stream of the fan. Such units are sold in various types, such as floor models, desk or table units of somewhat smaller size, and the column mounted or suspended types. In air circulators of the general type in discussion, the fan stream is delivered against a frusto-conical or similarly shaped baffle which is fixed in position with respect to the fan, and hence the fan stream, so that the air stream delivered by the unit is always constant in direction, pattern and characteristics. It is often desired for many personal reasons, to vary the angularity of the air stream; also it is often desirable, instead of directing the baffled stream in an annular or circular pattern, to concentrate at least the major portion of the discharged air in a pattern of a more or less restricted beam, or one of somewhat fan shaped characteristics. It is also highly desirable according to the different uses to which circulators of the type noted are devoted, to vary the angularity of the stream discharged by the unit, in respect to vertical direction, while providing full facilities for varying the pattern of the stream in one or a plurality of horizontal directions. None of these results being possible by a baffle fixedly related to the associated fan, the present improvements objectively attain fully, the several results noted.

Among the more important objects of the invention is the attainment of the full bodily adjustment of a baffle with respect to a fixed baffle axis; as preferably embodied, there is objectively attained a pivotal adjustment of a baffle for the general purpose noted, about a horizontal axis, in a unit embodying a vertical shaft fan.

Yet another important object of the invention is attained in a baffle arrangement, assembly and structure such as to provide a choice of baffling surfaces of differing characteristics in their effect on the air stream.

An additional important object is attained in facilities for varying the angle of a baffle element to the discharge stream of the associated fan, within limits, irrespective of choice of any of a plurality of differing baffle surfaces.

A still further marked advantage of present improvements is attained in facilities for a choice, in devices of types noted, of either a circular or annular direction of air stream say over a full 360 degree range, or a considerably more angularly restricted air stream, to enable its concentration relatively close to a given linear path.

Yet another object of the invention is importantly attained in an improved construction of baffle, of the general type and for the general purpose noted, as an improved article of manufacture, and which is of improved characteristics in shaping, may be readily formed to provide a choice of air baffling surfaces, and which exhibits remarkably low resonance.

The foregoing and numerous other objects will become more readily apparent from the following detailed description of a preferred embodiment of the improvements, particularly when considered in connection with the accompanying drawing, in which:

Fig. 1 is a top or plan view of an air circulator unit of baffle type embodying present inmprovements;

Fig. 2 is a side elevation, with certain parts shown in section, of the unit of Fig. 1;

Fig. 3 is a fragmentary side elevation of the unit, illustrating the facilities for selecting differing deflector surfaces and for adjusting the baffle irrespective of the surface utilized, and

Fig. 4 is a fragmentary section in a vertical plane illustrating one means of enabling adjustment of the baffle about an axis, and showing certain features of the baffle construction.

Referring now by characters of reference to the drawing, the circulator unit per se, apart from baffle construction and mounting, does not necessarily embody any elements of important novelty, but it may be noted for completeness in an operative structure that one such assembly is formed of a frame characterized by four exterior pillars or columns 10, 11, 12 and 13. These are supplied with suitable supporting feet 14, are tubular in form, and are surmounted by ornamental caps 15. The frame further comprises a plurality of annular elements such as 16 at the top, and 17 at the bottom secured as by screws or the like 20 to the four pillars.

A perforate enclosure 21 is secured to and supported by the rings 16 and 17, and serves as

will appear, to shroud the fan, driving motor and any accessories and appurtenances within the unit. In the unit illustrated a four-blade propeller type fan 22 is driven by a motor 23 conveniently controlled as by a switch generally indicated at 24, the latter being of a type to provide if desired, for selective motor speeds.

It will be obvious that the fan 22 is preferably only slightly less in diameter than the inner diameter of the enclosure 21 and discharges upwardly after the manner indicated by the arrows of Figs. 2 and 3, against a baffle member indicated generally at 25.

Referring now more particularly to the nature and construction of baffle 25, it is preferred to form this member symmetrical, as a hollow element, and ordinarily although not necessarily, of circular transverse section as shown. When circularly formed, as shown, it is constructed of an upper and a lower hollow portion, and formed about a central, depthwise axis. The material of which the baffle or deflector is formed has been selected with a view of minimizing in fact substantially obviating the resonance effects heretofore sometimes exhibited by certain units employing a fixed metal baffle of sheet or hollow construction. The baffle is preferably formed by molding a thermoplastic mixture which may consist for example, of a phenol-formaldehyde condensation product, with which may be admixed to the extent desired, (if any) certain bodying ingredients such as wood flour, cotton or asbestos fiber or the like. For convenience in molding the baffle 25, it preferably consists of an upper portion designated at 26 (Fig. 4) and a lower portion 27. The two units 26 and 27 are by further preference marginally formed to provide a rabbeted connection or joint, and to this end a shouldered portion or flange 30 is provided somewhat inwardly of the margin of element 27. It is also desirable that the two companion halves or mating portions 26 and 27 of the baffle be thermoplastically united so as to provide a permanent bond between the parts of the baffle, say along the marginal zone 31. As a convenience for mounting as will hereinafter more clearly appear, there may be molded into one of the elements, shown as the upper member 26, metal bushings 32, there being one of these in each of a pair of diametrally spaced zones, as will later appear.

For the purposes both of enabling the presentation to the fan discharge stream of a selected one of a plurality of baffling surfaces, and to enable a considerable angular adjustment of the baffle or deflector irrespective of which surface is selected, there is provided what constitutes in essence, a trunnion, pivotal or swingable mounting of the baffle, such that the entire baffle structure may be bodily moved as a unit so as to bring a given portion of either surface closer to or further from the fan 22. There is thus provided as a pivotal mounting for the baffle structure 25 either a pair of oppositely disposed pivot elements or an arrangement which in effect unites the two pivot elements into a single unit, such as a through rod constituting an axis member and designated at 33. The rod 33 is preferably of substantially greater length than sufficient to extend through the baffle 25, and is provided at each of its opposite ends with a screw threaded portion 34 adapted to receive in threaded engagement, a combined nut element and handle element 35, a pair of which are provided. The handles 35 may each conveniently consist of a molded plastic body into which is molded a tubular, metal, nut-forming portion 36, engaging in assembly the threads on portions 34 of the rod.

To receive the rod 33, two of the opposite pillars, say 10 and 12, are transversely apertured, and preferably but not necessarily provided with internal bracing sleeves 40. In register with the opposite ends of the apertures in the pillars are a pair of metal saddle washers 41 and 42 engaging which are, for reasons of frictional retention as will appear, one or more non-metallic elements such as fiber washers 43.

With further reference to the structure of baffle 25 it is particularly to be noted that the perimetral portion is convexly rounded so as to avoid any semblance of sharp edges or margins, which in baffles of more usual type tend to introduce disturbing eddy currents in the stream. It will be particularly noted also that one of the baffling surfaces, say that provided by member 26, is of a very gradual or relatively slight curvature, being curved on a substantially uniform radius as considered in any section parallel to the fan axis. In considerable contrast, the deflector surface provided by portion 27 is flared outwardly to a considerably greater angle, and is shown as formed substantially as the surface of a frustum of a cone. It is perhaps equally desirable, however, that the surface be given a slight curvature, either concavely or convexly, but preferably the latter.

The function of the baffle when adjusted to a position as shown by Fig. 2, will be at once apparent in that it will serve to deflect the air from fan 22 in an annular pattern over a full 360 degree range and will serve to direct this stream markedly upwardly, as well as radially outwardly of the unit. In such usage the unit will be located for example centrally of a room, with the occupants ranged about the fan so as to be affected substantially equally thereby.

Referring now to the facility for selecting a different baffling surface so as to attain a different pattern of air stream, it will now be obvious that merely by loosening one or both of the nuts, the baffle may be rotated through any desired angular range for selecting the different baffling surfaces, in the arrangement as shown, a full 360 degree pivotal movement of the baffle 25 being possible. It is however sometimes desirable for compactness, to locate the fan 22 extremely close to the baffle, in which case even though the baffle may possess all of the angular range necessary for useful variation in pattern and direction of the air stream, removal of rod 33, inversion of the baffle, and reinsertion of the rod 33 may be necessary in changing from one type of baffle surface to another.

The foregoing description has related primarily to the selection of different baffling surfaces, but it will now have become obvious that, irrespective of whether the surface of member 26 or the surface of member 27 be selected, the baffle assembly as a whole may be tilted to any desired position within permitted angular limits if any be imposed. It now appears obvious that this may be accomplished by loosening, preferably of the nuts 36 by rotation of handles 35, manually positioning the baffle as desired and tightening up on the handle nuts. Frictional retention of the baffle in adjusted position is provided for by engagement and cooperation of the metal washers 41 and 42, and the one or more fiber washers 43. For adjustment purposes, it is preferred that the arrangement be such that the baffle will journal through its bushings 32 on the rod 33,

but if desired the baffle may obviously be secured to the rod, and the latter be permitted to rotate in the elements 40 of columns 10 and 12.

An important advantage is provided in the facilities for bodily shifting the baffle structure 25 other than merely varying the "up or down" characteristics of the air stream. Repeated experiments have proven that with the baffle tilted relatively little, at most only a minor portion of the total volume of air delivery will emanate from the low side of the baffle, and by far the major portion will be delivered out of the zone of the unit adjacent the high side of the baffle. Each baffle surface being of an area substantially coextensive with the effective area of the fan discharge stream, the tilting adjustment makes possible a new result, namely, the facility for imparting a definite directional effect to the air stream deflected from the higher baffle portion. This occurs in a somewhat fan shaped pattern, but it approximates near the fan what may be designated as a beam directioning of the predominant air current.

A moderate experience by the user in the various air patterns obtainable by first selecting the baffle surface desired and secondly, by varying the angular presentation of the baffle to the fan discharge stream, will reveal a remarkable flexibility of the unit, in that the unit may be readily adapted to the best comfort of a single individual close to the unit, or, when desired, may be otherwise set for the personal cooling of a number of occupants of a given room, for example. The wide possibilities of variation of air stream lend themselves also to a marked improvement in the ventilation of sleeping rooms, smoke-clearing of offices, and for a number of evaporating or drying purposes as well as manifold other uses.

It will have appeared that while the combination of handles 35 and takeup nuts 36, is not strictly necessary to effect solely the clamp nut function in baffle adjustment, nevertheless these members serve admirably not only their baffle-positioning function, but as lifting handles in a small or portable air circulator unit, to enable it to be moved readily from place to place as desired.

It will have appeared that the invention as described serves fully to attain all of the several objects hereinabove expressly stated, as well as numerous others implied from the more detailed description. The detail of description is, however, to be understood solely in an instructive rather than in any restricting sense, numerous changes being possible in the parts, their combinations and arrangements, all within the intended scope of the claims hereunto appended.

I claim as my invention:

1. In an air circulator unit, a fan, a motor for driving the fan, a housing about the fan, a baffle characterized by a smooth, unbroken convex surface and a perimeter characterized by an absence of sharp edges, and of such nature as gradually to deflect the fan stream with a minimum of turbulence and diffusion, the baffle being mounted to extend substantially across the discharge stream of the fan, and extending slightly above the housing in such manner that the housing aids in directing the fan stream directly onto the baffle, a pivot rod extended through a portion of the baffle and threaded on one end, and a clamping nut engaging the threaded portion of the pivot rod and coacting with a fixed element of the unit, the baffle member being bodily rockable as a unit about an axis coincident with the pivot rod.

2. In an air circulator of the general type described, a fan operable about a vertical axis, a motor for driving the fan, an enclosure about the motor and fan forming a vertical frame and including a plurality of vertical frame members of the unit, a baffle mounted across the discharge stream from the fan, and arranged with the major portion of the baffle surface beyond the enclosure a pivot for the baffle bridging the vertical frame members, and clamping means coacting with the pivot, whereby the baffle may be adjustably disposed in various angular positions about the pivot, yet fully within the fan stream, and secured in adjusted position by said clamping means.

3. In an air circulator unit of the general type described, a fan, a fan motor, a frame structure for supporting and partly enclosing the fan and motor, the frame structure including a pair of longitudinal frame elements, a baffle carried by the longitudinal elements of the frame structure and extending substantially across the discharge stream of the fan, a trunnion mounting for the baffle, formed in part by the longitudinal frame elements, enabling it to be bodily adjusted to different angular positions in the fan stream, and a clamping device associated with the trunnion mounting adapted to position the baffle in each of its various adjusted relations to the fan.

4. The combination and arrangement of elements recited by claim 3, but further characterized in that the baffle is supplied with a pair of opposed, perimetrally located bushings, and the trunnion mounting of the baffle is constituted by a through rod coacting with said bushings and frame elements to constitute a pivotal mounting for the baffle.

5. In a unit of the general type described, a fan and fan driving means, a frame, a hollow, substantially enclosed baffle formed to provide a pair of markedly dissimilar, convex air deflecting surfaces, each of smooth and gradual contouring to minimize turbulence, and provided with supporting portions in opposite zones of the baffle perimeter, mounting means for the baffle carried by the frame, and coacting with said supporting portions to enable the baffle selectively to be disposed to present the differently characterized baffling surfaces to the air stream of the fan.

6. In an air circulating unit of deflector type, a frame, a fan, a fan motor, a deflector or baffle provided with a pair of differently sloped, opposite, convex surfaces, rod means coacting with the frame for supporting the baffle, the rod, baffle and unit being formed so as to enable selective changes in position of the baffle on the rod whereby to present to the fan stream different selected baffling surfaces, and clamping means including the rod means and frame, for holding the baffle in its several positions.

7. The combination and arrangement of elements recited by claim 6, but further characterized in that the rod is provided with a threaded portion, and the clamping means includes a nut coacting with the threaded portion of the rod to enable the baffle to be adjustably positioned on the rod irrespective of the baffle surface selected for reactive effect on the air stream.

8. In an air circulator assembly, a fan, a driving unit for the fan, a frame and housing structure forming an enclosure about the fan and unit, and a baffle carried by the frame structure beyond the enclosing portion of the frame and housing

structure and disposed in the fan stream, in a position such that the enclosure coacts in directing the fan stream directly upon the baffle, the baffle being in form, a hollow, fully enclosed nonmetallic element of substantial depth, mounted substantially facewise with respect to the fan, and presenting an air deflecting surface dished outwardly toward the fan, and means coacting with the frame structure for releasably supporting the baffle in any of a plurality of different angular positions in the fan stream.

9. As an article of manufacture, a baffle for use in substantially facing relation to a propeller type fan, the baffle being formed as a hollow structure circular in transverse section, and characterized by opposed outwardly projecting air deflecting faces of substantially dissimilar slope, the perimeter and faces of the baffle being of substantially rounded contouring throughout, and so characterized by an absence of sharp edge or marginal portion in any zone engaged by the air stream from the fan, the opposite face-forming portions of the baffle being of substantially dissimilar baffling characteristics, whereby to enable a choice of air deflecting surface upon inversion of the baffle with respect to the air stream from the fan with which it is utilized.

10. In an air circulator assembly of portable type, a frame structure, a motor, a fan driven thereby and a baffle carried by the frame structure, a pivot element for the baffle carried by the frame structure, the pivot element being provided with threaded ends extending through the cooperating parts of the frame structure, a pair of handles adapted to facilitate lifting the unit, each of said handles provided with a nut threadedly engaging the ends of the pivot element, the baffle, frame, pivot element and nuts being related in assembly so as to permit change in angularity of the baffle about the associated pivot element, by manipulation of the handles.

11. In an air circulator unit of the general type described, a fan, a fan motor, a baffle of circular transverse section, a frame structure by which the elements of the unit are carried, and including a pair of oppositely disposed frame members, a pivot rod having threaded ends and extending through the frame members and diametrally through the baffle, a pair of lifting handles, one adjacent each of said frame members, a nut carried by each of said handles and engaging the pivot rod, and frictional retaining elements between the baffle and each of the frame members whereby the baffle is normally frictionally retained in an adjusted position with respect to the fan, but may be readily released for adjustment to other positions.

12. In an air circulator assembly of portable type, a frame structure, a motor, a fan driven thereby, portions of the frame structure forming an enclosure about the motor and fan, a baffle carried by the frame structure beyond the discharge end of said enclosure, a pivot element for the baffle carried by the frame structure, the pivot element being provided with threaded ends extending through opposite cooperating parts of the frame structure, nut members threadedly engaging the opposite ends of the pivot element, the baffle, frame, pivot element and nuts being related in assembly so as to permit change in angularity of the baffle about the axis determined by the pivot element.

WILLIAM L. KISLING.