Jan. 29, 1957 I. M. PETERSIME 2,779,264

PULSATORS

Filed Jan. 6, 1953 2 Sheets-Sheet 1

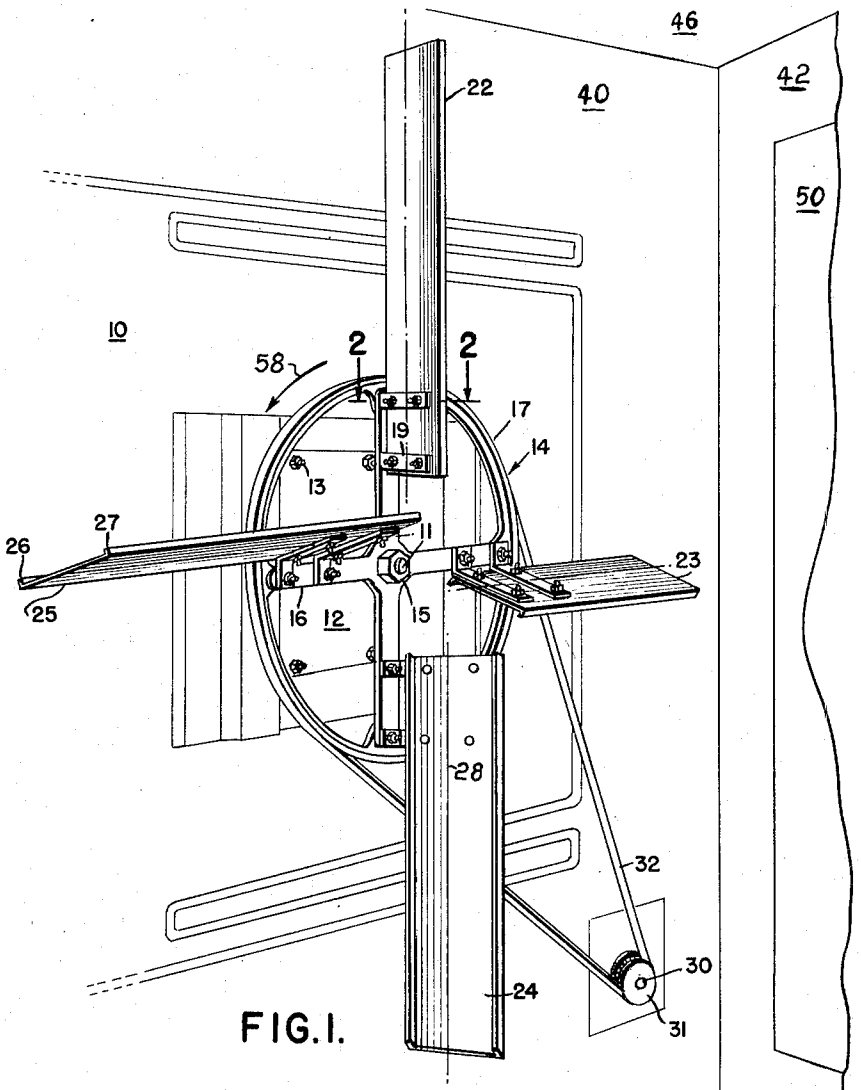


FIG. 1.

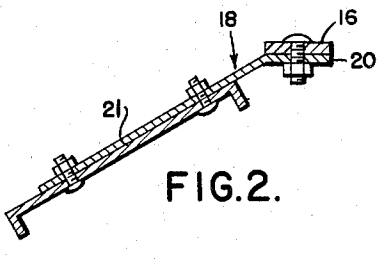


FIG. 2.

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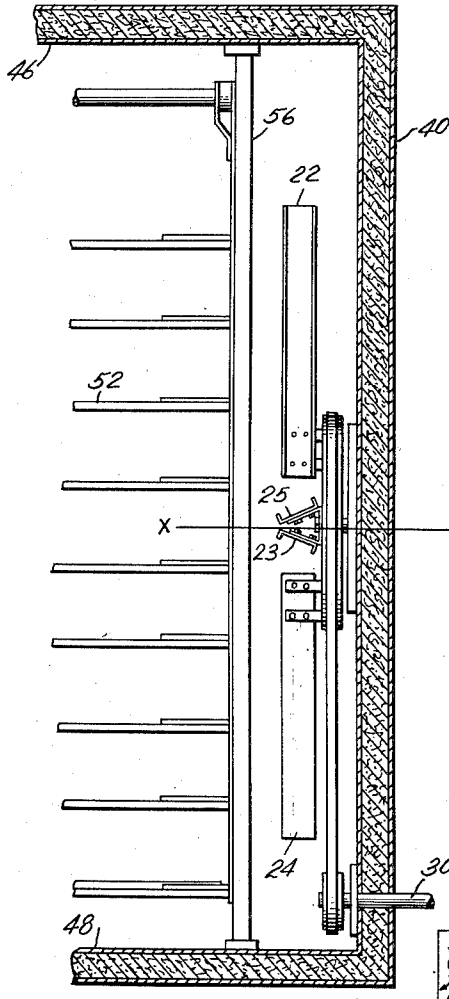


Fig. 3

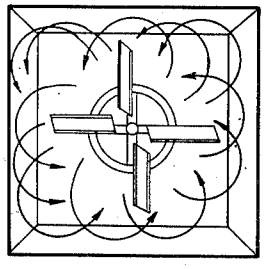


Fig. 4

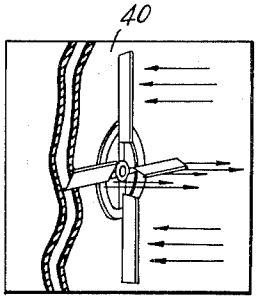


Fig. 5

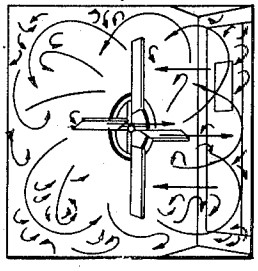


Fig. 6

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United States Patent Office 2,779,264
Patented Jan. 29, 1957

2,779,264

PULSATORS

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Application January 6, 1953, Serial No. 329,849

12 Claims. (Cl. 98—40)

This invention relates to incubators, and in particular to a device for producing pulsating air currents in an incubator.

Incubators which are often of considerable size are electrically heated and provided with means for introducing and withdrawing air. It is also known that some means for circulating air within the incubator is necessary. Many years of incubator experience has shown that for best results the air should pulsate within the incubator. By moving the air first in one direction and then in another, better results are obtained than if the air is merely flowed continuously in one direction. Many fans or agitators have been developed for moving the air. Some of these fans are used in conjunction with baffles and passageways in attempts to produce a uniform and pulsating air movement.

However, none of the previously developed fans or arrangements have achieved the optimum in air-flow requirements. Also the use of complicated baffles has resulted in increasing the cost of the incubators. It is accordingly an object of this invention to provide a fan or agitator which in itself embodies means for creating a pulsating flow of air within an incubator. The agitator or pulsator herein disclosed properly and adequately pulsates air and does so without the need for special baffling or other equipment.

It is most desirable that a pulsator for use in incubators be as simply constructed as possible in order to maintain the cost at a minimum and to insure satisfactory operation. It is accordingly a further object of this invention to provide a pulsating device which is extremely simple in construction and operation, and with which satisfactory operation for an extended period of time is assured.

These and other objects and advantages will become apparent from the following description of the present invention illustrated in the accompanying drawing, in which:

Figure 1 is a perspective view of a pulsator constructed in accordance with the invention, and showing the fan mounted as within an incubator.

Figure 2 is a sectional view taken along line 2—2 of Figure 1.

Figure 3 is a fragmentary sectional side view showing a pulsator constructed in accordance with the invention mounted in an incubator as in Fig. 1.

Figure 4 is a view illustrating the operation of the pulsator, and showing a portion of the air currents produced.

Figure 5 is another view showing a portion of the air currents produced by operation of the pulsator, and,

Figure 6 is a view showing the combined effect obtained through the air currents illustrated in Figs. 4 and 5.

Similar reference characters represent similar parts in the several figures.

Referring now particularly to the drawings: Figure 1 illustrates the fan mounted on the wall 10 of an incubator compartment. As shown, a shaft 11 is supported on

plate 12. Plate 12 is secured to the wall by means of nuts and bolts 13. A pulley-like wheel or base 14 is mounted on shaft 11. The wheel comprises a hub 15, spaced arms 16 and a rim 17 defining the perimeter of the wheel. Each of the spaced arms has mounted thereon two upstanding angle brackets 18 and 19. Each of the angle brackets comprises a leg 20 and an angularly disposed leg 21. Each of the brackets 18 and 19 on each of the arms 16, is alined with the other bracket thereon. However, the pairs of brackets on diagonally opposite arms 16 have their legs reversely arranged with respect to the opposite pair. Blades or impellers 22, 23, 24 and 25 are each connected to a pair of brackets 18 and 19. Each of the blades may be formed of a piece of sheet metal and may be provided with upturned flanges 26 and 27 to provide strength and stiffness. It is seen that the blades on diagonally opposite legs of the wheel have their impelling surfaces reversely arranged with respect to each other. Blade 22, for example, when viewed as seen in Figure 1, extends vertically upward and outwardly to the left at an angle to the imaginary vertical plane extending centrally through the pulsator, whereas blade 24 extends vertically upward and outward to the right of the same vertical plane, and extends at an acute angle with respect to blade 22.

It is seen that the pulsator comprises blades having flat sides for imparting movement to the air. The blades are fixedly mounted on a wheel or base, and the wheel is rotatably mounted on a shaft. The shaft has a central axis about which the blades rotate. The blades are positioned with their flat sides extending substantially radially outward from the axis of rotation. (For convenience of construction and simplicity the blades are positioned as shown in Fig. 1. Obviously, the blades can be placed in exact radial position with respect to the axis of rotation. However, the cost of manufacture would be increased.) Alternate blades have their flat movement imparting surfaces (sides) facing toward one end of the axis of rotation and the other blades have their flat sides (air movement imparting sides) facing toward the other end of the axis of rotation. The axis of rotation can be considered to extend forwardly and rearwardly of the blades and to have a length at least equal to the distance between points x, x' in Fig. 3. Each of the blades has a longitudinal central axis 28 which extends centrally along the flat sides. The longitudinal central axis of all the blades lie in a common plane on one side of and parallel to the plane of wheel 14.

The pulsator can also be described as having flat air movement imparting members or impelling members or surfaces alternate diagonally opposite ones of which (see 22 and 24 in the disclosed form) face in one direction parallel to the axis of rotation (toward the front as viewed in Fig. 1), while the other blades (see 23, 25) face in another direction parallel to the axis of rotation (toward the rear as viewed in Fig. 1), and with longitudinal central axis, all of which lie in a common plane. The common plane intersects the axis of rotation at right angles.

The pulsator may be driven by means such as shaft 30, pulley 31 and belt 32. The pulsator is driven at a speed selected in accordance with the amount of air to be moved, and also in accordance with the teachings of experience. The size of the pulsator is of course, governed by the size of the incubator. When the pulsator is rotated, it is obvious that each succeeding blade imparts movement to the air in a direction opposite that to which movement was imparted by the preceding blade. Thus, the air within the incubator is caused to pulsate to and fro.

The pulsator constructed in accordance with the invention is illustrated as used in an incubator. The incubator may comprise a wall 40, a side wall 42 and top

and bottom members **46** and **48**. Doors, such as **50**, are positioned in the side wall, and generally practically the whole side wall can be opened. The pulsator is shown mounted on wall **40**. A motor for driving shaft **30** can be mounted outside the incubator.

Figure 3 shows the pulsator mounted closely adjacent wall **40**. Shelves **52** are connected to uprights **56** and the trays containing the eggs are supported on the shelves. The trays normally comprise wire screen to facilitate the passage of air through the incubator. Ordinarily the pulsator would be mounted in an incubator in the manner shown.

Figures 4, 5 and 6 serve to illustrate the operation of the pulsator and the air currents which are generated. In these figures the pulsator is rotating counterclockwise. In Fig. 4 there is shown a general centrifugal movement of air created by the rotating movement of the pulsator. Such centrifugal movement is common to many fans. Figure 5, however, illustrates a movement of air which is not common to fans. It is seen that with counterclockwise rotation the upper and lower blades **22** and **24** will cause movement of air toward the wall **40**, but that the horizontally disposed blades will direct the air outwardly from the wall. These latter two described movements might be referred to as push and pull movements with the vertically disposed blades pulling the air toward the wall and the horizontal blades pushing the air outwardly. It is seen that the pulsator blades are not enclosed in a housing.

Figure 6 shows the effect obtained through combining the two air movements illustrated in Figs. 4 and 5, respectively. It is seen that the two air movements merge to produce a type of air movement resulting in complete diffusion throughout the incubator. The movements combine to produce a pulsating action which reaches into every corner of the incubator. There is no forced draft or harsh blast of air such as comes from an ordinary propeller-type fan. The push-pull movement is readily noticeable adjacent the pulsator. Ribbons or candle flames can be used to illustrate this action. The movement is particularly apparent in the portions of the blades nearer the center of rotation.

The air impelling or movement imparting surfaces of the blades are seen to be positioned to follow each other in an annular path as they rotate. The normal direction of rotation is indicated by the arrow **58** in Figure 1.

It is apparent that some modifications may be made in the herein disclosed device. While there are shown plain flat bladed elements **22** to **25**, blades of a different shape may be substituted. However, it is important that the air movement imparting faces be formed and arranged to produce the effects described. Also, a different number of blades may be employed than what is shown herein.

With the herein described pulsator, improved incubation settings are obtained. The air which is introduced and withdrawn by other means or by action of the pulsator is moved gently in and out of the egg trays. Localized temperature differences are thus obviated. The incubator is normalized. There is no forced draft or blast against one side of the eggs, as would occur with a uni-directional fan. Mild "breathing" air can be supplied to all sides of the eggs within an incubator efficiently and economically.

While I have shown and described a preferred form of my invention, it will be understood that variations in details of form may be made without departure from the invention as defined in the appended claims.

I claim:

1. A pulsator for incubators, comprising a wheel having a central hub, a rim, spaced arms interconnecting said rim and hub, angle brackets mounted on each of said arms, some of said arms being diagonally opposite other of said arms, each of said brackets having a base leg and an angularly disposed leg connected thereto, the angularly disposed legs of the brackets on diagonally opposite arms being disposed at an angle with respect to each other, and a blade connected to the last named legs of the brackets mounted on each of said arms, said blades comprising flat substantially straight elements, the blades connected to diagonally opposite arms of said wheel extending at an angle to each other with some of said blades facing in a first direction axially of said wheel and with respect to said rim, with some of said blades facing in a direction opposite said first direction.

2. A pulsator comprising a shaft, a wheel rotatably mounted on said shaft, spaced blades fixedly mounted on said wheel and extending substantially radially outward of the axis of rotation of said wheel, said blades having flat sides inclined with respect to said axis and adapted to impart movement to the ambient atmosphere upon rotation of said wheel, with the flat sides of alternate blades facing in one direction parallel to said axis of rotation and with the flat sides of the other blades facing in another direction parallel to said axis of rotation, each of said blades having a longitudinal central axis with the longitudinal central axis of all the blades lying in a common plane said blades being positioned to follow each other in an annular path as said wheel rotates.

3. A pulsator comprising spaced pairs of diagonally opposed blade-like elements rotatably supported for movement about an axis of rotation, said elements having flat sides for imparting movement to air, said sides extending substantially radially outward of said axis of rotation with alternate pairs of blades having their said sides facing in one direction parallel to said axis of rotation and with the other pairs of blades having their said sides facing in another direction parallel to the said axis of rotation, each of said blades having a longitudinal central axis with the longitudinal central axis of all the blades lying in a common plane said elements being positioned to follow each other in an annular path as said wheel rotates.

4. A device for imparting movement to air within incubators comprising a wheel, said wheel having opposite sides and a rim means for rotatably mounting said wheel within an incubator, blades attached to said wheel and extending radially outward of said wheel along one side thereof, said blades having surfaces for imparting movement to air as said wheel rotates, said surfaces of alternating blades facing in one direction parallel to the axis of rotation of said wheel and the said surfaces of the other blades facing in an opposite direction parallel to said axis said blades being positioned to follow each other in an annular path as said wheel rotates.

5. A pulsator for incubators comprising a wheel, means for rotatably mounting said wheel in an incubator, blades fixed to said wheel and having surfaces positioned to impart movement to air as said wheel rotates, the said surfaces of some of said blades facing towards one end of the axis of rotation of said wheel and the said surfaces of the other blades facing in an opposite direction parallel to said axis said blades each being positioned to follow each other in an annular path as said wheel rotates.

6. A pulsator comprising a rotatable member, means for mounting said member for rotation about an axis within an incubator, blades fixed to the said member each of said blades having surfaces extending radially outwardly from the axis of rotation of said member, said surfaces of some of said blades being positioned to impart movement to air as said member rotates and to face toward one end of said axis, the surfaces of the other blades being positioned to impart movement to air as said member rotates and to face toward the other end of said axis the said surfaces of the blades being positioned to follow each other in an annular path as said wheel rotates.

7. A pulsator for incubators comprising a wheel, means for mounting said wheel rotatably within an incubator, blades attached to said wheel, said blades being spaced on said wheel, each of said blades having an air impelling surface, said wheel having a rim and an axis of rotation,

said blade air impelling surfaces facing in the normal direction of rotation of the rim of said pulsator, but with the air impelling surface of each blade being disposed radially of said rim and at an angle of less than 90° with respect to the plane of said rim, with each blade having its air impelling surface facing axially with respect to said wheel in a direction opposite the direction the corresponding surfaces of the next adjacent blades face, and said blades having their said air impelling surfaces positioned to follow each other in an annular path as said wheel rotates about said axis.

8. A pulsator comprising a rotatably mounted base, angle brackets connected to said base at spaced points, blades attached to said angle brackets and radially disposed with respect to said base, said blades being arranged in diagonally opposed pairs, each blade of a pair having an impelling surface, the impelling surface of each blade facing axially with respect to said base in a direction opposite the direction the corresponding surfaces of the next adjacent blades face, the said air impelling surfaces of the blades being positioned to follow each other in an annular path as said wheel rotates.

9. A device for imparting movement to the atmosphere within an incubator comprising a rotatably mountable member adapted to rotate about an axis, spaced elements connected to said member, said elements having faces positioned to strike said atmosphere as said member rotates, the faces of alternate of said elements being positioned to impart movement to the atmosphere in one direction parallel to the axis of rotation of said member, the faces of the others of said elements being positioned to impart movement in the opposite direction, said faces being positioned to follow each other in an annular path as said member rotates.

10. A device for imparting movement to the atmosphere within an incubator comprising a rotatably mountable member adapted to rotate about an axis, spaced elements connected to said member, said elements having faces positioned to strike said atmosphere as said member rotates, the faces of alternate of said elements being positioned to impart movement to the atmosphere in one direction parallel to the axis of rotation of said member, the faces of the others of said elements being positioned to impart movement in the opposite direction, said elements having radially outer portions which are equidistant from the axis of rotation of said member.

11. A device for imparting movement to air within an incubator comprising a rotatably mountable member having a normal rotational axis, blades connected to said member and projecting radially outwardly from the said normal rotational axis, said blades having air impelling surfaces positioned to impart movement to air as said member rotates, with alternate blades having their air impelling surfaces facing in opposite directions along the axis of rotation of said member, the said air impelling surfaces of the blades being positioned to follow each other in an annular path as said wheel rotates.

12. A device for imparting movement to air within an incubator comprising a rotatably mountable member having a normal rotational axis, blades connected to said member and projecting radially outwardly from the said normal rotational axis, said blades having air impelling surfaces positioned to impart movement to air as said member rotates, with alternate blades having their air impelling surfaces facing in opposite directions along the axis of rotation of said member, said blades having radially outer portions which are equi-distant from the rotational axis of said member.

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