May 31, 1949. E. ZACHARIAS 2,472,039

ELECTRIC FAN

Filed Dec. 9, 1946

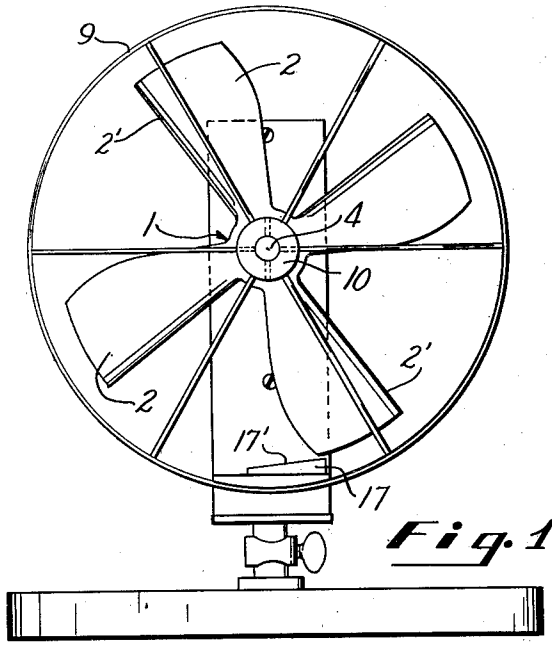



Fig. 1

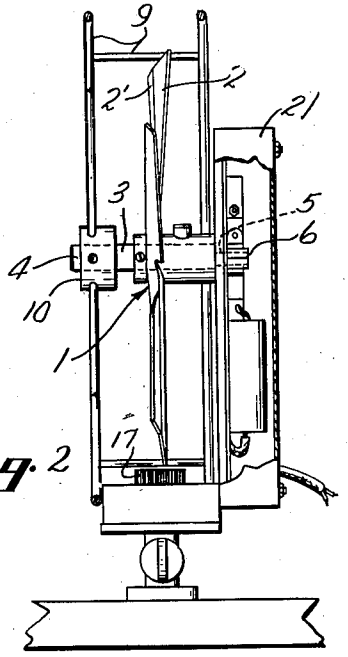



Fig. 2

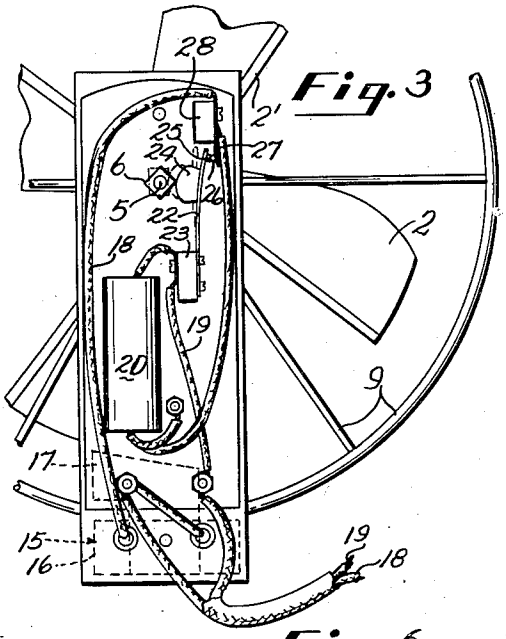



Fig. 3

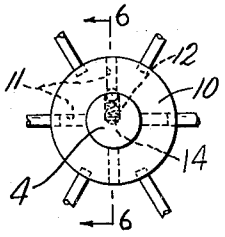



Fig. 4

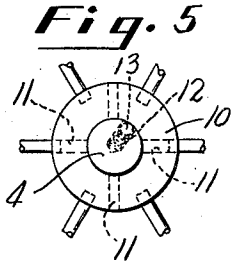



Fig. 5

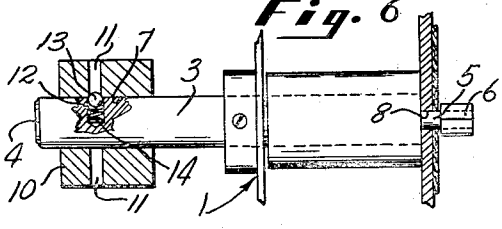



Fig. 6

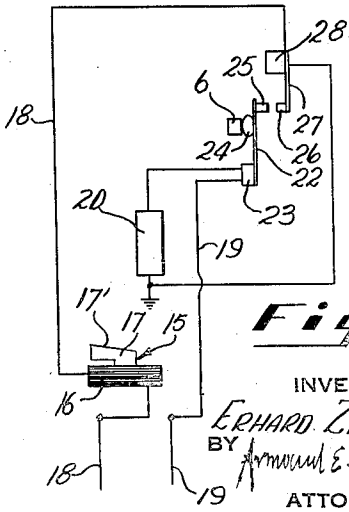



Fig. 7

INVENTOR
ERHARD ZACHARIAS
BY Armand E. Masthern
ATTORNEY

Patented May 31, 1949 2,472,039

# UNITED STATES PATENT OFFICE

2,472,039

## ELECTRIC FAN

Erhard Zacharias, New York, N. Y.

Application December 9, 1946, Serial No. 715,090

5 Claims. (Cl. 230—259)

1

My invention relates to an electric fan and more particularly to a fan of this kind which is operated electromagnetically.

My principal object is to provide a noiseless, simple and inexpensive fan of novel construction and capable of developing a strong torque and high relative speed.

With such subjects in view, and others which will appear as the description proceeds, the invention comprises various novel features of construction and arrangement of parts which will be set forth in the following description and claims, reference being made to the accompanying drawings which form part of the specification and which illustrate one embodiment of the invention.

The fan according to the invention is provided with an armature comprising metallic blades attractable by magnetic force arranged as usual; an electromagnet attracting and thereby revolving the blades of said armature when the electromagnet is supplied with electric current; means for interrupting the electric current temporarily at certain positions of the revolving armature; and detent means to fix the blades of the armature in a certain position when the fan is out of action.

In the accompanying drawings in which similar characters of reference indicate corresponding parts—

Figure 1 is a front view of an embodiment of my improved fan.

Fig. 2 is a side view of the same, partly in section.

Fig. 3 is a back view of the fan with the element box-cover removed.

Fig. 4 is an enlarged showing of the detent holding means.

Fig. 5 is similar to Fig. 4 except that the fan shaft has been slightly revolved.

Fig. 6 is a section along line 6—6 of Fig. 4, showing the detent means in greater detail.

Fig. 7 is a wiring diagram.

The fan armature 1 comprises several metallic blades 2, mounted as usual on a revolving shaft 3. A circular stationary wire frame 9 of known construction protects the revolving armature 1. A center disc 10 located in the front part of frame 9 is centrally perforated to form bearing 7 receiving the front journal 4 of the revolving shaft 3, as shown in Fig. 6.

An opening 8 is provided in the wall of a box 21, arranged adjacent to the back part of frame 9 for receiving and bearing the back journal 5 of shaft 3. Journal 5 is provided with a stub 6

2

of square cross-section, said stub extending into box 21.

The armature will be actuated by a fixed electromagnet 17 disposed below the blades in order to attract the same, thereby causing rotation of the armature. The electromagnet comprises coils 16 and a core of soft iron 15. Electric current is supplied to the electromagnet through circuit wires 18 and 19.

The current will be intermittently opened and closed by the means disposed in box 21, as shown in Figs. 3 and 7, and described below. Circuit wire 19 is connected with a metallic block 23 to which spring 22 is fixed. Said spring 22 is provided at its upper end with a contact point 25 and opposite to it, with a cam member 24. Said cam member consists of non-conducting material, preferably rubber. Member 24 is disposed to engage with the square-shaped stub 6. Circuit wire 18 is connected with a metallic block 28 to which a metallic spring 27 is attached, said spring being provided at its lower end with contact point 26. When the armature comprising shaft 3 and stub 6, connected to said shaft, moves from the position of stub 6 shown in dotted lines in Fig. 3 to the full line position, spring 22 will be bent back, contact point 25 will engage contact point 27, and the circuit will be closed. If springs 22 and 27 as well as stub 6 are in the position shown in Fig. 7, the circuit is interrupted. That means that the circuit is always closed when an edge of stub 6 engages with cam member 24 and bends it back, and that it is interrupted when one of the bases of stub 6 contact cam member 24. The electromagnet will be thereby energized and de-energized synchronously with the rotation of the armature. Clockwise the armature moves under magnetic action to the position in which the current is interrupted, and then it moves by momentum to a position where contact is made again. In this manner the circuit is intermittently made and broken.

In order to regulate the electromagnetic action during the make and break periods, condenser 20 is inserted in the circuit.

The magnetic action of core 15 is improved according to this invention by providing the same with a specially shaped top or surface 17' adapted to fit the shape of the outer ends of blades 2 to be attracted by said surface. This is shown in Fig. 1.

Blades 2 are shaped in a manner to produce the highest possible whirling motion when in rapid rotation. They are provided therefor at their rear sides with flanges 2'.

In order to insure that the blades are always under magnetic influence when the fan is to be started, that is, when a closed circuit is in existence when the current is supplied to the electromagnet at the start, detent means are provided to fix stub 6, together with the armature, in proper position when the fan stops.

Means of this kind, as shown in Figs. 4, 5 and 6, are provided partly in journal 4 of shaft 3 and partly in disc 10 belonging to the wire frame 9. Said means comprise a bore 12 provided in and revolving with shaft-journal 4 and in line with said revolving bore 12 four stationary bores 11, provided in disc 10. A spring loaded ball 13/14 inserted in bore 12 is adapted to engage with bores 11. It is evident that ball 13 will be pressed into bore 12 by wall 7 of disc 10 when shaft 3 is revolving quickly. In this case there will be no possibility for ball 13 to engage with one of bores 11. When, however, rotation is slowing down the spring loaded ball will eventually engage with one of the bores 11 as shown in Fig. 4, thereby fixing shaft 3 with blades 2 in a desired position. This position is determined by the arrangement of blades 2 on shaft 3 in relation to the arrangement of bore 12 in shaft journal 4. When shaft 3 stops rotating the blades have to be in a position as shown in Fig. 1, where they are under the influence of the electromagnet 17 in order to start rotation immediately when the current is turned on.

While I have described the principle of the operation, together with one embodiment of my invention, I desire to have it understood that the device shown is merely illustrative and that such changes may be made when desired as fall within the scope of the appended claims. For instance, the blades may be shaped and arranged on the shaft in order to provide an exhauster or a ventilator instead of a fan if so desired.

I claim:

1. An electro-magnetic fan comprising a salient pole magnetic stator provided with an energizing winding; a magnetic rotor for cooperating with the stator, said rotor consisting of a revolving armature comprising a revolving shaft provided with fan blades as rotor poles, said blades made of a material that is attracted by the magnetic forces generated in said stator; a make-and-break device connected in series relation with said energizing winding of the stator; means operated by rotation of said rotor for energizing and de-energizing said stator and thereby opening and closing said make-and-break device; and detent means likewise operated by rotation of the rotor for automatically positioning the rotor in an unbalanced magnetic relation to the stator as the circuit is broken and the rotor is brought to a standstill, whereby the fan becomes self-starting if switched on again.



2. An electro-magnetic fan as defined in claim 1, in which said make-and-break device comprises a stub of square cross-section, provided at and revolving with the shaft of the armature; and a contact device comprising a contact spring, contact being closed when the spring is pressed by one of the edges of the revolving stub and being interrupted when the spring is engaged by the base of said stub and thereby released.

3. A fan as defined in claim 1, in which said detent means comprises a stationary bearing carrying the rotatable shaft of the armature provided with the fan blades; and a number of bores symmetrically located in a circle inside said bearing; a spring loaded ball provided in a bore of the shaft in a position corresponding to the circle of bores inside the bearing, said spring loaded ball being adapted to engage in one of the bores of the bearing when rotation of the shaft slows down, said bore being arranged in a manner to fix at standstill one of the fan blades acting as rotor poles in proper position to the magnetic stator to start the fan and run up to speed if the contacts are closed.

4. In a fan as defined in claim 1, an electromagnetic salient pole having a top surface adapted to fit the shape of the outer end of the blades of the armature to be attracted by said core when energized.

5. In a fan as defined in claim 1, rotor poles consisting of fan blades, the outer edges of which are bent at right angles, said fan blades being symmetrically arranged at the revolving shaft in order to produce the highest possible whirling motion when in rapid rotation.

ERHARD ZACHARIAS.


## REFERENCES CITED

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

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 550,042 | Diehl | Nov. 19, 1895 |
| 1,005,572 | Parkerson | Oct. 10, 1911 |
| 1,212,282 | Tiffany | Jan. 16, 1917 |
| 2,063,773 | Warnick et al. | Dec. 8, 1936 |
| 2,233,933 | Anderson et al. | Mar. 4, 1941 |