A battery-operated miniature motor is mounted on a holder forming part of a pocket size housing, the holder being extendable from the housing, and a fan is secured to the rotor shaft of the motor. Batteries in the housing are electrically connected to the motor upon extension of the holder from the housing. In one embodiment of the invention, the holder comprises a slide forming the narrow wall of a trapezoid cross-section housing, this wall being movable relative to the other walls and carrying one of the end walls of the housing. In another embodiment of the invention, the holder is again the narrower base wall of a trapezoid cross-section housing, and the housing is divided into two sections with the two sections being hinged to the side edges of the holder so that they may be swung back to expose the motor and the fan. In a further embodiment, the housing includes a cup-shaped base and a similar shaped cover hinged thereto, and the holder is a partition hinged to the base and swingable up into a position engaging the free edge of the cover when the latter is open.

10 Claims, 9 Drawing Figures
MINIATURE ELECTRIC FAN

FIELD AND BACKGROUND OF THE INVENTION

This invention relates to a miniature electric fan comprising an electric motor lodged in the housing and having a rotor shaft on which a fan wheel is secured.

The purpose of such fans generally is to produce a cooling air stream. Besides use of the fans for cooling of technical units and the like, it is known also to use such fans in the form of table fans or wall fans at work locations, so as to supply a worker with a refreshing cool air stream, especially on hot and muggy days.

Known fans, however, have the disadvantage that, because of their size and outward form, they are not readily transportable, and because of their being fitted with a.c. motors, they can be operated only by connection to electric mains. Consequently, their use is very limited as to space.

SUMMARY OF THE INVENTION

The objective of the present invention is to provide a miniature electric fan of the type mentioned above which, not only is easily transportable but which also is light, can be easily carried in relatively small handbags, for example, so that the user can take it along everywhere, and is ready for use anywhere. In addition, the miniature electric fan embodying the invention is inexpensive to manufacture and easy to operate.

In accordance with the invention, this problem is solved in that a battery-operated miniature electric motor is secured to a holder which is mounted to be flapped out or pushed out relative to a pocket-size housing, in which are accommodated also one or more batteries.

Such a miniature electric fan is easy to transport and can readily be accommodated in handbags or pockets. Like a flashlight, it can be used anywhere irrespective of the existence of a commercial power supply. An especially important advantage is that both the fan motor and the fan wheel can easily be accommodated during transportation or when not in use, protected against external harmful influences, in the housing while, on the other hand, because the motor and fan wheel can be taken out of the housing, to avoid physical obstacles in the suction-side and compression-side airstream areas, the interfering housing parts are sufficiently removable or displaceable relative to the fan wheel so that a good blowing effect is attainable.

For the realization of these advantages, the housing forms may have any one of several preferably designs. In one design, the housing has an approximately symmetrical trapezoid-shaped cross section, and the miniature motor is fastened upright on the inside of a plate, the plate being located on the narrower side of the trapezoid. The plate has contacts, which, in the extended position of the plate, engage contacts connected with battery terminals fixed relative to the housing.

With this design, the holder of the miniature motor can be designed to be very narrow, so that it produces only a small air resistance in the suction area. The arrangement and fixation of the miniature motor on such a plate is easy and inexpensive to realize. The outer form of the entire housing thus is optimally adapted to the space requirement needed to accommodate the motor, the fan wheel and the batteries for operating the motor. The fan itself can be extended from the housing is a simple manner and very easily, and can be simultaneously switched on or off, while the fan is pushed back into the housing, the housing is closed on all sides.

Another object of the invention is to provide a miniature electric fan including a battery-operated miniature motor, which can be easily carried and can be simultaneously switched on or off, while the fan is pushed back into the housing, the housing is closed on all sides.

An advantageous embodiment of this form of construction resides in that the replaceable plate forms the bottom and is provided with a housing end wall at its end leading in the pull-out direction. To facilitate insertion and exchange of batteries, in a further development of this form of construction, the batteries are detachably secured on a slide plate. Another object of the invention is to provide a miniature electric fan which is inexpensive to manufacture and easy to operate.

An object of the invention is to provide a miniature electric fan which is inexpensive to manufacture and easy to operate.
electric motor mounted on a holder arranged to be enclosed in or extended from a pocket-size housing containing batteries for driving the motor.

For an understanding of the principles of the invention, reference is made to the following description of typical embodiments thereof as illustrated in the accompanying drawings.

**BRIEF DESCRIPTION OF THE DRAWINGS**

In the Drawings:

FIG. 1 is an elevation view of a miniature electric fan embodying the invention with the holder and the fan extended from the housing;

FIG. 1a is an elevation view of a miniature electric fan similar to that shown in FIG. 1, illustrating a different mounting means for the batteries;

FIG. 2 is a sectional view taken on the line II—II of FIG. 1 and looking in the direction of the arrows;

FIG. 2a is a sectional view taken on the line IIa—IIa of FIG. 1a and looking in the direction of the arrows;

FIG. 3 is a front elevation view of the fan housing shown in FIG. 1 in an inclined position of use;

FIG. 4 is an elevation view illustrating the closed housing of the miniature electric fan shown in FIGS. 1, 2 and 3;

FIG. 5 is a transverse sectional view of another embodiment of a miniature electric fan in accordance with the invention, illustrating the housing closed;

FIG. 6 is a view similar to FIG. 5 illustrating the housing opened; and

FIG. 7 is a transverse sectional view of another embodiment of miniature electric fan in accordance with the invention, illustrating the housing opened and the fan extended.

**DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Referring first to the embodiment of the invention shown in FIGS. 1 through 4, the miniature electric fan has, as referred to the symmetry lines 1 and 2, a symmetrical, approximately trapezoidal-shaped housing 3 with two inclined side walls 4 and 5 extending from parallel side wall portions 6 and 7. The side walls are interconnected by a cover wall 8 and a bottom wall 9, 10 parallel to cover wall 8. At its opposite ends, housing 3 is completed by substantially trapezoidal end walls 11 and 12.

In the embodiment of the invention having the bottom wall 9, as illustrated to the left of the symmetry lines 1 and 2, two batteries 13 and 14 are mounted on the inner surfaces of inclined walls 4 and 5, respectively, by means of known contact elements 15 and 16. The opposite longitudinal edges of bottom 9 are formed with grooves 17 into which there engage the end edges 18 and 19 of the inclined side walls 4 and 5, respectively. With this construction, bottom wall 9 can be pulled out of housing 3 in the direction of the arrow 20, as shown in FIG. 1.

A battery-operated miniature electric motor 24 is mounted on the inner surface of bottom wall 9 by means of a collar 21 in such a manner that its axis of rotation extends perpendicularly to the plane of bottom wall 9. Motor 24 has a rotor shaft 22 on which there is secured a four-blade fan wheel 23 whose diameter is a little smaller than the spacing of the inner surfaces of the parallel side wall portions 6 and 7 whose length is adapted to the height of fan wheel 23. Thus, fan wheel 23 just fits between these two side wall portions 6 and 7 when bottom wall 9 is reinserted into the housing, as shown in FIG. 4.

For the purpose of energizing motor 24 from the batteries 13 and 14, there are fastened on bottom wall 9, symmetrically with respect to the lines of symmetry 1 and 2, contact studs 25 which are brought into contact with counter-studs 26 when bottom wall 9 is pulled out of housing 3 in the direction of arrow 20 and fan wheel 23 is exposed. Counter-studs 26 are connected with the contact tabs 15 and 16 of the batteries 13 and 14.

In the embodiment of the invention having the bottom wall 9, shown to the left of the symmetry lines 1 and 2, batteries 13 and 14 must be inserted through the bottom aperture of housing 3 formed when bottom wall 9 is extended. This is obviated in the embodiment of the invention having the bottom wall 10, in which batteries 13 and 14 are not secured directly to housing walls 4 and 5 but are mounted on slides 27 displaceably mounted in bottom wall 10 and guided by means of skids 28 engaged in longitudinally extending grooves in bottom wall 10. Contacting clamping holders 31 and 32 are secured on skids 28 by means of pins 30. In this embodiment of the invention, clamping holder 32 has an upwardly bent cross-piece 34 in whose zone of movement there is a stop tongue 35 with a stop nose 36 which prevents a slide 27 from being pulled out of housing 3 unintentionally. In the pulled-out state of bottom wall 10, stop tongue 35 can be disengaged from cross-piece 34 so that the entire bottom wall 10 together with slides 27 and the two batteries 13 and 14 can be completely removed from the housing to facilitate replacement or reinsertion of the batteries. The exchange or reinsertion of batteries 13 and 14 thereby is facilitated as compared with the embodiment having the bottom wall 9. After insertion of batteries 13 and 14 into the clamping holders 31 and 32 of the slide 27, bottom wall 10 can then be inserted into housing 3 again and pushed down, the slide 27 being again retained in housing 3 by stop tongues 35 when bottom wall 10 is later extended.

In both of the embodiments shown in FIGS. 1 through 4, one end wall 11 is secured to bottom wall 9 or 10 so as to be movable outwardly along parallel walls or, respectively, the cover portions 46 and 47 so that the end walls can also be opened along with the side walls.

To expose fan wheel 23, shell halves 36 and 37 are pivoted open, after release of latches 45, into the position illustrated in FIG. 6. In this position, the half-shells 46 and 47 can serve simultaneously as a handle. It should further be noted that the end walls 11 and 12 of the housing 35 are bisected and are firmly connected with the side walls or, respectively, the cover portions 46 and 47 so that the end walls can also be opened along with the side walls.
In the position of shells 36 and 37 as shown in FIG. 6, motor 24 is energized, responsive to opening of housing 35, by contact-making means which have not been shown in the drawing, so that fan wheel 23 is rotated. From FIG. 6, it will be apparent that fan wheel 23 is completely exposed on the suction side as well as on the blowing side and, especially on the approach side, there are no hindering housing parts.

In the embodiment of the invention shown in FIG. 7, the housing comprises two shell halves 50 and 51, with shell half 50 forming the bottom portion and shell half 51 the cover portion. The shell halves 50 and 51 are interconnected by a hinge 53 along one pair of facing longitudinal edges. In lower shell half 50, two batteries 54 are arranged in laterally spaced parallel relation to each other, so that they leave an airspace therebetween. While the cavity formed in upper housing half 51 serves, in the closed state of the housing, to receive fan wheel 23. Fan motor 24 is secured centrally in a cover support 55 which is articulated, by means of a joint 56, to the front edge 57 of bottom shell half 50. The upper edge 58 of support 55 can be locked at the front edge of cover shell half 51.

It is, of course, readily possible to provide the joint 56 at the front edge 59 of the cover shell half 51, rather than at the front edge 57 of the bottom or lower shell half 50. To close the housing consisting of the two half-shells 50 and 51, and to position therein fan motor 24 with fan wheel 23, all that is necessary is to lay cover support 55 horizontally downward into the lower half-shell 50 in the direction of the arrow 60, and to swing cover shell half 51 closed in the direction of arrow 61.

The connection between the motor terminals and the battery poles, or, respectively, the clamping holders, takes place with the swinging out of cover support 55 through the medium of contact studs 62, 63 secured, on the one hand, to cover holder 55 and, on the other hand, to the bottom shell half 50 of the housing. These contacts are brought into engagement with each other in the position of the cover holder shown in FIG. 7.

Cover support 55, which serves simultaneously as a holder for fan motor 24, may be designed as a plate or as a strap type element, so that it causes a minimum of air resistance on the suction side of fan wheel 23. In addition, in the operating position shown in FIG. 7, fan wheel 23 is so far removed from housing shell 50 and 51. That the latter can exert no disturbing influence on the blowing action of the fan wheel.

While specific embodiments of the invention have been described in detail to illustrate the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A miniature electric fan comprising, in combination, a pocket size housing, a holder included in said housing for extension therefrom; a battery-operated miniature electric motor mounted on said holder and exposed outside said housing upon extension of said holder, said motor having a rotor shaft; a fan wheel secured to said rotor shaft; and at least one battery mounted in said housing for driving said motor when said holder is extended.

2. A miniature electric fan, as claimed in claim 1, in which said housing has an approximately symmetrical substantially trapezoid-shaped cross section including side walls having portions converging toward each other; said holder comprising a plate mounted on said converging side wall portions for displacement longitudinally relative to the housing to and from an extended position; said motor being secured to the inner surface of said plate with its rotor shaft extending perpendicularly to said plate.

3. A miniature electric fan, as claimed in claim 2, including first contacts on said plate connected to the terminals of said motor; and second contacts fixed to said first and second contacts being engaged responsive to extension of said plate from said housing to energize said motor.

4. A miniature electric fan, as claimed in claim 2, in which said plate forms the bottom wall of said housing; said housing having parallel end walls; the end wall located in the extending direction of said plate being secured to said plate for movement therewith.

5. A miniature electric fan, as claimed in claim 2, in which there are two batteries removably inserted in said housing.

6. A miniature electric fan, as claimed in claim 2, in which there are two batteries mounted on slide means displaceable along said plate for ready removal and reinsertion of the batteries.

7. A miniature electric fan, as claimed in claim 1, in which said housing has a substantially symmetrical and substantially trapezoid-shaped cross section including a bottom wall, a pair of side walls having portions converging toward said bottom wall, a top wall and a pair of end walls; said motor being mounted upright on the inner surface of said bottom wall with its rotor shaft extending substantially perpendicular to said bottom wall; said top wall and said end walls being bisected and the converging portions of said side walls being hingedly connected to opposite longitudinal edges of said bottom wall, whereby the resulting two halves of said housing may be swung open to expose said motor and said fan wheel.

8. A miniature electric fan, as claimed in claim 7, in which there are two batteries each mounted on the converging portion of a respective side wall; the housing halves, when fully swung to the open position, forming a handle for transport of said fan.

9. A miniature electric fan as claimed in claim 1, in which said housing comprises two half-shells hingedly interconnected at corresponding longitudinal edges, whereby one of said half-shells constitutes a bottom half-shell and the other of said shells constitutes a cover half-shell which can be swung between closed and opened positions relative to said bottom half shell; said cover being a planar element hingedly connected to the other longitudinal edge of one of said half shells and, in the open position of said housing, having its free end engaged with the other longitudinal edge of the other half shell to serve as a cover support; said motor being mounted on said cover support with its rotor shaft perpendicular to said cover support.

10. A miniature electric fan, as claimed in claim 9, in which said cover support is hingedly connected to said bottom half-shell; two batteries positioned in said bottom half-shell in laterally spaced parallel relation to leave an interspace therebetween; said motor being secured to extend inwardly from said cover support with said fan wheel being positioned outwardly of said cover support; said motor, when said cover support is swung down, being received in said interspace and said fan wheel being received within the cover half-shell when the housing is closed.

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