

"Depression and Elevation Angle Adjustment Device
for Electric Fan"

This invention relates to a device to enable a head part of an electric fan to operate in a depression or elevation angle.

Figure 17 - Figure 19 are the samples of the drawings showing depression and elevation angle adjustment devices of conventional electric fans published in the Japanese Utility Model Publication No. 49-43634. Figure 17 is a side view of an electric fan and Figure 18 is a section view of major portion and Figure 19 is an exploded perspective view of major portion.

In the drawings, (61) indicates a head part of an electric fan and comprises blades (62), an electric motor for blades (not shown), guards (63) etc. and is arranged such to be capable in depression and elevation of oscillating movements by a support (65) and a neck piece (67) explained later and (mounted on a support (65)) erected on a base (64). A bifurcated neck support (66) is formed on the upper part of the support (65), to provide side members (66a), (66b) in parallel and a groove (66c) on the inside of the side member (66a). (67) indicates a neckpiece having a hole (67a) to support a head part (61) and able to oscillate, having a side body (67b) to be pressed between the side members (66a) and (66b), and having a pivot tube (67c) at the central part of the side body. (67d) indicates an annular recess housing a helical spring, which will be explained later, formed around the periphery of said pivot tube (67c), and (67e) indicates a recess formed at the margin of the opening of the annular recess (67d). (67f) indicates a groove formed on the upper part of

the annular recess (67d) and (68) indicates the helical spring to absorb torque created by imbalanced load weight of the head part (61), having the one end (68a) of the spring housed inside the annular recess (67d) and bent axially and protruding outwards through the annular recess (67d), having the other end bent in the direction of the diameter of the spring and inserted in the groove (67f). (69) indicates an adjusting plate formed in the shape of a disc to be placed at the opening of the annular recess (67d), having a hole (69a) at the central part, with a round boss (69b) formed at the lower part, and with an arcuate hole (69c) in the upper part of the plate (69) formed with the holding parts (69d) each fitting to the recesses (67e) of the neckpiece (67) in the peripheral part, and having through the arcuate hole (69c) one end (68a) of the helical spring protruding. (70) indicates a position setting plate immovably interposed between the side body (67b) of the neckpiece (67) and the side member (66a) of the neck support (66) having a hole (70a) at the centre formed with a plurality of holes (70b) being fitted to the protruding boss (69b) arranged on the moving orbit of the boss (69b) of the adjusting plate (69) in its lower part, and formed in the upper part with a cutaway (70c) to which one end (68a) of the helical spring (68) is inserted. Further, the tip of one end (68a) of the helical spring (68) is to be inserted into the groove (66c) of the side member (66a) of the neck support (66). (71) indicates a pivot pin inserted into the pivot tube (67c) of the neckpiece (67) through the holes (70a) and (69a). (72) indicates a screw to be screwed to the end of the pivot

pin (71), and by having the pivot pin (71) and screw (72) fastened, the neckpiece (67) is fixed to the neck support (66).

As constructed above, in the device for depression and elevation angle operation of a conventional electric fan, the neck-
5 piece (67) moves around the centre of the pivot pin (71) together with the adjustment plate (69) when said head part (61) is moved to a depression or elevation position against the force of the helical spring (68). In this operation, the neckpiece (67), namely, head
10 part (61), is held in the designated position by the protruding boss (69b) of the adjustment plate (69) matching to the hole (70b) of the position setting plate (70) and the range of the depression or elevation movement of the neckpiece (67) is limited by the length of arcuate hole (69c).

In the depression and elevation angle adjustment device of the
15 above conventional electric fan, one end (68a) of the helical spring (68) is fixed and the other end (68b) moves to the direction to shorten the diameter of the helical spring (68) in its elevation angle position and moves to the direction to enlarge the diameter in its depression angle position. For this reason, there has been a problem that it is
20 difficult to have an equal movement both for depression and elevation positions due to different forces working on the helical spring (68) between, for the depression and elevation positions.

This invention is made to solve said problem and to provide a depression and elevation angle adjustment device for an electric fan
25 to obtain a depression and elevation angle movement by having the

helical spring work to one and same direction i.e. contract the spring diameter, in both cases of depression and elevation movements.

According to the invention, a depression and elevation angle adjustment device for an electric fan having a head part comprises
5 a neckpiece for supporting the head part, adjustment plates for holding the neckpiece and a helical spring housed in the neckpiece to absorb forces imposed by the weight of the head part, the device being operable so that the ends of the spring are acted on during depression or elevation adjustment of the neckpiece, one end of the
10 spring being acted on by a stopping plate or by the neckpiece itself, during elevation or depression adjustment respectively, whilst the other end of the spring is supported by an adjustment plate, the arrangement being such that during adjustment of the neckpiece, the diameter of the spring is always contracted.

15 Figure 1 - Figure 16 are the drawings showing one example of embodiment of this invention. Figure 1 is a vertical section view of the neckpiece portion. Figure 2 is a front view of the electric fan. Figure 3 is a right side view. Figure 4 is an exploded perspective view of the head portion oscillating device. Figure 5 is

a side view of the support body (partially sectional). Figure 6 is a partially enlarged view of Figure 1. Figure 7 is an enlarged section view of the line VII of Figure 5. Figure 8 is a left side drawing of the neckpiece. Figure 9 is a front view of the spring holding plate. Figure 10 is a drawing explaining working theory. Figure 11 - Figure 16 are drawings illustrating operations.

Firstly, referring to Figure 2 - Figure 4, an overall structure of an electric fan will be explained as follows: In the drawings, (1) is a front guard, (2) a guard ring formed along the periphery of the front guard (1), (3) a rear guard to hold the front guard (1), (4) blades housed in the interior of the front guard (1) and the rear guard (3), (5) an electric motor for driving blades (4) and the head portion (6) of the electric fan is constructed as shown in said (1) - (5). (7) is a substantially L-shaped support structure which holds the electric motor for blades on its upper part, (8) a handle fixed to the upper part of the support body (7), (9) a neckpiece connected to the lower part of the support body (7), (10) a holding piece equipped on the neckpiece (9) movable in a depression and elevation direction and preventing the lower part of the guarding (2) from moving forward, (11) a neckpiece cover to house the neckpiece (9), (12) a spindle protruding downward and fixed to a depression and elevation angle adjustment device (explained later) housed in the neckpiece cover (11), (13) a control box arranged in the lower part of the neckpiece cover (11), (14) its case, (15) a cover to cover the case (14), and (16) an ornamental panel placed in the front part of the control box (13) and

arranged with a push button switch (17). (18) is a spindle tube provided in the case (14) to hold a spindle (12), (19) an E-shaped ring checking an upward movement of the spindle and being placed to the end of the spindle (12), (20) an arm inserted and connected to the spindle (12) by a friction effect through a clutch bed (21),
5 (22) an electric motor for head oscillatory movement fixed in the interior of the case (14) by screws (24) via a support plate (23), (25) a crank fixed by a pin (26) to the axle of the electric motor for head oscillatory movement, (27) a rod with one end being pivotally
10 mounted to the tip of the crank (25) via a washer (28) and the other end pivotally mounted to the tip of the arm (20), (30) a time switch, (31) a knob for setting its time, and said (12), (18), (20) - (30) are stored in the interior of the control case (13).

As a result, the main body (32) of electric fan is constructed of
15 the head part (6) and said parts (7) - (31).

(33) is a support post, and (34) a tube body forming a main part of the support post (33), and the upper part of the support post (33) is connected to the bottom part of the control box (13) by a screw (35) for preventing its coming off, the lowest part of the support post (33)
20 is connected to a base (37) by a tube fixing screw (36). The base (37) is constructed of a bottom plate (38) and an ornamental plate (39) covering the upper surface. (40) is a cord through which electric power is supplied to the electric motors (22) and (5) for head oscillation and for blades, coming through the bottom plate (38) and
25 tube body (34).

In the electric fan comprised as above, on electric power being supplied, the electric motor (5) makes blades (4) rotate and send air through a front guard (1).

On the other hand, when electric power is supplied to the
5 electric motor for head oscillation, the crank (25) rotates and makes the rod (27) reciprocate and this reciprocal movement is transmitted to the arm (20).

For this reason, the arm (20) makes swaying movements around the centre of the axis and gives the support body (7) a swaying movement
10 via the spindle (12) connected to the arm (20) and the neckpiece (9). Thus the head portion (6) oscillates.

Furthermore, the double head oscillating device conventionally known is also installed at the joint location between the lower part of the control box (13) and the tube body (34). Details will be
15 omitted here.

Next, referring to Figure 1 and Figure 5 - Figure 16, the depression and elevation angle adjustment portion will be explained.

Referring to Figure 1 and Figure 5 - Figure 9, (45) is a screw to connect the lower part of the support body (7) to the back of the
20 neckpiece (9), and further the support body (7) is in its both lower sides connected to the neckpiece (9) by a screw (46) inserted through a groove (9a) provided in the neckpiece (9).

An annular cavity (9b) opened in one side is provided at the lower part of the neckpiece (9) and an axis tube (9d) with a hole (9c)
25 piercing the neckpiece (9) is formed in the central area and guiding

protrusions (9e) projecting radially on the periphery of the axis tube are placed. (9f) is an elongated hole made in the area above the uppermost guiding protrusion (9e) and perforates the upper part of the annular cavity (9b) and (9g) are a plurality (3 pieces in the drawing) of bosses formed along the marginal part of the opening of said cavity (9b) and protruding to the direction of the centre of the cavity (9b), and (9h) is a hole perforating the neckpiece (9) in the lower location of the cavity (9b) and (47) indicates adjustment plates with side walls (47d) in U-shaped figure and in parallel to each other, with a spindle (12) fixed on the bottom and having an arc-shaped cutaway formed on each wall in the both upper marginal parts and having a hole (47b) in the central area of one side and holes (47c) to be mentioned later in the lower areas of both sides and the lower part of the neckpiece (9) inserted thereinto.

(48) is a spring stopping plate placed at the opening of the annular cavity (9b) of the neckpiece (9), with a hole (48a) through which the axis tube (9d) is formed in the central area, an arcuate hole which corresponds to the cutaway (47a) of the adjustment plate (47) and faces the arcuate hole (9f) of the neckpiece (9), and matching grooves (48c) which correspond to the matching bosses (9g) are formed along the marginal part.

The spring stopping plate (48) is stopped in its movement by locating the matching grooves (48c) with the matching bosses (9g), the neckpiece (9) is incorporated to the spring stopping plate (48) and held to the adjustment plate (47) by a bolt (49) and a nut (50).

(51) is a helical spring housed in the cavity (9b) of the neckpiece (9) and supported by the outer surface of the guiding protrusions (9e), one end (51a) of which is bent 90 degrees towards the axis and passes through the elongated hole (48b) of the spring stopping plate (48), the other end (51b) is bent 90 degrees to the axis direction similarly, extending outwardly to the cutaway (47a) of the adjustment plate (47) through the elongated hole (9f) of the neckpiece (9). (52) is a ball disposed either end of the hole (9h) and matching from inside to one of the plurality of holes bored in the both lower sides of the adjustment plates and arranged on a circular arc around the centre of the bolt (49), and, during assembly of the fan, one ball is inserted to hole (9h) in the lower part of the neckpiece (9) and the one at the side of a hole (47b) is inserted through the hole (47b). (53) is a pushing spring housed in the hole (9h) and pushes both balls (52) outwardly, and (54) is a screw to fasten a neckpiece (11) to the adjustment plate (47).

That is, in case of operating with a head piece (6) moved forward or backward, the neckpiece (9) turns at the centre of the bolt (49) and is given a certain recovering force by the helical spring (51), making a depression and elevation movement.

Now, a working principle is explained in the Figure 10.

Both ends (51a), (51b) press each edge of the cutaway (47a) in the standard position as shown in Figure 10 (a). In the case of elevation movement, one of the ends (51a) of the helical spring (51)m moves to the direction shown by the arrow mark A as shown Figure 10(b)

and the other end (51b) is supported by the cutaway (47a). In the case of the depression movement, the other end (51b) of the helical spring (51) moves to the direction contracting the diameter and creating the recovering forces in the same direction by the flexure of the spring as explained in Figure 10.

Next, in the operation of the head part (6), that is, neckpiece (9) in the neutral position, both ends (51a) and 51b) of the helical spring (51) press the edge of the cutaway (47a) of the adjustment plate (47) as shown in Figure 11 and Figure 12.

In the operation of the head part (6) moved upward, one end (51a) of the helical spring (51) is pressed by the edge of the elongated hole (48b) of the spring stopping plate (48) and turns. The other end (51b) presses the end of the cutaway (47a) of the adjustment plate (47) as shown in Figure 14. Further in the case of the head part (6) moved to the depressed direction, the other end (51b) of the helical spring (51) turns by the pressing of the end of the elongated hole (9f) of the neckpiece (9) as shown in Figure 16.

The one end (51a) presses the edge of the cutaway of the adjustment plate (47) as shown in Figure 15. Thus operated, the helical spring creates a recovering force in the same direction by its flexure. During this operation, the pushing spring (53) is pushing the balls (52), the balls are fitting to the holes (47c), adjusting the position of the neckpiece (9) namely, the head part (6), and enable to set the depression or elevation movement at an appropriate location.

As explained above, according to the invention, this invention

has an effect to provide a constant, even depression and elevation movement by holding the neckpiece with the adjustment plate with an arc-like cutaway formed in its upper margin, providing a cavity and an arcuate hole corresponding to the cutaway in said neckpiece,

5 housing a helical spring in said cavity, having both ends extend through said elongated holes, having the neckpiece press the edges of said cutaway in the neutral position, having one of the ends press the edge of said elongated hole in the case of the neckpiece moved, and having the helical spring work in the same direction, i.e.

10 contract the spring diameter, both in the depression and elevation movements.

C L A I M S

1. A depression and elevation angle adjustment device for an electric fan having a head part, the device comprising a neckpiece for supporting the head part, adjustment plates for holding the neckpiece and a helical spring housed in the neckpiece
5 to absorb forces imposed by the weight of the head part, the device being operable so that the ends of the spring are acted on during depression or elevation adjustment of the neckpiece, one end of the spring being acted on by a stopping plate or by the neckpiece itself, during elevation or depression adjustment respectively,
10 whilst the other end of the spring is supported by an adjustment plate, the arrangement being such that during adjustment of the neckpiece, the diameter of the spring is always contracted.
2. A depression and elevation angle adjustment device for electric fan as claimed in Claim 1, in which the neckpiece has an
15 annular cavity to house the helical spring, a spring stopping plate placed at the opening part of the cavity, arcuate holes provided in both adjustment plates and spring stopping plate to enable the ends of the spring to protrude outwards by bending axially of said helical spring through the arcuate holes,
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3. A depression and elevation angle adjusting device for electric fan as claimed in Claim 1, in which the neckpiece is held at an adjusted position between the adjustment plates in the depression and elevation angle by spring-loaded balls being pushed



outwards with a pushing spring inserted in the interior of the neckpiece to one of a plurality of holes provided on each adjustment plate.



* C L H S *

4. An electric fan provided with a depression and elevation angle adjustment device as claimed in any one of Claims 1 to 3.
5. A depression and elevation angle adjustment device, substantially as hereinbefore described with reference to Figures 1 to 16 of the accompanying drawings.
6. An electric fan, provided with a depression and elevation angle adjustment device, substantially as hereinbefore described with reference to Figures 1 to 16 of the accompanying drawings.
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