 OFFSET TUBULAR BRACE FOR FAN HOUSING

Marcel J. Bayhi, New Orleans, La., assignor to Reed Unit-Fans, Inc., New Orleans, La., a corporation of Louisiana

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The present invention relates to an improved offset tubular brace for connecting a fan or the like to a supporting base.

The means for supporting bearings and blade components in fans heretofore has presented a serious problem due to the difficulty of providing efficient and economical means for handling the weight and loads developed. The conventional spider or double tube offset arrangement has been used to create a balance or reverse load condition due to the pull developed between the motor and the blade shaft. A line representing the line of force drawn through the motor shaft and the blade shaft, is brought nearer to the neutral axis line of the supporting structure, so as to reduce the moment arm.

It has been found that the smaller the moment arm, the smaller the bending stress created in the supporting tube structure, so that more rigidity can be obtained for a given cross sectional area. In other words, the section of the tubular brace between the blade shaft and the motor shaft acts as a column in compression when the parts are in operation. Thus, by keeping the offset load as near as possible to this column neutral axis line, greater load carrying capacity can be developed in the column for a given cross sectional area of tube.

Accordingly, it is an object of the present invention to provide a simple but effective supporting brace for a fan which provides a maximum amount of strength with a minimum amount of brace material.

Another object of the present invention is the provision of a fan-supporting brace of the type described which is positioned, in operation, as close as possible in alignment with the line of force between the fan shaft and the motor shaft so as to reduce to a minimum the moment arm through which the force acts.

Still another object of the present invention is the provision of a fan supporting brace of the type described which reduces vibration of the parts to a minimum and insures quiet and noiseless operation of the fan.

A further object of the present invention is the provision of a tubular fan supporting brace which is simple in construction, efficient in operation, economical to manufacture and easy to install.

Other objects and advantages of the invention will become apparent from the following description when taken in conjunction with the accompanying claims and drawings.

Referring to the drawings, in which is shown for purposes of illustration a preferred embodiment of the invention:

Figure 1 is a plan view of an attic fan constructed in accordance with the present invention;

Figure 2 is a detailed side view of the brace assembly; and

Figure 3 is a sectional view taken substantially along the line 3—3 of Figure 1.

Referring to the drawings, 10 indicates an attic cooling or ventilating fan or the like which, as shown, includes a supporting frame or housing 11, arranged to fit in a suitable opening in the wall of a room or a building. The housing 11 is shown of substantially square shape but, manifestly, may be of any configuration and size and is provided with a central ventilating opening 12. Extending axially into the opening 12 is a rotatable fan shaft 13 connected at its lower end to radially circumferentially spaced fan blades or propellers 14 by the arms 15, so as to be rotatable therewith for creating a forced draft through the opening 12.

The rotatable shaft 13 extends through a fixed housing or bushing 16 (Fig. 2) positioned between the vertically spaced collars 17 that are locked to the rotatable shaft 13 by the set screws 18. The upper end of the shaft 13 is fixed to the hub 19 of a pulley or wheel 20 by a set screw 21. The pulley 20 has a grooved outer periphery for receiving an endless belt 22 which is connected to a similarly formed pulley 22' on the motor shaft 23 of an electric motor 24. The motor 24 is fixed to the top of the housing or fan frame 11 in any suitable manner, adjacent one another the shafts, so that the motor shaft 23 is disposed substantially parallel with the fan shaft 13.

A one piece or integral tubular brace 25 extends across the ventilating opening 13 and above the same. The brace 25 has an intermediate offset or central horizontal straight portion 26 which is bent as at 27 at its opposite ends to form arms or portions 28. Each of the arms 28 has a depending outer end portion 29 (Fig. 2) which may be welded or otherwise connected as at 30 to an angular plate 31 that is fixed to the top of the frame or housing 11 in any suitable manner, such as by the screws 32.

The fixed bushing 16 has connected to one side thereof of a channel shaped member 33 (Fig. 3), in any suitable manner, such as by the threaded bolts 34. The spaced parallel arms 35 of the member 34 are provided with aligned transverse openings through which extend the intermediate straight portion 26 of the brace. The portion 26 is welded, as at 36, to the member 34, so that the brace 25 constitutes a fixed support for maintaining the rotary fan shaft 13 and the blades 14 in proper position during the operation of the fan.

It will be noted that the intermediate straight portion 26 of the brace 25 is positioned between the bushing 16 and the motor 24 and that one of the arms 28 extends adjacent one side of the motor while the other arm 28 is positioned on the opposite side of the housing 11. In other words, the brace 25 is so shaped and positioned relative to the fan shaft 13 that both ends of the tubular brace are disposed in a straight line drawn through the axis of the fan shaft. Stated differently, both ends of the tubular brace and the fan shaft are disposed in the same vertical plane. One of the arms 28 extends from a fixed point adjacent the motor 24 to a fixed point adjacent the fan where it connects with the transverse intermediate offset straight portion 26. The offset intermediate portion 26 then communicates with the tubing 25 by having the load extend from one side of the load line to the opposite side thereof.

It will be seen that, by the proper selection of the tubing forming the brace 25 and by properly placing the
blade shaft 13 in relation to the offset straight portion 25 of the brace, and also by locating the opposite ends or arms 28 of the brace in relation to the load line, it is possible to produce a more rigid one piece tube unit and one which is more economical than the conventional double tube brace arrangement. For a given weight, there is no section in the brace assembly in which the material is better distributed for torsion, compression, and changing loads, than in a round tubing, such as the offset brace tubing 25. Further, the close coupled bending of the one piece tubing brace does not weaken or reduce the strength of the assembly for loads in a vertical or angular direction.

It will be observed that, in taking the dead load of the center assembly, i.e., blade, bearing, bearing support, shaft and blade and adding to it the thrust load created by a lay-down attic fan installation, the one piece supporting tubular brace or member 28 simulates in structure and function a tubular beam with fixed end supports. Further, a tubular beam of circular cross section has the least weight for given strength and thickness where the fan support is designed for equal loading in any direction. However, the brace 25 be made of any shape other than tubular, the section would require far more material to accomplish the desired results and would also create more complicated fabrication problems before it could meet the desired requirement of loading and operating conditions. The particular shape of the one piece offset tubular brace insures proper relation between the bends and load lines being maintained. Moreover, the location of the fixed ends provides means for carrying more load per pound without sacrificing rigidity and vibration absorbent qualities. It is also capable of accomplishing the desired results in a more economical and efficient manner and at a minimum expenditure of time, effort, and cost than for supports as previously constructed and used.

The intermediate and central straight offset portion 26 of the brace is bent at its opposite ends, so that the arms or portions 28 provide a balance between the motor shaft 22 and the blade shaft 13 for insuring the efficient operation of the fan. One of the arms 28 is also positioned relative to the motor shaft, so that a line representing the line of force passing through the motor shaft and the blade shaft, is close to the axis line of the supporting brace when the parts are assembled. Thus, means are provided for reducing the moment arm, so as to insure maximum rigidity. In other words, the tubular portion of the brace between the blade shaft 13 and the motor shaft 22 serves as column for absorbing the compression and vibration forces of the fan assembly. By maintaining the offset load as near as possible to the neutral axis line of this column, greater load carrying properties are developed in the column, so as to enhance the efficient operation of the fan assembly, at a minimum expenditure of time, material and effort.

Thus, it will be seen that the offset tubular brace or fan mounting not only reduces vibration of the parts to a minimum, but also insures quiet and noiseless operation of the fan.

It will be understood that the form of the invention shown is merely illustrative and that such changes may be made as come within the scope of the following claims.

I claim:

1. In a fan assembly including a casing having a centrally disposed opening, a shaft having one end thereof extending into said opening, a pulley fixed to said shaft, a motor mounted on the casing, means operatively connecting the motor to said pulley for rotating the shaft, and a housing receiving said shaft, the improvement comprising a one piece tubular brace extending substantially diametrically across said opening, said brace including an intermediate offset straight portion positioned between said shaft and said motor, means connecting said intermediate portion to said housing, said brace having arms extending outwardly in opposite directions from the intermediate offset portion, each of said arms having a laterally extending end portion, and means connecting each end portion to the casing in alignment with said shaft, the end portion of one of said arms being mounted on said casing adjacent said motor so that the axis of said one arm is disposed closely adjacent a line of force between the motor and shaft.

2. In a fan assembly including a casing having an opening, and a rotatable shaft extending into said opening, the improvement comprising means for maintaining the shaft in proper operative position including a one piece tubular brace having an intermediate straight portion, angularly disposed straight arms extending from the ends of said intermediate portion in opposite directions, means supporting said shaft and connected to the intermediate portion of the brace, and means connecting the ends of the arms to the casing so that the same are disposed in a plane extending through the axis of the shaft.

3. In a fan assembly including a casing having an opening, and a rotatable shaft extending into said opening, the improvement comprising means for maintaining the shaft in proper operative position including a one piece tubular brace having an intermediate straight portion, angularly disposed arms extending from the ends of said intermediate portion in opposite directions, means supporting said shaft and connected to the intermediate portion of the brace, said arms having end portions and means connecting said end portions to said casing in alignment with said shaft.

4. A one piece supporting structure for mounting a centrally located shaft housing in a casing consisting of a tubular brace having a straight intermediate portion for fixed attachment to the shaft housing, straight arms extending outwardly in opposite directions from the ends of said intermediate portion, each of said arms being disposed at an angle with respect to said intermediate portion and terminating in an end arranged to be fixedly secured to the casing, said arm ends being disposed relative to each other so that a line passing through both intercepts said intermediate portion.

5. A mounting adapted to serve as the sole support between a casing and a rotary assembly driven by a motor mounted on the casing with its axis in parallel relation to the axis of the rotary assembly, said mounting consisting of a rigid brace having an intermediate offset portion for fixed attachment to the rotary assembly, a first arm extending from said offset portion and terminating in an end portion arranged to be secured to the casing adjacent the motor, said arm having a neutral axis arranged to be disposed closely adjacent the line of force between the rotary assembly and the motor so as to reduce the moment arm between the line of force and the brace arm and a second arm extending from said offset portion in the opposite direction and terminating in an end portion generally aligned with said offset portion and said first arm end portion.

References Cited in the file of this patent

UNITED STATES PATENTS

1,715,669 Nuttall June 4, 1929
1,761,752 Scott June 3, 1930
1,929,686 Hirschman Oct. 10, 1933
2,115,527 Hingel June 30, 1938
2,558,541 Cotten June 26, 1951
2,573,145 Sprouse et al. Oct. 30, 1951
2,735,611 McLean Feb. 21, 1956