

Feb. 2, 1937.

C. A. BRINKERT

2,069,694

MOTOR SUSPENSION

Filed Nov. 16, 1934

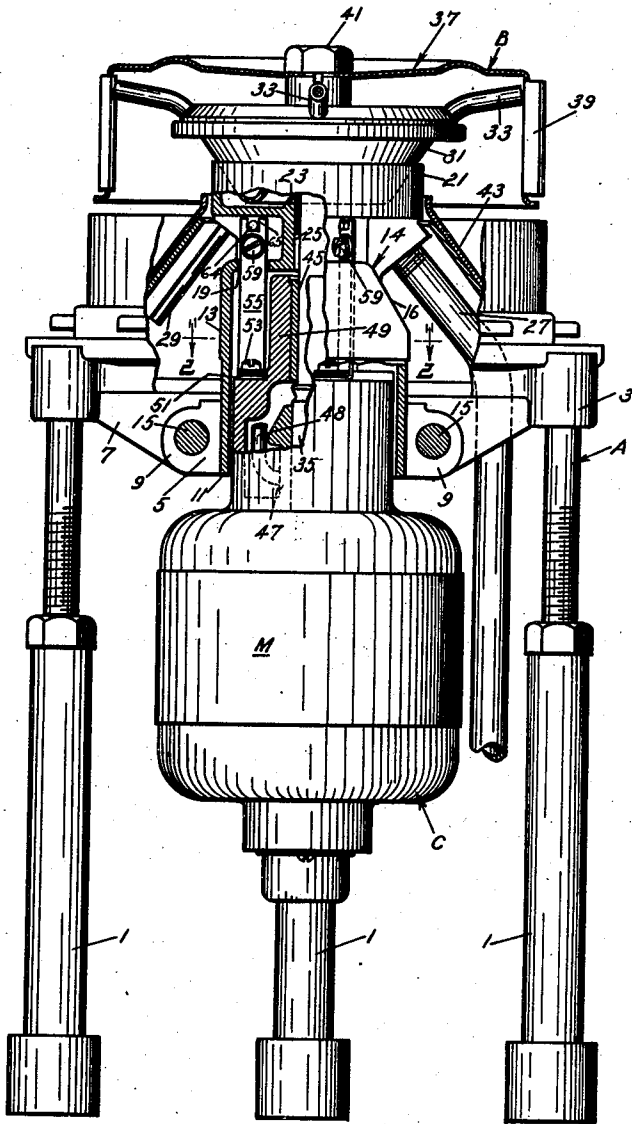


Fig. 1

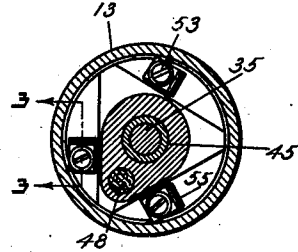


Fig. 2

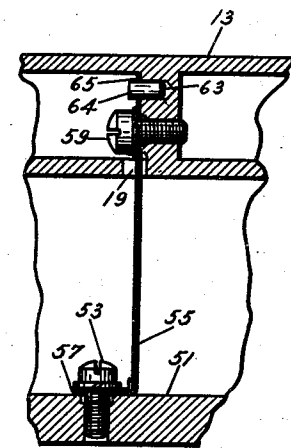


Fig. 3

Inventor
Carroll A. Brinkert

334

Strauch & Hoffman
Attorneys

UNITED STATES PATENT OFFICE

2,069,694

MOTOR SUSPENSION

Carroll A. Brinkert, Detroit, Mich., assignor to
The Timken Silent Automatic Company, De-
troit, Mich., a corporation of Michigan

Application November 16, 1934, Serial No. 753,377

9 Claims. (Cl. 248—18)

This invention relates to motor mountings for effectively eliminating the transmission of noise producing vibrations from a motor to the motor support, and more particularly to the resilient suspension of an electric motor in a liquid fuel burner and like mechanism in which noise is objectionable.

A number of complaints have been made to manufacturers of liquid fuel burners by owners of domestic installations on account of noises which have been traced to the burner motor. It seems that the electric motors which actuate the burner mechanisms, no matter how well they are made and due to their rapid rate of rotation, set up certain vibrations. The burner is usually installed in the basement of a building and where rigid motor mountings are used or other than rigid mountings of types which are ineffective to eliminate noise are used, the vibrations set up by the burner motor travel upwardly through the building and are accentuated in one or more places of the upper structure to the annoyance of the occupants.

The attempted remedy for such a situation has been to install another motor. As all motors do not have the same vibration characteristics, the replacement motor may or may not correct the noises apparent in the building. On occasion, as many as ten to fifteen motors have been installed in a single dwelling in an effort to correct the noises. Also, in some cases, elimination of such noise is impossible by merely substituting another motor as some dwellings and other buildings are more susceptible to vibration noise accentuation than others.

Many means of damping motor vibrations have been tried, among the most prominent of which is using a resilient coupling on the motor shaft and mounting the motor in rubber. Coil springs for supporting the motor have also been tried as well as horizontally-placed flat springs, but with only indifferent success, as such designs have failed to retain the motor in its true running position and have caused out-of-balance rotation.

My invention to be described hereinafter effectively corrects the above-noted noise conditions, and also avoids the defects of prior devices.

It is the primary object of this invention to provide an improved resilient connection between an actuating means together with the rotatable device driven thereby, and a fixed support which will dampen vibration and insure smooth and quiet running conditions.

It is a major object to provide, in an oil burner mechanism, an actuating means which is flexibly

suspended from the fuel oil distributing means. More specifically in this connection, it is an object to provide improved suspending means consisting of flat spring members having their flat portions in radial planes and their longitudinal axes in vertical planes.

It is a further object to provide in a motor mounting, vertical, flat motor suspending springs whose flat surfaces lie in radial planes which intersect in a single line and which line is substantially coincident with the longitudinal axis of the motor which is preferably of the type employing two bearings.

In prior devices incorporating a resilient supporting means, the upper portion of the motor has been subjected to excessive heat transmitted from the combustion gases. This has resulted in a motor design wherein a single bearing, located at the lower end of the motor is all that is provided. This is due to the fact that the excessive temperatures would impair the efficiency of upper bearings. It has not been feasible or practicable in prior devices to shield the upper portion of the motor from heat due to the cumbersome resilient supporting means heretofore provided.

Therefore, it is a further object to provide means in a burner motor suspension whereby the resilient suspending means is protected from the high temperatures of the combustion gases.

It is a further object to provide a resiliently suspended motor having a plurality of spaced bearings, at least one of which is adjacent the resilient suspending means and protected against the high temperatures of the combustion gases.

In the preferred embodiment of the invention I provide a motor incorporating the novel mounting as a portion of the motor proper whereby the motor is interchangeable with and may replace the motor of existing installations; and it is also within the scope of my present invention to modify existing installations by the addition of the novel motor mounting to be disclosed.

Therefore it is a still further object of my invention to provide a motor mounting so designed that it can be applied to burner installations already in use to eliminate all objectionable noise thereof in operation.

The above and further objects will be apparent upon a study of the following description and the appended claims when taken in connection with the accompanying drawing wherein:

Figure 1 is an elevational view, sectioned in part, of a liquid fuel and air distributing means for fuel burning apparatus incorporating my invention;

Figure 2 is a sectional view taken on the line 2—2 of Figure 1; and

Figure 3 is an enlarged sectional view taken on the line 3—3 of Figure 2.

Referring now to the drawing wherein like reference characters refer to like parts wherever they occur and with particular reference to Figure 1, the oil and air distributing means consists essentially of a frame A, a rotary burner head mechanism B and an electric motor M including a casing C.

It is to be understood that this invention may be applied to any kind of apparatus wherein the actuating means or electric motor is flexibly or resiliently suspended. For the purpose of description, I have shown my invention in connection with the burner mechanism disclosed in the Herbert W. Alden and Milton A. Powers Patent No. 1,882,694 which issued October 18, 1932. Reference may be had to this Alden and Powers patent for a more detailed description of the apparatus than will appear hereinafter.

The burner frame A is supported by three adjustable legs 1. Said frame comprises a circular metallic ring having three bosses 3 with blind holes therein for the insertion of the legs 1. Inwardly of and concentric with said ring is a split circular collar 5 which is integrally connected to said ring by means of radial ribs 7 and has bosses 9 at the split portion which have aligned apertures therethrough. Inserted within the split circular collar 5 is a lower portion 11—cylindrical in form—of the oil inlet casting 13. Clamp bolts 15 are inserted through the aligned apertures of bosses 9 thereby supporting and positioning said oil inlet casting.

The inlet casting 13 has the aforementioned cylindrical portion 11 at its lower end which tapers inwardly at one side adjacent the upper end thereof as indicated by reference character 16 to allow clearance for an inlet pipe. The cylindrical portion 11 ends in a horizontal wall 14 and the casting 13 is of minimum diameter above the wall 14. The upper end of the cylindrical member 11 provides an annular space 17 interrupted only by the tapering portion 16, the said annular space terminating abruptly in the previously described wall 14. Spaced radial slots 19, the purpose of which will appear hereinafter, are provided in the horizontal wall 14.

The upper portion 21 of the oil inlet casting 13 is cup-like in shape and has a central raised boss 23 which is centrally apertured as at 25. Leading angularly into the cup-like portion 21 and adjacent its rim are two apertures to which are fitted an oil inlet pipe 27 and an oil drain pipe 29. Fitted into the upper portion of the aperture which is fed by the oil inlet pipe 27 is a suitable means—not shown—for transmitting the oil to the distributor cup 31. Said distributor cup is fitted around its upper periphery with spaced finger tubes 33. The distributor cup 31 is supported on and driven by the upper portion of the motor shaft 35. Resting upon the upper portion of distributor cup 31 and also driven by motor shaft 35 is a fan 37 having vertical blades 39 projecting downwardly at its outer periphery. Distributor cup 31 and fan 37 are clamped to the motor shaft 35 by means of a bolt 41 or equivalent means suitable for the purpose. The quantity of air admitted to the burner mechanism is governed by a conical air shutter mechanism 43 consisting of an outer

stationary conical member and an inner rotatable conical member. Said members are apertured at intervals so that the amount of opening through which the air may enter may be controlled by moving the inner conical member with respect to the outer.

The motor shaft 35 extends within the motor M and carries an armature in a conventional manner. The shaft has a supporting bearing at its lower end in the bottom of the motor casing and near its upper end it is fitted in a sleeve bearing 45. An oil reservoir 47 is provided below the bearing 45 in the motor casing and suitable means, such as a wick 48, utilized as shown in Powers Patent 1,888,693, may be provided for carrying lubricant to the bearing. The motor casing, which contains the motor field, has a cylindrical upper portion 49, which carries the bearing 45. The portion 49 of the motor extends within the cylindrical portion 11 of the casting 13 to define the inner wall of the annular space 17 above referred to. Adjacent the cylindrical portion 49 is a flat circular surface 51 which is threadedly apertured at several places around its periphery for the insertion of cap screws 53 which clamp several motor suspension springs 55 thereto. In the illustrative embodiment three suspension springs 55 are employed spaced at equal distances around the cylindrical part of the motor.

The springs 55 are flat strips of suitable spring material and may be strips of oil tempered spring steel each having one end thereof bent at right angles. The bent end of each spring has an aperture therethrough for the insertion of a cap screw 53. Clamped between each cap screw 53 and each spring 55 is a relatively stiff clamping member 57 which insures that the bent portions of the springs 55 will be uniformly clamped to the surface 51 throughout their registering area.

At the opposite end of each spring 55 is a second aperture which is adapted to receive a cap screw 59. These screws 59 are inserted into threaded apertures provided therefor in the oil inlet casting 13. The casting 13 is provided with vertical walls 61 in line with the previously mentioned slots 19 so that when springs 55 are inserted through the slots, their upper portions will be in register with the walls 61. Immediately above and in line with the threaded apertures in the walls 61 are apertures 63 to receive pins 64 each of which cooperates with a notch 65 formed in the upper end of each spring 55 to thus form a locking means.

As clearly shown by Figure 2, the springs 55 are placed radially with respect to the axis of motor shaft 35. In other words, the direction in which springs 55 will flex is coincident with the direction of the torquing forces of the motor C. The springs are designed to be of such stiffness that they will not permit the motor frame to revolve too far with respect to the oil inlet casting. In preferred practice the permissible relative rotational movement is restricted to approximately one-fourth inch.

It is to be noted that the springs 55 are very stiff in a radial direction so that there can be no off-center running of the motor. Should the screws 59 become loosened, which is a remote possibility, and permit movement of the motor in a radial direction, the skirting of the cylindrical portion 11 over the outside diameter of the motor oil reservoir 47 will not permit excessive unbalancing of the running conditions.

The motor suspension of the present inven-

tion may be applied to existing installations, the form of mounting shown permitting such replacement readily to be made. The cylindrical portion 11 of the oil inlet casting 13 as previously explained is rigidly clamped in the circular collar 5, and the casting 13 constructed in accordance with the present invention may be used in place of the part 24 illustrated in the patent previously referred to. A motor fitted to receive the springs 55 in the manner disclosed herein can then be used to drive the fan 37 and the distributor cup 31.

In the event that the motor and casting 13 are shipped as an assembled unit, strain on the springs 55 is prevented by the limited clearance between the outside of the cylindrical oil reservoir 47 of the motor proper and the inside diameter of the encircling collar 11. Any side thrust on the motor such as might occur from handling during shipment cannot impose great stress on the springs as they can flex slightly after which the motor contacts the collar 11 to prevent further strain of the springs. Any downward stress on the motor during shipping or handling and the weight of the motor and the parts carried thereby in normal operation is readily taken by the springs 55 as they are amply strong in tension. Any upward movement of the motor C which might occur during handling or shipping is absorbed by a slight bowing of the springs. Upward movement is definitely limited by contact between the top of the cylindrical portion 49 and the flat surface adjacent the point of reduced diameter 14.

In the arrangement described, practically the entire operating portion of the springs 55 is enclosed within the oil inlet casting 13. Spring material such as steel and the like loses its temper when it is subjected to excessive temperatures, but the shielding herein obtained practically eliminates the possibility of any decrease in efficiency of the springs 55. In addition to shielding the springs from heat, the oil inlet casting 13 also shields the upper motor shaft bearing 45 from heat. This is extremely important for if the bearing were subjected to high temperatures its lubricant would also be subjected to high temperatures that would reduce the lubricating qualities thereof.

From the foregoing description it is evident that this invention provides a motor suspension which effectively absorbs torque impulses and which will not transmit vibrational disturbances. It is also evident that the motor suspending means is effectively shielded against excessive heat transmission and that the upper motor bearing is also protected against high temperatures.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In combination, a motor having a vertical shaft, a supporting frame comprising a supporting clamp, a stationary member apertured to provide an opening through which said shaft extends upwardly, said member comprising a hollow skirt portion depending from an integral upper portion, the skirt portion thereof being

supported in said clamp, said motor having a projecting nosing received within said skirt portion, and resilient means housed by said skirt and suspending said motor nosing from said upper portion of said member.

2. A motor and mounting assembly for a fluid fuel burner or the like comprising a motor having a casing and a shaft adapted to receive a driven member at its upper end, a stationary member disposed between said casing and said upper end of the shaft and having a depending hollow skirt portion, said motor casing having a projecting nosing of decreased size received within said skirt portion, and resilient means housed between said nosing and said skirt portion and wholly by itself suspending said motor from said stationary member, said assembly thereby being adapted for suspension as a compact and noiseless unit from any fixed supporting structure.

3. In a liquid fuel burner having a motor, a supporting frame, a stationary member comprising a hollow skirt like portion adapted to surround said motor at its upper end, said hollow portion being connected to said frame, an upper portion on said stationary member, and a horizontal wall between said skirt and said upper portion, circumferentially spaced radial slots in said wall, and spring elements for suspending said motor from said stationary member, said spring elements being connected to said motor at circumferentially spaced points and projecting upwardly through said slots and secured to said upper portion of said stationary member.

4. In a liquid fuel burner having a motor, a supporting frame, a stationary member comprising a lower hollow skirt like portion terminating in an upper horizontal wall and tapering at one side adjacent its upper end and adapted to surround the upper end of said motor to provide an annular space, a cup like upper portion and an intermediate portion on said stationary member, said hollow portion being connected to said frame, circumferentially spaced radially disposed slots in the horizontal wall of said hollow portion, and spring elements connected to said motor at circumferentially spaced points for suspending said motor from said stationary member, each of said spring elements being housed within said annular space and projecting upwardly through one of said slots, the upper ends of said spring elements being secured against vertical radial walls connecting said cup like portion to said skirt.

5. In a motor suspension, an overhead support; an electric motor disposed vertically and having a housing with its top end reduced in diameter and arranged below said support, said top end having several flat horizontal surface portions relatively close to the motor axis; and means for suspending said motor from said support; said means comprising flat spring elements each vertically arranged for connection at one end with said support and having a horizontally offset portion at its other end for connection with one of said flat horizontal surface portions of the top end of the motor housing.

6. In the combination defined in claim 5, said spring elements being arranged with their flat surfaces in substantially radial planes; and the upper end connection for each spring comprising a vertical flat surface portion on said support, a fastening element projecting perpendicularly thru said spring and said vertical portion, and

means for preventing the spring from swinging about said fastening element.

7. In a motor suspension, an overhead support; a vertically arranged electric motor provided with a housing that is very materially reduced in diameter at its upper end; said support including a skirt of but slightly larger diameter than said reduced upper end of the housing and surrounding the latter; and a set of flat vertical springs arranged within said skirt close to the motor axis and connected between said support and the top of said reduced upper end of the housing to suspend the motor, said springs being thin and each of a length many times its width.
8. In a motor suspension, an overhead support; a vertically arranged electric motor having its shaft extending upwardly through said support, and having an upper housing portion provided with a reduced extension enclosing a bearing for said shaft; a skirt extending downwardly from

said support in spaced relation to said reduced extension, said skirt being joined to the support above said bearing by means extending inwardly toward the motor shaft and affording several vertical openings; and several elongated elements flexibly suspending said motor housing from said support, each element being connected to the support at one end and projecting downwardly through one of said openings and through the space formed between said skirt and said reduced extension into connection with said housing at its other end.

9. In the combination defined in claim 8, said elongated elements being in the form of flat bands with their side surfaces arranged substantially radially of the motor axis, and with their lower ends securely held in engagement with the top of the upper end of the motor housing.

CARROLL A. BRINKERT. 20