Dec. 21, 1926. 1,611,795

S. W. WARNER

SUSPENSION FOR ELECTRIC MOTORS

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Fig. 1.

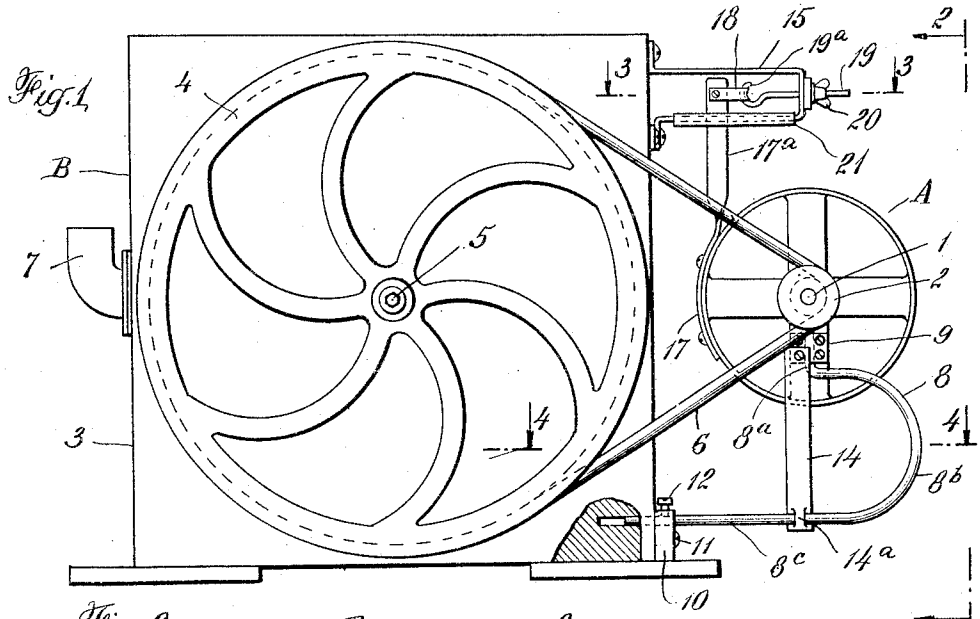



Fig. 2.

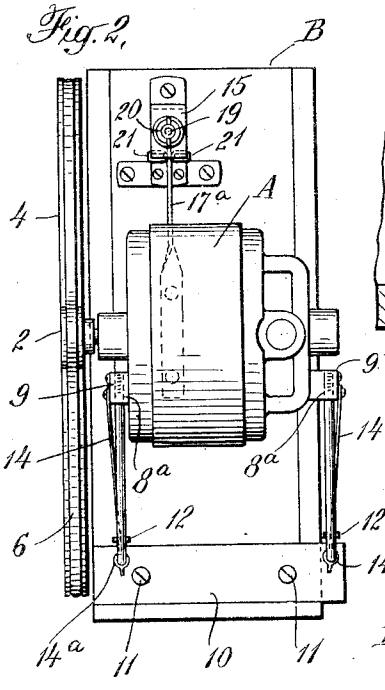



Fig. 3.

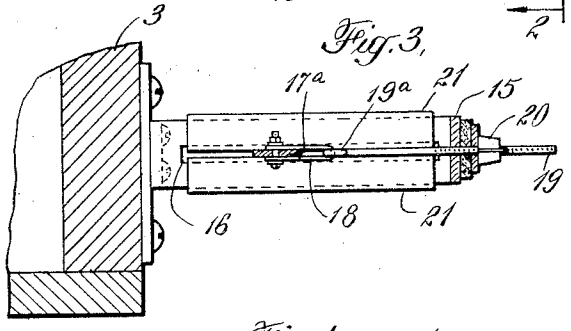
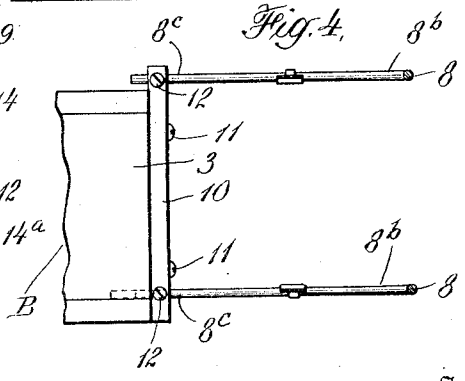



Fig. 4.




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# UNITED STATES PATENT OFFICE.

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## SUSPENSION FOR ELECTRIC MOTORS.

Application filed February 23, 1923. Serial No. 620,858.

My present invention relates to a suspension for electric motors adapted to lessen the hum and vibratory noises of electric motors, these being particularly objectionable in certain kinds of devices such as electric motor driven player pianos and other musical instruments.

The suspension means constituting my present improvements are particularly effective in preventing these noises and are otherwise advantageous in providing easy belt-adjusting means and other features as will be apparent from the following description in connection with the drawings.

The drawings show a preferred embodiment of my improvements in electric motor suspension means, and specifically show same for a motor with its drive shaft positioned horizontally. My improvements have a general application but for illustration are shown operative for driving the exhauster of a player piano.

In said drawings, Fig. 1 is an elevation of an electric motor driven exhauster embodying my suspension wherein the shaft of the motor (the same being true also of the exhauster) is horizontal for use especially with an upright piano as distinguished from a grand; Fig. 2 is a combined cross sectional and elevation view on the line 2—2 in Fig. 1 looking in the direction of the arrows; Fig. 3 is the same on the line 3—3 looking in the direction of the arrows; and Fig. 4 is the same on the line 4—4 in Fig. 1 looking in the direction of the arrows.

A is the electric motor having drive shaft 1 and drive pulley 2. The exhauster B has a casing 3 containing the pumpers and other mechanism not necessary to be shown. 4 is a pulley on the shaft 5 driven by the belt 6 from the motor pulley 2 for driving the exhauster. 7 is a tubular elbow for connecting the automatic piano player action, etc., with the exhauster.

The motor is suspended on a pair of bent spring metal rods 8—8, each comprising a short vertical portion $8^a$ on the upper limb of a U-shaped portion $8^b$ whose lower limb may have a horizontal prolongation or extension $8^c$. Said vertical portions $8^a$ of the rods are screw-threaded to be screwed into threaded sockets 9 firmly secured to the sides of the motor underneath its shaft. The prolongations $8^c$ are adjustably received through holes in a bar 10 secured by screws 11 across the end of the exhauster casing adjacent its bottom. 12—12 are set screws for securing said prolongations $8^c$ in any desired position of longitudinal adjustment through said holes in said bar 10 so that the members 8 tend to press the motor yieldingly away from the exhauster. In this way, the motor is supported on the bent spring rods 8—8 with its shaft 1 substantially horizontal and substantially parallel to the shaft 5 of the exhauster, said motor being adjustable to and away from the end of the exhauster for a coarse or approximate adjustment of the belt 6.

14—14 are a pair of flexible straps of leather or the like whose upper ends are attached to the sides of the sockets 9 and whose lower ends are provided with loops $14^a$ through which the lower limbs of the members 8 project. These straps 14 tend to dampen vibration of the upper limbs of the spring members 8 relatively to their lower limbs when the motor is in operation.

15 is a U-shaped metal member mounted upon the end of the casing of the exhauster so as to project horizontally therefrom, as best shown in Fig. 1. The lower limb of this U-shaped member 15 has a slot 16 (Figs. 2 and 3). Projecting up through this slot is a flat metal piece $17^a$ which is an integral extension from the curved metal piece 17 secured by screws to the side of the motor next the exhauster.

Between the upper and lower limbs of the U-member 15, the upper end of the piece $17^a$ is provided with a loop 18 adapted to be engaged by a hook $19^a$ on the end of a screw threaded rod 19 which projects freely through a hole in the cross piece of said U-member 15 beyond which said threaded rod 19 carries a washer and a wing nut 20.

The sides of the slot 16 are leather covered at 21 and said sides, by engaging the sides of the piece $17^a$, check vibration of the motor in a direction endwise of its shaft. Adjusting the wing nut 20 serves to adjust the entire motor delicately to and away from the exhauster and acts as a delicate adjustment for properly tensioning the belt 6.

The piece 17—$17^a$ is purposely mounted on the motor nearer its pulley end as shown in Fig. 2, so that the hook member 19—$19^a$ and the related parts can effectively oppose the pull of the belt 6.

The described suspension means is very

effective in silencing the hum of an electric motor including an alternating current motor, and at the same time provides an effective working support for said motor with all necessary adjustments thereof.

The individual adjustment of the spring members 8 at the set screws 12 permits the member 8 adjacent the drive pulley of the electric motor to be adjusted further outwardly or away from the driven apparatus than the other spring member for the purpose of increasing the spring tension of the curved part $8^b$ of said member at the pulley end of the electric motor, and thereby keep the motor shaft parallel to the shaft of the driven apparatus in spite of the pull of the drive belt 6 tending to put same out of parallelism.

Changes and modifications can be made in the herein preferred embodiment of my improvements without departing from the essence thereof and which will still be within the spirit of my invention and within the spirit and meaning of the annexed claims and as such are intended to be covered thereby.

What I claim is:

1. In combination, an electric motor having its shaft substantially horizontal and substantially parallel to the shaft of a driven apparatus, U-shaped spring supporting members located in planes transverse to said motor shaft with said motor resting on the upper limbs of said members and with their lower limbs projecting toward the driven apparatus; and means for supporting said members by their lower limbs so that they are adjustable lengthwise relatively to their supports.

2. Means for supporting an electric motor with its drive shaft substantially horizontal and substantially parallel to the shaft of a driven apparatus, comprising U-shaped spring members located in planes transverse to said motor shaft with said motor resting on the upper limbs of said members and with their lower limbs projecting toward the driven apparatus; means for supporting said members by their lower limbs so that they are adjustable lengthwise relatively to their supports; means at the top of said motor for adjusting it to and away from the driven apparatus; and means limiting endwise vibration of said motor comprising contacting parts, one being on the motor and the other being extraneously supported.

3. Means for supporting an electric motor with its drive shaft substantially horizontal and substantially parallel to the shaft of a driven apparatus, comprising U-shaped spring members located in planes transverse to said motor shaft with said motor resting on the upper limbs of said members and with their lower limbs projecting toward the driven apparatus; means for supporting said members by their lower limbs so that they are adjustable lengthwise relatively to their supports; means at the top of said motor for adjusting it to and away from the driven apparatus; and means limiting endwise vibration of said motor comprising contacting parts, one being on the motor and the other being extraneously supported, said parts permitting adjustment of the motor to and away from the driven apparatus, said parts being located at the drive pulley end of the motor shaft.

4. Means for supporting an electric motor with its drive shaft substantially horizontal and substantially parallel to the shaft of a driven apparatus; spring means located under said motor in support of same; means limiting endwise vibration of said motor comprising a part adapted to be attached to the motor and another part extraneously supported, one of said parts being forked so as to straddle the other, said parts being so positioned that they are not slidable on each other in a direction parallel to the aforesaid driving and driven shafts but can slide on each other in a direction which is transverse to said shafts and also can slide on each other vertically.

5. Means for supporting an electric motor with its drive shaft substantially horizontal, comprising U-shaped spring members located in planes transverse to said motor shaft with said motor resting on the upper limbs of said members; means for supporting said members by their lower limbs; and strap means connected across the U of the U-shaped spring members.

6. In combination, an electric motor having its shaft substantially horizontal, U-shaped spring supporting members located in planes transverse to said motor shaft with the upper limbs of said members attached to said motor in a vertical plane through the motor shaft; and means for supporting said spring members by their lower limbs.

7. Electric motor supporting means comprising U-shaped spring members supporting said motor and pressing it yieldingly away from the driven apparatus to which the motor is belted; and means connecting said motor to an extraneous support for steadying said motor against the pull of the driving belt.

8. Electric motor supporting means comprising U-shaped spring members supporting said motor and pressing it yieldingly away from the driven apparatus to which the motor is belted; means connecting said motor to an extraneous support for steadying said motor against the pull of the driving belt; and means for damping vibrations of said motor lengthwise of its shaft.

9. Means for supporting an electric motor with its drive shaft substantially horizontal comprising spring members supporting said

motor and pressing it yieldingly away from the driven apparatus to which the motor is belted, said spring members being adjustable to exert different pressures on said motor; means adjustably connecting said motor to an extraneous support for steadying the motor against the pull of the driving belt.

10. Means for supporting an electric motor with its drive shaft substantially horizontal comprising spring members supporting said motor and pressing it yieldingly away from the driven apparatus to which the motor is belted, said spring members being adjustable to exert different pressures on said motor; means adjustably connecting said motor to an extraneous support for steadying the motor against the pull of the driving belt; and means for damping vibrations of the motor lengthwise of its shaft.

Signed at New York, in the county of New York and State of New York, this 16th day of February, A. D. 1923.

STERLING W. WARNER.