Sept. 6, 1966 E. G. STURGEON 3,271,598

PIVOT MOUNTING FOR OSCILLATORY TOOL

Filed Nov. 14, 1963

3 Sheets-Sheet 1

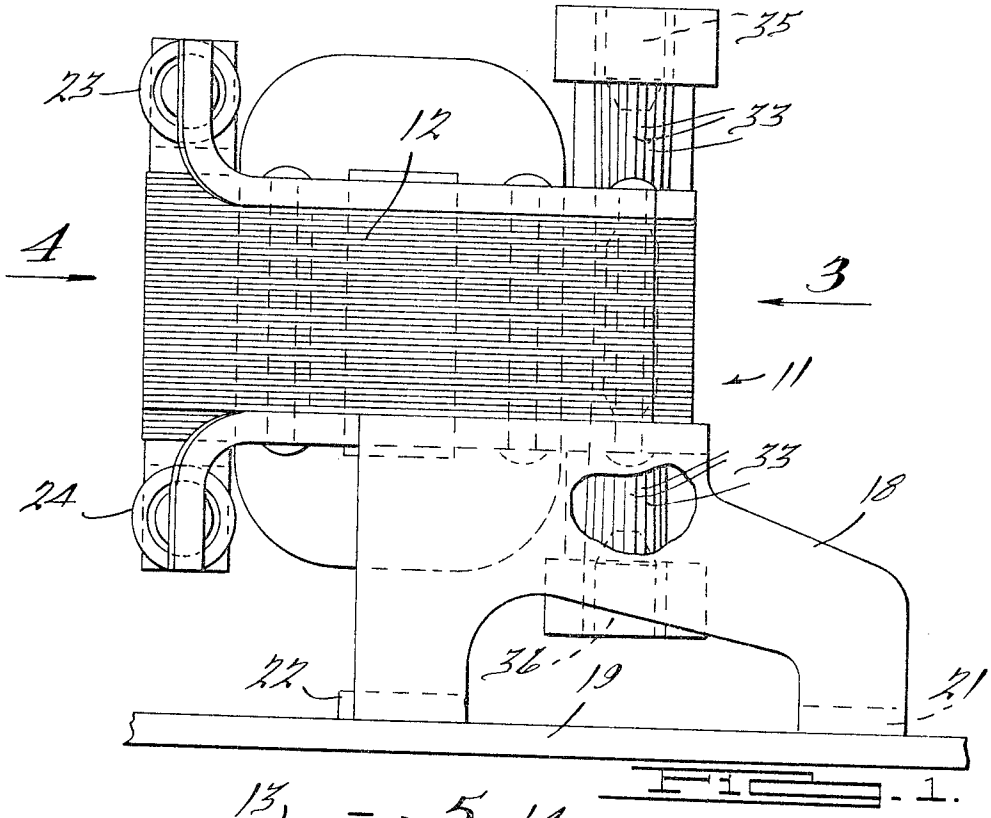


FIG. 1.

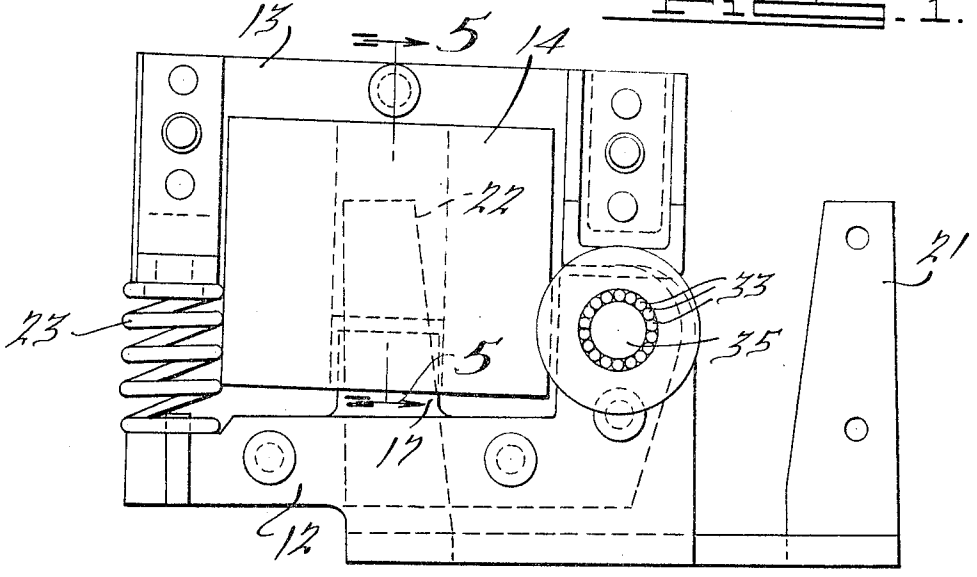


FIG. 2.

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3 Sheets-Sheet 2

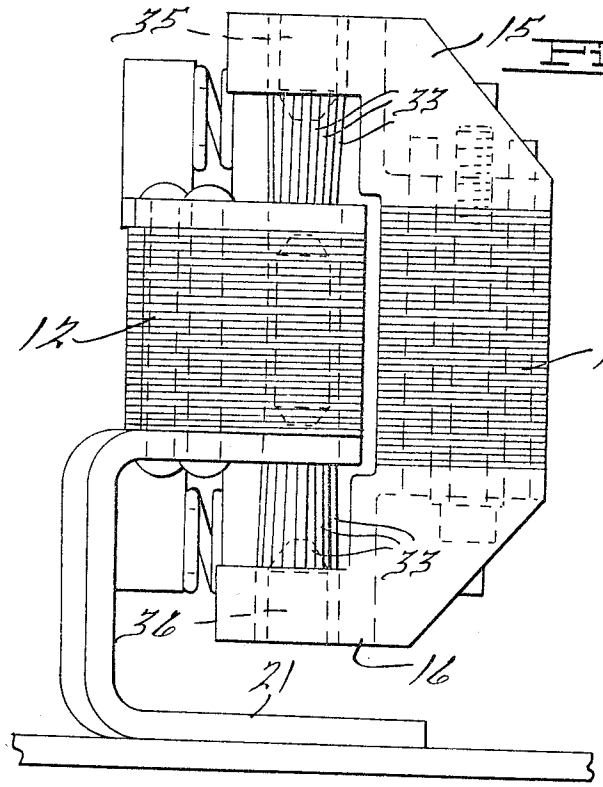


FIG. 3.

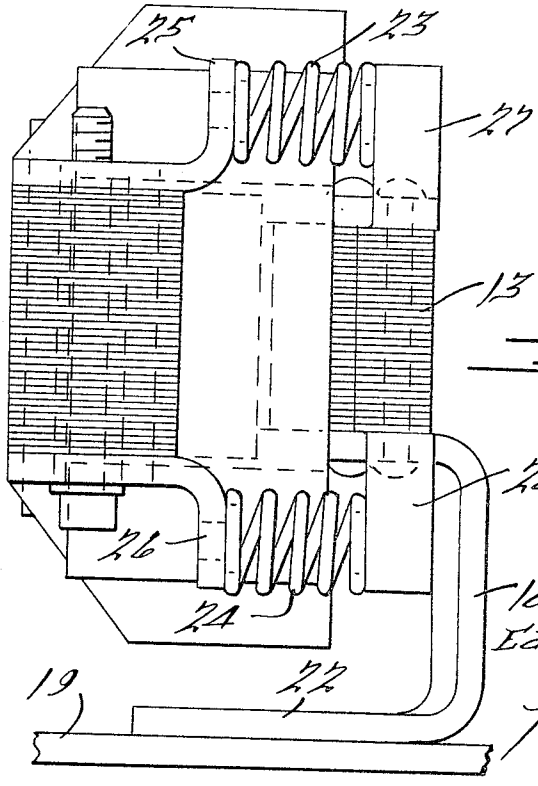


FIG. 4.

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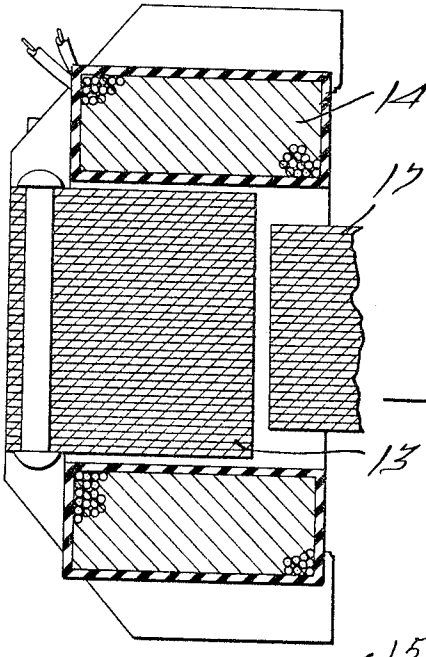


Fig. 5.

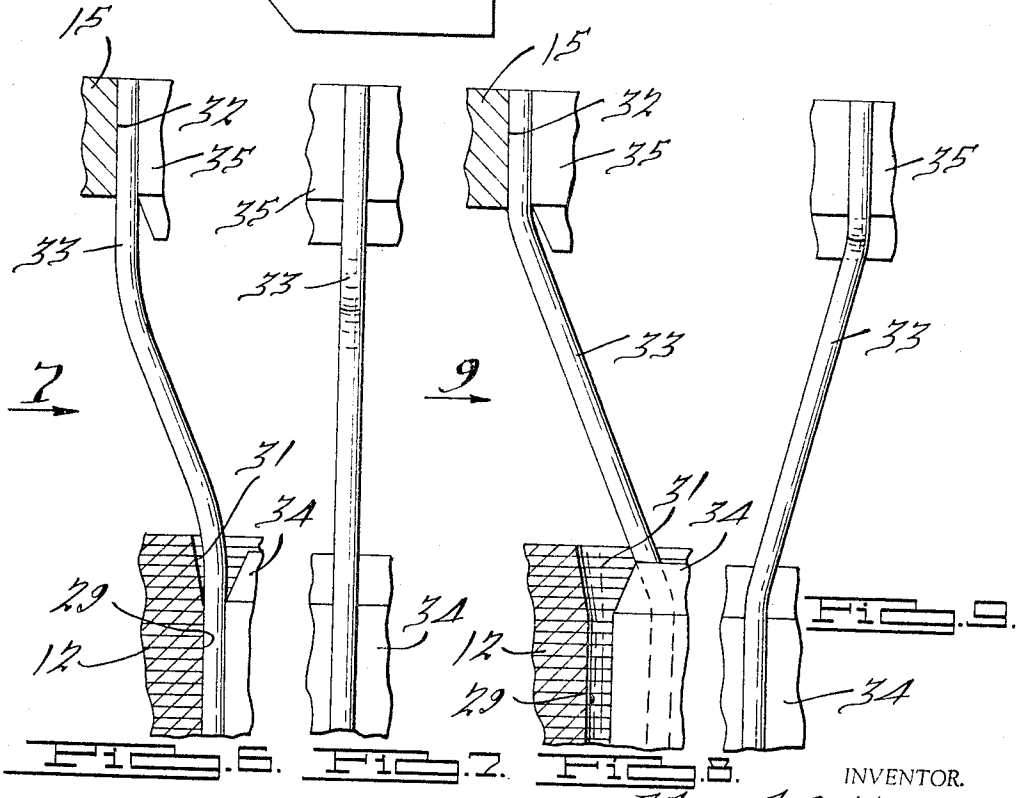


Fig. 6. Fig. 7. Fig. 8. Fig. 9.

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PIVOT MOUNTING FOR OSCILLATORY TOOL

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7 Claims. (Cl. 310—29)

This invention relates to oscillatory tools, and more particularly to means for pivotally mounting the armatures and connected tool holders of electromagnetically operated oscillatory sanders or the like.

It is an object of the present invention to provide an armature support for an electromagnetic reciprocating tool motor which is an improvement over that shown and claimed in Patent No. 2,836,940, issued to Thomas F. Carmichael on June 3, 1958. It has been found that the armature support shown in that patent restricts the length of stroke which is feasible with portable sanders or the like in that one or more of the support rods will sometimes fail by breakage after a relatively short period of use if the stroke is greater than a certain amount. Sometimes a single rod may break in an armature support made according to the aforementioned patent, but the break remains undetected, the remaining rods taking the entire load. In such cases, however, the pivoting action will be off center, decreasing the efficiency of the tool and sometimes tending to raise the noise level.

An object of the present invention is to provide an armature support which includes all the important advantages of that shown in the aforementioned patent but in which none of the rods will fail even after extended use with a relatively long stroke.

These and other objects of the present invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings.

In the drawings:

FIGURE 1 is a side elevational view of an electromagnetic motor for a portable sander showing the novel armature support;

FIG. 2 is a top plan view of the motor;

FIG. 3 is an end elevational view taken in the direction of the arrow 3 of FIGURE 1;

FIG. 4 is an end elevational view taken in the direction of the arrow 4 of FIGURE 1;

FIG. 5 is a fragmentary cross-sectional view taken along the line 5—5 of FIG. 2;

FIG. 6 is an exaggerated side elevational view of a portion of a single rod shown in its unstretched condition;

FIG. 7 is an end elevational view of the unstretched rod taken in the direction of the arrow 7 of FIG. 6;

FIG. 8 is a view similar to FIG. 6 but showing the rod in its stretched condition; and

FIG. 9 is a view of the rod taken in the direction of the arrow 9 of FIG. 8.

Briefly, the illustrated embodiment of the invention comprises an electromagnetic motor having a core on which a coil is mounted, and an armature mounted adjacent the core and carrying a platen for a portable sander. The core has a pair of spaced securing legs at one end which are on opposite sides of a portion of the armature and spaced therefrom. The armature has an apertured portion through which extend a group of spring-like rods arranged in annular fashion, the rods extending from opposite ends of the armature aperture into apertures formed in the core legs. Plugs are forced into the spaces formed by the rods within the armature and core apertures, frictionally securing the rods in position. The diameter of the apertures in the core legs is slightly greater than the diameter of the aperture in the armature, so that the rods flare outwardly in a slightly curved or S-shaped fashion as they extend from the armature to the core legs. Because of this curvature, sufficient slack exists in the rods to permit a relatively long armature stroke during operation of the motor, the slack being taken up at the opposite ends of the stroke, thus preventing excessive stresses in the rods which might result in slippage at their connections with the core legs or in fatigue failure after continued use.

Referring more particularly to the drawings, the electromagnetic reciprocating motor is generally indicated at **11** and comprises an armature **12** and a core **13**, these elements being fabricated in laminar fashion. Core **13** is of generally E-shaped construction, having a coil **14** mounted on the central portion thereof. A pair of armature supporting brackets or legs **15** and **16** are secured to one end of core **13** and extend outwardly on opposite sides of armature **12**, as seen in FIG. 3.

The armature is of generally L-shaped construction, its main portion extending past coil **14**, as seen in FIG. 2, and having an extension **17** (FIG. 5) within the coil. The shorter leg of the armature is disposed between the outwardly projecting ends of legs **15** and **16**, as seen in FIGURE 3. The armature carries a bracket **18** extending to one side thereof, and a platen **19** is secured to a pair of legs **21** and **22** at the lower end of bracket **18**, as seen in FIGS. 1 and 2. A pair of helical coil compression springs **23** and **24** are disposed between the core and armature, as seen in FIGS. 3 and 4, the core carrying L-shaped brackets **25** and **26** which support springs **23** and **24**, respectively, and are secured to the end of the core opposite that which carries legs **15** and **16**. A pair of brackets **27** and **28** are secured to armature **13** and support the other ends of springs **23** and **24**, respectively. Springs **23** and **24** tend to urge the armature away from the core, the pulsating flux created by current within coil **14** coacting with the springs to create rapid reciprocating movement of armature **12** during operation of the tool.

The portion of armature **12** between brackets **15** and **16** is provided with an apertured portion **29**, as seen in FIGS. 6 and 8, this apertured portion having flared upper and lower ends **31**. Brackets **15** and **16** are provided with apertured portions **32**, the diameter of apertured portions **32** being slightly greater than the diameter of aperture **29**. This difference in diameters is exaggerated in FIGS. **6** and **8** to aid understanding of the invention.

A plurality of circumferentially arranged rods **33** are disposed within apertured portions **29** and **32**, the rods extending axially the entire distance between the upper surface of bracket **15** and the lower surface of bracket **16**. These rods are fabricated of an appropriate metal having spring-like qualities and together form an annular arrangement as seen in FIG. 2. The lengths of the rods are identical, this length being such that when the rods are in their normal centered position, as seen in FIGS. 6 and 7, they will have a substantial amount of slack or extra length between upper apertured portion **32** and apertured portion **29**, and between lower apertured portion **32** and apertured portion **29**, the latter portion of the rod not being seen in FIGS. 6 to 9.

The rods are frictionally secured to armature **12** by a plug **34** which is tapered at both ends and is forced into the space surrounded by the rods, plug **34** thus forcing the rods outwardly against apertured portion **29**. The length of plug **34** may be slightly less than the total length of apertured portion **29**, including its flared ends **31**. The upper and lower ends of the rods are fixed to legs **15** and **16** by plugs **35** and **36**, respectively, as seen in FIG. 3. These plugs are tapered at their inwardly facing ends and are slightly longer than the length of apertured portions **32**. They likewise force rods **33** outwardly, causing them to be in firm frictional engagement with legs **15** and **16**. Because of the fact that

the diameter of apertured portions **32** is slightly greater than that of apertured portion **29**, the upper and lower ends of the rods will be slightly spaced apart in a circumferential direction, whereas the central portions of the rods within apertured portions **29** may be in contact with each other. The spacing of the upper and lower ends of the rods is not shown in FIG. 2 because it is so slight.

In operation, armature **12** will vibrate back and forth (clockwise and counterclockwise) from its FIG. 2 position in response to pulsating flux created by current passing through coil **14**, and the action of springs **23** and **24**. During this rapid reciprocation about a pivotal axis passing through the centers of plugs **34** and **35**, the free portions of rods **33** will be slightly twisted in alternately opposite directions, the twisting action being a combined motion including a twisting movement about each rod's own axis, plus an angular bending with respect to the axis of plugs **34** and **35**.

FIGS. 6 to 9 illustrate the action of a single rod **33** in order to bring out more clearly the advantages of the invention. FIGS. 6 and 7 show the rod in an intermediate or unstretched position, that is, a position between its two extreme positions of oscillation. It will be noted that the slack in rod **33**, which is exaggerated in FIGS. 6 and 7 for purposes of clarity, will create a slightly S-shaped configuration of the free portion of each rod. Actually, because of the spring-like nature of the rods, they will tend to elongate when in the position of FIGS. 6 and 7, that is, they will have a tendency to straighten themselves out, but will be prevented from doing so by the fact that they are fixed to legs **15** and **16** which in turn are a fixed distance from each other. The weight of armature **12** and its attached parts, which in theory would tend to straighten the upper free length of rods **33** and increase the curvature of the lower free length, and upward forces on the armature when sanding which would have the opposite tendency, may be disregarded for purposes of this explanation, since these forces will be negligible compared with the other forces acting on rods **33**.

As armature **12** moves from its central position in one direction or the other, the movement of each rod **33**, described above, will cause the slack in the free portions of the rod to be taken up, either partially or completely, so that the S shape will be flattened or will disappear altogether. This is illustrated in FIGS. 8 and 9, wherein it will be seen that the portions **31** of apertured portion **29** will permit this flattening to take place without interference.

As the armature moves back from each extreme end end its stroke toward its central position, the S shape in each rod **33** will reappear and will increase until the central point is passed, after which it will again decrease as the armature moves toward the other extreme end of its stroke.

The result will be that the upper and lower ends of rods **33**, which are secured between plugs **35** and legs **15** and **16**, respectively, will not tend to be pulled toward each other. There will also be no substantial axial tensile force created in rods **33**. It has been found that with this construction, the useful life of the pivot mounting is greatly increased and that a longer arc of stroke is possible for the armature during this life without the danger of fatigue failure of one or more rods **33**.

While it will be apparent that the preferred embodiment herein illustrated is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In a mount for pivoting a first part relative to a second part in an electromechanical vibrator, an apertured portion in said first part, an apertured portion in said second part slightly larger in diameter than said first apertured portion, said apertured portions being in concentric but axially spaced relation, and a plurality of annularly arranged spring-like rods disposed within said apertured portions and extending therebetween, the portions of said rods within said apertured portions being fixed thereto, the portions of said rods between the apertured portions having some slack so as to form a slight S-shape, whereby reciprocation of said first part relative to said second part about the common axis of said concentric apertured portions will cause the slack in said rods to be at least partially taken up as the extreme end of each arcuate stroke is reached.

2. In a pivotal mounting for a first part which is movable relative to a second part in an electromechanical vibrator, a pair of legs on said second part disposed on opposite sides of and spaced from a portion of said first part, apertured portions in said legs and said first part portion, said apertured portions being in concentric relation but with the apertured portion of said first part having a slightly smaller diameter than the apertured portions of said legs, a group of annularly arranged spring-like rods extending through said apertured portions, and means for securing the portions of said rods within said apertured portions of said legs and first part, respectivley, the free lengths of said rods between said apertured portions having some slack so as to form a slight S-shape when the first part is in a central angular position with respect to said second part, arcuate movement of said first part with respect to said second part about the pivot created by said rods causing the free lengths of said rods to stretch and tend to become taut, thus flattening said S-shapes.

3. The combination according to claim **2**, said means for fixing said rods within said apertured portions comprising plugs forced into the spaces surrounded by said rods.

4. In a pivot mounting for the armature of a reciprocating electromagnetic motor having an armature member, core member, and coil mounted on said core member, apertured portions on said members, said apertured portions being concentric but in axially spaced relation, one of said apertured portions being slightly larger in diameter than the other, a plurality of annularly arranged spring-like rods extending between and into said apertured portions, and means securing said rods in said apertured portions, the free portions of said rods between said apertured portions having some slack and being slightly S-shaped in their unstretched position when said armature is in a central position with respect to its arcuate stroke, movement of the armature toward either end of its arcuate stroke causing said free portions of the rods to take up said slack.

5. In a pivot mounting for the armature of an electromagnetic reciprocating motor having an elongated armature, E-shaped core, and coil mounted on the central portion of said core, a pair of legs on one end of said core, said legs being spaced from and on opposite sides of one end of said armature, said legs and the armature portion between the legs having apertured portions, the apertured portion in said armature being of slightly smaller diameter than the apertured portions in said legs, spring means between said armature and core urging the armature away from the core, a plurality of spring-like rods of circular cross-sectional shape extending through said apertured portions and between said armature and legs, said rods being annularly arranged and in closely adjacent relation within the apertured portion of said armature, and plugs within said apertured portions forcing the portions of said rods within said apertured portions against the walls of the apertured portions so as to be in frictional contact therewith, the free lengths of said rods between said apertured portions having some slack and being slightly S-shaped in their unstretched condition when the armature is at rest, at least some of the slack of said free rod lengths being taken

up when said armature approaches each end of its arcuate stroke.

6. The combination according to claim 5, said plugs being tapered to facilitate their being forced into the space surrounded by said rods, and relieved portions at the ends of said armature apertured portions to provide clearance for the movement of said free rod lengths.

7. In a pivot mounting for the armature of a reciprocating electromagnetic motor having an armature member, core member, and coil mounted on said core member, a pair of legs on one of said members, said legs being spaced from and on opposite sides of said other member, an apertured portion in said other member, a pair of apertured portions in said legs axially aligned with said first apertured portion but of slightly larger diameter, a plurality of spring-like rods of circular cross-sectional shape extending through said apertured portions, said rods being annularly arranged and in closely adjacent relation within the apertured portion of said other member, the ends of said rods being annularly arranged within the apertured portions of said legs, and plugs within said apertured portions forcing the portions of said rods within the apertured portions against the walls of the apertured portions so as to be in frictional contact therewith, the free lengths of said rods between said apertured portions having some slack and being slightly S-shaped in their unstretched condition when the armature member is at rest, at least some of the slack of said free rod lengths being taken up when said armature member approaches each end of its arcuate stroke.

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