April 21, 1942. W. H. YOUNG 2,280,610

VIBRATORY ELECTRICAL TOOL

Original Filed July 2, 1935 2 Sheets-Sheet 1

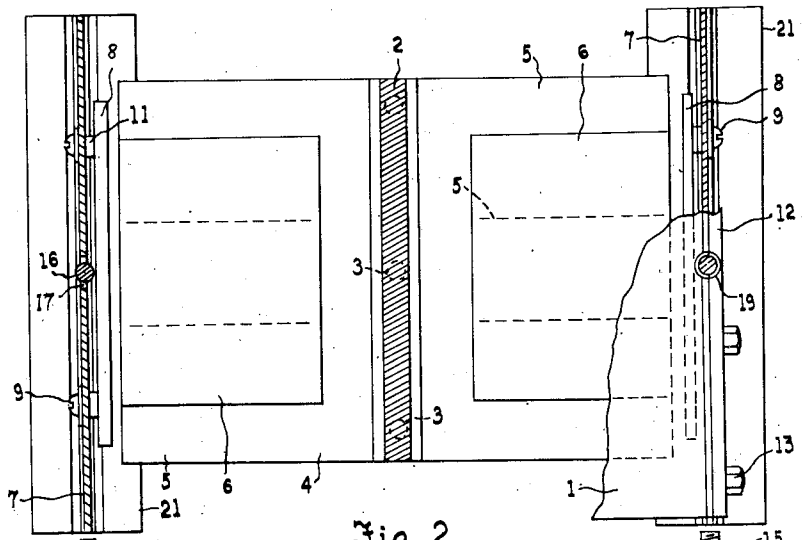


Fig. 2.

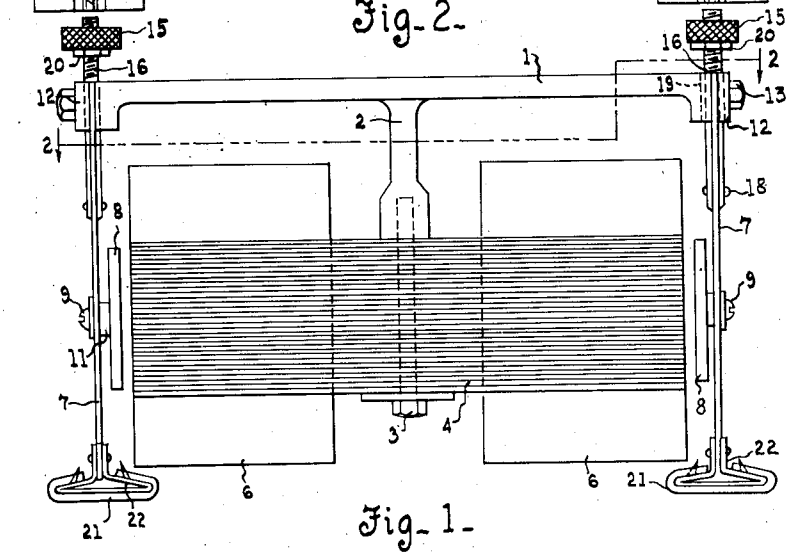


Fig. 1.

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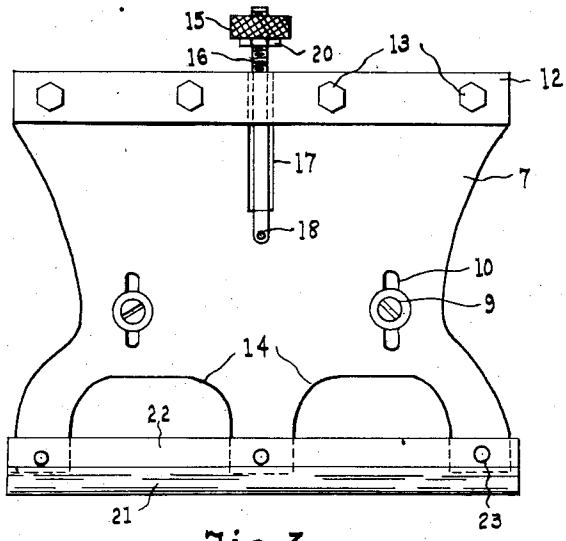


Fig. 3.

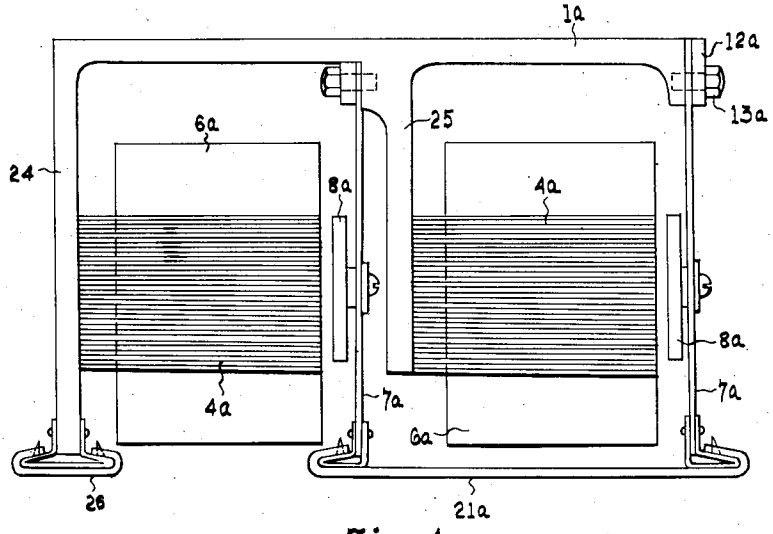


Fig. 4.

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UNITED STATES PATENT OFFICE

2,280,610

VIBRATORY ELECTRICAL TOOL

Walter H. Young, deceased, late of Detroit, Mich., by James Van Fleet, administrator, Detroit, Mich., assignor, by mesne assignments, to Gene E. Rogers, Cincinnati, Ohio

Original application July 2, 1935, Serial No. 29,526. Divided and this application July 20, 1936, Serial No. 91,632

13 Claims. (Cl. 15—98)

This invention relates to polishers and particularly to electrically vibrated polishers. The present application is a division of pending application Ser. No. 29,526, filed July 2, 1935, from which has matured Patent #2,175,237, granted October 10, 1939.

An object of the invention is to mount a vibratory motor on a suitable frame, and to transmit at least a part of the weight of said frame and motor to a surface to be polished through a polishing pad vibrated by said motor.

Another object is to mount a working member such as a floor polisher jointly upon the vibratory elements of a duplex electric motor.

A further object is to actuate a polishing pad by mounting it on one end of a leaf spring fixed at its other end and adapted to be periodically attracted to an electro-magnet.

These and various other objects the invention attains by the construction hereinafter described, and illustrated in the accompanying drawings, wherein:

Fig. 1 is a view in side elevation of a floor polisher energized by the improved motor.

Fig. 2 is a horizontal sectional view of the same, taken on the line 2—2 of Fig. 1.

Fig. 3 is a front view of the floor polisher.

Fig. 4 is a side elevational view of a modified construction.

In these views, the reference character 1 designates a normally horizontal rectangular metal plate formed midway between its ends with a downwardly projecting rib 2. These parts 1 and 2 form a frame of an approximate T-shape. Rigidly secured to said rib by bolts 3 and spaced beneath the plate 1 by the rib is a laminated electro-magnet 4, the ends of which similarly form spaced polar legs 5. As illustrated, three such legs are formed by each end portion of the magnet, windings 6 being applied to the central legs.

To the ends of the plate 1 are similarly rigidly secured the upper margins of a pair of duplicate flexible sheet-metal vibrators 7, which extend downwardly past the magnet poles, and constitute supports for the entire appliance. These vibrators are of steel (or other magnetic material) and are hence responsive to the pull of the magnet. To increase the magnetic response of the vibrators, it is preferred to attach to each thereof a soft iron armature 8 opposed to the adjacent pole faces. As illustrated, the armatures 8 are each mounted on the corresponding vibrator 7 by a pair of bolts 9, and provision is made for a limited vertical adjustment of the armatures by vertically slotting the vibrators, as indicated at 10, to receive said bolts. It is preferred to interpose one or more small washers 11 between each vibrator and the corresponding armature, to prevent the latter from materially detracting from flexibility of the vibrator.

As illustrated, the vibrators are each clamped to the plate 1 by a metal bar 12 fastened to the ends of said plate by bolts 13. To reduce the weight of the vibrators and so render them more freely actuable by the magnet, one or more openings 14 may be formed in the lower portion of each vibrator.

For readily regulating the natural vibration rate of the vibrators and so turning them to the magnetic impulse rate, it is preferred to equip each vibrator with an easily adjustable weight 15, and in order that these weights may have a counter balancing effect on the vibrators, it is preferred to position the weights above the fixed upper margins of the vibrators. Thus the weights are formed by milled nuts engaging suitably threaded rods 16, centrally upwardly projecting from the vibrators. Since the upper marginal portions of the plates are fixed, it is necessary to attach the rods some distance below such portions, so that they may respond to flexure of the vibrators. This is accomplished by locating the rods in slots 17 extended suitably downward from the upper edges of the vibrators, and rigidly attaching the lower ends of the rods to the corresponding edges of the slots. As shown, the rods have their lower ends notched to straddle the vibrators, and are riveted to the latter, as indicated at 18. Suitable openings 19 are formed around the rods, jointly in the plate 1 and clamping bars 12, to afford the rods a requisite lateral play. Each weight-forming nut 15 is preferably engaged by a suitable lock nut 20 to maintain adjustment of the former.

To the lower edges of the vibrators 7, are secured a pair of similar polishing pads 21 which transmit the weight of the appliance to a floor or other surface to be polished, and are reciprocatory against such floor or surface. As illustrated, said pads (which may be formed of felt or the like) are mounted on sheet metal holders 22 riveted (or otherwise rigidly secured) to the vibrators, as indicated at 23.

Ordinarily, the windings will be energized by an alternating current, the frequency of which will establish the rate of periodic attraction of the vibrators to the magnet. Thus, for example, in using A. C. current at sixty cycles (per second) the motor will induce vibration at seventy two hundred oscillations per minute. Each attrac

tion of the vibrators will, of course, involve a flexure thereof about their upper margins from their normal vertical positions, counter flexure occurring during the low energization periods of the magnet.

In that form of the invention shown in Figs. 1 to 3 inclusive, the vibrators have relatively reverse movements, swinging toward each other under magnetic influence and springing in opposite directions during the low periods of such influence.

As modified in Fig. 4, the vibrators *7a* are adapted to swing in unison, being disposed in a corresponding relation to their respective magnets *4a*. The latter are similarly secured by bolts *3a* to vertical plates **24** and **25** projecting downwardly from and integral with the top plate *1a* of the frame. Thus a polishing pad *21a* (or some other work-performing member) may be connected across the lower ends of the vibrators for reciprocation thereby jointly. To avoid instability, it is preferred to make the end plate **24** downwardly coextensive with the two vibrators and to provide on the lower end of said end plate an additional polishing pad **26**.

It is to be noted that the nuts **15** are readily accessible for adjustment, and that the extent of their vibratory travel, while the motor is operating, is not sufficiently great to prevent convenient adjustment of said nuts.

For propelling the described polisher across a floor, it may be equipped with any suitable handle (not shown), attached in any well known manner.

While specifically described in its application to a floor polisher, the described motor may obviously serve, either in its duplex or a single form, to perform various other useful operations. It is also to be understood that while attachment of the soft iron armatures **8** to the sheet steel vibrators **7** is preferred, that it may suffice for some uses of the motor, to rely on the vibrators alone to serve as armatures.

The invention is presented as including all such modifications and changes as come within the scope of the following claims.

What is claimed is:

1. A surfacing tool comprising a frame, a pair of laterally flexible vibrators secured to and downwardly projecting from the frame and jointly forming supports for the frame, surface-treating members carried by said vibrators, and means carried by and beneath the frame, and between the vibrators for periodically flexing the vibrators and thereby reciprocating the surface-treating means.

2. A surfacing tool comprising a frame, a pair of spaced flexible vibrators mounted at corresponding ends thereof on said frame for flexure to and from each other, surface-treating means carried by the other ends of said vibrators, and means carried by the frame between said vibrators for electro-magnetically energizing the vibrators.

3. A surfacing tool comprising a frame having a downward projection, a flexible vibrator fixed upon and downwardly projecting from the frame in spaced relation to said projection, an electromagnet carried by said projection, said vibrator including an armature coacting with said magnet, and surface-treating members mounted on the lower ends of said projection and vibrator.

4. A surfacing tool comprising a frame, a pair of downwardly projecting leaf spring vibrators secured at their upper ends to the frame, and jointly forming supports for the frame, a working member jointly carried by the lower ends of said vibrators, and means carried by the frame between the vibrators for positively vibrating at least one thereof to reciprocate the working member.

5. A surfacing tool comprising a frame, a pair of spaced, substantially parallel flexible vibrators, mounted corresponding ends thereof on said frame for flexure to and from each other, surface-treating means carried by said members at their other ends, and means disposed between said vibrators, magnetically effecting their vibratory flexure.

6. A surfacing tool comprising a frame, a pair of resiliently and laterally flexible vibrators secured to, downwardly projecting from and jointly forming supports for the frame, surface-treating means carried by the vibrators at their lower ends, and means carried by the frame for flexing the vibrators to laterally reciprocate the surface-treating means.

7. A surfacing tool as set forth in claim 6, the surface-treating means being jointly carried by said vibrators, and said flexing means being effective to substantially synchronize the vibrators in their lateral flexure.

8. In a surfacing tool as set forth in claim 6, armatures carried by said vibrators, and electromagnetic means serving as said flexing means, effective on the vibrators through said armatures.

9. A surfacing tool comprising a frame, two electro-magnets carried by and beneath the frame, a pair of resiliently flexible vibrators fixed at their upper ends on and downwardly projecting from the frame, an armature on each vibrator, such armatures responding respectively to the respective magnets, and surface-treating means carried by the lower ends of the vibrators and supporting the frame.

10. A surfacing tool comprising a frame, a pair of spaced, substantially parallel sheet metal springs downwardly projecting from the frame, substantially rigid connections between the upper ends of such springs and the frame, an armature carried by each of the springs between its upper and lower ends, electro-magnetic means upon the frame effective on the armatures to vibrate the springs, and means carried by the lower ends of the springs for supporting the tool and transforming vibration of the springs into useful work.

11. A surfacing tool comprising a frame, surface-treating members forming supports for said frame, one of such members being substantially fixed on the frame, a pair of spaced flexible vibrators secured at corresponding ends thereof to the frame, means for mounting another of the surface-treating members on the paired vibrators, and means on the frame for actuating the paired vibrators.

12. A reciprocatory tool comprising a frame, a sheet metal spring secured at one end to the frame, a working member mounted on the other end of said spring and reciprocable by vibration of the spring, an electromagnet carried by the frame, and an armature carried by said spring between said ends thereof for subjecting the spring to said magnet, such armature being adjustable to and from the working member to vary the stroke of said member.

13. A device of the character described comprising a pair of electromagnets adapted to produce simultaneous periodic vibrating forces in

opposite directions, an arm supported adjacent each electromagnet for movement toward and away therefrom, an armature carried by each said arm intermediate its ends and adapted to be actuated in response to said periodic vibrating forces of the adjacent electro-magnet, means associated with each said arm providing a vibrating mechanical system therewith, a work engaging member carried by each of said arms, said arms being adapted to vibrate in unison and in opposite directions in response to said electromagnets to substantially neutralize inertia effects, and means for tuning the natural period of vibration of said vibrating systems to a condition of substantial mechanical resonance with said periodic vibrating forces.

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Administrator for the Estate of Walter H. Young, Deceased.