

Jan. 1, 1935.

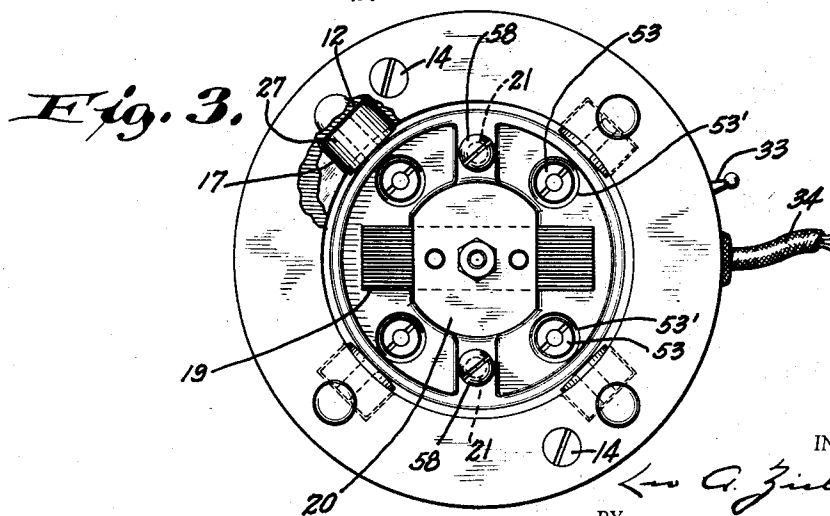
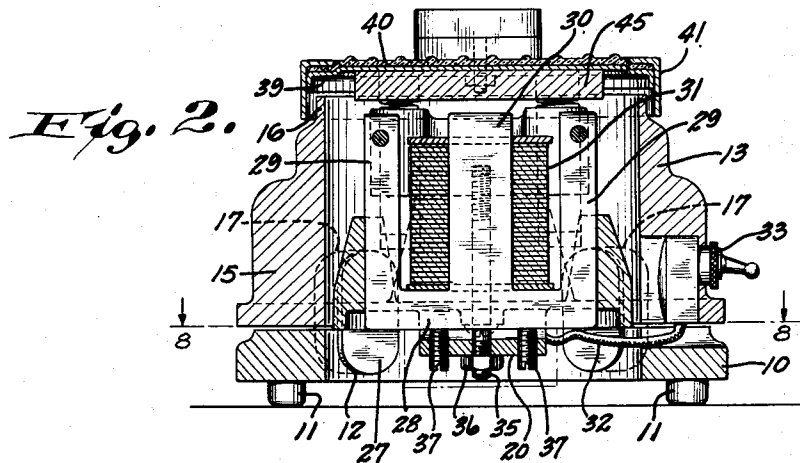
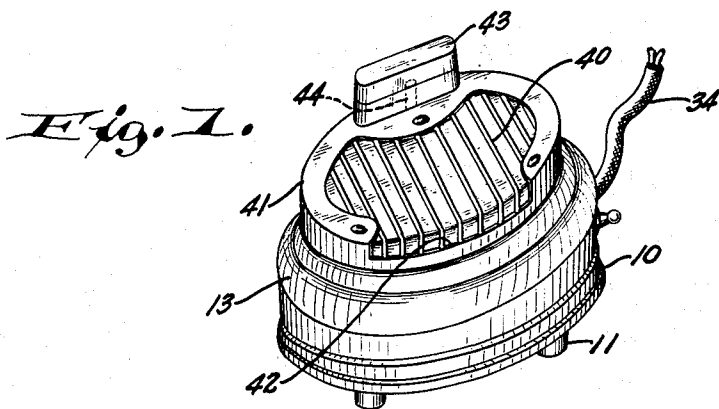
L. A. ZIELKE

1,986,038

VIBRATOR

Filed March 8, 1933

2 Sheets-Sheet 1



INVENTOR.

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Fig. 4.

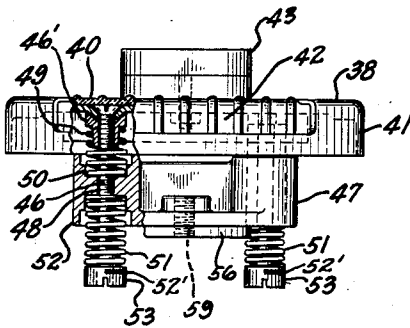


Fig. 5.

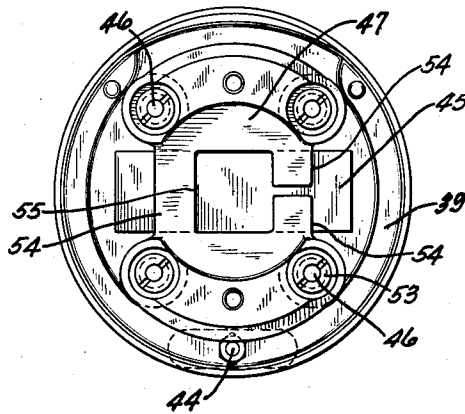


Fig. 6.

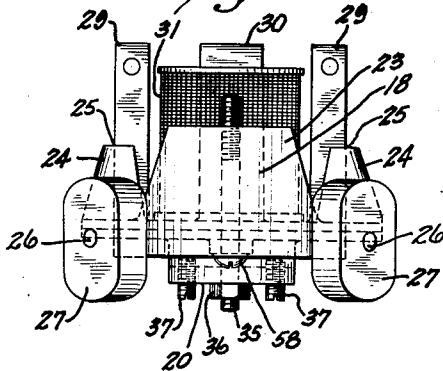


Fig. 7.

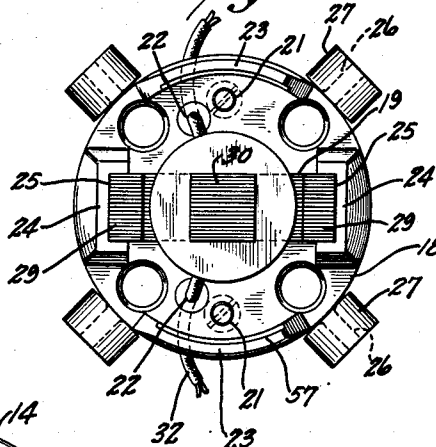
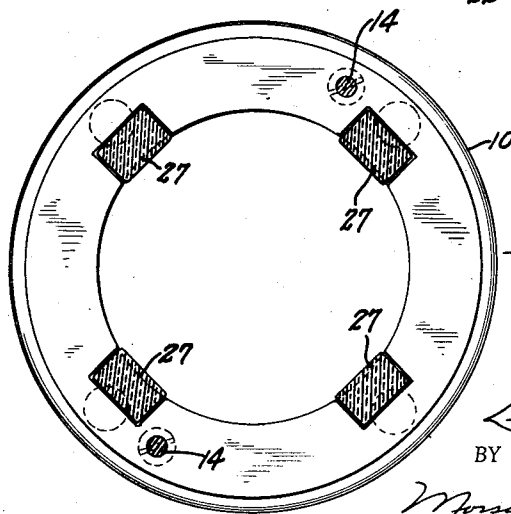


Fig. 8.



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VIBRATOR

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Application March 8, 1933, Serial No. 659,989

6 Claims. (Cl. 259—72)

This invention relates to improvements in vibrators, and more particularly to vibrators for use in the field of dentistry.

Dentists, in forming plates, castings or bridge work, usually make an impression of plaster of Paris or other modeling material of the affected parts and then by means of this impression form a counter-model of plaster of Paris, or other suitable material. The preparation of the plaster of Paris necessitates a careful mixture with water, and as a result of the mixing process there are necessarily many air bubbles produced. The above mixture is then poured into the impression to form the counter-model, and it is impossible to properly work the mixture into all parts of the impression without vibrating the latter. Vibration is also essential in order to eliminate air bubbles and thus assure a dense, true and hard model upon which dental restorations may be properly built.

It is a general object of the present invention to provide an improved electrically operated vibrator particularly adapted for the above-mentioned use, but which may be employed in other fields.

In view of the fact that a dental mold vibrator is necessarily of relatively small size, the problem is presented of providing a construction which will prevent vibration of the base and resulting noise, and which will eliminate any tendency of the device to travel because of the vibration. It is, therefore, another object of the invention to provide an improved vibrator of small size, having means for minimizing the amount of vibrating motion transmitted to the base and supporting structure, and also for minimizing the amount of noise produced during operation.

A more specific object of the invention is to provide a mechanically operated vibrator having a surrounding supporting structure and base, a magnet carrying spider mounted within said supporting structure, and a yieldingly mounted vibrating platform cooperable with said magnet supporting spider, the said parts fitting together in a manner to provide a strong and compact unit.

Other specific objects of the invention are to provide a vibrator as above described in which the magnet carrying spider is mounted on resilient cushions within the supporting structure; in which the magnet assembly is adjustable with respect to the armature; in which the supporting structure and base are of such weight as to provide a firm foundation for the device; and in

which the vibrating platform is of novel construction and relatively light in weight.

With the above and other objects in view, the invention consists of the improved vibrator and all its parts and combinations as set forth in the claims, and all equivalents thereof.

In the accompanying drawings illustrating one complete embodiment of the preferred form of the invention in which the same reference numerals designate the same parts in all of the views:

Fig. 1 is a perspective view of the improved vibrator;

Fig. 2 is an enlarged vertical sectional view;

Fig. 3 is a bottom view;

Fig. 4 is an elevational view of the vibrating platform and associated structure, parts being broken away and shown in section;

Fig. 5 is a bottom view of the part illustrated in Fig. 4;

Fig. 6 is an elevational view of the magnet carrying spider;

Fig. 7 is a plan view thereof; and

Fig. 8 is a sectional view looking down on the base piece and taken on line 8—8 of Fig. 2.

Referring to the drawings, it will be seen that there is a ring-shaped base 10 preferably formed of heavy cast iron and having resilient leg portions 11 depending therefrom. The base is formed with spaced pockets 12 preferably four in number which communicate with the upper surface thereof and with the inner periphery. This base member is secured to an annular member 13 also formed of heavy cast iron, by means of bolts 14. The lower portion of the annular member 13 is relatively thick as at 15 to give desired weight and the upper portion may be thinned out as at 16. The interior periphery of the member 13 is formed with pockets 17 which are of similar shape to the pockets 12 of the base and which register therewith. The base 10 and annular member 13 form a two-part surrounding foundation structure for the device.

A magnet carrying spider or inner frame, designated generally by the numeral 18 and illustrated in Figs. 2, 3, 6 and 7, consists of a base part having a rectangular slot 19 formed therein and having a depending seat portion 20 positioned below the slot. The base of the spider is also formed with oppositely disposed bores 21 and with openings 22 for the passage of wire conductors.

On opposite sides of the spider are upwardly extending arcuate sections 23 and positioned between said extensions 23 are oppositely disposed

extensions 24 having grooves 25 therein which register with the ends of the rectangular opening 19 of the base of the spider. The base of the spider is further formed with a plurality of laterally projecting lugs or rods 26 on which are mounted cushions 27 preferably of rubber and preferably oval in shape or of such shape as to fit within the openings formed by the combined recesses 12 and 17 of the base 10 and annular member 15.

A U-magnet 28, preferably of laminated construction, has side pole pieces 29 and an intermediate pole piece 30, the latter forming the core for the winding 31 which provides the magnetic field. The winding 31 has its terminals connected to conductors 32 which pass through the openings 22 of the spider and which are suitably connected through a switch 33 with an outlet extension 34.

A bolt 35 depending from the bottom of the U-magnet has a threaded lower end which extends through an opening in the depending seat 20 of the spider and which is adapted to receive a nut 36 to hold the magnet assembly in position within the slot 19 of the spider base and within the recesses 25 of the side extensions 24. Set screws 37 are threaded through the seat portion 20 and are engageable with the lower part of the magnet assembly to cause vertical adjustment of the latter when the nut 36 is loosened to permit such adjustment.

The vibrating platform designated generally by the numeral 38 is illustrated in detail in Figs. 4 and 5. The platform proper consists of an inverted cup-shaped stamping 39 having its upper surface covered with a layer of rubber or other suitable material 40. The rubber is held in position by an annular rim piece 41 which is cut away at the front as at 42 to expose the rubber along the front edge. Secured to the rear part of the rim is an auxiliary platform 43 which is mounted on a bolt 44 so as to be rotatable on said bolt with respect to the platform.

To the lower side of the platform stamping 39 is secured an armature 45. Also depending from the lower side of the stamping 39 are four bolts or rods 46, two being positioned on each side of the armature. The stamping 39 is countersunk as shown in Fig. 4 to receive the heads of the bolts and nuts 46' threaded on the bolts engage the lower side of the stamping 39. A frame part 47 preferably an aluminum casting is formed with four openings 48 through which the bolts 46 of the vibrating platform slidably extend. Coil springs 49 surrounding the upper portions of the bolts are positioned between the vibrating platform and the frame part 47 and have their lower ends received by pockets 50 which are concentric with the bores 48. Coil springs 51, preferably of greater strength than the springs 49, surround the lower portions of the bolts 46 and have their upper ends positioned in pockets 52 which are in alignment with the pockets 50. Lock nuts 53 are threaded on the lower ends of the bolts and can be manipulated to control the tension of the springs. This is made possible by the provision of four openings 53' in the base of the magnet carrying spider, the openings being positioned below and in alignment with the nuts 53 when the device is assembled and being of such size as to permit the insertion of a tool therethrough to operate the nuts 53. The nuts are formed with peripheral slits 52' which extend into the threaded bore thereof, and the portions of each nut on each side of the slit are normally squeezed

together so that when the nut is in place on a bolt it will automatically lock itself in position to prevent loosening from vibration. The frame part 47 has opposite side portions recessed as at 54 to expose the ends of the armature 45 and has a central opening 55 somewhat larger than the end of the magnet core 30 which exposes the central portion of the armature 45. The bottom edge of the frame part 47 is provided with an offset 56 which cooperates with offsets 57 formed in the upper edge of the side extensions 23 of the magnet carrying spider to permit the frame part 47 to fit against the top of the spider in the manner shown in Fig. 2, with the depending portions of the rods 46 extending on opposite sides of the magnet assembly. Bolts 58 extend upwardly through the bores 21 in the base of the spider and are adapted to be threaded in bores 59 of the frame part 47 associated with the vibrating platform to hold said frame part securely to the magnet carrying spider.

In operation, when the switch 33 is manipulated, current will pass through the winding 31 of the magnet pole 30, causing magnetization of said pole and of the poles 29, alternating current being employed. An intermittent attraction of the armature 45 in connection with the platform will result. Thus each time the magnet is energized the vibrating platform will be moved downwardly against the tension of the weaker springs 49 and when the magnet is deenergized said springs will return the platform to normal position. The inertia of the platform, however, will tend to cause it to continue in its upward movement and this latter movement will cause a compression of the stronger springs 51 and when these latter springs again expand they will give the platform a starting impulse downwardly thereby aiding the electro-magnet when it is again energized until the armature is brought close to the magnet poles. Likewise, when the magnet is energized the magnet carrying spider 18 tends to move upwardly toward the armature compressing the upper portions of the rubber cushions 27 and when the magnet is de-energized the spider is urged downwardly by the cushions and by gravity and its inertia tends to compress the lower portions of the rubber cushions 27. These cushions in expanding give the spider an upward impulse thereby aiding the again energized magnet and cooperating with the springs 51 which are simultaneously giving the platform a starting impulse downwardly. The set screws 37 and the lock nuts 53 are so adjusted as to cause perfect cooperation and synchronization between the action of the springs, cushions and magnet. The net result will be a smooth, rapid vibration of the platform and spider in opposite directions.

Due to the fact that the device is of relatively small size, the rapid vibration would be likely to cause the device to travel on the table or other surface on which it is positioned. With the present construction, however, the surrounding frame part 15 and base 10 are so heavy as to form an ample foundation and support for the vibrating parts and therefore the possibility of traveling is eliminated. Furthermore, it is to be noted that the only connection between the magnet carrying spider and the vibrating platform combination and the outside frame 15 is through the rubber cushions 27. As a result these cushions not only act in cooperation with the springs and magnet but also to absorb the vibration and prevent transmission to the outside frame part and

base. Furthermore, the rubber cushions will minimize the noise of operation.

The impressions may be positioned on the rubber covering 40 of the vibrating platform if a dull vibration is desired. If a sharper vibration is necessary the impressions may be positioned to overlap the metallic rim 41. Very fine work may be performed on the auxiliary platform 43, the said platform being preferably constructed with a rubber top. This platform, as before mentioned, can be adjusted to any desired angular position with respect to the platform by rotation of the bolt 44.

From the above it may readily be seen that a very strong and compact unit has been provided in which the vibrating parts are so mounted in the heavy surrounding frame and base as to prevent undesirable transmission of vibration thereto.

Although only one form of the invention has been shown and described, it is obvious that various changes and modifications may be made without departing from the spirit of the invention and it is to be understood that all such changes are contemplated as may come within the scope of the claims.

What I claim is:

1. In a vibrator, a surrounding foundation structure composed of two separable parts, said two foundation structure parts having recesses therein, a frame supported within said foundation structure on vibration absorbing means received by said recesses, a platform movable with respect to said frame and supported solely thereby, and means in connection with said frame for causing vibration of said platform.

2. In a vibrator, a surrounding foundation structure composed of two parts separable on a line extending in a horizontal plane, said two foundation parts having complementary registering recesses therein, a frame supported within said foundation structure on vibration absorbing means received by said recesses, a platform movable with respect to said frame and supported solely thereby, and means in connection with said frame for causing vibration of said platform.

3. In a vibrator, a frame having a bottom slot and side grooves, a platform movably connected to said frame and having an armature in connection therewith, an electro-magnet pole struc-

ture positioned in said slot and side grooves of the frame, a coil wound on said pole structure and coöperable with said armature to cause vibration of said platform, and means in connection with said frame for adjusting the normal position of said electro-magnet in said bottom slot and side grooves to vary the normal distance thereof from the armature.

4. In a vibrator, a surrounding foundation structure having a bottom opening, a frame supported within said foundation structure, a second frame having a plurality of openings therein, a platform having rods depending therefrom and slidable in the openings of said second frame to provide for movement of the platform relative to said second frame, a coil spring surrounding said rods and cooperating with said second frame to cushion said slidable movement, nuts threaded on said rods for adjusting the tension of said springs, means for securing said second frame in a position above said first frame, and means for causing vibration of the platform, said first frame being formed with openings positioned below the spring adjustment nuts of the platform rods to provide for adjustment thereof from the bottom of the device.

5. In a vibrator, a foundation structure, a frame supported on said foundation structure, a second frame secured to said first frame in a position thereabove and having a plurality of openings therein, a platform having rods depending therefrom and slidable in the openings of said second frame, the lower end of the rods being free, coil springs surrounding said rods above and below the second frame, nuts threaded on said lower ends of the rods for adjusting said springs, and means for causing vibration of the platform.

6. In a vibrator, a foundation structure, a frame supported on said foundation structure on resilient means, a platform having at least one rod depending therefrom and slidable with respect to said frame, the lower end of the rod being free, oppositely acting springs on said rod, an electro-magnet for causing vibration of said platform, and means for adjusting said magnet and springs to bring about synchronism between the action of the springs, resilient frame supporting means, and magnet.

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