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VIBRATORY DEVICES FOR CLEANING DENTURES OR THE LIKE

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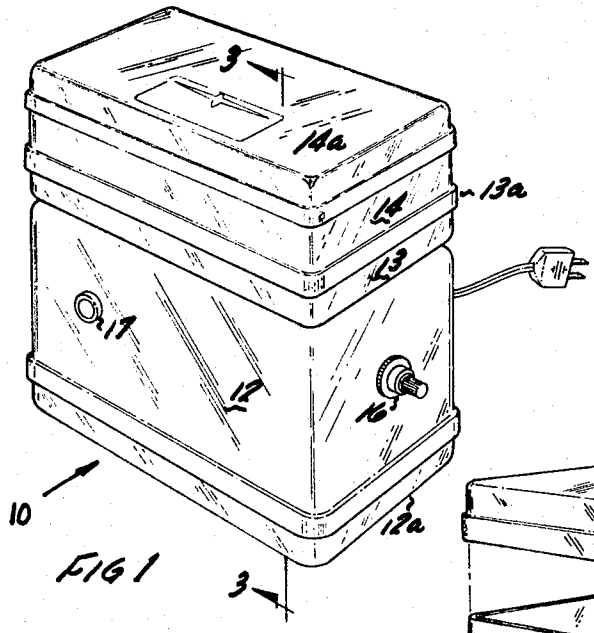


FIG 1

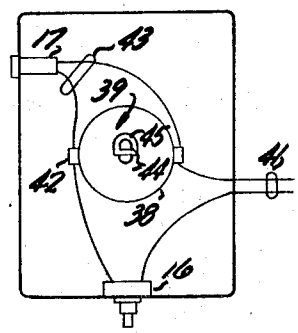


FIG 4

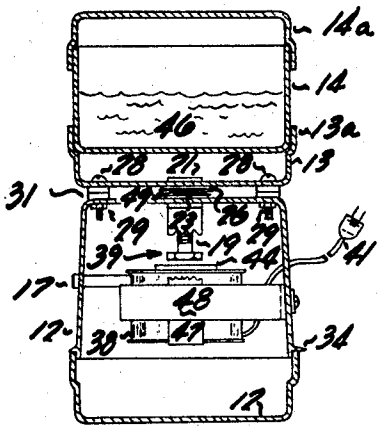


FIG 3

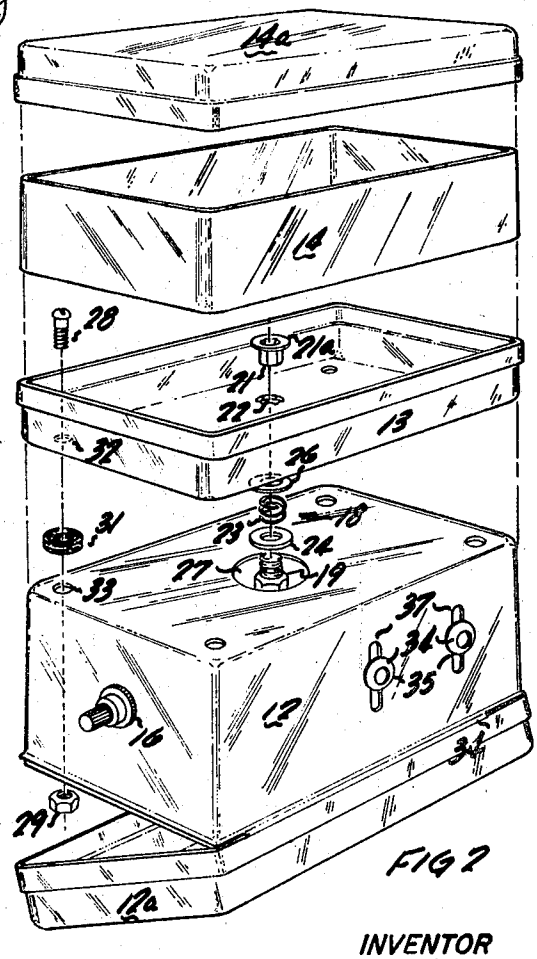


FIG 2


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# VIBRATORY DEVICES FOR CLEANING DENTURES OR THE LIKE

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Continuation-in-part of application Ser. No. 535,646, Mar. 11, 1966. This application July 29, 1966, Ser. No. 568,831

7 Claims. (Cl. 259—72)

## ABSTRACT OF THE DISCLOSURE

Includes a crib that receives a tank which is turn contains cleaning liquid for dentures. The crib is supported by resilient means associated with a lower housing which has an electromagnetic vibrating means therein in order that when the electromagnetic means vibrates it causes said cleaning liquid to vibrate.

This application is a continuation-in-part of application Ser. No. 535,646, filed Mar. 11, 1966.

This relates generally to vibratory cleaning devices and more particularly an improvement over our application of the same name, Ser. No. 535,646, filed Mar. 11, 1966, and is accordingly concerned with devices for removing surface impurities from various types of articles, such as denture plates, jewelry or the like.

In the prior art it is well known to clean surfaces of all types of solid articles by first immersing them in a suitable liquid and then employing ultrasonic vibrations which are transmitted to the liquid in which the articles are immersed, said ultrasonic vibrations loosening and removing the foreign particles from the surfaces of the articles. All of these types of devices heretofore available have been relatively complicated instruments, sensitive to high temperatures and generally quite expensive. Hence, they did not readily lend themselves to popular use as they were primarily designed for dentists or for specialized industrial applications. Because of the paucity of available cleaning devices, denture wearers usually do not adequately clean their dentures although the dentures are in need of cleaning. About the only time that the dentures are adequately cleaned is when the denture wearer sees his dentist and has him clean the same with the ultrasonic devices.

To obviate these problems, we have provided new and improved vibratory devices which comprise resilient tanks that are supported by resilient plates which are caused to vibrate at the lower sonic frequencies by vibrating means and in turn impart vibration to cleansing liquids in said tanks. These devices are described in the above noted earlier patent application. It has been found that the lower sonic type of vibratory cleaning device operates most efficiently if the vibrations are imparted to the fluid with equal amplitude throughout the fluid container.

Accordingly, it is the primary object of our present invention to provide new and improved vibratory cleaning devices which amplify and equalize the vibratory motion of the cleaning tank and which are inexpensive and therefore readily lend themselves to popular use.

Another object of this invention is to provide efficient low cost vibratory cleaning devices for removing certain impurities from various types of articles particularly dentures and jewelry or the like.

According to a preferred embodiment of the invention the cleaning device comprises a lower housing section containing an alternating current actuated magnetic vibrator whose armature is physically attached to a resiliently supported crib. The cleaning tank rests in the crib removed



from continuous relationship with the armature, thereby decreasing the dampening effect of the loaded tank on the vibratory system. A cover encloses the cleaning tank to protect it and its contents from ambient contaminants.

Other and further objects of our invention will become readily apparent to those skilled in the art from the following description of the specific embodiments thereof as illustrated in the drawings wherein:

FIG. 1 is a perspective view of a preferred embodiment of our improved vibratory devices;

FIG. 2 is an exploded view of FIG. 1 showing the connection and relationship of the lower housing section, the crib and the tank;

FIG. 3 is a sectional view of FIG. 1 taken along a plane passing through the line 3—3 in FIG. 1 and illustrating the alternating current actuated magnetic vibrator, and

FIG. 4 is a schematic wiring diagram for the form of our invention shown in FIG. 1.

Referring more particularly to the drawings wherein like characters of reference indicate corresponding parts throughout, the reference character **10** in FIG. 1 indicates a preferred embodiment of the outer portion of our vibratory device which includes a lower housing **12**, a crib **13**, and an upper tank **14**, said tank being adapted to contain a liquid cleansing medium such as water or other suitable liquid. The lower housing **12** may be formed from different materials such as plastic or the like, its main function being to house the vibratory mechanism in addition to resiliently supporting the crib **13**. The lower housing **12** has a bottom cover **12***a*, while the tank **14** is shown equipped with a lid **14***a*. The lid **14***a* helps to protect the cleaning fluid from normal household contaminants, such as dust.

The cleaning device can be of any shape; however, we have shown it as having vertical walls and of a generally rectangular cross-section. The tank **14** is slightly smaller than the lipped section **13***a* of crib **13** and consequently nests therein.

Also visible in FIG. 1 are a power switch **16** for controlling the operating condition of the cleaning device, and a pilot light **17** for indicating whether or not power is on. The switch **16** could, within the scope of this invention, incorporate a timing device for automatically setting the operating time of the vibratory cleaning action.

The armature assembly **18** is best seen in FIG. 2, which is an exploded view of the cleaning device of FIG. 1. As shown in FIG. 2, the armature assembly comprises a threaded fastener, such as hexhead screw **19**. The screw is of course fabricated from a readily magnetizable material. The screw **19** is attached to crib **13** with a threaded female fastener such as hexnut **21**. Nut **21** fits into aperture **22** in the center of crib **13**, but is prevented from passing through aperture **13** by attached washer **21***a*. The screw **19** prevented from falling through aperture **22** in the event the device is turned upside down and, in general, maintained rigidly coupled to crib **13** by spring **23** sandwiched between washers **24**, **26**. As is readily discernible in FIG. 2, the screw **19** passes through washers **24**, **26** sandwiching spring **23** therebetween and threads into nut **21**. The spring is compressed and thereby forces washers **21***a* and **26** against opposite sides of the bottom of crib **13**. Thus armature screw **19** is rigidly attached to cribs **13** and extends through aperture **27** in the center of the top of lower housing section **12**. The distance between the head of screw **19** and the bottom of crib **13** is readily adjusted by threading the screw **19** in and out of nut **21**.

Means are provided for resiliently attaching crib **13** to lower housing **12**. More particularly at each of the four corners of the crib **13** and lower housing **12** there is provided an assembly, such as shown at one corner in FIG. 2, comprising screw **28**, nut **29** and grommet **31**.

The grommet, preferably fabricated from a resilient material such as rubber, is held in place between the crib **13** and the lower housing **12** by screw **28** threaded into nut **29**.

In assembly the screw **28** passes through aperture **32** in crib **13**. The head of screw **28** is larger than the diameter of aperture **32**; accordingly the head on assembly is mounted juxtaposed to the bottom of crib **13**. The screw **28** is sufficiently long to pass through aperture **32**, grommet **31**, aperture **33** in lower housing **12** and nut **29** is threaded onto the screw **28** until the nut abuts the upper section of housing **12**. The grommet **31** thus resiliently supports crib **13** on housing **12**.

Means such as hinge **34** are provided for attaching bottom cover **12***a* to housing **12**. Thus for assembling or disassembling the cleaning device, changing the pilot light or for whatever purpose, whenever, it becomes necessary or desirable to work within the lower housing **12**, the bottom cover is opened to allow ready access to the inside of the housing **12**. The hinged arrangement assures that the bottom cover is readily opened and is not easily misplaced.

Fastening means such as screws **34**, in combination with washers **36** are assembled through slots **37** in housing **12** to aid in supporting the vibrating device best shown in FIG. 3. The slots **37** enable the position of the alternating current coil of the vibrating device to be adjusted to optimize the actuation of the armature **18**.

FIG. 2 further shows the tank **14** and its cover **14***a*. The tank **14** is made to slip fit into crib **13**. The cover **14***a* similarly slip fits over tank **14**.

FIG. 3 best shows the inventive cleaning device operatively assembled.

A magnetic coil assembly **38** is disposed upright in the lower housing **12** and it is adjusted in cooperation with armature assembly **18** so that the pole piece assembly **39** thereof is proximately disposed with relation to the head of screw **19**. And, as can be seen from FIG. 3, the coil assembly **38** can be connected to a 110 volt alternating current power source by means of the power cord **41** connected to terminals **42**. The switch **16** is connected in the lead **41** so that the coil can be energized at will.

As best seen in FIG. 4, signal light **17** is connected in parallel with the coil assembly **38** by means of the leads **43**. As can be seen from FIGS. 1 and 2, the switch **16** and the signal light **17** are attached to upwardly extending walls of the lower housing **12**.

The pole piece **39** assembly of coil assembly **38** comprises a pair of laminated poles **44**. One of the poles **44** is surrounded by a soft iron shoe **45**. When the power cord **41** is attached to a power source and the switch **16** is operated to the ON position, the coil assembly **38** and pilot light **17** are operated. When the coil **38** is energized it builds up sufficient flux twice per cycle of the source of energizing electricity to magnetically attract the armature assembly **19**. For example, if the coil is connected to a 60 cycle source then sufficient electromotive power is generated twice per cycle or 120 times per second to attract the armature assembly **19** toward the coil. As the energizing current alternates the forces exerted by the resilient grommets **31** force the armature assembly away from the pole pieces of the alternating current coil.

As is best seen in FIG. 3, the tank **14** is filled with a cleansing liquid **46**. The object to be cleaned is immersed in the liquid. The cover **14***a* is positioned over the top of the tank. The tank slip fits within the lip **13***a* of crib **13**. Thus the tank is supported by but loosely coupled to the cradle **13**.

The crib **13** is resiliently coupled to the lower housing **12** through at the four corners of the assembly. More particularly, the crib **13** rests on the four resilient grommets **37** and is held in place with fasteners such as screws **28** threaded into nuts **29** until the heads of the screws



abut the bottom of cradle **13** and the nuts abut the top of lower housing **12**.

Means such as L-shaped brackets **47**, **48** are used to support the coil assembly **38**. Bracket **47** is shown attached to the top of lower housing **12** with any well-known fastening means, such as metal screw **49**.

Bracket **48** is attached to the side wall of lower housing **12** with the aforementioned screws and washers **34**, **36** through slots **37**. The height of the coil assembly **38** is adjusted by fixing the position of screws **36** in slots **37**.

Bracket **47** is shown broken in FIG. 3 to better illustrate the armature arrangement in conjunction with the coil assembly. The screw **19** is shown removed the distance of the normal air gap from the pole pieces **39**. The shoe **44** is also visible in FIG. 3. The position of the armature screw **19** can be changed by threading it further into nut **21**, which merely increases the pressure of spring **23** against washer **26**. In operation, when the switch is turned on the coil assembly **38** is energized to attract armature **18** as a function of the power source frequency. Since the screw is rigidly connected to crib **13** it forces the entire crib down against the four resilient grommets. The grommets, in turn, force the crib back to the normal position as the electromotive force diminishes. Thus, the crib vibrates at twice the power source frequency. The amplitude of vibration is limited only by the arc gap distance and screw **28**. The tank positioned relatively loosely in the crib is loosely coupled to the source of vibration. Because of the loose coupling the dampening effect of the tank on the vibration is greatly diminished. Thus the full force and effect of the vibration operate to efficiently agitate the liquid and to cleanse the object being cleaned. Also, because of the undampened vibration the amplitude of vibration is maximized. A further advantage growing out of the loose coupling is that the cleansing agitation is increased because the liquid is agitated by the primary vibration of the armature acting against the spring of the grommets, and also by the secondary vibration resulting from the inherent resiliency of the crib itself. The inherent resiliency is further increased by the symmetrical positioning of the supporting grommets around the centered armature.

From reading the description in connection with the drawings it should be realized that we have provided vibratory devices which fulfill the objects of this invention in a remarkably unexpected fashion. The device illustrates and described is not only different from the prior art in that the cleaning tank is removed from contiguous relationship with the armature, but the device is simple, efficient, and relatively inexpensive.

It is believed that our invention, its construction and assembly, and many of its advantages should be readily understood from the foregoing without further description, and it should also be manifest that while we have illustrated a preferred embodiment of our invention for purposes of example, the special details are nevertheless capable of wide variation within the purview of our invention as defined in the appended claims. Thus, it is contemplated that other electrical vibrating means can be incorporated in our invention to fulfill the objects of this invention.

What we claim and desire to secure by Letters Patent of the United States is:

**1.** A vibratory device for cleaning dentures or the like, comprising a tank for containing liquid used in cleaning dentures, electromagnetic vibrating means, said electromagnetic vibrating means including armature means, a lower housing for holding said vibrating means, and crib means coupled to said armature means for supporting said tank means removed from said armature means, said crib means being resiliently supported on said lower housing and receiving and supporting said tank by engaging it around the lower portion thereof, said crib means being provided with means for attaching said armature means to the bottom of the center thereof.

2. The vibratory device of claim 1 including four resilient means supporting said crib means on said lower housing at the four corners of said box-like crib means.

3. The vibratory device of claim 2 wherein said resilient means comprises grommets and screw means for adjustably clamping said grommets between said crib means and said lower housing.

4. The vibratory device of claim 3 wherein said electromagnetic vibrating means comprises an alternating current actuated coil, pole pieces surrounded by said coil, slug means placed around one of said pole pieces, and bracket means supporting said vibrating means and for adjusting the air gap distance between the top of said pole pieces and said armature means.

5. The vibratory device of claim 4 wherein said armature means comprises a screw, and wherein said means for attaching said armature means to the center of the bottom of said crib means comprises means including holes in the top of said housing and the bottom of said crib means enabling said screw to pass therethrough, nut means for fastening to said screw within said box-like crib means, coil spring means for compressing between the head of said screw and the bottom of said crib means exerting a force against said nut means whereby said screw is firmly but adjustably attached to said crib means.



6. The vibratory device of claim 5, including means for transmitting alternating current to said coil means, switch means for controlling the transmission of said current to said coil means, and pilot light means for indicating when said alternating current is transmitted to said coil.

7. The device of claim 6, including means for covering said tank and hinged cover means at the bottom of said lower housing.

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