This invention relates to small portable vibrators which may be easily handled for being manually held against an object to be vibrated, and, more specifically, it pertains to an impeller comprising an unbalanced weight of spherical form mounted between spaced-apart flat discs which are in frictional point contact with said spherical weight at its axis of rotation on opposite sides of the weight.

The invention is an improvement over that disclosed and claimed in my application Serial No. 440,923, filed July 2, 1954, and incorporated herein in full as a part of this disclosure.

One of the main objects of the invention is an impeller having an unbalanced weight in the form of a sphere in rolling frictional contact with a pair of discs between which it is mounted for radial movement.

Another object of the invention is an impeller frictionally connected with a spherical unbalanced weight at its axis of rotation with point contact obtained as distinct from surface contact.

Further objects, and objects relating to details of construction and economies of operation, will readily appear from the detailed description to follow. In one instance, I have accomplished the objects of my invention by the device and means set forth in the following specification. My invention is clearly defined and pointed out in the appended claims. A structure constituting a preferred embodiment of my invention is illustrated in the accompanying drawings, forming a part of this specification, in which:

Fig. 1 is a cross section of an electrically powered vibrator embodying the invention.

Fig. 2 is a perspective view of the impeller.

Fig. 3 is a perspective view of a modified form of the impeller.

Referring specifically to the drawings in which like numerals designate like parts, numeral 1 is a motor fixed by bolts 2 to a plate 3 that is fitted against the member 4 which is to be vibrated, there being an elastic gasket disc or ring 5 of some elastic material, such as rubber, interposed between member 4 and the plate 3. This plate 3 is preferably bonded to the elastic ring 5 by some adhesive material, and the ring 5 is likewise adhesively bonded to one side of member 4.

The member 4, which can be of any material such as metal, wood, plastic or the like, is provided with a chamber 6 having an annular wall 7 surrounding the motor shaft 8 that extends within said chamber 6. An annular raceway 9 is preferably mounted in the chamber against the wall 7 and surrounding an unbalanced weight 10, in the form of a spherical ball, that is mounted in an impeller 11 fixed to the motor shaft 8 for being driven by said impeller when the shaft is rotated.

The impeller 11 comprises two thin flat metal discs 12, 12a which are clamped to the motor shaft 8 in spaced-apart relation by a spacer sleeve 13 interposed therebetween, on the shaft 8, for spacing them apart lengthwise of said shaft and radially extended. The discs 12, 12a are perforated with a central opening 14 through which the motor shaft projects. A collar 15 is fixed to the shaft 8, and disc 12 is clamped between the collar 15 and the end of sleeve 13, whereas the other disc 12a is clamped between the other end of sleeve 13 and clamp nut 16 which is screw-threaded to the end of the motor shaft 8. A lock nut 17 is also screw-threaded to the end of the shaft 8 adjacent the clamp nut 16.

The distance between the inside walls of the discs 12, 12a is not greater than the diameter of the ball 10 in order that any two diametrically opposite points of the ball will be in frictional contact with the discs. The opposite points of the ball in contact with the discs will be along the axis of rotation of the ball as it rotates about the inside wall of the raceway 9.

Because of the flat or planar surface of the inside walls of the discs and the spherical contour of the ball, there will be polar contact between, as distinguished from surface contact, and the points of contact will be at the axis of rotation of the ball. This frictional point contact between the discs and the ball will be sufficient to cause the ball to be rotated with the impeller without having the ball fixed thereto. The ball can, however, be moved relatively to the discs, and will at different times be in different relative positions. As a result, all wear between the parts is distributed over the entire surface of the ball and over a wide area of the discs rather than at localized points.

The discs are made of relatively thin metal, and are somewhat resilient or flexible so as to be spring-pressed against the opposite sides of the ball. While sufficient frictional contact is ordinarily obtained by having the discs spaced apart with the space therebetween equal to the diameter of the ball, the clamping pressure thereagainst can be increased by having the space therebetween somewhat less than the diameter of the ball. The clamping pressure can be regulated by the length of the spacer sleeve 13 which spaces the discs. A spacer sleeve 13 of the desired length for spacing the discs can be selected, and the shorter the length of the spacer sleeve 13 in respect to the diameter of the ball, the greater will be the clamping pressure of the discs exerted against the opposite points of the ball. The ball 10, while not fixed in any one position relative to the discs is held against rolling and is impelled to be moved by the impeller discs. The point contact between the discs and the ball will always be at the axis of rotation.

While the discs 12, 12a are preferably duplicates, it will be understood that they would yieldably frictionally clamp against the opposite sides of the ball by having one disc rigid and inflexible, and the other flexible and resilient since the one flexible and resilient disc would yieldably clamp the ball against the other disc as well as if both discs were flexible and resilient.

In the modification of Fig. 3, the ball is yieldably clamped by having one or both of the discs 12, 12a yieldably mounted on the motor shaft 8 between resilient washers 18 and 19, said washers being centrally perforated to fit on the shaft 8. Ordinarily, sufficient yieldable clamping action is obtained by having only disc 12 so mounted, but the other disc 12a could likewise be so mounted between two resilient washers. These washers 18 and 19 could be of any resilient material, such as rubber, or of a form to be resilient, such as a flat spring.

From the foregoing description of the construction, its operation should be obvious. The ball is housed in the chamber between the discs 12, 12a and is spring-clamped between said discs by point contacts at the axis of rotation of the ball on opposite sides of the ball. The ball will be caused to be driven circumferentially.
with the impeller by reason of the frictional contact. The driving connection between the discs and the ball is established at the axis of rotation of the ball and at point contacts, as distinct from surface contact, so that there is a minimum amount of surface contact, if any, between the members, and the driving connection is established by friction rather than by positive interengagement of the parts.

I am aware that there may be changes in details of construction without departing from the invention, and, therefore, I claim the invention broadly as indicated by the appended claims.

Having thus described my invention, what I claim as new and useful, and desire to secure by United States Letters Patent, is:

1. A vibrator comprising a stator member having a chamber therein, a motor driven shaft mounted on said stator member and projecting into said chamber, an impeller fixed to the shaft comprising spaced-apart flat discs, and an unbalanced weight interposed between said discs and in frictional contact therewith for impelling rotation of said weight for being rotated about said raceway.

2. A vibrator comprising a stator member having a chamber therein provided with a surrounding raceway, a motor shaft mounted on the stator member and projecting into said chamber, an impeller comprising spaced-apart discs fixed to the shaft to extend radially thereof with their peripheral edges disposed adjacent the raceway, and a rotatable unbalanced weight mounted between the spaced-apart discs and in contact therewith for impelling rotation of said weight for being rotated about said raceway.

3. An impeller for a vibrator comprising a motor driven shaft, spaced-apart discs radially fixed to said shaft and an unbalanced weight in the form of a ball mounted between said discs, the width of the space between said discs being not greater than the diameter of the ball for effecting frictional contact therebetween for rotating the ball.

4. The impeller of claim 3 in which one of the discs is resilient for frictionally clamping the ball between said discs.

5. The impeller of claim 3 in which one of the discs is yieldably mounted on the motor shaft for frictionally clamping the ball between said discs.

6. A vibrator comprising a stator member having a chamber therein provided with an annular raceway, a motor driven shaft mounted on said stator member and projecting into said chamber, an unbalanced weight mounted within the chamber, and an impeller fixed to the shaft and frictionally connected to said weight for driving said weight about said raceway within the chamber.

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