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HAND-HELD VIBRATORY MASSAGER

The present invention relates in general to a hand-held vibratory massager, and more particularly to such a vibratory massager with an applicator head in which a vibration-generating member is mounted together with a drive motor therefor.

As disclosed in Japanese Utility Model publication (KOKOKU) No. 44-12708, there has been already proposed a hand-held vibratory massager with an applicator head mounting therein a drive motor and an eccentric flyweight driven thereby to produce vibration. The applicator head is resiliently supported by means of a coil spring to a hand grip for limited movement in all directions in relation to the hand grip. Such prior massager is found advantageous in eliminating any driving connection between the hand grip and the applicator head, utilizing the weight of the motor itself to increase vibratory energy produced at the applicator head, and in turn reducing the weight of the hand grip for easy manipulation of the massager. However, it poses another problem that the hand grip is likely to suffer from an excessive counter shaking which is a reaction movement transmitted back from the vibrating applicator head through the resiliency of the coil

spring, producing fatigue of the user's hand holding the hand grip. This occurs when the center of mass of the flyweight is displaced from that of the entire applicator head in the axial direction thereof. In fact, such displacement is inevitable in the prior art massager because the mass center of the entire applicator head is approximately in coincidence with that of the incorporated motor which itself is of heavy construction and accounts for almost all of the weight of the applicator head, and the flyweight connected to the end of the motor output shaft has its mass center correspondingly offset in the axial direction of the output shaft from the mass center of the motor, or the applicator head. The above problem will be easily understood from Figs. 5A and 5B, 6A and 6B of the attached drawings in which the applicator head 2 is schematically shown to be coupled to the hand grip 1 by means of the coil spring 3. As shown in these figures, when the mass center Mf of the flyweight is offset by a distance L in the axial direction from the mass center Mc of the entire applicator head 2, a vibratory force F produced at the flyweight being in motion will cause a torque (F x L) about the mass center Mc of the applicator head 2, which torque in turn causes a reaction force to be transmitted back to the hand grip 1 through the resiliency of the coil spring 3, eventually shaking it about the mass center C of the hand grip 1. This occurs equally either the mass center Mf is offset on the opposite side of the mass center Mc from the hand grip 1

(Figs. 5A and 5B) or it is offset to the hand grip 1 from the mass center Mc (Figs. 6A and 6B). The above shaking or jerky movement of the hand grip compels the user holding the hand grip to keep it in position against the continuing shaking movement during the massaging process, greatly accumulating fatigue of the user's hand and therefore adversely affecting the performance of the massager.

Other prior massagers which are found to be relevant to the present invention are listed in following.

1. U.S.P. 4,224,932 issued to Farb;
2. U.S.P. 4,604,993 issued to Moriwaki et al.

U.S.P. 4, 224, 932 (Farb) discloses a massager with an applicator head which is rotatably supported on a rigid drive shaft extending from a hand grip. The applicator head includes an eccentric flyweight bearing which is connected to the drive shaft for rotation in a circular pattern about the drive shaft. No resilient connection is provided between the applicator head and the hand grip nor is the drive motor incorporated within the applicator head.

U.S.P. 4,604,993 (Moriwaki et al) discloses a massager in which an applicator head is resiliently supported to a hand grip. But, the applicator head described is designed to be driven by a drive motor mounted within the hand grip through an elongated drive linkage extending from the hand grip into the applicator head. Thus, it is not

intended to incorporate the drive motor in the applicator head itself.

The present invention is intended to eliminate the above-mentioned problem and provides a vibratory massager that is improved by dynamic balance.

According to the present invention there is provided a vibratory massager comprising

a manually holdable handle and a

vibrator head flexibly connected to the handle, the head including a motor and an eccentric drivable by the motor such that its vibratory force acts substantially through the center of mass of the vibrator head.

Such vibratory massager may comprise:

an elongate hand grip;

an applicator head resiliently connected to one longitudinal end of the hand grip by means of a resilient coupling member for limited movement in substantially all directions relative to the hand grip;

a drive motor mounted within the applicator head, said drive motor having an output shaft which defines a center axis of said applicator head;

an eccentric flyweight carried on the output shaft of said motor in eccentric relation thereto for providing a vibratory motion to said applicator head upon rotation of said output shaft; and

counterbalancing means mounted within said

applicator head and arranged substantially to align the center of mass of the entire applicator head on said center axis with the center of mass of said eccentric flyweight in a plane of rotation about said center axis.

Since a limited movement of the applicator head relative to the hand grip is permitted, as above, the applicator head can be moved into an optimum angular position for achieving an effective massaging action whilst the hand grip can be maintained in a position allowing easy and comfortable manipulation to be performed.

Since the applicator head is provided with counterbalancing means, it can be dynamically balanced so that no appreciable counter shaking movement is transmitted back to the hand grip. A cause of serious fatigue of the user's hand grasping the hand grip is thus eliminated.

In a preferred embodiment, the counterbalancing means comprises a counterweight mounted within the applicator head in such a relation that the motor, the eccentric flyweight, and the counterweight are aligned in this order in the axial direction of applicator head. The applicator head is formed at its external top end with a convexedly shaped face which forms inside thereof a concave recess for receiving the counterweight. The convex end face of the applicator head is generally perpendicular to the axis of the

motor output shaft and is driven to move in a circular path within a plane perpendicular to the center axis so that it applies a rubbing massage action to a portion of the body against which it is placed. By better utilization of the concave portion formed inside of the convexedly shaped end face serving as the rubbing massage section, the counterweight is received within the applicator head in axially spaced relation from the flyweight within a limited axial dimension of the applicator head.

In the accompanying drawings:

FIGURE 1 is a perspective view of a hand-held vibratory massager in accordance with a preferred embodiment of the present invention;

FIGURE 2 is a sectional view of an applicator head and the portion of a hand grip composing the vibratory massager;

FIGURE 3 is a perspective view of a portion of the applicator head and a counterweight held thereby;

FIGURES 4A and 4B are diagrams schematically illustrating the principle of the present invention, respectively;

FIGURES 5A and 5B are diagrams schematically illustrating the feature and problem of a prior vibratory massager; and

FIGURES 6A and 6B are diagrams schematically illustrating the feature and problem of another

vibratory massager introduced for comparison with the preferred embodiment.

A preferred embodiment of the invention will now be detailed and reference will be made to the drawings just mentioned. The description that follows is given by way of example only.

Referring to Fig. 1, a hand-held vibratory massager in accordance with a preferred embodiment of the present invention is shown to be composed of an elongated hand grip 10 and an applicator head 20 which are resiliently connected by means of a coil spring 30. The hand grip 10 is a hollow tube provided with a main switch handle 11 and a control dial 12 for adjusting the rate of vibration effected by the applicator head 20. A power cord 13 extends from the rear end of the hand grip 10 for energization of an electric motor 40 mounted within the applicator head 20.

As shown in Fig. 2, the applicator head 20 comprises a core barrel 21, a cushioning annulus 22 surrounding the barrel 21, and a convexedly shaped end plate 23 covering the top face of the barrel 21. The core barrel 21 is composed of a base member 21a and a top member 21b secured together by means of screws 24 (only one of which is seen in the figure). The motor 40 is mounted within the core barrel 21 together with a flyweight 50 so that the applicator head 20 is made as a self-contained vibration-generating unit. Fixed in the narrow end

of the base member 21a is a ring 25 on which the motor 40 is supported with its output shaft 41 extending in coaxial alignment with a center axis X of the applicator head 20. The motor 40 includes a casing 42 composed of a base plate 42a secured to the ring 25 and a cylindrical cover 42b surrounding a stator 43 and a rotor 44. The output shaft 41 carried by the rotor 44 is journaled at its longitudinal ends respectively by bearings 45 and 46, one at the base plate 42a and the other at an extension bracket 42c on the top center of the cylindrical cover 42b. The eccentric flyweight 50 is connected to the exposed end of the output shaft 41 by a stem 51 in such a way that a major portion 52 thereof rotates around the extension bracket 42c upon rotation of the output shaft 41 for producing vibrations transverse to the axis of the output shaft 41 or the center axis X of the applicator head 20.

One end of the coil spring 30 extends into the ring 25 of the applicator head 20 and is threadedly engaged therewith, while the other end of the coil spring 30 extends into the end of the hand grip 10 where it is secured by means of a clamp member 14. A corrugated cover 31 surrounds the coil spring 30 between the applicator head 20 and the hand grip 10 with its opposite ends connected respectively to the applicator head 20 and the hand grip 10. This resilient coupling permits the applicator head 20 to move substantially in all directions with respect to the hand grip 10 in a limited extent, so that

the applicator head 20 can be brought into an optimum angular position with respect to the hand grip 10 during the massaging treatment, assuring an effective massage treatment with the hand grip 10 supported by the user at a comfortable position.

The annulus 22 of the applicator head 20 is made of a cushioning material, for example, foamed polyethylene covered by a soft shell 26 which is connected at its inner ends to the core barrel 21 and is formed on its exterior with a number of circumferentially extending ribs 27. The side face of the annulus 22 including the ribs 27 serves to apply a tapping massage effect upon a selected body portion against which it is placed. The convexedly shaped end plate 23 is made of relatively hard plastic material and extends over a cushioning material 28 with its peripheral end hooked to the end of the top member 21b. The end plate 23 is cooperative with the cushioning material 28 to apply a rubbing massage effect upon the body portion as the applicator head 20 vibrates.

Mounted within the applicator head 20 is a counterweight 60 which is offset from the motor 40 and the flyweight 50 along the center axis X in order to provide dynamic balancing of the applicator head 20. The counterweight 60 is in the form of circular metal plate which is mounted coaxially within a shallow sink 21c in the end of the top member 21b and is secured thereto by means of screws 61, as best shown in Fig. 3. And this counterweight 60 is received together with the cushioning material 28 within a concave recess formed inside

of the convexedly shaped end plate 23. It is this counterweight 60 that acts to coincide the mass center Mc of the entire applicator head 20 including the motor 40 and resiliently supported by the coil spring 30 with the mass center Mf of the flyweight 50 in the direction of the center axis X of the applicator head 20. That is, the mass center Mc of the entire applicator head 20 and the mass center Mf of the flyweight 50 are aligned in a same plane P perpendicular to the center axis X of the applicator head 20, as indicated in Fig. 2. In other words, when the flyweight 50 is rotating, the mass center Mc of the entire applicator head 20 comes on the center axis X in coincidence with the center of rotation of the mass center Mf of the flyweight 50.

The effect of dynamically balancing the applicator head 20 will be discussed with reference to Figs. 4A and 4B. Since the mass center Mc of the applicator head 20 and the mass center Mf of the flyweight coincide with each other in the axial direction, or there is no displacement between Mc and Mf in that direction, force F produced at the rotating flyweight 50 acts only to vibrate the applicator head 20 and will not cause any substantial torque about the mass center Mc of the entire applicator head 20, leaving the hand grip 10 free from any reaction shaking which would otherwise result from such torque developed as in the prior massager of Figs. 5A and 5B, 6A and 6B. Thus, the hand grip 10 can be kept rather intact during the massaging treatment, whereby the user can enjoy the

massaging effect for an extended time without suffering such reaction shaking or irritating jerky movement. It is to be noted at this time that the bearing 46 is utilized to support the output shaft 41 at a point which coincides with the mass center Mf of the flyweight 50 in the axial direction for stably and effectively supporting the output shaft 41 against the vibration of the flyweight 50. Further, the counterweight 60 of rigid material serves to back up the cushioning material 28 over the entire area thereof in order to give a proper cushioning characteristic to the tapping massage section at the top end face of the applicator head 20.

CLAIMS:

1. A vibratory massager comprising a manually holdable handle and a vibrator head flexibly connected to the handle, the head including a motor and an eccentric drivable by the motor such that its vibratory force acts substantially through the center of mass of the vibrator head.

2. A vibratory massager comprising:

an elongate hand grip;

an applicator head resiliently connected to one longitudinal end of the hand grip by means of a resilient coupling member for limited movement in substantially all directions relative to the hand grip;

a drive motor mounted within the applicator head, said drive motor having an output shaft which defines a center axis of said applicator head;

an eccentric flyweight carried on the output shaft of said motor in eccentric relation thereto for providing a vibratory motion to said applicator head upon rotation of said output shaft; and

counterbalancing means mounted within said applicator head and arranged substantially to align the center of mass of the entire applicator head on

said center axis with the center of mass of said eccentric flyweight in a plane of rotation about said center axis.

3. A vibratory massager as claimed in claim 2, wherein said counterbalancing means comprises a counterweight which is disposed within said applicator head in such a relation that the motor, the eccentric flyweight, and the counterweight are aligned in this order in the axial direction of said applicator head.

4. A vibratory massager as claimed in claim 3, wherein said applicator head is formed at its external end with a convexedly shaped massaging face which forms inside thereof a concave recess for receiving said counterweight in axially spaced relation with said flyweight.

5. A vibratory massager as hereinbefore described with reference to and as illustrated in Figures 1 to 4 of the accompanying drawings.