Dec. 8, 1959 J. P. HUSSAR 2,915,912

ELECTRICALLY-OPERATED TOOTHBRUSH

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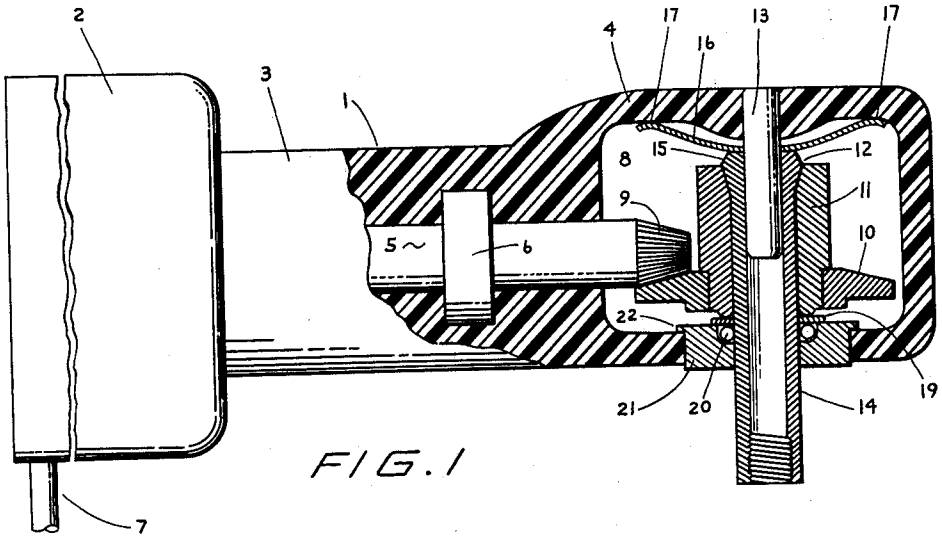


FIG. 1

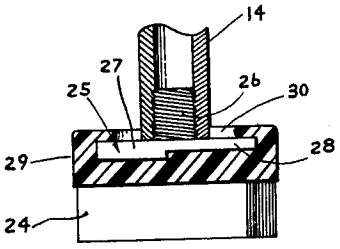


FIG. 2

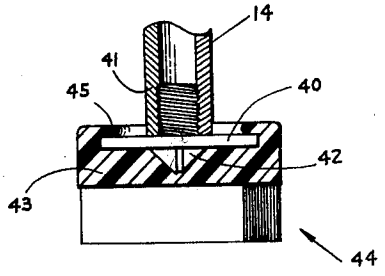


FIG. 3

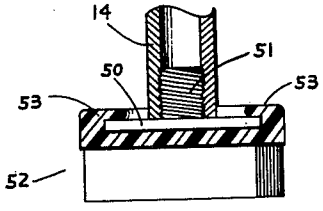


FIG. 4

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ELECTRICALLY-OPERATED TOOTHBRUSH

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6 Claims. (Cl. 74—423)

The present invention relates to an improved structure in an electrical toothbrush.

The present invention specifically relates to an electrically-operated toothbrush in which a rotatable brush is operated from a motor source through a series of gears and other elements which provide a suitable operating control over the rotating brush.

There has been a continuous development of electrically-operated toothbrushes. To date, however, structures devised have not been entirely satisfactory for operation intermittently over long periods of time. The difficulties encountered in constructing a satisfactory electrically-operated toothbrush include the fact that the brush itself must, of course, be of a very small size and must further be shaped to conform with suitable operating requirements. Among these requirements is the necessity of providing the brush which rotates with sufficient shielding so as to prevent its engagement with or rubbing of the inside wall of the user's mouth.

Further, the structure must be sufficiently rugged, although small, to withstand substantial stresses on the driven shaft which rotates the rotating brush. These stresses may be applied to the driven shaft from almost any angle. Moreover, the bearing means which support this shaft must be quite strong in nature; for in view of the very small size of the unit, the leverage action on the driven shaft, caused by sideways motion of the brush, can be quite substantial.

Additionally, the structure must include provisions for slowing or stopping the rotation of the brush when an excess of pressure is applied to it. This is required in order to protect the user from gum injuries due to excessive speeds and pressures of the brush against the gums.

The present invention satisfactorily attains the objects enumerated above as well as other objects and further provides advantages not heretofore known. In the present invention there is provided a driving shaft which engages, through a set of bevel gears and a coaxially-mounted bushing on one of the bevel gears, a driven shaft. This driven shaft is securely mounted for free rotation and longitudinal movement on a pin with additional support being provided to the shaft by a bearing member. Compact means are provided between the bushing and the driven shaft for frictional engagement of the shaft with the bushing. This particular arrangement enables the driving shaft and gears associated therewith to continue at normal operating speed, although the driven shaft is disengaged from the driving shaft on the application of excessive pressure onto the brush. The present invention also provides by this structure the unit which is compact in nature and which may readily be assembled with a minimum of expense.

There is also provided in the present invention a novel means of securing the rotating brush to the driven shaft with this engagement being of such a nature as to permit a ready removal of the brush and its replacement by a new one. These and other features of the present invention will be more clearly understood when considered

in connection with the accompanying drawings in which:

Figure 1 is a partially cross-sectional side view of the invention,

Figure 2 is a cross-sectional elevation of the brush attached to the driving shaft,

Figure 3 is a modification of the brush and drive shaft, and

Figure 4 is a further modification of the brush and drive shaft.

Referring first to Figure 1, there is illustrated an electrically-operated brush having a casing generally indicated at **1**. This casing may be made of any suitable material, but preferably is made of a plastic, such as polystyrene or acetate. Within this casing **1** there is provided a motor section **2** and a shaft section **3**, which interconnects the motor section **2** with the head **4**. A driving shaft **5** extends longitudinally through the shaft section **3** and is suitably mounted in it for rotation by one or more bearings **6**. The shaft engages and is operated by a motor contained within the motor section **2**. This motor is not shown, but it may be of conventional design and may receive a power supply through the cord **7**.

The other end of this driving shaft **5** projects into a hollow opening **8** formed in the head **4**. The end of this driving shaft **5** is formed into a beveled gear **9**. A second bevel gear **10** operatively engages the first bevel gear **9**. This second bevel gear **10** is secured in fixed relation by suitable means to the bushing **11**. The bushing **11**, which is coaxial with the gear **10**, is provided with a central opening having a beveled end **12**. This opening in the bushing **11** is coaxially aligned with the pin **13**. This pin **13** is fixed in the wall of the head **4** and projects into the opening of the bushing **11**. Coaxially mounted on the pin **13** and also coaxially positioned within the opening in the bushing **11**, is the driven shaft **14**. This driven shaft **14** is preferably hollow along its entire length, although it need actually be hollow only along a limited portion of its length. The driven shaft **14** is freely rotatable upon the pin **13** and is further movable longitudinally with respect to it. The driven shaft **14** is provided with a flared end **15** within the opening **8**. This flared end **15** has a contour shaped to conform with the flared end of the opening within the bushing **11**. These two flared surfaces, one on the driven shaft **14** and one at the end of the opening in the bushing **11**, are adapted to frictionally engage with one another when the driven shaft **14** is moved outwardly of the casing. If necessary, the surfaces of the driven shaft **14** and the flared or beveled portion of the bushing **11** may be roughened to facilitate the frictional engagement. A frictional engagement is normally maintained, unless other stresses are applied through the driven shaft **14**, by means of the spring **16**. This spring is preferably dome-shaped with a central opening symmetrical with the spring **16**. The spring **16** is coaxially mounted on the pin **13** with its peripheral edges engaging the inner surface of the head section **4** at **17**.

The bushing **11** and bevel gear **10** are secured in a fixed longitudinal position in one direction by the engagement of the gear **9** with the gear **10** and in the other direction by the washer **19**, preferably formed of steel, the ball bearing race **20** and the cap **21**. The washer **19**, ball bearing race **20** and cap **21** are all coaxially mounted on the driven shaft **14**. The cap **21** is fixed by suitable means within an opening in the head **4**. The ball bearing race **20** is positioned within this cap and is covered with the washer **19** interposed between the cap **21** and the bottom of the bushing **11**. To prevent accidental dislodging of the cap **21**, a shoulder **22** may be provided, which shoulder engages the cap with the wall of the head **4**.

The bevel gears **9** and **10** may, if desired, be formed of

frictional engaging surfaces. However, for a more positive drive, the bevel gear arrangement is preferred.

At the end of the driven shaft **14**, there is secured a rotatable brush **24**, as illustrated in Figure 2. This brush is secured to the driven shaft **14** through a plate member **25**. This plate member is secured to the end of the shaft **14**, preferably by a threaded stud **26** which threads into the end of the driven shaft **14** and which is also secured to the plate **25**. The plate **25** is preferably circular in plan view with a two level thickness as illustrated at **27** and **28**. The brush **24** is provided with a cap **29** having a recess which conforms to the stepped configuration of the plate **25**. This recess is positioned under a lip **30** so that the brush **24** with its cap **29** preferably formed of a flexible plastic material, such as polyethylene, may be engaged and securely held by the plate **25** during the rotation of the shaft **14**. A modification of the brush and attachment elements is illustrated in Figure 3.

In this Figure 3 there is illustrated the plate **40** secured by a threaded stud **41** to the lower threaded end of the driven shaft **14**. The plate **40**, which may be circular in plan view has a projecting section shaped similar to a Philips head screw driver as illustrated at **42**. This engaging member **42** projects into a complementary recess within the cap **43** of the brush **44**.

The cap of the brush **44** is secured to the plate **40** with the element **42** in its engaging position by the lips **45** which overlap the plate **40**.

A further modification of this structure is illustrated at Figure 4 in which the plate **50** is secured to the driven shaft **14** by a threaded stud **51** projecting from the upper surface of the plate into the threaded recess of the driven shaft **14**. The plate **50**, unlike those previously mentioned, is rectangular in shape and is positioned within a recess in the cap **52**, which recess has a corresponding rectangular shape. A lip **53**, about the periphery of the recess, secures the plate **50** to the brush **52**.

Having now described my invention, I claim:

1. An electrically-operated toothbrush having a drive shaft with a first bevel gear at the end thereof, a second bevel gear interengaging the first and having a bushing secured thereto, said bushing having a beveled opening with a frictionally-engaging surface, a pin coaxially aligned with said opening, a driven shaft freely rotatable on and longitudinally movable with respect to said pin, said driven shaft projecting through said opening with a flared frictional engaging surface, and tensioning means normally tensioning said surfaces into engagement.

2. A structure as set forth in claim 1 wherein said pin is mounted on a casing and projects into a coaxial opening in said driven shaft and said driven shaft has a limited longitudinal movement.

3. A structure as set forth in claim 1 wherein said tensioning means comprises a dome-shaped spring coaxial with said pin and having one surface engaging the end of said driven shaft.

4. A structure as set forth in claim 1 wherein said toothbrush is provided with a casing having an enclosed head, said pin mounted within said head and said driven shaft projecting from said casing.

5. An electrically-operated toothbrush having a casing with walls forming an enclosed chamber, a driving shaft with a first bevel gear at the end thereof mounted for rotation within said casing, a second bevel gear interengaging the first bevel gear and having a bushing coaxially secured thereto with said bushing having an opening with a flared friction engaging surface, a hollow driven shaft coaxially positioned within said bushing, a fixed pin projecting into said hollow driven shaft and supporting it for free rotation and limited longitudinal movement, said driven shaft having a friction engaging surface adapted on longitudinal movement outwardly of said casing to engage said surface of said bushing, and tensioning means normally tensioning said surfaces into engagement.

6. An electrically-operated toothbrush having a drive shaft with a first bevel gear at the end thereof, a pin mounted normal to and in the same plane as the axis of said shaft, a driven shaft, a bushing and a second bevel gear each coaxial with said pin, said driven shaft freely rotatable on said pin, said bushing and second bevel gear interengaged, said first and second bevel gears interengaged, frictional engaging means provided in part on said driven shaft and in part on said bushing, and tensioning means normally maintaining said bushing and driven shaft in frictional engagement.

References Cited in the file of this patent

UNITED STATES PATENTS

1,897,365	Duey	Feb. 14, 1933
2,005,337	Doll	June 18, 1935
2,401,992	Waller	June 11, 1946
2,723,014	Locke	Nov. 8, 1955

FOREIGN PATENTS

919,905	Germany	Nov. 8, 1954