April 3, 1945. J. R. NALBACH ET AL 2,372,731

POWER OPERATING MEANS FOR TOOTH BRUSHES

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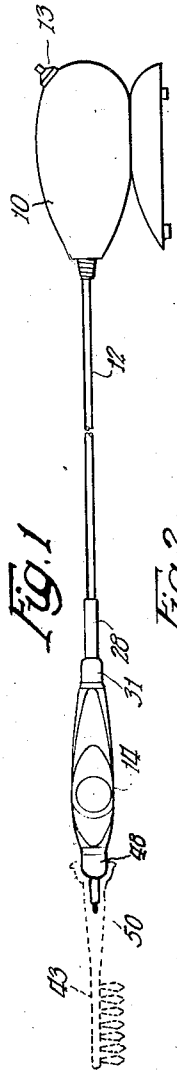


Fig. 1

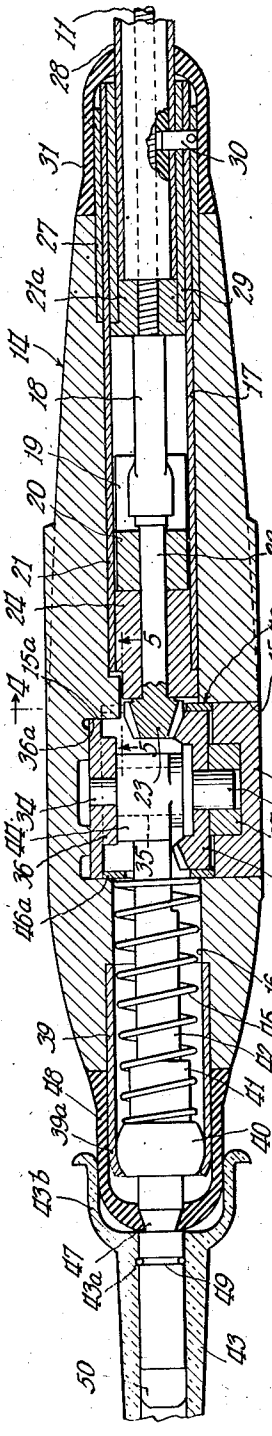


Fig. 2

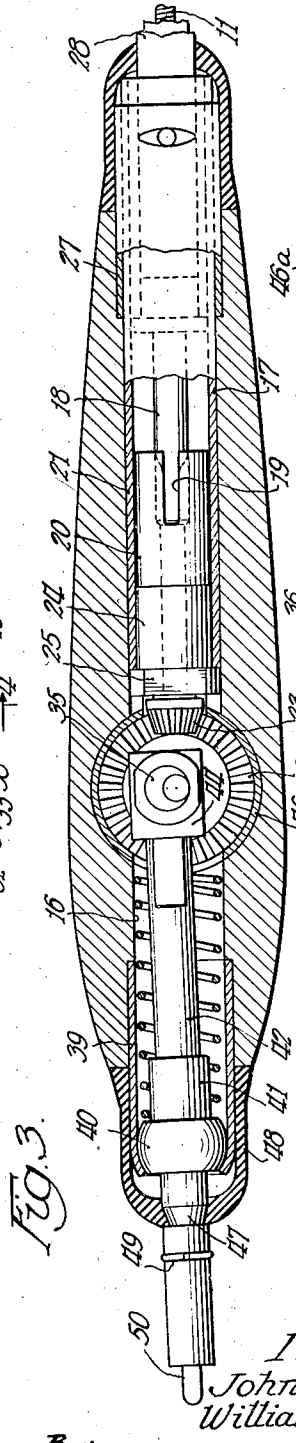


Fig. 3

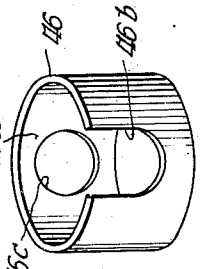


Fig. 6

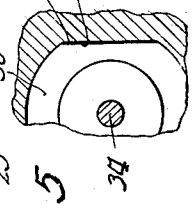


Fig. 5

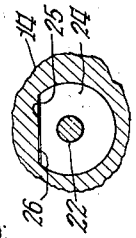


Fig. 4

Inventors:
John R. Nalbach
William F. Gresham

By:
Sheridan Davis & Cargill Attys.

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POWER-OPERATING MEANS FOR TOOTHBRUSHES

John R. Nalbach, Oak Park, and William F. Gresham, Chicago, Ill., assignors to Conrad D. Mastrud, Oak Park, Ill.

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4 Claims. (Cl. 74—44)

This invention relates to power operating means for tooth brushes.

In some forms of power operating means for tooth brushes comprising a handle constituting a casing for the motion translating mechanism which is driven by a rotary electric motor and imparts to a tooth brush a movement such that the ends of the bristles move in co-planar circular or elliptical paths, the entrance of water and dentifrice into the mechanism has impaired the operation and at times rendered the mechanisms inoperable. In the type of devices mentioned where the brush is carried on a reciprocable arm extending from the casing, it has been found that water and dentifrice from the brush getting on the arm tends to be worked into the casing and not only clogs the mechanism in time but due to the abrasive character of some of the constituents of the dentifrices damages the parts. Since such brushes utilize relatively small motors of fractional horse power, it is not feasible to pass the reciprocable members through tight packings for excluding foreign substances and if it were, the abrasive action of some dentifrices would doubtless soon damage the operating arm. With a relatively low power supply available in such devices, it is desirable not only that water, dentifrices and other substances be excluded from the casing, but that the means employed for that purpose shall not impose an excessive load in the motor and thereby substantially reduce the power available for operating the brush for cleansing and massaging the teeth and gums.

It is therefore an object of the present invention to provide a mechanism of the general type mentioned above which is provided with means which effectually exclude water and dentifrices from the mechanism without imposing excessive loads on the power means.

An additional object of the invention is to provide a non-divided casing for the motion translating mechanism since it has been found that where a casing is of two parts fastened together by screws, notwithstanding that the casing sections may be formed carefully of moulded plastic, the joint between the sections is not always sufficiently tight to exclude water. The difficulties resulting from the use of a divided casing including the entrance of foreign substances as well as the mis-alignment of parts are largely avoided by using a non-divided or essentially a one-piece casing. The provision of a suitable one piece casing, however, has presented difficulties in the matter of assembly therein of the operating parts of the mechanism, including bearings, gears, bushings, eccentrics, reciprocating arm or pitman and other parts and it is a further object of this invention to provide a casing and parts so designed as to facilitate the assembly therein of the mechanism and the retention of locking of the same in proper operative relation.

Additional objects of the invention relate to features of construction and relation and assembling of parts which will be more particularly pointed out in, or be apparent from a consideration of, the following specification and accompanying drawing wherein

Figure 1 is a general view of a power operated tooth brush or dental instrument embodying the present invention.

Figure 2 is an enlarged longitudinal sectional view of a brush operating mechanism.

Fig. 3 is a longitudinal sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a broken sectional view taken on line 4—4 of Fig. 2.

Fig. 5 is a broken sectional view taken on line 5—5 of Fig. 2.

Fig. 6 is a view of a detached spring abutment member.

In the drawing an electric motor 10 is shown adapted to rest upon a suitable support or to be attached to a wall for example at a convenient height and location. The motor operates a flexible shaft 11 the exterior sheath 12 of which appears in Fig. 1. The shaft 11 operates the brush operating mechanism under control of a switch 13 on the motor casing.

The brush operating mechanism is shown in Figs. 2 and 3 and, as illustrated, comprises a one piece casing 14 having a cylindrical axial passage therethrough which is intersected by a transverse recess or chamber 15, the forward and rear portions of the axial passage being designated by numerals 16 and 17 respectively. The recess or chamber 15 which is generally cylindrical extends from one side of the casing, as shown in Fig. 2 a distance less than the corresponding dimension of the casing and has a bottom wall (shown uppermost in Fig. 2) which is integral with the casing.

The driving end of the flexible shaft 11 extends into the passage section 17 and has secured thereto a driving member 18 which releasably seats in a slot 19 of a bushing 20 which is rotatable within a removable tube or sleeve 21 which lines the wall of the passage 17. A shank 22 of a bevel pinion 23 is fixed within an axial

passage of the bushing 20 whereby rotation of the member 18 effects rotation of the bushing and also of the pinion.

A bearing 24 in the liner tube 21 is secured thereto against relative rotation, as by having a pressed fit therein, or by brazing or the like. The tube 21, bushing 20, pinion 23 and bearing 24 constitute a removable sub-assembly which is restrained against rotation within the passage 17 by the inter-engagement of two flat, chordal surfaces 25 and 26, the former in the bearing 24 and the latter at the inner end of the passage 17 as shown in Fig. 4.

Projecting from the rear end of the passage 17 is a tubular metal sleeve 27 which is fixed relative to the casing and reinforces the rear portion thereof as is desirable where the casing is formed of moulded plastic. A flexible tube 28, as of rubber, is shown on the portion of the flexible shaft within and adjacent the casing 14 for resisting sharp bends in the shaft. Surrounding the inner portion of the protective tube 28, where the latter is used, or upon the inner end of the sheath 12 if the member 28 is not employed, is secured a cylindrical ferrule 29 which is slidable within the cylindrical tube 21 and at its inner end receives a stationary centering plug 21*a* which centers the rotary shaft 11 and coupling member 18 within the tube 17.

The motor 10, shaft 11, shaft driven member 18, protective tube 28 and ferrule 29 may be considered a second sub-assembly which can readily be operatively attached to the first sub-assembly by a pin 30 which is adapted to be inserted in alined openings provided in members 27, 21, 29, 28 and if desired, as shown, into the outer surface of the sheath 12. By removing the pin, the second sub-assembly can readily be separated from the first, the member 21 of the latter of which being the element by means of which the two assemblies are retained by the pin in cooperative or driving relationship while the member 27 prevents withdrawal of the second assembly from the casing. The pin 30 is retained in position by a resilient cup-like member 31 which is adapted to be stretched or expanded slightly into gripping relation with the rear end of the tube 27 and with the flexible shaft thereby excluding foreign matter from the passage 17.

Within the chamber or recess 15 is a bevel gear 32 which meshes with and is driven by the gear 23 which projects into the chamber. Secured to the gear for rotation therewith is a crank member comprising co-axial journals 33 and 34 and an intermediate eccentric crank pin 35. A bearing 36 receives the journal 34 while a bearing 37, secured in a closure member 38 for the chamber 15 receives the journal 33. The bearing 36 is restrained from rotation by the coaction of a flat chordal surface 36*a* thereof which contacts a similar surface 15*a* provided in the wall of the chamber 15 as shown in Fig. 5.

In the forward portion 16 of the axial passage of the casing 14 is secured a sleeve 39 which at its forward end projects from the passage and is contracted at 39*a* to provide a bearing seat or surface for an oscillatable bearing 40 having a rearward extension 41. Extending through an axial passage in the bearing 40 and extension 41 is a cylindrical brush operating rod or arm 42 the forward end of which is arranged for releasable engagement with a hollow shank tooth brush 43 for example, or other operable device. The rear end of the arm 42 has a head 44 which receives the eccentric crank pin 35 that effects reciprocation of the arm when the device is in operation.

It will be noted that the brush 43, that is the free ends of the bristle thereof, operate in a given plane, the paths of movement of the ends of the individual bristles being either circular or elliptical, depending on the location of the bearing 40 with respect to the bristles and the head 44 of the arm. If the bearing 40 is spaced midway between the bristles and the head, the paths of movement of the latter will be substantially circular whereas if the bearing is nearer the head, the bristle paths of movement will be elliptical with the major axes disposed transversely of the brush. The last mentioned arrangement is shown and is preferred for tooth brush operation since with the casing or handle held in horizontal relation the major axes of the bristles will then be parallel with the teeth and the extent of movement of the bristles in an up and down direction will be greater than in a horizontal direction transversely of the teeth. The extent of the movement afforded the bristles can be varied by utilizing a crank arm with a greater or lesser throw than the one illustrated or by substituting a longer or shorter bearing tube for the tube 39 illustrated in the drawing or by providing the brush with a longer or shorter shank.

A spring 45 is disposed between the bearing 40 and a tubular spring-abutment member 46 (shown in Fig. 6) which lies in contact with the annular wall of the chamber 15 and has portions 46*a* partially overlying the inner end of the passage 16 which portions constitute a seat or abutment between which and the bearing 40 the spring 45 is suitably compressed for retaining the bearing in contact with the bearing seat 39*a* of the tube 39. The abutment member 46, which has suitable openings 46*b*, 46*c* therein in alignment with the passages 16 and 17 respectively, permit withdrawal of the arm 42 in a rearward axial direction or insertion in the forward direction as will be explained later.

The forward portion of the arm 42 as shown is provided with an annular recess or seat 47 for receiving an annular wall of an opening in a hollow elastic sealing member 48 which extends rearwardly into sealing contact with the forward portion of the member 39. The sealing member, being elastic and easily flexible, preferably is made of rubber or equivalent material and provides a tight seal with both members 39 and 42 and which by reason of its flexibilitly permits movement of the latter without imposing excessive load on the mechanism and provides an effective seal against entrance of water, dentifrice or other matter into the operating mechanism at the forward end of casing 14.

The exterior portion of the arm 42 is provided with means, such as a contractile spring ring 49 for releasably seating in an annular groove 43*a* provided in the interior wall of the hollow shank of the brush 43. The shank is provided, in the form of the brush illustrated, with a cup-like rear end 43*b* which preferably seats on the exterior of the forward portion of the sealing member 48 which arrangement excludes foreign matter from the interior of the brush shank. The forward end of the operating arm 42 is provided with an extension 50 which seats in a complementary recess in the shank of the brush for preventing axial rotation of the brush with respect to the arm.

As mentioned above the single key or pin 30 retains the two previously described sub-assemblies in operative position within the casing 14 and upon removal of the pin those assemblies can be withdrawn readily from the casing. When they have been so withdrawn the remaining portions of the operating mechanism can be withdrawn also, first by removing the closure 38 which carries the bearing 37, then removing the gear 32 which carries also the eccentric crank pin 35 and journals 33 and 34, then by sliding the arm 42 axially through passage 17 and lastly removing the annular spring abutment member 46, spring 45, bearing 40 and bearing 36 the last four members being removable through the chamber 15. In assembling the parts the bearing 36 may first (but not necessarily) be placed in the chamber 15 and then the bearing 40 inserted in chamber 15 and into passage 16 as is also the spring 45. The spring abutment member (shown in detached relation in Fig. 6) is then inserted in the chamber, the spring 45 being contracted into the passage 16 by any suitable means to enable the member 46 to be slid past the adjacent end of the spring. The member 46 retains the bearing 36 in position in the chamber. The arm 42 with the integral crank head is then inserted in the rear end of the passage 17 and slid into the approximate position shown in Fig. 2 after which the gear 32 and crank assembly may be inserted and the closure 38 with attached bearing 37 placed in position, but it may be more convenient to insert the bearing and closure assembly later. Hence following the insertion of the arm 42, the sub-assembly carried by the sleeve 21 may next be inserted in the passage 17 from the rear open end thereof and thereafter the sub-assembly which includes the driving member 18, ferrule 29, and adjacent enclosed end of the flexible drive shaft, may be inserted and secured by the pin 30. Thereafter, unless previously assembled as mentioned above, the closure 38 and bearing 37 assembly may be placed in position (after placing lubrication in the chamber 15 if required) and the closure secured in position by a suitable retainer screw (not shown) or by reason of the closure having a tight or pressed fit with the wall of the passage. The marginal portion of the closure member 38 contacts the adjacent edge of the spring abutment member 46, preferably when the outer surface of the closure is flush with the adjacent surface of the casing 14. When the sealing members 31 and 48 have been placed in position the assembly is complete and the interior of the casing is sealed against entrance of foreign substances, such as water, dentifrice or the like.

The sealing members being resilient, particularly the front member 48, the latter not only flexes laterally but also distends slightly longitudinally as the arm 42 pivots at the rocking bearing 40 and is moved outwardly by the throw of the crank pin 35. The member 48 thus provides a constant seal between the relatively stationary forward end of the casing and the movable arm 42 and avoids the necessity of using a packing around the arm for excluding foreign substances from the mechanism, which not only increases the load unduly, but has not been found satisfactory in preventing the entrance of dentifrice into the interior of the casing along the reciprocating arm 42. The sealing member 48 grips the arm without relative sliding relation therebetween and hence effectually excludes the passage of water and dentifrice inwardly of the casing along the arm.

Since the casing, which constitutes a manipulable handle for the brush, is of one piece rather than of two pieces secured together by screws, the misalignment of bearings and resultant wear and failure of parts as has been experienced where a two section casing has been employed, has been avoided and a quieter operating and more satisfactory mechanism which can be readily assembled with simple fastening means has been provided.

While we have shown and described a structure embodying the present improvement for the purpose of illustration, detailed changes may be made therein within the spirit of the present invention.

We claim:

1. In combination a manipulable handle for an operated member comprising an elongated one-piece casing provided with a transverse chamber having an end opening in a side wall of the casing and forward and rear axial passages extending from said chamber to the respective ends of the casing, rotary driven means in the rear passage comprising a pinion extending into said chamber, a motion translating mechanism in said chamber comprising a gear driven by said pinion and a crank pin operable by said gear, a reciprocable arm in said forward passage having a crank head engaging said crank pin within said chamber and a portion extending from said passage forwardly of the casing for engagement with an operated member, said reciprocable arm and said rotary driven means being insertable into the respective operative positions through said rear passage and said motion translating mechanism being insertable into said chamber through said end opening thereof, a rotary drive assembly in said rear passage provided with means for drivingly engaging said rotary driven mechanism, and means extending through a rear portion of said casing and into said assembly for retaining the latter and said driven mechanism in cooperative relation.

2. In combination, a manipulable handle constituting a casing for operating means of a device to be actuated, said casing having an intermediate transverse chamber having one end open at a wall of the casing and forward and rear axially arranged passages extending from said chamber to the respective ends of the casing, said forward passage having at the forward end thereof a bearing seat for an oscillatable bearing, a bearing in said seat having a bore therethrough, a reciprocable oscillatable member extending longitudinally of said passage through said bore to the exterior of the casing for releasable engagement with a device to be actuated, said member being provided with a crank head disposed within said chamber, a cylindrical sleeve in said chamber having diametrical openings therein registering with said passages, a perimetrical portion of the sleeve adjacent one of said openings partially overlying the rear end of the forward passage to define a spring abutment, a helical compression spring disposed in said forward passage between said abutment and said oscillatable bearing for retaining the latter against said bearing seat, a motion translating mechanism in said chamber comprising a crank shaft provided with end journals and a gear, a closure member for said opening of said chamber provided with a bearing for one of said journals, a second bearing for the other of said journals disposed at the opposite end of said chamber, said bearings in said chamber being retained in spaced apart re-

lation by said sleeve, and rotary means in the rear passage comprising a pinion projecting through the second opening of said sleeve into driving engagement with said gear in said chamber for effecting operation of the reciprocable-oscillatable member.

3. In a device of the class described a manipulable handle having an axial passage therethrough and a transverse chamber intersecting said passage to provide forward and rear passage sections, said forward passage having a semispherical constriction at the forward end constituting a seat for a ball-like oscillatable bearing provided with a bore for receiving a reciprocable member, said forward section of said axial passage and said chamber being arranged whereby said bearing may be inserted in the latter and moved along the former into position in said seat, a helical compression spring in said forward passage section for retaining said bearing in contact with said seat, a cylindrical sleeve insertable in the open end of said chamber and fitting against the side walls thereof and provided with opposed openings each in registration with one of the adjacent ends of said passage sections, a portion of said sleeve overlying a portion of the adjacent end of said forward passage section and constituting an abutment for said spring for retaining the same under compression against said seat, a reciprocable-oscillatable arm adapted to be inserted through said rear passage sections and extending into said forward passage through said registering sleeve opening and the bore of said bearing to the exterior of the casing for supporting on the outer end thereof a device to be operated, the inner end of said arm being provided with a crank head, a pair of removable bearings in said chamber retained in spaced apart relation by abutting contact with the ends of said sleeve, a crank shaft in said chamber journalled in said bearings and comprising a crank pin slidable axially of the chamber into operative engagement with said crank head, a gear secured to said crank shaft, operating means for said gear comprising an assembly slidable forwardly into said rear passage section and comprising a bearing, a pinion adapted to project into said chamber into driving engagement with said gear and having a shaft journalled in said bearing, rotatable driving means for said shaft coupled to the same within said rear passage section and having a non-rotatable outer member and means for releasably engaging said last mentioned member for retaining said rotatable driving means in operative relation within said rear passage section.

4. In a device of the class described a manipulable handle having an axial passage therethrough and a transverse chamber intersecting said passage to provide forward and rear passage sections, said forward passage having a semispherical constriction at the forward end constituting a seat for a ball-like oscillatable bearing provided with a bore for receiving a reciprocable member, said forward section of said axial passage and said chamber being arranged whereby said bearing may be inserted in the latter and moved along the former into position in said seat, a helical compression spring in said forward passage section for retaining said bearing in contact with said seat, a cylindrical sleeve insertable in the open end of said chamber and fitting against the side walls thereof and provided with opposed openings each in registration with one of the adjacent ends of said passage sections, a portion of said sleeve overlying a portion of the adjacent end of said forward passage section and constituting an abutment for said spring for retaining the same under compression against said seat, a reciprocable-oscillatable arm adapted to be inserted through said rear passage section and extending through said forward passage, said registering sleeve opening, and the bore of said bearing to the exterior of the casing for supporting on the outer end thereof a device to be operated, the inner end of said arm being provided with a crank head, a pair of removable bearings in said chamber retained in spaced apart relation by abutting contact with the ends of said sleeve, a crank shaft in said chamber journalled in said bearings and comprising a crank pin slidable axially of the chamber into operative engagement with said crank head, a gear secured to said crank shaft, operating means for said gear comprising an assembly slidable forwardly into said rear passage section and comprising a bearing, a pinion adapted to project into said chamber into driving engagement with said gear and having a shaft journalled in said bearing, rotatable driving means for said shaft coupled to the same within said rear passage section and having a non-rotatable outer member and a withdrawable locking device for retaining said rotatable driving means in operative engagement with said assembly and retaining the pinion of the latter in mesh with said gear.

JOHN R. NALBACH.
WILLIAM F. GRESHAM.