Aug. 14, 1956 C. D. KEELY ET AL 2,758,326

ROTARY TOOTHBRUSH

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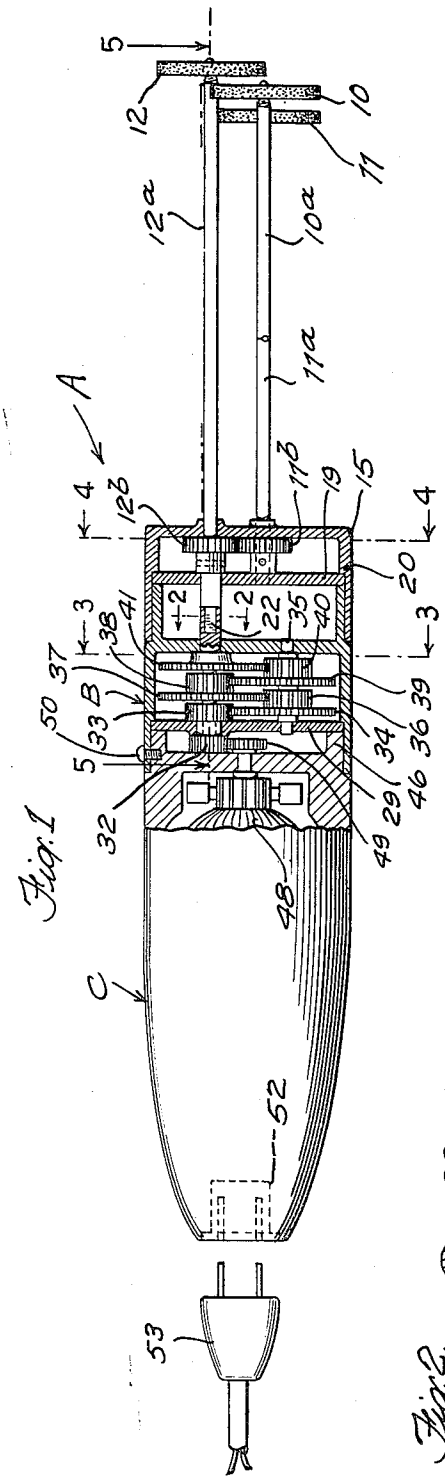


Fig. 1

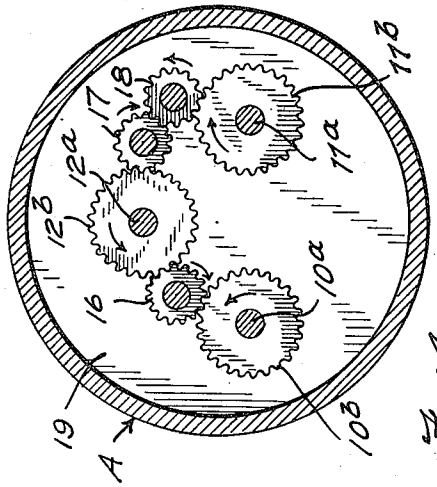


Fig. 4.

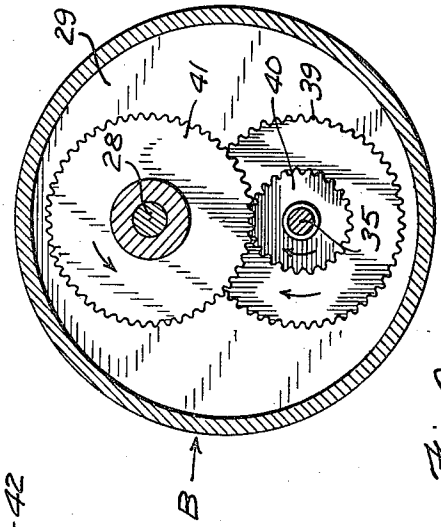


Fig. 3.



Fig. 2.

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Fig. 5.

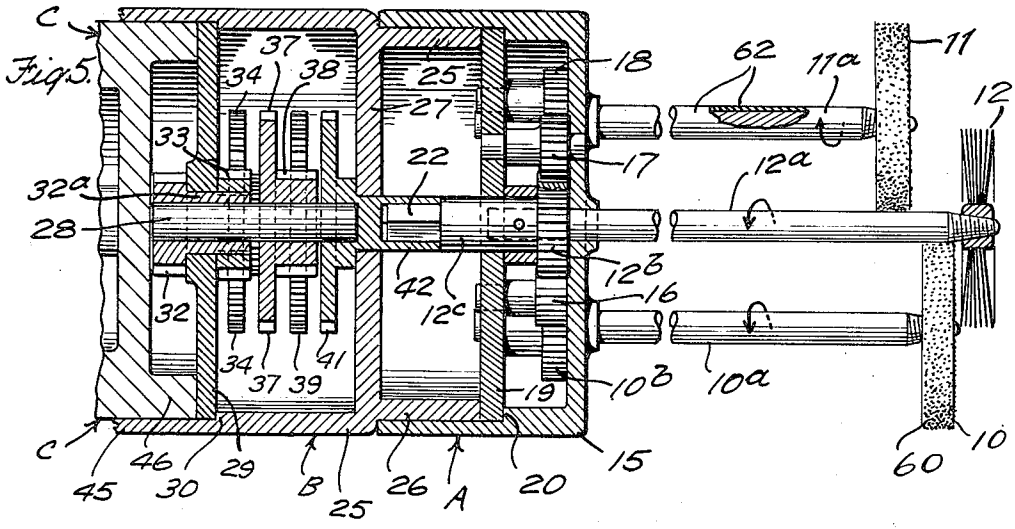


Fig. 6.

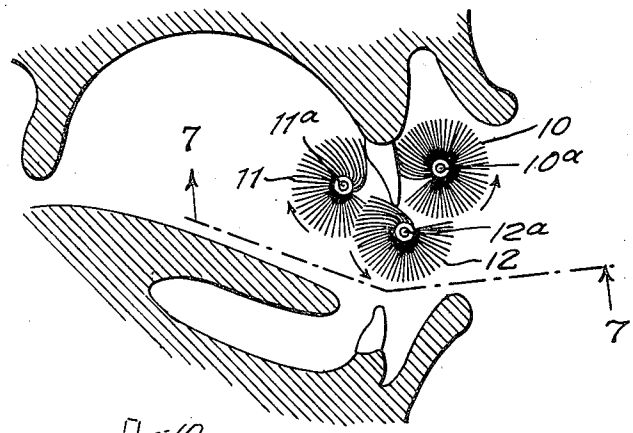
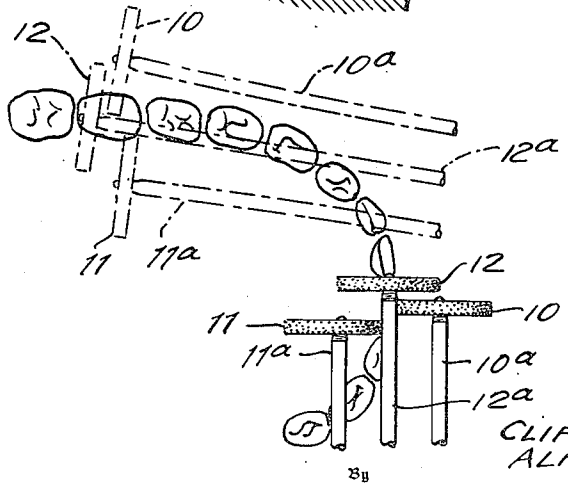


Fig. 7.



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ROTARY TOOTHBRUSH

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2 Claims. (Cl. 15—23)

Our present invention relates to improvements in rotary toothbrushes. In general it is an object of our invention to devise an improved power driven toothbrush which will be simple, practical and easy to use and which will overcome difficulties of existing types which have prevented their wide adoption.

It is a further object of our invention to provide such a brush which will enable the user to reach without difficulty the teeth least accessible, i. e., the back molars, and which will subject the teeth to gentle yet effective and approved cleaning action.

A still further object is to provide a device of this type consisting of a pair of oppositely rotatable brushes disposed at the ends of driven shafts which have sufficient flexibility so as to enable the brushes simultaneously to contact opposite sides of incisor teeth, for example, and yet by virtue of the flexibility of either or both shafts to contact opposite sides of the molar teeth.

A still further object is to provide such a device which will have means preferably in the form of a third cleaning brush for limiting the travel of the first two mentioned brushes into the gum region and counteracting the natural tendency of the opposed brushes, which simultaneously contact opposite sides of the teeth, to work down into the gum region by virtue of the fact that the direction of rotation of the brushes will be away from the gums.

A still further object is to provide a rotary tooth brush of the type mentioned in which the cylindrical brushes are of substantially disk-like shape, at least some of which occupy different planes from one another whereby said brushes when rotating do not interfere with one another.

A still further object is to so contrive the parts as to provide a unit containing the three brushes which will be readily separable from the motor drive unit containing desirably the speed reduction unit enabling each member of a family, for example, to have his own brush unit which may be readliy fitted into the driving unit. Likewise, if desired the speed reduction unit may be readily separable from the motor unit.

Other objects to be attained and the advantages thereof will be apparent as the description proceeds and the novel features will be pointed out in the claims.

In the drawings,

Fig. 1 is a view in elevation partly in section of the preferred embodiment;

Fig. 2 is an enlarged sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional view taken on line 3—3 of Fig. 1;

Fig. 4 is an enlarged sectional view taken on line 4—4 of Fig. 1;

Fig. 5 is an enlarged sectional plan view along line 5—5 of Fig. 1;

Fig. 6 is a view showing our improved device in use; and

Fig. 7 is a bottom plan view seen in the direction of the arrows 7—7 of Fig. 6.

Referring to the drawings in detail, our preferred embodiment consists of three separable units, namely, a brush holding unit A, a speed reducing element or gear box B, and a motor drive unit C. Unit A contains the oppositely driven brushes 10, 11, respectively mounted on shafts 10*a*, 11*a*, together with a brush 12 on shaft 12*a* which, as already pointed out, serves as a stop for limiting the travel of brushes 10 and 11 against the gums while also serving as a cleansing unit in itself. Shafts 10*a*, 11*a*, 12*a* pass into and are journaled within casing 15 and said shafts are driven through spur gears 10*b*, 11*b*, 12*b* attached respectively to shafts 10*a*, 11*a*, 12*a*. Power is applied to the system thus far described through gear 12*b* as will be pointed out below. Gear 12*b* in turn drives gear 10*a* through idler 16 and gear 11*b* through the idler pair 17, 18 as shown best in Fig. 4. Gears 16, 17, 18, 10*b*, 11*b* and 12*b* are journaled between the end of casing 15 and a preferably press-fitted disk-like wall 19 held in casing 15 against a shoulder 20. Gear 12*b* has an elongated hub 12*c* having its bearing in wall 19. Hub 12*c* has formed on its left hand end a reduced square portion to be received in a broached recess of the output end of the gear box drive to be described.

Gear box B consists of a housing 25 having a reduced portion 26 to engage the casing 15 of the brush unit A. Within housing 25 is disposed upper shaft 28 journaled in a disk-like wall 29 which is press-fitted into casing 25 against a shoulder 30. Shaft 28 has at the left end thereof a spur gear 32. Gear 32 has a hub 32*a* passing through the wall 29 and receives a pinion 33 press-fitted on the right hand end thereof, parts 32 and 33 being free to turn as a unit upon shaft 28. Pinion 33 engages gear 34 rotatably mounted on lower shaft 35. Integral with gear 34 is pinion 36 which engages the gear 37 on upper shaft 28. Integral with gear 37 is pinion 38 engaging larger gear 39 rotatably mounted on lower shaft 35. Pinion 40 is integral with gear 39 and engages larger gear 41 on upper shaft 28. Gear 41 has an elongated hub 42 which passes freely through wall 27 and has the broached opening already mentioned to receive the square end 22 of hub 12*c* attached to shaft 12*a*. Gears 37, 38 and 41 turn freely on shaft 28. By virtue of the gearing thus described, the speed of the brushes is brought to a suitably low value.

Gear box B is attached to the motor casing C by engagement of a flange 45 of the gear box with a reduced portion 46 of the motor casing. Within said casing is disposed motor 48 upon whose armature shaft is disposed spur gear 49 exterior of the motor casing C which engages spur gear 32 of the gear box B. The gear box may be attached to the motor casing by means of one or more set screws 50. The motor casing C is provided with the usual electrical socket 52 to which plug 53 of an outlet cord may be attached.

To return to the brushes 10, 11, 12, these are preferably of known construction in which the bristles are held at generally right angles to their shafts. Each brush is secured to its shaft preferably by means of a screw thread on a somewhat reduced shaft end engaging a hub 61 of the brush proper. Desirably the screw threads of the shaft terminals are chosen to be either right-handed or left-handed so that resistance to rotation of the brush will cause it to become tight rather than loose on the shaft. By virtue of the holding means described, the brushes are readily removable from their shafts. Other standard brush mountings may be employed. Shafts 10*a*, 11*a*, 12*a* are of sufficient length to reach the rear molars when the casing 15 is held outside the mouth, and normally are so arranged that the oppositely rotating brushes

10 and 11 are as close as desired—preferably overlapping whereby opposite sides of the incisor teeth may be simultaneously engaged. On the other hand said shafts 10*a*, 11*a* are sufficiently flexible so that when the molar teeth are cleaned said shafts will readily further separate to enable brushes 10 and 11 simultaneously to engage opposite sides of such teeth. Since it is desirable that the direction of rotation of the brushes 10 and 11 engaging the opposite sides of the teeth always be away from the gums, i. e., toward the teeth, thereby having the effect of urging the brushes toward the gums, means are provided for limiting the travel of the brushes 10 and 11, preferably in the form of a third brush 12 as already stated. While it is preferred that this means consists of a rotatable brush, some of the objects of the present invention will be attained if the shaft 12*a* either not rotate or be constituted of a brush of different character, as for example one which had bristles extending along a substantial proportion of the shaft; or the shaft 12*a* may simply be enlarged. If desired the shafts 10*a*, 11*a*, 12*a* may have a plastic coating 62 which will thereby prevent the metal from coming in contact with the mouth.

When the brush unit is electrically driven, it is important that the gear box B provide sufficient speed reduction so as to maintain a speed of rotation of the brush shafts at a suitable low value, i. e., less than 100 R. P. M., good results having been obtained at speeds between 10 and 25 R. P. M.

Figs. 6 and 7 show our improved mechanical brush in use wherein the oppositely rotating brushes 10 and 11 are always used for cleaning the sides of the teeth whereas brush 12 always serves as a stop against the travel of the brushes 10 and 11 into the gums in addition to its cleaning action. These figures show the operation of cleaning the upper teeth; the dotted lines of Fig. 7 show the brushes 10 and 11 engaging opposite sides of the molar teeth whereas the full line position shows engagement with the incisor teeth. To clean the lower teeth the brush unit is turned approximately 180° thereby bringing the brushes 10 and 11 on opposite sides of those teeth.

It will be evident that by having the brushes in different planes they do not interfere with one another even though they overlap in planes parallel to the shafts. In the embodiment shown all three brushes overlap in planes parallel to the shafts; if desired side brushes 10, 11 may not so overlap although our experience thus far has indicated the desirability of having top brush 12 overlap brushes 10, 11. By having brushes 10 and 11 overlap, a more intensive brushing action may often be had. Other types of rotary brushes may be used, as for example those of the tufted variety.

Due especially to the fact that it is desirable for the brushes not to turn rapidly, our improved device lends itself readily to hand operation, whereby the electric motor C shown may be replaced by a knob or crank to be turned by hand, and such motion transmitted by appropriate means comprising a shaft and gearing, not

shown, to rotatably drive the brushes in the same manner as already described. In such case the gear box B would, of course, be omitted. Likewise the electric motor C may be replaced by a spring or other appropriate motor.

While certain preferred embodiments of the invention have been illustrated and described in detail, it is to be understood that changes may be made therein and the invention embodied in other structures. It is not therefore the intention to limit the patent to he specific consructions illustrated, but to cover the invention broadly in whatever form its principles may be utilized.

We claim:

1. A power driven rotary toothbrush comprising a drive mechanism, a housing therefor, a pair of parallel shafts extending therefrom, said shafts being each coupled to said drive mechanism adjacent one end and being each free at the other end, said drive mechanisms being adapted to rotate said shafts, and a cylindrical brush axially mounted on each shaft adjacent said free ends and oriented for cooperative brushing action one on each side of a tooth, the brushes being relatively axially displaced and radially overlapping with respect to each other, said shafts being resiliently flexible to enable said brushes to be separated and thus accommodated to various tooth thicknesses, shapes, and contours, said shafts extending from said housing a sufficient distance to reach all teeth without insertion of said housing in the mouth of a user, and the extending shafts and brushes assembly being unsheathed to afford easy maneuverability in the mouth of a user and means adjacent said assembly for restricting the travel of said brushes over the sides of a tooth toward the gums.

2. A toothbrush as defined in claim 1 wherein the restricting means comprises a third shaft coupled to said drive mechanism adjacent one end and being free at the other end, said drive mechanism being adapted to rotate said third shaft, a third cylindrical brush axially mounted on said third shaft adjacent its free end, said third shaft being oriented intermediate the first two shafts but displaced from the axial plane thereof, said third brush being oriented to have an axial displacement and radial overlapping relationship with respect to the first two brushes, whereby said third brush functions to brush the top surface of a tooth while said first two brushes operate on the side surfaces thereof, and further functions to restrict the travel of said first two brushes over the sides of a tooth toward the gums.

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