Feb. 27, 1934. G. E. CARLSON ET AL 1,949,241

ROTARY TOOTHBRUSH

Filed July 30, 1932 2 Sheets-Sheet 1

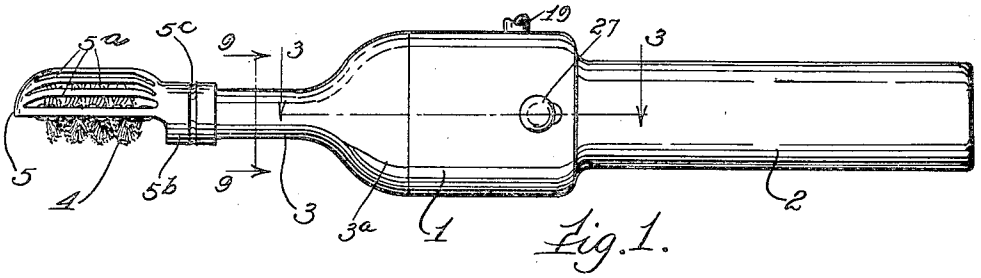


Fig. 1.

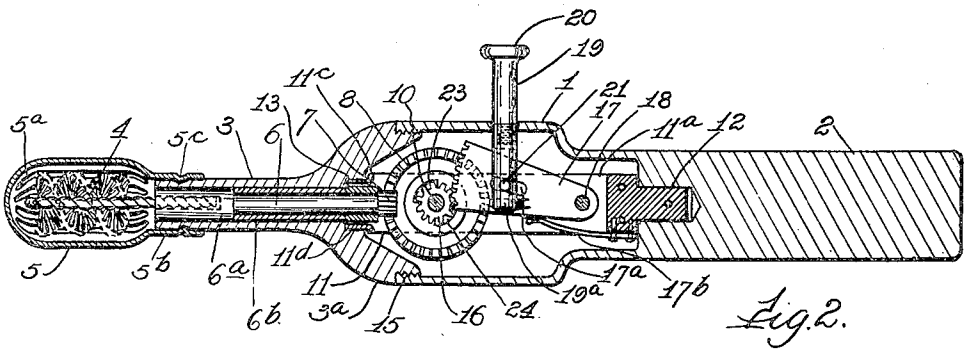


Fig. 2.



Fig 13.

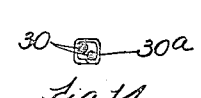


Fig 14.

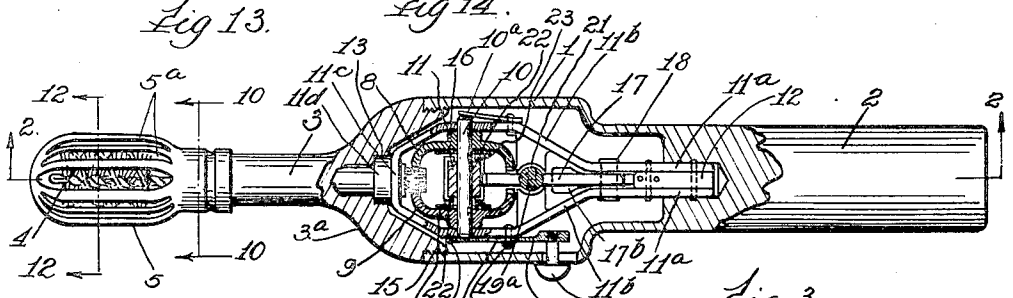


Fig. 3.

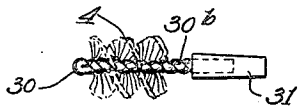


Fig 15.

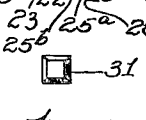


Fig 16.

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Feb. 27, 1934. G. E. CARLSON ET AL 1,949,241

ROTARY TOOTHBRUSH

Filed July 30, 1932 2 Sheets-Sheet 2

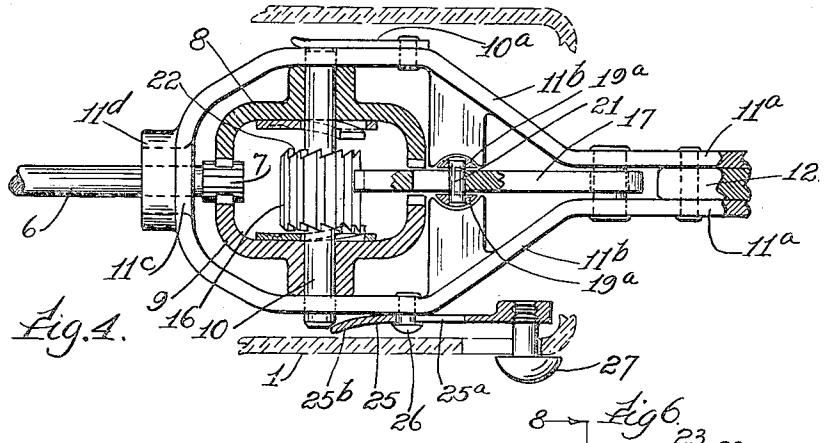


Fig. 4.

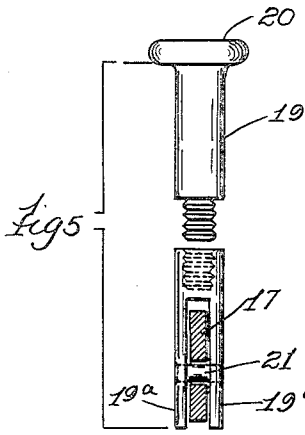


Fig 5



Fig 7.

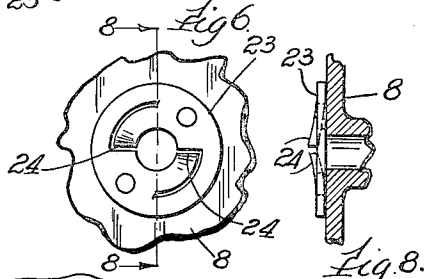


Fig 6. Fig. 8.

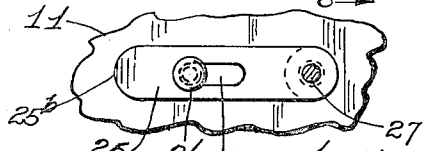


Fig 11.

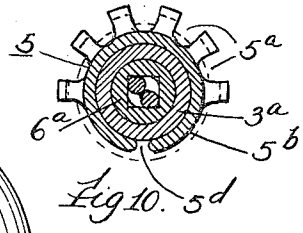


Fig 10.

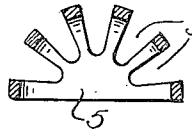


Fig. 12.

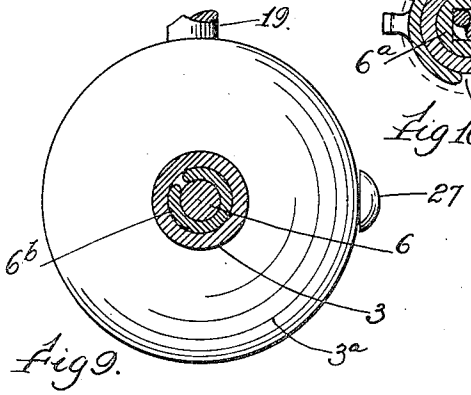


Fig 9.

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Patented Feb. 27, 1934 1,949,241

UNITED STATES PATENT OFFICE

1,949,241

ROTARY TOOTHBRUSH

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Application July 30, 1932. Serial No. 626,376

8 Claims. (Cl. 15—25)

This invention relates to toothbrushes, and its object is to provide a brush which shall be more efficient in operation than the standard type now in use. Instead of arranging the bristles in fixed relation to the handle, the present construction includes a rotary shaft which carries the brush itself, and means for revolving the shaft at a considerable speed to ensure an effective brushing action as the bristles are brought into contact with the teeth. Another object of the invention is to provide a mechanism for rotating the brush, which shall be so compact that it may be contained entirely within a relatively small handle, so that the entire mechanism may be portable and shall not depend upon any auxiliary power plant for securing rotary motion. Another object of the invention is to provide a mechanism with a removable brush element which may be replaced by a new brush as required. Another object is to provide a simple driving mechanism, including arrangements for propelling the brush in either direction, and all designed for economy of construction and durability in operation. The invention thus consists in the combination of features and elements of construction herein shown and described, as indicated by the claims.

In the drawings:

Figure 1 is a side elevation of a rotary toothbrush embodying this invention.

Figure 2 is a vertical section taken substantially at the axis of the device, as indicated at line 2—2 on Figure 3.

Figure 3 is a top plan view, partly in section, as indicated at line 3—3 on Figure 1.

Figure 4 is a partly sectional view of the driving mechanism shown in Figure 3, but illustrating the parts adjusted for reverse rotation of the brush.

Figure 5 is a dis-assembled view of the driving plunger, including in section the driving segment associated therewith.

Figure 6 is a detail face view of one of the driving ratchets.

Figure 7 is an end view of the driven gear which cooperates with the ratchets.

Figure 8 is a detail section taken as indicated at line 8—8 on Figure 6.

Figure 9 is a transverse section taken as indicated at line 9—9 on Figure 1.

Figure 10 is a detail section taken as indicated at line 10—10 on Figure 3.

Figure 11 is a fragmentary detail view of the reverse button and its associated cam bar.

Figure 12 is a sectional view of the guard taken as indicated at line 12—12 on Figure 3.

Figure 13 is a detail view of the brush removed from the mechanism.

Figure 14 is a transverse section of the shank of the brush shown in Figure 13.

Figure 15 is a detail view of a brush having a modified form of shank.

Figure 16 is an end elevation of the shank of the brush shown in Figure 15.

As shown in the drawings, this device includes a driving mechanism enclosed in a housing, 1, from one end of which housing there extends a handle, 2, while the other end provides a constricted portion, 3, in which there is journaled a driving shaft carrying a brush, 4. A hood or guard, 5, covers the brush at one side, and preferably said guard is made with a plurality of longitudinal slots, 5^a, which tend to prevent pocketing or packing of any material within the guard, and facilitate cleansing of the brush and guard by simply holding them under a stream of running water. The driving shaft, 6, (see Figure 2) terminates at its inner end in a pinion, 7, which meshes simultaneously with a pair of crown gears, 8 and 9, journaled on a transverse shaft, 10. The shaft, 10, has its bearings in a frame, 11, which is anchored in the handle portion, 2, and is formed from flat bar stock having its two end portions, 11^a, riveted to opposite sides of a filler block, 12, and extending therefrom divergently at 11^b. The portions, 11^b, connect with parallel portions which provide the journal bearings for the shaft, 10, and forwardly of these bearings the frame bar converges to a transverse portion, 11^c, formed with a collar, 11^d, which fits into a suitable recess at 13 in the forward end of the housing, 1.

For convenience of assembly, and also to permit oiling the mechanism when necessary, the constricted portion, 3, includes a cap member, 3^a, which serves to close the end of the housing, 1. As shown, these parts are provided with threads at 15, by which they are connected, and at the same time rendered readily detachable. When the cap, 3^a, is removed from the housing, 1, the toothbrush drive shaft, 6, remains in its bearings in the part, 3, and the gear, 7, is simply withdrawn from between the teeth of the gears, 8 and 9.

The gears, 8 and 9, are driven alternatively through clutch connections with a pinion, 16, which is carried on the shaft, 10. This pinion meshes with a gear segment, 17, pivoted at 18, and actuated by means of a plunger, 19, whose knob, 20, extends outside the housing, 1. As shown, the knob is bifurcated at its lower end

so as to straddle the segment plate, 17, and a driving pin, 21, connecting the two limbs, 19a, of the plunger, engages a slot, 17a, in the segment for actuating it. The segment is urged by a spring, 17b, toward one limit of its range of oscillation, while pressure upon the knob, 20, forces the plunger into the casing, 1, and swings the segment toward its opposite limit. Thus it is possible to hold the device by the handle, 2, grasping it with the fingers while employing the thumb of the same hand to reciprocate the plunger, 19.

Each end of the pinion, 16, is formed with ratchet-like teeth, 22, as seen in Figures 4 and 7, and the inner faces of the gear wheels, 8 and 9, are provided with clutch disks, 23, each having a pair of spring driving lugs, 24, offset slightly from the main plane of the disk, and adapted to engage the ratchet teeth of the member, 16. Said member, 16, is fixed to the shaft, 10, and the latter is axially movable in its bearings in the frame, 11, for shifting the ratchet teeth at the ends of the gear, 16, either into or out of engagement with the driving lugs, 24, of the clutches. Such shifting of the shaft, 10, is accomplished by providing a flat spring, 10a, which bears against one end of the shaft for holding it normally in the position illustrated in Figure 4. A cam bar, 25, is slidably mounted on the side of the frame, 11, by engagement of its slot, 25a, with a rivet, 26, fixed in the frame, and a button, 27, extends outside the casing, 1, for manipulation of the cam bar. The end portion of the bar is bent up, as shown at 25b, so that normally it just clears the projecting end of the shaft, 10, but when the bar, 25, is shifted to the opposite limit of its adjustment permitted by the length of the slot, 25a, the bent end portion or cam portion, 25b, of the bar, acts to force the shaft, 10, to its opposite limit in opposition to the pressure of the spring, 10a, thus disengaging the ratchet teeth of the member, 16, from the clutch on the gear, 9, and engaging the other set of ratchet teeth with the clutch associated with gear, 8. Thus, although the effective driving stroke of the pinion, 16, continues in the same direction as before, and the gear, 8, revolves in the same direction as did the gear, 9, the shaft, 6, will be turned in the opposite direction by reason of the fact that the gear, 8, meshes with the pinion, 7, at one side of the axis of said pinion, while the gear, 9, meshes with the pinion at the other side of its axis. This permits the brush, 4, to be rotated always in a direction for brushing downwardly against the surfaces of the upper teeth, or upwardly against the surfaces of the lower teeth so as to clear them of any foreign matter which may be lodged thereon, particularly in the crevices between adjacent teeth. It will be understood that rotation is only effected by the swing of the segment, 17, in one direction, as for example, by the movement produced by the inward thrust of the plunger, 19, while the return stroke of the segment and plunger is produced by the force of the spring, 17a.

As a preferable form of the brush, 4, we have shown it with the bristles spirally arranged and held between the limbs of the folded and twisted wire shank, 30, of familiar form. The shaft, 6, includes an enlarged portion, 6a, at its outer end, preferably having a square socket, and the projecting end portion, 30a, of the shank, 30, is deformed to present a non-circular outline, as seen in Figure 14, so that it may be fitted into such square socket for driving engagement. As an alternative construction Figure 15 shows a square bushing, 31, permanently fitted to the end, 30b, of a twisted wire shank, 30, and having a slightly tapered external form of square cross-section, as seen in Figure 16. Either construction permits the brush element, 4, to be renewed whenever it becomes worn or otherwise unsuitable for use, or may permit the inter-changeable employment of brushes of different texture or materials, if desired. The guard, 5, is shown with a cylindrical sleeve portion, 5b, having a bead, 5c, pressed into it for engagement with a circumferential groove in the constricted neck portion, 3, of the housing. Preferably, the sleeve, 5b, is longitudinally split, as indicated at 5d on Figure 10, so that the sleeve may be sprung for snapping it on or off the part, 3. This permits the guard itself to be removed readily for cleaning, or for access to the brush element, 4, for cleaning the latter or removing it from the square socket of the drive shaft.

It will be noted that the frame, 11, is supported in the chamber by the engagement of its parallel ends, 11a, in an axial recess in the handle member, 2, and the lodgment of its forward flange or collar, 11d, in the axial recess, 13, of the cap or cover, 3a. The mechanism is held definitely in position and prevented from turning about the axis of the handle and its cap by the fact that the plunger, 19, projects transversely through an opening in the wall of the chamber, 1, and thus defines the position of the assembled mechanism. For journaling the shaft, 6, in the constricted part, 3, we provide a bushing, 6b, which, as indicated in Figure 9, is longitudinally split so that it may be formed slightly over-size as to curvature to ensure that when forced into the axial bore of the part, 3, it will spring outwardly into firm frictional engagement therewith for holding the shaft, 6, properly positioned. Also for convenience of assembly the plunger, 19, is made in two parts, the outer end portion being screwed into the inner end portion so that with the outer end removed the complete mechanism may be inserted axially into the housing, 1, after which the outer end of the plunger may be secured in operative position.

It will thus be seen that the construction herein shown and described is relatively simple and economical to manufacture, and that the mechanism may be readily assembled within the handle. The latter may be made of attractive ornamental material, such as "Bakelite" or molded celluloid, which will be easy to keep in clean and sanitary condition while serving as a water-proof housing for the mechanism itself. While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and re-arrangements of the parts may be made without departing from the spirit and the scope of the invention, and that the same is not limited to the particular form herein shown and described, except in so far as indicated by the appended claims.

We claim:

1. A toothbrush comprising a brush element, a shaft to which it is secured, a handle including a chamber, and drive mechanism in the chamber including a pinion on the shaft, a pair of gears meshing with the pinion at opposite sides of its axis, a clutch member associated with each of said gears, and a rotary member journaled between said clutch members, means for driving said rotary member and means for shifting it into

driving engagement with one clutch or the other at will for determining the direction in which the brush is to be driven.

2. A toothbrush comprising a brush element, a shaft to which it is secured, a handle including a chamber, and drive mechanism in the chamber including a pinion on the shaft, a pair of gears meshing with the pinion at opposite sides of its axis, a clutch member associated with each of said gears, a pinion journaled between said clutch members with its opposite ends formed to cooperate therewith respectively, a gear segment meshing with the pinion and pivoted in the chamber for oscillation, a plunger connected to the segment and projecting outside the chamber, and means for shifting said pinion at will along its axis for driving engagement with one clutch or the other.

3. A toothbrush comprising a brush element, a shaft to which it is secured, a handle with a chamber at the forward end of the handle, and a constricted projection from said chamber in which said shaft is journaled, a drive mechanism in the chamber including a pinion on the shaft, a pair of crown gears journaled on a transverse axis, spaced apart from each other, and both meshing simultaneously with the pinion at opposite sides of its axis, a clutch member carried by each of said gears, and a rotary member journaled co-axially with said gears between them, and provided with cooperating clutch parts for engagement respectively with the clutch parts on the gears, means for driving said rotary member and means for shifting it axially for engaging one pair of clutch parts or the other to determine the direction in which the brush is to be driven.

4. In a toothbrush comprising a brush element, a shaft to which it is secured, a handle including a chamber, and drive mechanism in the chamber comprising a pinion on the shaft, a pair of gears meshing with the pinion at opposite sides of its axis, a rotary member journaled between said gears with clutch means arranged for connecting said rotary member alternatively with said gears by shifting it axially, said member being carried on a transverse shaft with spring means urging the shaft toward one limit of its axial movement, and a cam member within the chamber engaging the shaft and movable for shifting it axially, together with an actuator for said cam accessible outside the chamber and means for driving said rotary member.

5. In a toothbrush comprising a brush element, a shaft to which it is secured, a handle including a chamber, and drive mechanism in the chamber comprising a pinion on the shaft, a pair of gears meshing with the pinion at opposite sides of its axis, a rotary member journaled between said gears with clutch means arranged for connecting said rotary member alternatively with said gears by shifting it axially, said member being carried on a transverse shaft, spring means acting against one end of said shaft to urge it toward one limit of axial movement, and a cam plate slidable over the opposite end of said shaft for shifting it to an opposite limit, said clutches being engaged respectively at said limits, a shifter button for the cam plate projecting outside the chamber and means for driving said rotary member.

6. In combination, a handle having a chamber formed at its forward end, said chamber and handle being of circular cross-section and axially disposed, a cap for the chamber detachably connected thereto and having a constricted portion projecting substantially in line with the axis of the handle, a shaft journaled in said portion with a rotary brush at its outer end and a pinion secured to its opposite end within the chamber, and drive mechanism for said brush including gearing within the chamber mounted to mesh with said pinion, and a frame supporting said gearing which includes a pair of side members converging toward the axis of the chamber and extending into a recess axially disposed in the handle, said side members converging in the opposite direction to an axially disposed flange or collar, said cap having a recess to receive said flange to support the driving mechanism, said mechanism including a plunger extending transversely of the chamber and projecting through an aperture in its wall, whereby said plunger holds the mechanism against rotation about the axis of the chamber.

7. In a rotary toothbrush which includes a handle with a chamber formed at its forward end, a drive mechanism housed in the chamber including a frame having a pair of side members extending parallel to each other and spaced apart with a spacing block secured between them, a segment plate pivoted between said members, means for oscillating said segment, a pinion on a shaft which is journaled in said side members with its teeth meshing with the teeth of the segment, and a pair of gears loosely journaled on said shaft at opposite sides of the pinion with clutch means arranged for connecting said pinion alternatively to said gears by shifting it axially, a pinion with which said gears mesh simultaneously at opposite sides of its axis, and a shaft extending from said chamber with one end secured to said pinion and with a brush element on its opposite end.

8. A rotary toothbrush comprising a handle with a chamber at its forward end and a shaft projecting forwardly from said chamber in substantially axial alignment with the handle, a brush element on the outer end of the shaft, and drive mechanism for said shaft within the chamber, said mechanism including a plunger arranged for reciprocation transversely of the chamber axis and projecting through the lateral wall thereof for manipulation by a thumb or finger of the hand which grasps the handle, together with direction-reversing means within the chamber and a shifter button for said means disposed on the outer surface of the chamber and angularly separated from the plunger in convenient position for manipulation by the thumb of the hand which grasps the handle.

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