United States Patent [19]

Warner

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[45] **Sept. 18, 1973**

[54] DENTAL INSTRUMENT

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[52] U.S. Cl. ..... 132/92 R

[51] Int. Cl. A61c 15/00

[58] Field of Search ..... 132/92 R, 91, 93; 32/40 R

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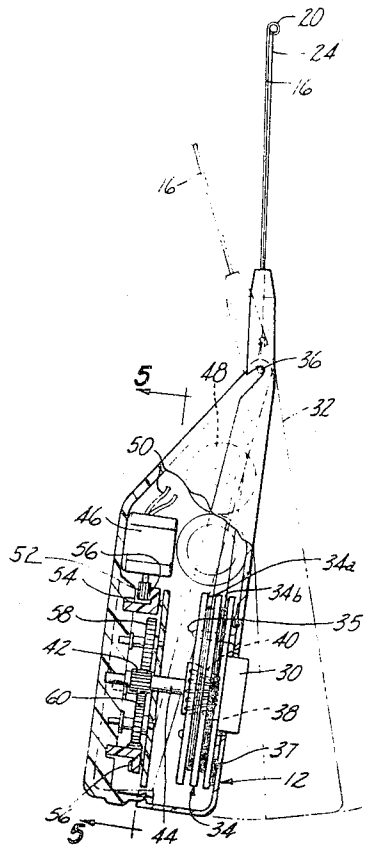
Primary Examiner—Robert Peshock

Attorney—Robert C. Hauke et al.

[57] **ABSTRACT**

The device uses a strand of dental floss for removing particles entrapped between teeth or around the bases of teeth. The strand of dental floss is mounted on an extended fork used for supporting the strand and to allow oscillating movement when used in a cleaning operation. A drive means is included for imparting the oscillating movement to the strand. There is also included a device cooperating with the spool for carrying the strand and supporting the strand for registering a new, unused strand of dental floss for operation subsequent to each cleaning cycle.

15 Claims, 14 Drawing Figures



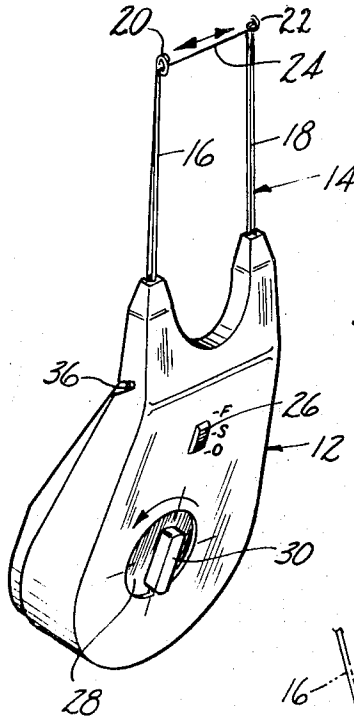


Fig-1

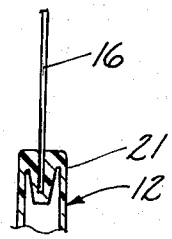


Fig-4

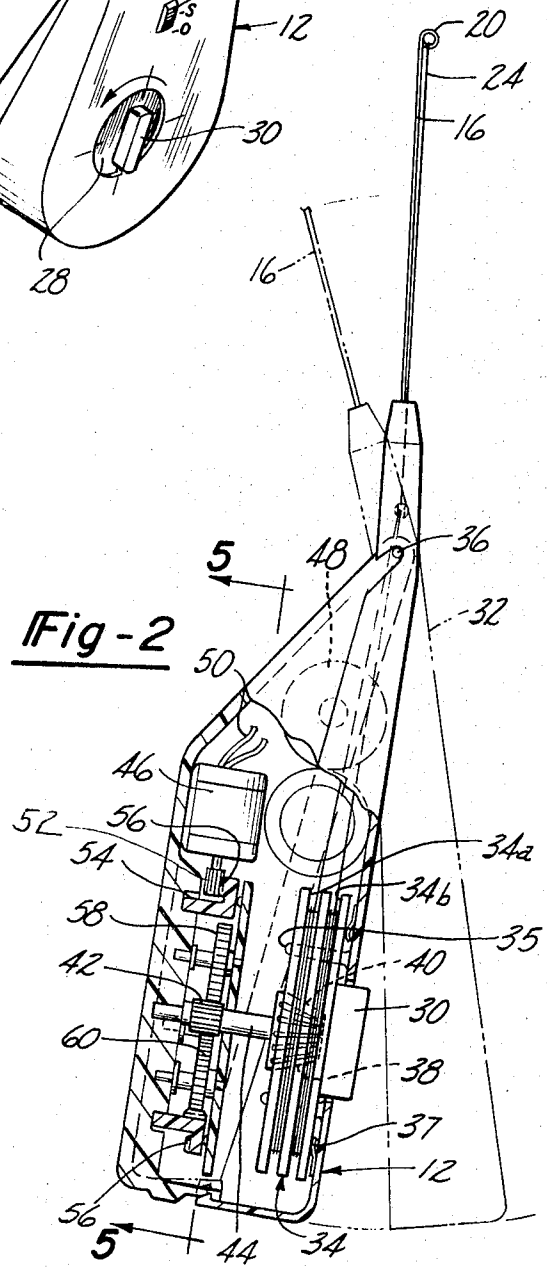


Fig-2

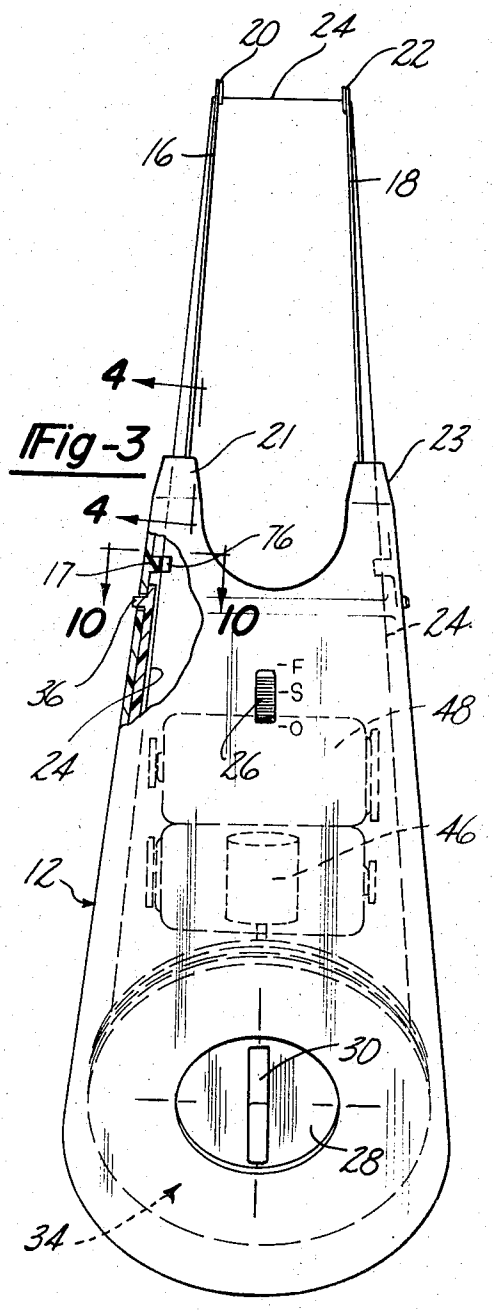


Fig-3

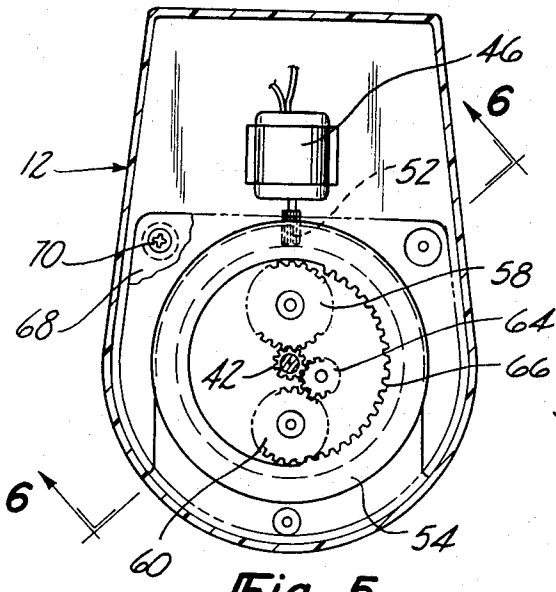


Fig-5

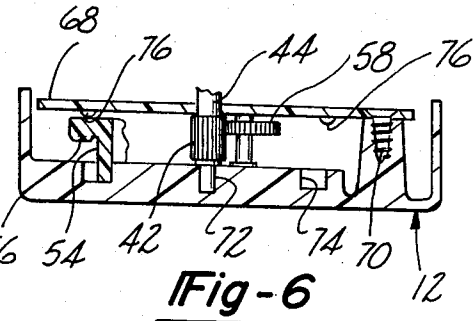


Fig-6

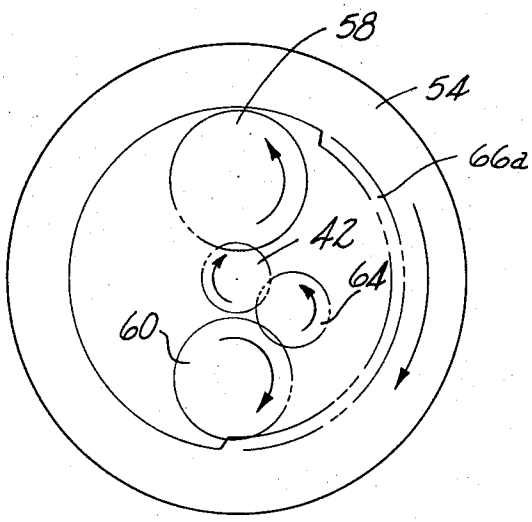


Fig-7

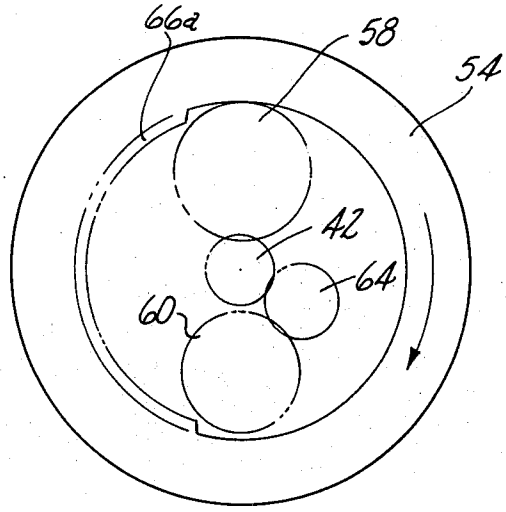


Fig-8

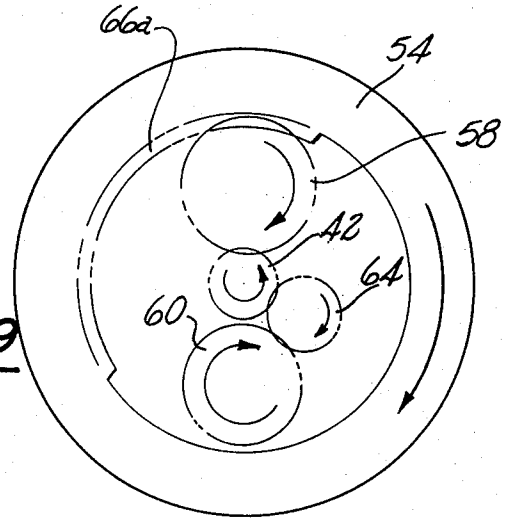


Fig-9

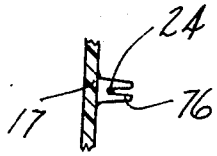


Fig-10

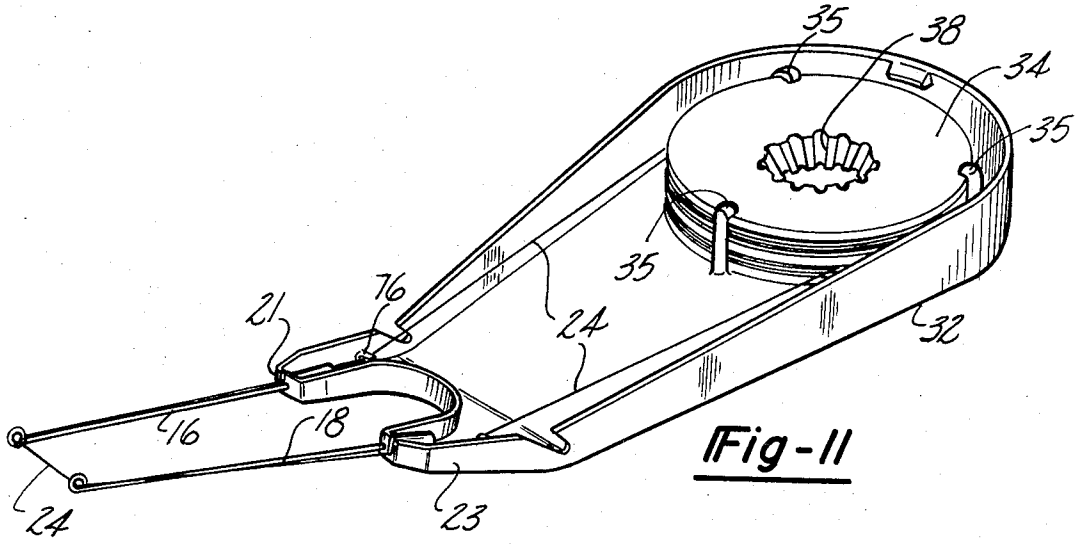


Fig-11

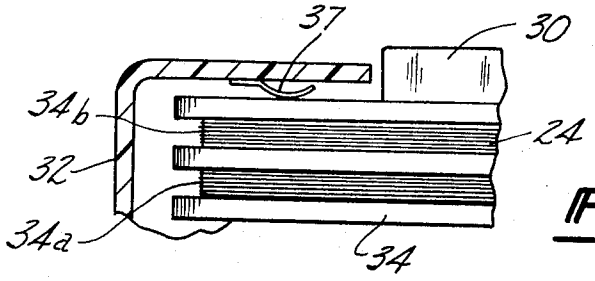


Fig-12

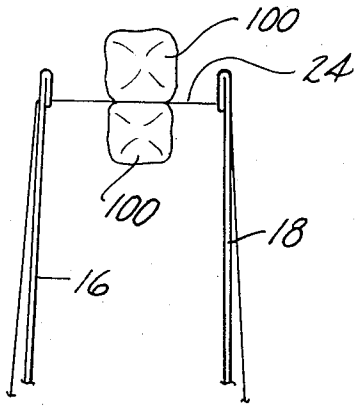


Fig-13

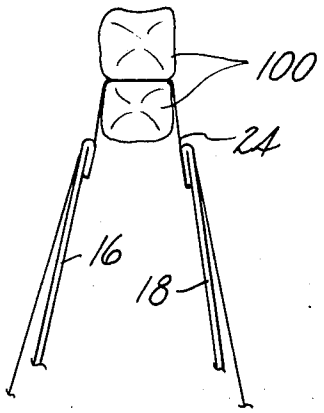


Fig-14

DENTAL INSTRUMENT

BACKGROUND OF THE INVENTION

A problem exists with respect to cleaning between teeth to remove entrapped food particles or to remove prior accumulated tartar deposits which tend to grow between teeth with deleterious effect to the structure of the teeth and to the gums. It is well known that dental floss is an appropriate cleaning agent when used manually and moved forwardly and rearwardly between the teeth in an oscillating cleaning motion. A difficulty arises in supporting one end of the dental floss strand within the mouth by the user's thumb or finger.

The present invention provides a dental instrument which is so shaped with respect to the strand of dental floss and the holder or handle that the cleaning operation may be accomplished without the necessity for inserting within the mouth the thumb or fingers of the user. The instrument makes possible the cleaning of the teeth between the molars at the extremities of the mouth and in relatively inaccessible positions where the floss could not otherwise be manually positioned.

SUMMARY OF THE PRESENT INVENTION

The present invention includes a motorized dental cleaning instrument in which a fixed or variable speed oscillating motion is provided for the dental floss which is used for between- teeth cleaning. Additional features included in the invention are the spool mounting arrangement for the strand and the manner in which the spool is incrementally registered after each cleaning operation to present a new length of strand of dental floss for use in the next cleaning operation. One embodiment of my invention provides for a removable handle, guide and spool which may be detached from the drive device.

The present invention will further be seen to have an offset planar relationship to the holder which facilitates placement of the strand into its cleaning position without undue difficulty in positioning it into the necessary cleaning position in the mouth. The extended fork structure supporting the dental floss is deflectible to allow the user to selectively adjust the pressure being exerted against the teeth.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described in the accompanying specification and in the drawings in which like elements will be identified by like numerals where they appear in different figures of the drawings, and in which:

FIG. 1 is a perspective view of the dental instrument;

FIG. 2 is a partial sectional side elevational view of the dental instrument, with its cover shown in phantom outline pivoted toward an open position;

FIG. 3 is a front elevational view of the dental instrument, again partially in section to illustrate the construction of the case and the forked guide for the dental floss strand;

FIG. 4 is a sectional view of an upper portion of the instrument with parts broken away illustrating one of the fork portions and its connection to the instrument handle;

FIG. 5 is a transverse sectional view taken along the section line 5—5 of FIG. 2 showing the drive means and gear train used to provide the required oscillating motion of the strand of dental floss;

FIG. 6 is a cross-sectional view of the device as shown in FIG. 5 taken along the section line 6—6 illustrating the manner in which the gear train is used to provide the oscillatory motion above referred to;

FIGS. 7, 8 and 9 are schematic views of the gear train utilized to provide the oscillatory drive to the strand of dental floss, which views show the parts in the intermediate and in the two different operating positions;

FIG. 10 is a partial sectional view taken along the section line 10—10 of FIG. 3 and illustrating a further structural detail of the dental instrument;

FIG. 11 is a perspective view showing the combined handle, guide and spool removed from the drive portion of the instrument;

FIG. 12 is a fragmentary view to enlarged scale showing a part of the fastening arrangement for the spool; and

FIGS. 13 and 14 are schematic views showing the instrument as it is positioned in use.

DETAILED DESCRIPTION OF THE DRAWINGS

With reference to FIG. 1, there is a general showing of the dental cleaning instrument which includes a holder 12 and a fork portion 14, which includes a pair of opposed arms 16 and 18. The fork portion 14 is annularly offset and in an inclined plane relative to the axis of the holder 12 in the manner shown. Included in the arms 16 and 18 are a pair of loops or guide eyes 20 and 22, respectively, formed at the arm ends. The eyes 20 and 22 are formed in loops of 360°or more to permit ready entry and passage of a strand 24. The strand 24 of dental floss material is shown in the manner in which is is mounted, passing through the guide eyes 20 and 22. During the cleaning operation, the strand 24 is oscillated backwardly and forwardly in the manner shown by the arrows and for a length substantially equal to or greater than the distance between the guide eyes 20 and 22. In this manner, once the strand 24 of dental floss has been prepositioned between two adjacent teeth or about the base of a single tooth, the cleaning operation can be accomplished.

The dental instrument is powered by a motive means which is preferably electrically operated. The preferred embodiment of the invention is illustrated with respect to a battery powered or DC operated device, but it will be appreciated that it may be similarly powered by an alternating current potential with cord and plug arrangement. For best results, a speed control knob 26 is included with spaced OFF, SLOW and FAST positions provided to control the motive means operation.

Also shown in the FIG. 1 drawing is the apparatus which is used at the end of each cleaning operation to reposition a new strand 24 of dental floss between the eyes 20 and 22 in preparation for the next cleaning operation. This apparatus includes a hub 28 and an extending knob 30 which are associated with the spool 34 on which the strand 24 is wound in a manner that will be further explained and clarified, particularly in connection with FIGS. 2 and 3 hereinafter.

The FIG. 2 drawing shows the manner in which the case 32 of the holder 12 may be pivotally positioned from a locking or closed position to an open position to allow for the replacement of a new spool of dental floss. The spool is identified by the numeral 34 and is shown in its position as it is mounted within the holder 12. A plurality of hold-down fingers 35 are included to hold the spool 34 against several springs 37. A pivotal

mounting for the case 32 is shown about a hinge pin 36. The spool 34 is shown with the strand of dental floss 24 wound about it on two separate spaced spool portions 34*a* and 34*b* in such manner that, according to the rotation of the knob 30 counterclockwise in the direction of the arrow, the spool may be rotated and registered an incremental amount to provide for the positioning of a new length of strand 24 as indicated above. It will be seen that the spool 34 has a central recessed and tapered toothed portion 38 in mesh with a like tapered drive gear 40 to which is imparted an oscillating drive movement during the cleaning operation. To provide for this oscillating drive movement, a pinion gear 42 is mounted at the left hand end of a connecting shaft 44. The basic motive means and the power for the gear train, next to be described, is provided by an electrically powered motor 46 to which is connected a pair of batteries 48 through leads 50 in a manner well known in the art. The intermediate gear train includes a drive pinion 52 extending from the driveshaft of the motor 46. Rotative drive is thus communicated from the pinion 52 to a ring gear 54 through its toothed periphery having its teeth 56 in driven engagement with the teeth of the pinion 52. The ring gear 54 is continuously rotated during the operation of the motor 46. Also included in the intermediate drive gear train are a pair of pinion gears 58 and 60, which are appropriately journaled for rotation between opposed internal surfaces of the casing of the holder 12 as indicated. The second pair of pinion gears 42 and 64 are of the idler gear type and are shown in mesh respectively with the teeth of the gears 58 and 60. The arrangement of the drive gear train just identified will be more completely shown in connection with FIGS. 5–9 hereinafter.

FIG. 2 further shows the manner in which the strand 24 is passed along the fork arm 16 and at the upper open end of the arm 16 through the associated eye 20 to align it in the laterally oriented oscillatory path already shown in FIG. 1.

FIGS. 3 and 4 clarify the mode of construction of the holder 12 with respect to the fork arms 16, 18 and the side portion 17, and further serve to clarify the manner in which the two batteries 48 are positioned and held in place between the opposed sides of the base or holder 12. The speed of rotation of the motor 46 may be constant or may be controllable in a manner well known in the electrical art, preferably through a variable resistance whose value is controlled by the setting of the control knob 26. The fork arms 16 and 18 are mounted on the holder 12 on a pair of upstanding ends 21 and 23. The arms 16 and 18 are of a deflectible spring wire to allow for adjustment of tensions as will be shown in FIGS. 13 and 14 hereinafter. The pivotal mounting pin 36 is shown about which the cover 32 for the instrument may be pivoted between an open and a closed position. Also shown is the relationship within the instrument of the spool 34, of the hub 28 forming an integral part of the spool 34, and of the thumb knob 30 used to register successively different lengths of the strand 24 in position between the form arms 16 and 18 for each different cleaning operation. The detail of the spool 34 used for mounting the dental floss is also shown in FIG. 2.

FIG. 4 illustrates the construction of one of the elongated fork arms 16 and the manner in which it is anchored in the upwardly extending end 21 of the holder 12.

FIG. 5 is a sectional view taken from the drawing of FIG. 2 better to illustrate the construction of the intermediate gear train and the ring gear 54, which are used to impart the oscillatory drive to the dental floss strand 24. The ring gear 54 is continuously driven, for example, in a clockwise manner through the motor 46 and the drive gear 52 in engagement with the ring gear tooth portion 56. It will be noted that there is included on the internal surface of the ring gear 54 a drive portion or tooth gear sector 66, which sector extends over somewhat less than 180° of the internal ring gear circumference. While the present invention shows the ring gear 54 as including a toothed gear sector, the drive may likewise be provided through a V-drive arrangement formed on the inner sector. This alternate embodiment of a V-drive sector is shown in connection with FIGS. 7–9.

FIG. 5 also shows the manner in which the intermediate gear train mechanism is mounted in the holder 12 and retained in place by a cover plate 68 and a plurality of threaded fasteners 70.

The FIG. 6 drawing additionally clarifies the manner in which the parts of the intermediate gear train are retained in place between the cover plate 68 and the base of the holder 12. The gear 42, which is used to impart the oscillatory drive through shaft 44 to the spool 34, has its lower, reduced diameter shaft portion retained rotatably in place in a mating circular opening 72 formed in the base of the holder 12. The ring gear 54 is supported for rotation in a matching circular cut-out journal portion 74 pre-formed in the base part of the holder 12. Also clarified is the manner in which a plurality of extending fingers 76 are depressible into holding engagement with the upper surface of the ring gear 54 to retain it in place in a rotative manner in the circular cut-out portion 74.

Reference is now made to FIGS. 7, 8 and 9 which are schematic drawings illustrating the several different positions of the parts of the gear train and the resultant different directions of rotation. This rotation provides the oscillatory motion through the gear 42, which gear extends upwardly through the associated connecting shaft 44, which in turn is connected to the tapered end 40 as best shown in FIG. 2.

FIG. 7 shows the relative position of the parts as the internal sector V-drive 66*a* is moved into engagement with the teeth of the pinion 60 to rotate it in a clockwise direction. The teeth of the gear 60 are in mesh with those of the idler gear 64 to drive the gear 64 in a counterclockwise direction and thus to rotate the gear 42, which is connected as explained hereinbefore to the hub of the spool 34. Accordingly, in the position illustrated in FIG. 7, the gear 42 and the associated spool 34 are rotated in a clockwise direction.

FIG. 8 illustrates the intermediate or inactive condition in which the sector 66*a* is away from engagement with both the gears 58 and 60 at the time before the direction of rotation of the gear 42 is changed and the rotation of the spool 34 is reversed.

The final operating position in which the spool 34 is rotated in a counterclockwise direction is shown in FIG. 9. The internal sector 66*a* is in driving engagement with the pinon 58 to rotate it in a clockwise direction, thus driving the gear 42 in a counterclockwise direction to provide the reverse turning of the gear 42 and of the spool 34. Therefore, it will be seen that the ring gear 54 is rotated continuously in a clockwise di-

rection and, in accordance with the successive engagement of the sector **66***a* with the teeth of either gear **60** or **58**, the spool **34** is rotated either clockwise or counterclockwise to provide the required oscillatory movement of the spool **34** and of the strand **24** of dental floss backwardly and forwardly through the eyes **20** and **22** at the fork end **14** of the instrument.

FIG. **10** illustrates a detail of construction of the side wall of the arm **16** including an internal guide member **76** which is used to guide the dental floss strand **24** in its upward movement away from the spool **34.**

FIGS. **11** and **12** show a combined cover, spool and guide unit removed from connection with the motor drive means for the spool **34.** It will be understood that a cleaning instrument can be used by several different individuals. The removable personalized portion is easily detachable and replaceable in operating position in the instrument.

FIGS. **13** and **14** finally show the instrument as the strand **24** is inserted between two adjacent teeth **100** and the instrument is moved first in one direction and then in the other. The arms **16** and **18** are readily deflectible to follow the periphery of the teeth **100** and adjust the tensions being applied.

It will be seen that by the present invention I have provided a novel and improved device for cleaning between teeth, which device has the capability of use in all portions of the mouth.

What is claimed is:

1. An instrument for cleaning between teeth comprising a holder, a guide means mounted on and extending from said holder, a spool rotatively mounted on said holder, a strand of dental floss mounted on said spool and aligned through said guide means, a drive means operatively coupled to said spool for providing a reciprocating movement to said strand in said guide means, and means operably connected to said spool for rotating it and registering a different length of said strand in said guide means subsequent to each cleaning operation.

2. The combination as set forth in claim **1** wherein said guide means comprises a fork fixed to said holder, said strand mounted through a pair of guide eyes at opposed ends of said fork.

3. The combination as set forth in claim **1** wherein said means for providing a reciprocating movement of said strand comprises a ring gear and an electrically powered motive means operably connected to said ring gear for rotating it.

4. The combination as set forth in claim **3** wherein a drive sector is mounted on the inner periphery of said ring gear for providing a drive motion to said spool through an intermediate gear train.

5. The combination as set forth in claim **4** wherein said drive sector includes a plurality of teeth extending over an arcuate distance of less than **180°** of said ring gear and wherein a pair of pinion gears are separately engageable with said toothed sector of said ring gear to provide said reciprocating drive.

6. The combination as set forth in claim **4** wherein said sector comprises a V-drive portion of said ring gear.

7. The combination as set forth in claim **5** wherein said intermediate gear train comprises a pair of pinion gears and a pair of idler gears, said idler gears mutually meshed and coupled to said spool, each of said idler gears cooperable with a different one of said pinion gears for providing a different direction rotation of said spool.

8. The combination as set forth in claim **1** wherein said registering means comprises a manipulatively adjustable knob connected to and extending outwardly from said spool and said holder.

9. The combination as set forth in claim **8** wherein said motive means includes an electrical motor and a DC power source mounted in said holder.

10. The combination as set forth in claim **9** wherein said motive means includes an electrical motor and an externally connected AC power source.

11. An instrument for cleaning teeth including a holder, a fork portion fixed to said holder and linearly offset relative to said holder, a strand of dental cleaning material slidably mounted between the opposed ends of said fork portion, a spool for mounting said strand fixed to said holder, a drive means for providing a limited reciprocating movement of said strand while in contact with the teeth during the cleaning operation of said instrument, and means further operably connected to said spool for providing an incremental movement thereof to fix a different length of said strand in operative position relative to said fork portion.

12. The combination as set forth in claim **11** wherein said fork portion includes a pair of opposed relatively flexible arms, each having a loop portion at its free end.

13. The combination as set forth in claim **11** wherein said holder comprises two separable portions, one including said drive means and the other including said fork portion and said associated spool and strand.

14. The combination as set forth in claim **11** wherein said strand is connected to said spool in an endless loop to provide a feed in one direction and a corresponding take-up in the other direction.

15. The combination as set forth in claim **11** wherein said spool is driven by said drive means and said spool includes an intermediate connecting portion capable of ready removal from driven engagement with said drive means to allow replacement of said spool.

* * * * *