

[54] DENTAL FLOSS DISPENSING AND  
MANIPULATION SYSTEMS 1,174,016 2/1916 Kenyon ..... 132/92 R  
3,696,821 10/1972 Adams ..... 132/91

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[21] Appl. No.: 415,627

[57] ABSTRACT

[52] U.S. Cl. .... 132/91  
[51] Int. Cl. .... A61c 15/00  
[58] Field of Search..... 132/91, 89, 90, 92 R

[56] References Cited  
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Combination of separate yet nesting floss dispenser holding unit and a unit for holding free end portion of dental floss provide for operator's manipulating dental floss while forcefully tensioning it during teeth flossing without discomfort to operator's fingers. The separate units are structured to be firmly nested during storage periods.

8 Claims, 30 Drawing Figures

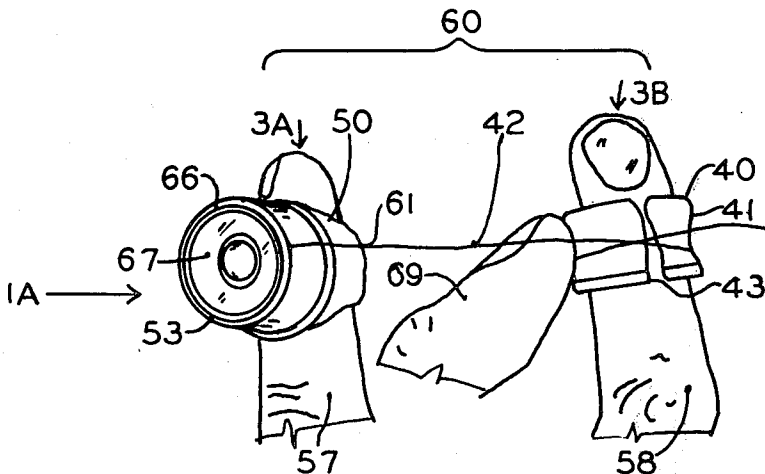


FIG. 1

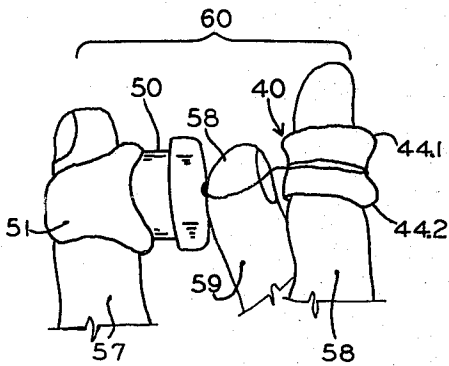


FIG. 2

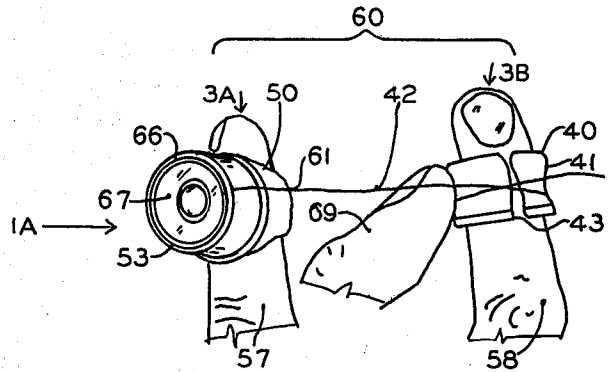


FIG. 3

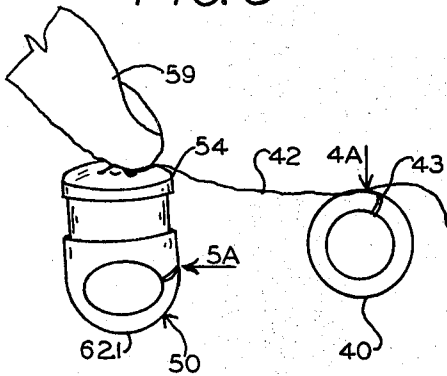


FIG. 4

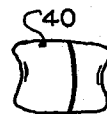


FIG. 5

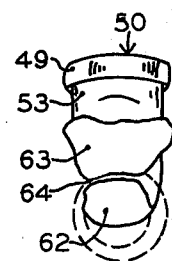


FIG. 6

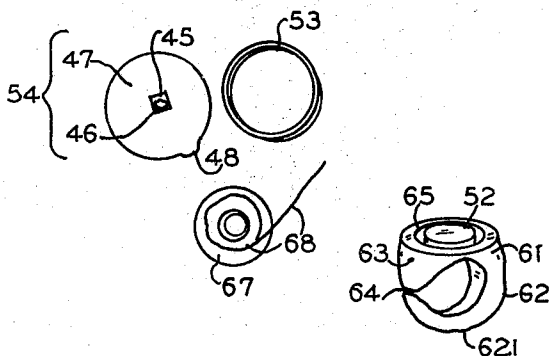
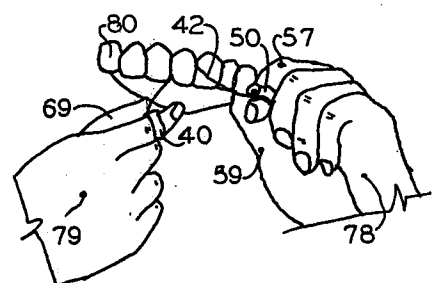
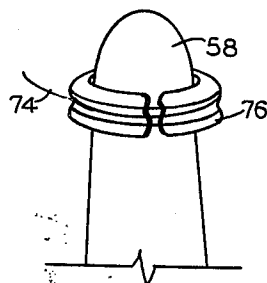
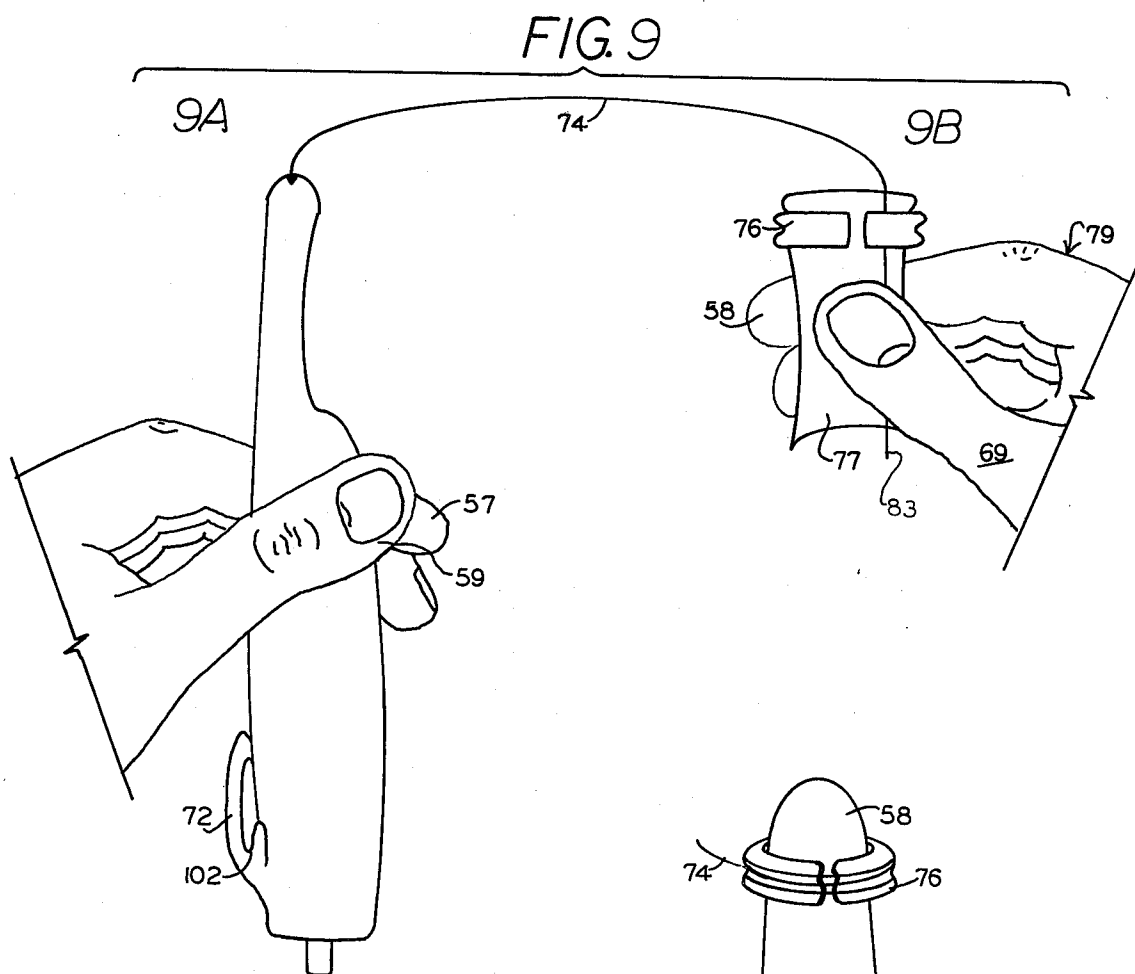
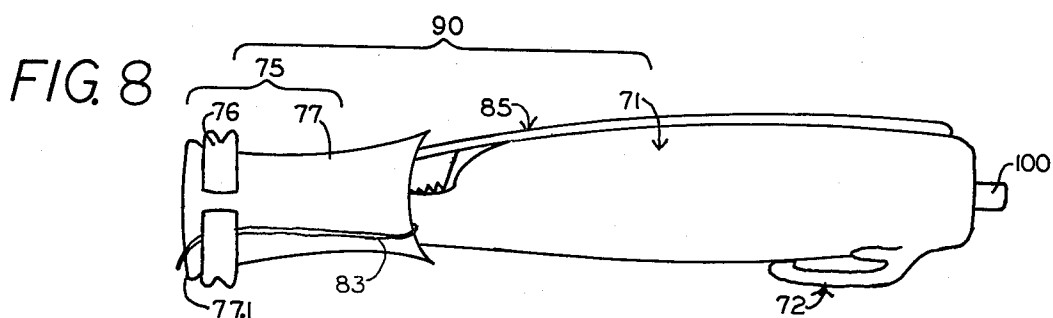


FIG. 7





**FIG. 10**

FIG. 11

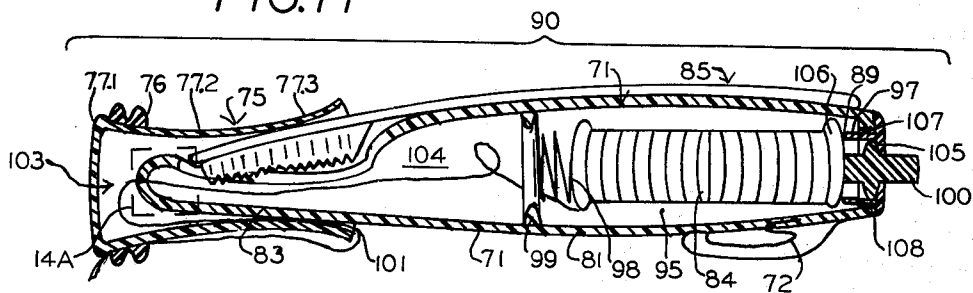


FIG. 12

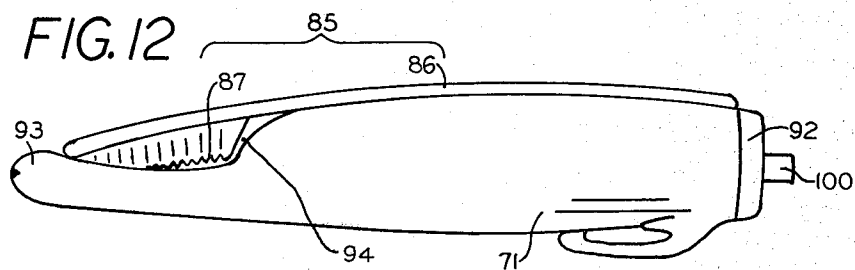


FIG. 13

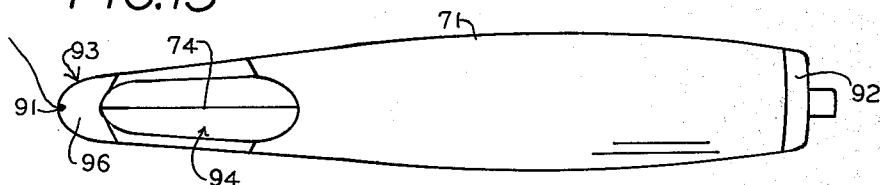


FIG. 14

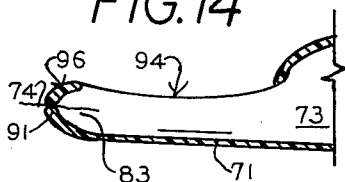


FIG. 16

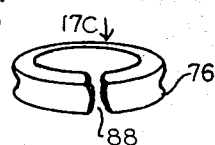


FIG. 15

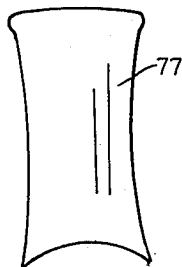


FIG. 17

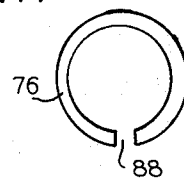


FIG.18

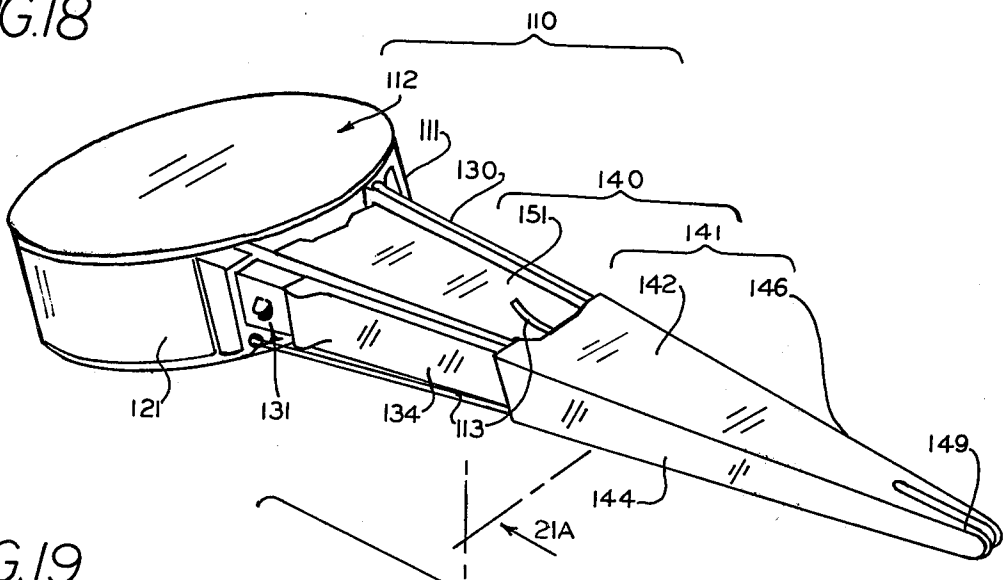


FIG.19

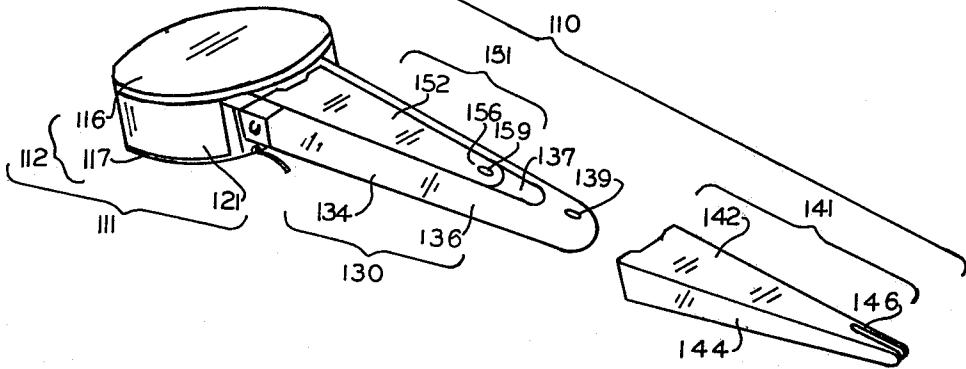


FIG.21

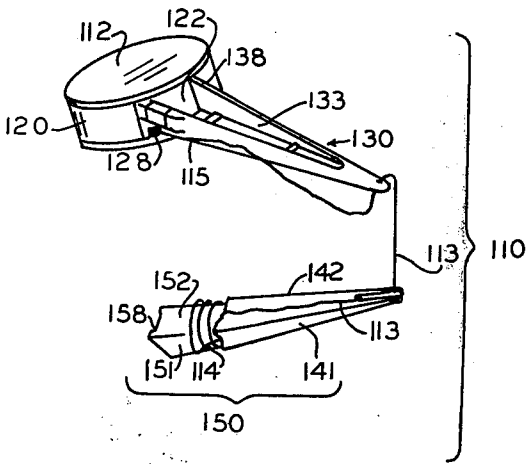
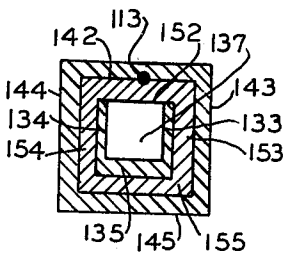


FIG.20



FIG. 25

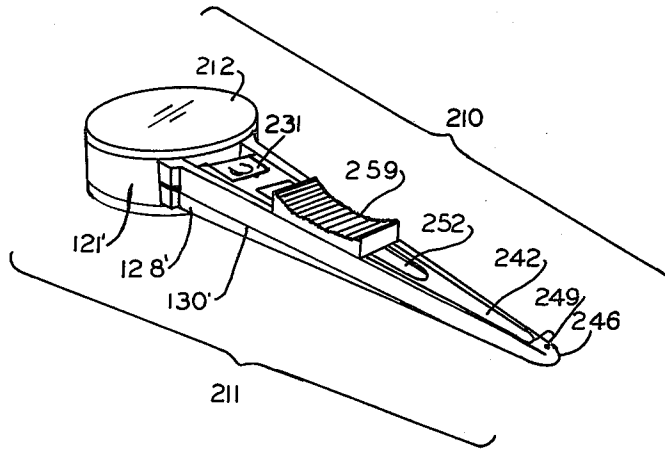


FIG. 26

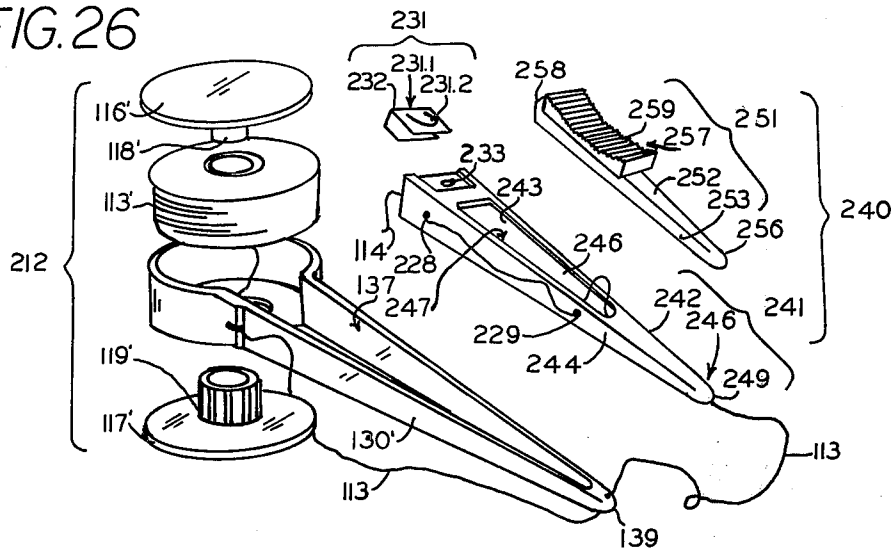


FIG. 29

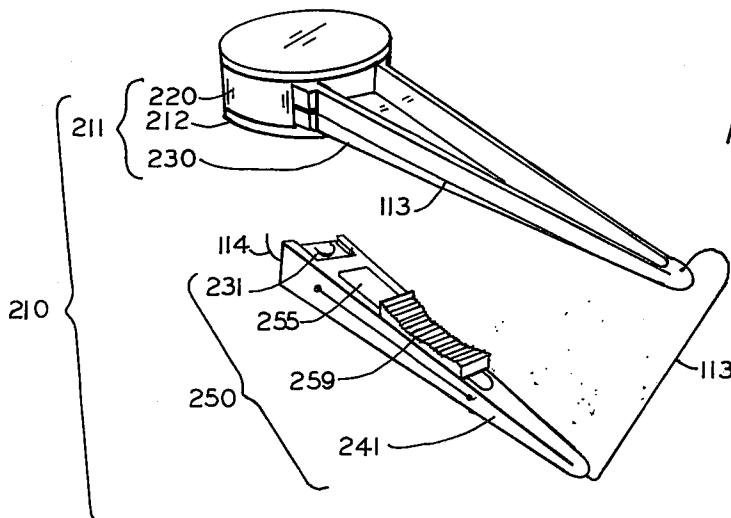


FIG. 27

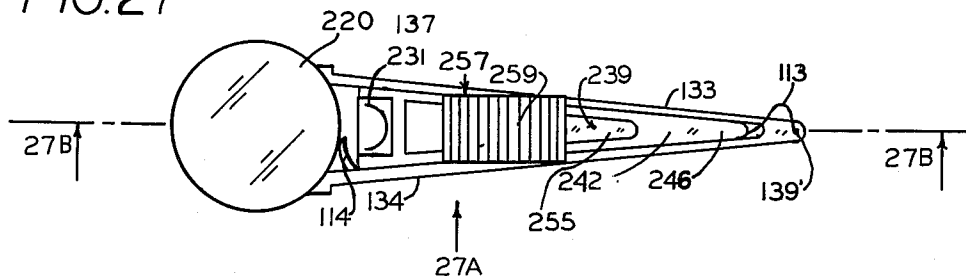


FIG. 28A

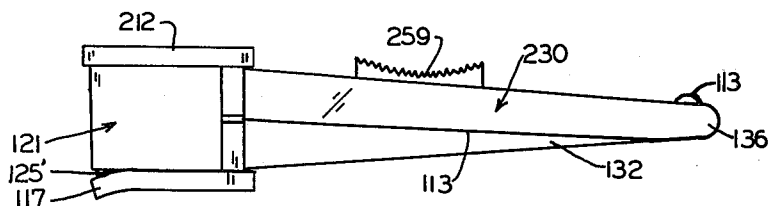
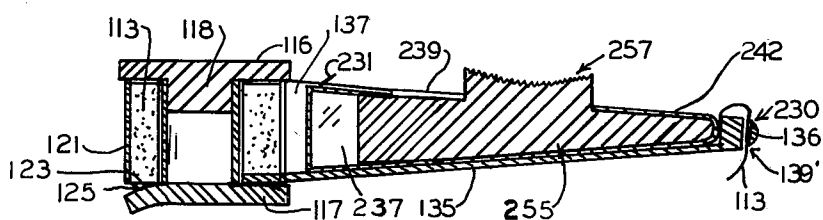


FIG. 28B





## DENTAL FLOSS DISPENSING AND MANIPULATION SYSTEMS

### BACKGROUND OF THE INVENTION

#### 1. THE FIELD OF THE INVENTION

The field of invention to which this invention pertains is toothpicking apparatuses which hold threads and include a thread supply container.

#### 2. DESCRIPTION OF THE PRIOR ART

Many dental patients who are completely convinced of the need for removal of bacterial plaque, and who are adequately trained in the proper techniques of flossing their teeth, fail to floss thoroughly or regularly because floss, wrapped tightly around the forefingers as provided for by currently available floss dispensers, cuts off circulation and causes genuine discomfort in the fingertips.

### SUMMARY OF THE INVENTION

The apparatuses of this invention are designed to provide the dental patient with a highly efficient floss arc for use in complete comfort.

In the combination of a unit for holding free end of a floss length and a unit for floss dispensing and holding, surfaces for supporting each of the units are large, whereby a large total force may be applied to each of the portions of the floss held by such units in the operator's hands and each unit has a floss contacting surface that bears the high intensity forces applied between such portion of the floss by the units; for each of the units the surface thereof directed to holding a floss portion is spaced away from the surfaces of the units used to support and manipulate such units so that the fingers of the operator are protected while high intensity forces are applied to the floss. Each free end holding unit is arranged to be firmly yet readily releasably attached to the floss dispensing unit for ready storage and portability of both units together. In such storage position, the floss dispensing unit and floss free end holding unit are (in embodiments 90, 110 and 210) adapted to hold floss therebetween to provide ready access to such floss when needed. The preferred embodiment provides the components of the floss holding unit and the free end of the floss in assembled condition for immediately available manipulative use.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows the completely assembled floss dispenser 50 and floss free end holder 40 of apparatus 60 in operative combination and position and condition as a left side view of each of the dispenser and free end holding assemblies along the direction of arrow 1A of FIG. 2.

FIG. 2 is a top view of assembly 60 with the right thumb 69 of the operator holding the floss against the side of holding assembly 40 and the cap 54 of assembly 50 removed.

FIG. 3 is an end view of the assembled assemblies 50 and 40 of FIG. 1 as seen along the direction of arrows 3A and 3B of FIG. 2.

FIG. 4 is a top view of the free end floss holder assembly 40 as seen along the direction of arrow 4A of FIG. 3.

FIG. 5 is a side view of the assembled dispenser assembly 50 as seen along the direction of arrow 5A of FIG. 3.

FIG. 6 is an exploded view of the parts of the dispenser assembly 50 disassembled with the sleeve 53 shown in top view and the spool 67 shown in top view and illustrating the top of the cap 54 and showing a side view of ring base 61.

FIG. 7 shows the apparatus 60 in use by an operator thereof on his teeth.

FIG. 8 is a side view of the apparatus 90 in assembled and portable nested position.

FIG. 9 shows the pen assembly 70 and the ring and ring sleeve assembly 65 held in the left hand 57 and on the right hand 58, respectively, of an operator.

FIG. 10 is a variation of use of the ring 76.

FIG. 11 is a cross-sectional view through the assembled apparatus shown in FIG. 8 to show the relations of the overall assembly 90.

FIG. 12 is a side view of the toothbrush and the pen body 71 of the overall assembly 90.

FIG. 13 is a top view of the pen body 71.

FIG. 14 is an enlarged cross-sectional view of zone 14A of FIG. 11.

FIG. 15 shows the ring sleeve 77 separated from the assembly 75.

FIG. 16 is a front view of the ring 76.

FIG. 17 is a top view of the ring 76 along direction of arrow 17C of FIG. 16.

FIG. 18 is a perspective view of another embodiment, 110, of dental floss dispenser and holder assembly, according to this invention, in its assembled and portable nested condition.

FIG. 19 is a perspective view of embodiment 110 with one locking sleeve unit thereof, 141, removed from the remainder of assembly 110 in an initial stage of operation of that embodiment.

FIG. 20 is a perspective view of the apparatus 110 in the operative position of its parts (although not shown being manipulated, as is shown in FIGS. 23 and 24); in the position shown in FIG. 20 the locking sleeve assembly 150 is shown in its nested operative position while the dispenser assembly 111 (composed of the spool 120 and the guidance arm 130) are shown in perspective.

FIG. 21 is a transverse vertical section through the plane 21A of FIG. 18.

FIG. 22 is a diagrammatic exploded view of the apparatus embodiment 110 with the spool assembly shown expanded in an exploded view while the inner locking sleeve 151 is shown removed from its position within the chamber 137 of the guidance arm 130.

FIG. 23 is a view, as seen by the operator, of his left hand 78 and right hand 79 holding the major subassemblies 111 and 150 of the apparatus 110.

FIG. 24 is a front view illustrating the appearance of the visible portions of the apparatus 110 (namely, a portion of the operatively nested sleeve assembly 150 and a portion of the floss 113 while held in the same position by the operator's right hand 79 and left hand 78 as illustrated in FIG. 23) this being the appearance as seen on looking toward the operator while the apparatus 110 is being used by the operator.

FIG. 25 is a perspective view of yet another embodiment of dental floss and holder assembly, 210, according to this invention in its assembled and portable nested or storage condition.

FIG. 26 is a diagrammatic exploded view of the apparatus embodiment 210 with the spool assembly shown in expanded and exploded view while the locking

sleeve assembly 240 is shown removed from its storage position within the chamber 137 of the guidance arm 130.

FIG. 27 is a top view of the assembly 210 in the position of parts shown in FIG. 25.

FIG. 28A is a side view of the apparatus shown in FIG. 27 along the direction of the arrow 27A of FIG. 27.

FIG. 28B is a vertical longitudinal sectional view through the section plane 28B—28B of FIG. 27.

FIG. 29 is a perspective view of the apparatus 210 in the operative position of its parts, although not shown being manipulated as is shown in FIGS. 23 and 24. The locking sleeve assembly 250 is shown in perspective view in its nested operative position while the dispenser assembly 211 is also there shown in perspective and operatively connected by a length of floss to assembly 250.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

The apparatus assembly 60 comprises a dispenser assembly 50 and a floss free end holder and finger protector assembly 40 shown in FIGS. 3–5 to be located on one of operator's fingers, as 57, on operator's left hand and another on operator's finger, as 58, on the other (right) hand, as shown in FIGS. 1 and 2.

The dispenser assembly 50 is a unitary combination which comprises, in operative combination, a plastic ring base 61 with a short curved arm 62 and a long curved arm 63 thereon and a gap 64 between the ends of said arms, said arms having some resilient extensibility. The ring base has a circular groove 65 therein (see FIG. 6) for firm fitting therein and attachment, by a press fit thereto, of a rigid right cylindrical sleeve 53, also made of plastic. A flexible yet firm removable cap 54 located on top of the sleeve is firmly yet releasably attached thereto by a press fit.

Cap 54 comprises a flat circular disc 47, a cylindrical skirt 49 at the periphery thereof and firmly attached thereto and continuous therewith, a sturdy release ear 48 attached to the skirt and projecting laterally therefrom and a cutter blade base 45 and cutter blade 55. The base 45 is a thin steel sheet firmly attached to the center of the disc 47; the cutter 55 is a semi-cylindrical ear firmly attached at its wide diametral end to the base 45 and projects sufficiently (about 1/16 inch) at its free end 46 from the base 45 to hold the floss, 68, for cutting. The skirt and a base are formed of firm yet resilient plastic, as polyethylene and the skirt forms a releasable fit with the top of sleeve 53.

The sleeve 53 and cap 54 and base 61 enclose a floss holder chamber 66. Chamber 66 loosely accommodates a dental floss spool 67 and allows it to turn freely therein yet not tumble so that the floss thereon may not tangle. Standard dental floss 68 is releasably wound on and held on floss spool 67. Floss spool 67 may be a standard sewing machine bobbin with a column 67.1 and shoulders 67.2 and 67.3 joined together firmly. The floss 68 passes from spool 67 to holder and finger protector assembly 40 between the softly rounded top of sleeve 53 and the bottom of cap 54 and may be cut off at floss cutter 55. The floss may pass freely between cap 54 and sleeve 53 for drawing floss from the spool on release of the cap from the sleeve or the floss may be locked against movement relative to sleeve 53 when the cap and the sleeve are firmly joined together. Nor-

mally, the skirt 49 of cap 54 and rounded top of sleeve 53 form a sufficiently tight fit to hold the floss 68 therebetween during normal floss usage, especially if the cap be held against the sleeve by pressure of the user's thumb 59 against the top of the cap 54, as shown in FIG. 1. Nevertheless, the free end 42 of the length of floss 68 on spool 67 is readily released by pulling upward on ear 48 to release the cap from the sleeve 53. The ring-like C-shaped free floss and holder 40 is in the shape of an elastic incomplete cylinder with an outer surface 41 that is concave outwards and has a slot 43 to allow for expansion. The surface 41 serves to center and hold the end of the floss 68 wrapped therearound as in FIGS. 1 and 2, especially when such floss is held by placing the right thumb 69 of the user in the concave groove 41, as shown in FIG. 2 (when right finger 58 supports holder 40) or when several crossed turns of floss lock the floss against movement therearound, as in FIG. 1.

When holder 40 is on the left hand, the left thumb holds the thread against the holder 40 and the right hand finger holds dispenser assembly 50.

The interior surface of the ring base 61 and the ring 51 form a firm, yet releasable, grip on the user's fingers as 57 and 58, which fit is made as firm as desired by merely pushing the ring 51 or base 61 further along the length of the user's fingers.

In operation of apparatus 60, the floss 68 is passed from the spool 67 and wrapped around and held, as above described, on the free floss end holder 40.

The apparatus 60 provides for a strong grip on the portions of the floss held by the dispenser assembly 50 and by the floss free end holder assembly 40 without any damage whatsoever to the user's fingers. Because of this absence of pain and/or damage to the finger, assembly 60 permits the user to more effectively use the floss, as well as use it for a longer period of time and, accordingly, because of its greater efficiency of use and longer period of use without unpleasantness to the user, improves the treatment obtainable thereby. Apparatus 60 is also provided with a transparent plastic container for protection against dirt and for portability; dispenser assembly base ring 61 and the holder 40 may be both made of polyvinyl chloride or like tough, soft, water-proof non-toxic plastic.

In the particular embodiment of apparatus 60 shown, sleeve 53 is 3/8 inch outside diameter and 1/2 inch long (parallel to its central longitudinal axis). The outside diameter of cap 54 is 1 1/8 inch; holder 40 has a maximum diameter (in FIG. 2) of 1 inch and is 3/4 inch high from its bottom edge 44.2 to its top edge 44.1; cutter blade 55 is 1/8 inch wide at its base; ring 51 is 1 1/4 inch wide across its face 52 and 1 inch high from face 52 to lowest portion 62.1 of arm 62, as shown in FIG. 3; arm 62 is 5/8 inch wide at its bottom or lowest portion 62.1. The interior and exterior surfaces of ring 51 and holder 40 are smooth so as to not damage a user's fingers. FIGS. 1–6 are pictorial and to scale so that other dimensions may be drawn therefrom in view of the above particular data for embodiment 60.

#### Embodiment 90 (FIGS. 8–17)

The assembly 90 comprises a pen assembly 70 and a shaped sleeve and ring assembly 75.

The pen assembly 70 comprises a resilient yet firm clip 72 and a body 71. The pen body 71 (shown in FIG. 11) is an elongated rigid hollow structure with a wall 81

of circular cross section much like a conventional ball point pen and of that size, i.e. about 5½ inches and ¾ inch outside diameter. It has a floss compartment 73 therein wherein a spool or a roll 84 of floss 74 is held and the string of floss 74 leading therefrom passes through that compartment to a opening 91 at the end of the compartment 73. It is closed by screwed head 92.

The pen body 71 has firmly attached to the outside thereof a combination pencil clip and floss cutter 72. The body 71 has a wide removable head 92 and a narrow tip 93. An outlet opening 91 co-axial with the central longitudinal axis of the body 71, is located at the tip 93 and a wide slot 94 is located close to but definitely spaced away by a collar 96 from the tip 63 and the longitudinally extending opening 91 therein.

An elongated cylindrical spirally wound roll of dental floss roll 84 is held in a floss zone compartment, as 95, defined by an inwardly projecting ring or shoulder 99, to hold the reel or roll of floss 84 in place in the chamber 73. The tip end 93 of the pen body 71 has a short narrow hole 91 therein and a definite collar or bridge portion 36 thereover, as shown in FIGS. 11 and 13; one end of the collar 96 and wall 81 define a conical surface with the hole 91 at the apex thereof and the portion 83 of the chamber 73 at the base of such conical surface and continuous therewith. The front edge of collar 96 defines the rear of hole 91 and provides that the floss 74 passes through the hole 91 as a guide therefor. The collar portion 96 is also sufficiently short and the slot 94 sufficiently long and wide and the interior surface 83 sufficiently smooth that an operator may, with his fingers, manipulate a free end as 83 of the floss 74 to pass readily through the hole 91 on replacement of the spool of floss as needed.

A resilient helical spring 98 within compartment 95 bears against the ring or shoulders 99 defining the floss compartment 95 and against a base of the spool 84 and urges the rear spool face 89 of the spool 84 into contact with the pointed teeth 97 which are firmly attached to the head 92 of the pen body 71 to engage and hold the spool 84.

The removable head 92 has an end plate 105 that slidably holds a rigid cylindrical push button handle 100 and has sharp teeth 97 firmly fixed thereto and is attached by threads 108 to the barrel or wall 81. The forward end 106 of the handle 100 is smooth and has a laterally extending shoulder 107 that engages plate 105 to restrain travel of handle 100. Plate 105 is rigid. Push button handle 100, when urged toward the spool, compresses spring 98 and allows the spool 84 to rotate on the smooth front end of handle 100 to release the floss 74 on spool 84. When the push button handle 100 is not depressed, the spring 98 urges the spool against the teeth 97 in locking engagement therewith and prevents release of the spool and the floss thereon by preventing rotation of the spool. Actuation of the push button 100 thus serves to release the floss spool for dispensing. The pocket clip 72 has a sharp floss cutter 102 located therein for cutting the floss passed out of pen body 71.

A toothbrush 75 is located with its handle 76 and brush 77 adjacent the pen body 71 with the brush portion 77 projecting into the slot 94, generally as shown in FIGS. 8, 11 and 12, and is held in place by the resilient yet firm fit of sleeve 75 thereover.

The ring sleeve and ring assembly 75 comprises a rigid shaped hollow cylinder and a ring 76 in slidable yet lockable relation thereto. Ring 76 is slit.

As shown in FIG. 8, the sleeve or shaft 77 is a hollow shaped cylinder and has at its narrowest portion a smaller internal diameter than the external diameter of the pen body at the joining zone or point 101, as shown in FIG. 8, where the removable sleeve 77 contacts and engages the pen body 71 in the nested position of the apparatus 90. The sleeve 77 is hourglass shaped with a wider portion at one end 77.1 and narrower portion 77.2 in the middle and has a convex inward outline, as shown in FIG. 12, and a wide portion 77.3 at the other end and has a concave outward outline as shown in FIGS. 8, 9, 11 and 15. The hourglass shaped sleeve 77 is sufficiently long to be held in the fingers, as 58 and 69, of right hand 70 of the operator 80, while the fingers as 59 and 57 of the other left hand 78 of the operator holds the pen assembly 70 wherein the floss 74 is held. When nested as in FIG. 8; split ring 76 is located in a lockable yet slidable relationship to the hourglass shaped sleeve 77. The split ring 76 is a C-shaped free floss end holder, like 40, and has the shape of an elastic incomplete cylinder with an outer hourglass shaped surface 76.1 that is concave outwards. Ring 76 has a longitudinal slit 78 which allows for some elastic expansion movement of that ring 76 relative to the sleeve 77 and thereby for the floss 74 to be readily and firmly held between the outer surface of sleeve 77 and the inner surface of the split ring by the gripping by the split ring 76 against the floss 74, as shown in FIG. 9, by a wedging action and consequent firm locking of the floss therebetween as well as by turning of the floss around the ring to tighten the floss about the ring and lock it after the floss has been located thereunder, as shown in FIG. 2 for ring 40.

The ring 76 is made of soft enough material to also resiliently expand as it is pushed up the larger diameter portion of the cylindrical sleeve 77 and this softness allows the floss 74 to be firmly yet releasably locked between the larger diameter portion 77.1 of the sleeve 77 and the split ring. The floss is slipped through the slit 78 and between ring 76 and sleeve 77 while the ring 76 is adjacent the narrow portion 77.2 of sleeve 77 and thereby held in place when the ring is moved toward the wider end, as 77.1, of the sleeve 77.

This relation of elements 76 and 77 provides for a firm location of the dental floss by the split ring 76 and for the support of the ring 76 on the sleeve 77. Additionally, the split ring 76 may, as shown in FIG. 10, be held directly on the pen holder body 11 and held on an operator's finger, as 58, without the sleeve, generally as in embodiment 60; then, the outer surface 76.1 also serves to center and hold the end of the floss 74 wrapped therearound as in FIG. 9, especially when such floss is held as by placing the right thumb 69 of the user in the concave surface 76.1 (as shown in FIG. 2) or when several crossed turns of floss lock the floss against movement therearound (as in FIG. 1 for embodiment 60. In both cases of use of a split ring as 76 or 40, as herein disclosed, the operator's finger is protected against pain or damage due to tight floss.

The sleeve 77 firmly holds the pen body 71 for attachment thereto and also holds the toothbrush 75 together therewith so that the dental floss dispenser assembly 70 and split ring and sleeve assembly 75 and the toothbrush 75 are held together as a nested group or

unit 90, as shown in FIGS. 8 and 11. As above set out, the sleeve 77 is readily disconnected from the pen body 70 and the dental floss of spool 74, as shown in FIG. 9 is passed from the pen body 70 to be firmly held by the split ring and sleeve assembly 75 between the ring 76 and the sleeve 77 for manipulation on the operator's teeth generally as also shown in FIG. 7 while the spring 38 holds the spool 24 firmly in position and prevents release of the floss 74 therefrom. The pen assembly 70 thus serves to store and dispense a supply of dental floss 74 and to firmly hold a portion thereof; and, in cooperation with assembly 75, which firmly holds another portion of said floss and rapidly releases such floss, to permit the energetic flossing of the human teeth without discomfort.

#### Embodiment 110 (FIGS. 18-24)

The dental floss dispensing and manipulation assembly 110 comprises a floss dispenser assembly 111 in cooperative assembly with a floss locking sleeve assembly 140.

The floss dispenser assembly 111 comprises, in cooperative assembly, a spool 112, a spool casing 120 and a guidance arm 130. The locking sleeve assembly 140 comprises, in cooperative combination, an outer locking sleeve 141 and an inner locking sleeve 151 in storage condition shown in FIG. 18.

The spool 112 has a top circular plate 116, a bottom circular end plate 117, a top cylindrical sleeve 118 firmly attached to the top end plate 116, and bottom cylindrical sleeve 119 attached to the bottom plate 117. The top cylindrical sleeve is rigid and extends at right angles, as shown in FIG. 22, to the top end plate 116 and is firmly attached thereto, while the bottom sleeve 119 is rigid, splined exteriorly, and has a cylindrical interior surface of slightly larger size than the outside diameter of the top sleeve 118 and is firmly attached at its bottom to the bottom spool end plate 117. The outer surface of sleeve 118 fits firmly yet releasably within the inner surface of the bottom sleeve 119 with a press fit. The dental floss 113 is firmly wrapped in spiral fashion around the bottom sleeve 119. As below described, when the plates 116 and 117 are turned, the splined sleeve 119 engages the mass of the thread 113 and provides for the rotation thereof about the common central axis of the circular plates 116 and 117, the cylindrical sleeves 118 and 119 and the cylindrical coil of floss 113.

The spool casing 120 comprises a hollow cylindrical C-shaped compartment wall 121, with a section thereof removed to provide a gap 122 so that the wall 121 is generally C-shaped, as shown in FIG. 22.

The bottom edge of wall 121 is firmly joined to the peripheral edge of a circular compartment floor 123 with a central hole 124 therein. Some rigid teeth, 125 and 125', extend downward from the exterior surface of the floor 123 (as shown in FIGS. 28 and 29). A spool chamber 127 is accordingly formed within the compartment wall 121 and above the floor 123. A floss discharge hole 128 extend radially of the wall 121 adjacent to gap 122 and through the wall.

The spool 113 is located within the spool chamber 127 and firmly attached to the splined bottom spool sleeve 119. The plates 117 and 116 are firmly attached together by the engagement of the sleeves 118 and 119, as the outer surface of sleeve 118 fits within the inner surface of sleeve 119 with a very

firm press fit whereby the end plates 116 and 117 may be separated when the replacement of the floss mass 113 is desired.

The spool end plates 117 and 116 have flat interior bottom surfaces which smoothly engage the flat parallel top and bottom edges of the wall 121; the sleeve 119 extends through the hole 124 slidably and smoothly, thereby the spool 113 is firmly and rotatably held within the chamber 127 and may be moved by rotation of either of the plates 116 or 117 relative to the casing 121 to loosen the floss 113 within the chamber 127 to permit the withdrawal of the floss outward of the chamber 127 through the hole 128 and such movable means also provides for releasably holding such floss against movement from the floss holding chamber.

The guidance arm 130 is a firm elongated narrow pyramidal structure firmly attached to walls 121 and 135 of spool casing 120. The guidance arm comprises a rigid elongated triangular flat left side plate 133, a rigid elongated triangular flat right side plate 134 and a rigid elongated triangular bottom plate 135. The plates 133, 134 and 135 enclose and define the pyramidal shaped guidance arm chamber 137 therebetween and terminate in a rounded guidance arm point or nose 136. The guidance arm chamber 137 has an elongated pyramidal shape with a base 138 that is adjacent to wall 122. Guidance arm nose portion 136 is provided with a straight cylindrical hole 139 therethrough that communicates with chamber 137 for location in that hole of the floss 113. The larger, or base, portion of the pyramidal chamber, 138, is co-extensive with the gap in opening 122 in the wall 121 of the spool casing 120. Walls 134-136 of arm 130, like casing 120 and spool 112, are formed of firm yet resilient soft smooth-surfaced plastic as polyethylene.

The right hand wall 134 of the guidance arm 130 supports a cutter assembly 131; assembly 131 has a base 132 and a cutting blade 131.1. The base 132 is a rigid steel plate and is firmly attached to the side wall 134 and supports a semicylindrical cutter blade 131.1 with a sharp cutting edge adjacent to the base; the cutter blade 131.1 is a semi-cylindrical ear firmly attached at its wide sharp edge diametral end to the base 132 and the dull free end of the blade 131.2 projects sufficiently (about 1/16 inch) from the base to conveniently hold the floss 113 for cutting.

The guidance arm 130 is firmly attached to the spool casing 120 by firm attachment of the side walls 133 and 134 of guidance arm to the wall 121 at either side of the wall gap or opening 122 and the compartment floor 123 is co-extensive and continuous with the bottom wall 135 of the guidance arm 130 whereby a rigid and firm connection therebetween is effected.

The locking sleeve assembly 140 is composed of an outer elongated pyramidal sleeve 141, and a like elongated pyramidal inner sleeve 151. Sleeves 141 and 151 are identical in size and shape and are interchangeable in their position, as shown in FIGS. 18 and 20.

The outer locking sleeve 141 comprises a elongated triangular rigid top wall 142 firmly connected at its left edge to the like shaped side wall 143 and at its right side to the like shaped side wall 144, while the side walls 143 and 144 are firmly connected at their bottom to the side edges of the bottom wall 145. These triangular walls all have the same isosceles shape and size and join together at a rounded point or nose 146 whereat is provided a elongated yet narrow notch 149 for hold-

ing floss 113. The locking sleeve chamber 147 enclosed within the walls 142, 143, 144 and 145 is pyramidal in shape with a square open base 148 at the end of the chamber 147 distant from the nose 146.

The locking sleeve assembly 140 is composed of a like outer sleeve 141 and inner sleeve 151. Sleeves 141 and 151 are interchangeable in their position. The inner locking sleeve 151 comprises an elongated triangular rigid top wall 152 firmly connected at its left edge to the like shaped side wall 153 and at its right side to the like shaped side wall 154, while the side walls 153 and 154 are firmly connected at their bottom to the side edges of the bottom wall 155. These triangular walls all have the same isosceles shape and size and join together at a nose 156 whereat is provided an elongated yet narrow notch 159 for holding floss 113. The locking sleeve chamber 157 enclosed within the walls 152, 153, 154 and 155 is pyramidal in shape with an open square base 158 at the end of the chamber 157 distant from the nose 156.

In the nested condition of the apparatus 110, as shown in FIG. 18, one sleeve unit 151 of the interlocking sleeve assembly 150 is firmly yet releasably located within the chamber 137 of the guidance arm 130, as shown in FIG. 18, while that guidance arm is releasably yet firmly located within the other sleeve unit 141.

The nose 146 of the outer sleeve 141 is of a size and shape to be used to enter the space of chamber 137 (where indicated by lead line of referent numeral 137 in FIG. 19) between the nose 156 of the locking sleeve 151 and the nose 136 of the guidance arm 130 to pry or lift up the sleeve 151. Such step is performed by removing the locking sleeve 141 from the wedged, press fit attachment thereof to arm 130 in the assembly shown in FIG. 18 to the position of parts shown in FIG. 19 where such locking sleeve 141 is pulled away from the guidance arm 130. The floss 113 is then passed from the hole 128 through the hole 139 of the guidance arm 130 and passed through the notch 159 of the arm 150 and around the walls of the sleeve 151 generally as shown in FIG. 22; thereupon, the sleeve 141 is passed over the sleeve 151 as shown in FIG. 20, and floss 113 is held between the sleeve 141 and the sleeve 151, generally as shown in FIG. 21, inasmuch as the sleeve 141 and 151 form a wedging action to firmly hold the floss 113 in such position and form the operative free floss end locking assembly 150, which comprises the sleeves 141 and 151 nested together, as shown in FIGS. 20 and 21, and firmly yet releasably holding the free end 114 of the floss 113. The floss 113 passes from its locked position between units 141 and 151 to the slot 149 in nose 146 of sleeve unit 141 to the hole 139 in nose 136 of arm 130 and so provides for firm gripping of the unit 150 and fine control of the floss in slot 149 and hole 139 by the operator (as shown in FIGS. 23 and 24) without discomfort to the flesh of the fingers guiding and locating the floss by the use of assemblies 111 and 150 of apparatus 110. The assembly 150 may be held by one of the operator's hands, as the right hand 79, as shown in FIGS. 23 and 24, while the floss 113 is passed between the teeth, as 80, as shown in FIG. 24 and unit 111 held in the operator's other hand, as 79, so that the floss may be vigorously and properly applied to the operator's teeth without discomfort to the operator's fingers.

#### Embodiment 210 (FIGS. 25-29)

The dental floss dispensing and manipulation assembly 210 comprises a floss dispenser assembly 211 in cooperative assembly with a floss free end locking assembly 240.

The floss dispenser assembly 211 comprises, in cooperative assembly, a spool 212, a spool casing 220 and a guidance arm 230.

In the embodiment 210, the components of the floss holder and dispenser assembly 211 is the same as assembly 111, as shown by the referent numerals therefor in FIGS. 25-29 in embodiment 110 but the floss free end holder assembly 240 is novel and the cutter is attached to the assembly 240, not 211 and hole 139' is vertical, not entering chamber 137.

The locking sleeve assembly 240 is composed of an outer elongated pyramidal sleeve 241, and an elongated pyramidal inner sleeve 251.

The outer locking sleeve 241 comprises an elongated triangular rigid top wall 242 firmly connected at its left edge to the like shaped side wall 143 and at its right side to the like shaped right side wall 244, while the side walls as 243 and 244 are firmly connected at their bottom to the side edges of the bottom wall 245. These triangular walls all have the same isosceles shape and size and join together at a rounded point or nose 246 whereat is provided an elongated yet narrow hole 249 for holding floss 113. The locking sleeve chamber 247 enclosed within the walls 242, 243, 244 and 245 is pyramidal in shape with a square open base 248 at the end of the chamber 247 distant from the nose 246. A top opening 239 in wall 242 provides for movement of the knob 257 of unit 251.

The top wall 242 of the sleeve 240 supports at its base end, as shown in FIGS. 25 and 26, a cutter assembly 231; assembly 231 has a base 232 and a cutting blade 231.1. The base 232 is a rigid U-shaped steel plate and is firmly attached to the top wall 242 and supports a semicylindrical cutter blade 231.1 with a sharp cutting edge adjacent to its base; the cutter blade 231.1 is a semi-cylindrical ear firmly attached at its wide sharp-edged diametral end to the base 232 and the dull free end of the blade 231.2 projects sufficiently (about 1/16 inch) from the base to conveniently hold the floss 113 for cutting. An ear 233 on wall 252 holds plate 232 in place. The inner locking sleeve 251 comprises an elongated triangular rigid top wall 252 firmly connected at its right edge to the like shaped side wall 254 and at its left side to a like shaped side wall, while the side walls are firmly connected at their bottom to the side edges of the bottom wall same in shape as wall 252. These triangular walls all have the same isosceles shape and size and join together at a nose 256. The inner locking sleeve is an elongated solid pyramid 255 with a rear square base 258 at the end of sleeve 251 distant from its nose 256, and a control knob 257 fixed thereto. A control knob 257 is firmly fixed to the top wall 252; it has an upper curved and milled face 259 for movement thereof.

In the nested condition of the apparatus 210, as shown in FIG. 25, sleeve unit 241 of the innerlocking sleeve assembly 240 is firmly yet releasably located within the chamber 137 of the guidance arm 130, as shown in FIG. 25, while that sleeve 251 is movably yet lockably located within the sleeve unit 241 by movement towards and away from nose 246.

The floss free end holder assembly 240 comprises a first outer casing or sleeve 241 and a second, inner casing 241 or sleeve; the outer casing or sleeve envelopes and slidably holds the inner casing in a slidable yet firmly held relative relationship whereby the only manipulation of the locking elements required for holding or releasing the free end of the floss is longitudinal sliding of one assembly (251) relative to the other (241). There is no requirement for assembling the elements to create a working relationship therebetween. Thereby, the locking assembly 240, when released from the guidance arm of the dispensing and holding assembly 211, is immediately available for operation.

The pyramidal shape element 55 slidably fits in chamber 247 to be positioned in either a slidable loose, floss-releasing position as in FIG. 27, or a tightly wedged floss holding position as in FIG. 28B by manipulation of the knob 257.

The knob 257 is firmly fixed to the top surface of inner sleeve body 255 and has a larger width than the width of hole 239 in wall 242 of sleeve 241 and has a flat smooth bottom face that slidably engages the smooth top of wall 242 to provide for slidable movement of the wedge body 255 within the chamber 247 of sleeve 241 to achieve its floss releasing or floss holding position.

The relative sizes of exterior surface of body 255 and the interior surface of chamber 247 of sleeve 241 are such that there is in the released position of body 255 of unit 251, shown in FIG. 27, a definite but small space between the front of nose 256 of the locking sleeve 251 and the rear of nose 246 of locking sleeve 241 in the release position (FIG. 27) to provide for movement of the body 255 from its floss releasing to its floss locking position (locked position shown in FIG. 28B).

Grasping of knob 257 allows operator to pry or lift up the sleeves 251 and 241 from the press fit location of sleeve 241 in chamber 137.

Operation of apparatus 210 is effected by removing the locking sleeve 241 with 251 therein from the wedged, press fit attachment thereof to arm 230 in the assembly shown in FIG. 25 to the position of parts shown in FIG. 29 where the assembly of locking sleeve 241 and sleeve 251 is released or pulled away from the guidance arm 230. The floss 113 then passes from casing 220 via hold 128 and through the hole 139' of the guidance arm 230 and passes through the hole 249 in the sleeve 241 and into chamber 247 diagrammatically as shown in FIG. 26. When the inner locking sleeve 251 is moved within the sleeve 251 to locking position, as shown in FIG. 29, floss 113 is then firmly (yet releasably) held between the inner wall of sleeve 241 and the outer wall of body 255 of locking sleeve 251, generally as shown in FIG. 29, inasmuch as the adjacent surfaces of sleeve 241 and body 255 then form a releasable yet firm wedging action to firmly hold the floss 113 and each other in position to form the operative free floss end locking assembly 250, which (assembly 250) comprises the sleeves 241 and 251 nested together, as shown in FIG. 29.

The floss 113 passes from its firmly held or locked position shown in FIG. 29 (and also in FIG. 28B) between units 241 and 251 to the hole 249 in nose 246 of sleeve unit 241 to the hole 139' in nose 136 of guidance arm 230 and so provides for firm gripping (by the unit 250) and fine control of the floss in hole 249 and hole 139' by the operator (as shown in FIGS. 23 and

24) without discomfort to the flesh of the fingers guiding and locating the floss by the use of assemblies 211 and 250 of apparatus 210. The assembly 250 may be held by one of the operator's hands, as the right hand 79, as shown in FIGS. 23 and 24, while the floss 113 is passed between the teeth, as 80, as shown in FIG. 24 and unit 211 held in the operator's other hand, as 79, so that the floss may be vigorously and properly applied to the operator's teeth without discomfort to the operator's fingers.

The finger protector assembly 40 may be readily attached to the dispenser assembly 50 by displacing the arms 62 and 63 and pushing assembly 40 thereof through the slot 64 as shown in dotted lines in FIG. 5 for ready and convenient storage and transport of both units of assembly 60 together. The flexibility of the cap 54 near its skirt 49 and the size thereof provide for firmly holding the floss between the cap 54 and sleeve 53 while storing the assembly 60 between periods of use thereof and provides for ready access to such floss.

In embodiment 90 in the nested storage position as shown in FIG. 8 the inwardly convex shaped sleeve 77 holds the free end of the floss 83 between that interior surface of that sleeve and the exterior surface of the floss dispenser wall inasmuch as that wall has an internal chamber 103 having portions—to the front of the zone of contact of that sleeve with the outside of the shell 81—larger than the outside diameter of the portion of wall and has portions that have an internal diameter that are less than the outside diameter of that body exterior. The rigid portion of the shell or wall 81 between the shoulders 99 and the hole 91 enclosing chamber 104 serves as an extension arm in the same manner as do the guidance arms 130 and 230 of embodiments 110 and 210 during the manipulation of the floss thereof as shown in FIGS. 23 and 24 for embodiments 110 and 210.

In embodiment 110 the outer sleeve 141 in the nested position of parts of FIG. 18 holds the free end 114 of floss 113 in position for ready access for later use. This holding is accomplished by the firm yet releasable wedging fit and action between the smooth inner surface of the outer sleeve 141 and the smooth outer surface of the guidance arm 130 and the holding therebetween of the thin and readily flattened dental floss, as shown in FIG. 18.

In embodiment 210 the outer sleeve 241 in the nested position of parts shown in FIG. 25 holds the free end of the floss in position for ready access for later use as shown in FIG. 29. This holding is accomplished by the firm yet releasable wedging fit and action between the most inner surface of guidance arm 230 and the smooth outer surface of sleeve 241 and the holding therebetween of the thin and readily flattened dental floss as well as the holding action of adjacent walls of sleeve assemblies 241 and 251.

Conventional dental floss as is used in embodiments 60, 90, 110 and 210 has a width of about 0.7 mm and a thickness of about 0.2 mm and is made of many loosely packed fibers each about 0.02 mm. diameter.

The floss of embodiment 210 extends from hole 249 to hole 229 via cavity 247 and then to hole 228 as shown in FIG. 29 and is held against the interior wall of guidance or extension arm 230 by sleeve wall 244 in storage position of FIG. 25 and is held against interior of sleeve 241 by the body 255.

Spool plates 117 and 117' and firm and stable yet resiliently flexible as they are made of relatively soft plastic. The flexibility of plate 117 is the same as 117' of embodiment 210 and provides for bending of up to 1/2 inch on normal finger pressure. This bending is shown exaggerated for purpose of illustration clarity in FIGS. 28A and 28B and provides a releasable engagement with teeth as 125 and 125' on bottom of wall 123 and so allows spool 112 of embodiment 110 (and 212 of embodiment 210) to be turned by hand to wind or unwind floss on that spool by turning the spool plate 116 or 117. In the operative position of assembly 11 (and 211) the hand of the operator holding such assembly, as in FIGS. 23 and 24 prevents the spool from turning while such hand also engages arm 130 (or 230) and forcefully supports and manipulates the remainder of assembly 111 or 211.

In embodiment 110 the outer diameter of spool plate 116 is 1 1/2 inches and plates 116 and 117 are 1/32 inch thick; wall 121 is 7/16 inch high and 1 inch outside diameter; hole 139 is 3/64 inch interior diameter and its center is 2 1/2 inch from nearest edge of spool plate 116; arm 130 is 2 3/4 inch long measured along side 134; the top of chamber 137 is 2 1/4 inch long from opening 122 to rear of nose 146; nose 146 is a solid 1/8 inch thick member; sleeve 141 (like 151) is 1 15/16 inches long measured along side 144 and 3/8 inch wide from outside of wall 134 to outside of wall 133 at base 138 and is 1/8 inch wide at distance of 1/8 inch from end 146; each of walls 142-145 and 152-155 are 3/64 inch thick; the material used for units 90, 110 and 210, except for the steel cutter, is polyethylene.

I claim:

1. In combination, a floss dispensing and holding assembly and a finger protecting floss locking body assembly separatable therefrom for holding a length of dental floss therebetween,

- a. said floss dispensing and holding assembly comprising, in operative combination, rigid walls defining a floss holding chamber, a dental floss spool within said floss holding chamber, dental floss on said spool, and movable locking means supported on said chamber wall and releasably engaging said spool for releasably holding said floss against movement from said floss holding chamber, said floss dispensing and holding assembly also comprising a rigid narrow wedge-shaped guidance arm permanently and firmly attached at an inner wide end thereof to said rigid wall of said floss dispensing and holding chamber and extending to a rounded narrow outer end, an upwardly open receptacle within said guidance arm and an orifice through a wall of said guidance arm near the narrow outer end of said guidance arm and continuous with said receptacle;
- b. said finger protecting floss locking body assembly comprising a tapered body with a floss engaging orifice at one, narrow, end thereof and a finger engaging surface at the other, wider, end thereof, said ends spaced apart from each other and a firm wedge-shaped body portion therebetween firmly

attached to and continuous with said finger engaging surface and to said floss engaging orifice, said wedge-shaped body portion being of variable width along its length; said tapered body, in one position, firmly fitting against inner side walls of said receptacle within said guidance arm and, in another position of said tapered body, said body being movable freely along a part of the length of said receptacle in said guidance arm and being separable and separate from said floss dispensing and holding assembly;

- c. a length of said floss extending from said spool through said orifice of said guidance arm and through said orifice at the end of said tapered body, said wedge-shaped body portion fitting into said receptacle in said guidance arm with said length of floss attached to said tapered body whereby said floss is stored ready for use attached to said floss dispensing and holding assembly and to said locking body assembly.

2. Apparatus as in claim 1 wherein said locking means in said dispensing and holding assembly for releasably holding said floss against movement comprises a flexible cap engaging said chamber wall.

3. Apparatus as in claim 1 wherein said locking body assembly comprises also a second tapered body which has a tapered internal chamber with larger diameter opening at one, wide end than the outside diameter of the outer end of said guidance arm and a smaller internal diameter at said wide end than the outside diameter of the inner wide end of said guidance arm and has a terminal portion that has an internal diameter that is less than the outside diameter of the outer end of said guidance arm and said second tapered body forms a releasable attachment on said guidance arm.

4. Apparatus as in claim 3 wherein said first and said second tapered bodies are identical in size and shape and are interchangeable in position.

5. Apparatus as in claim 4 wherein said tapered bodies and said guidance arm are pyramidal in shape.

6. Apparatus as in claim 1 wherein said locking body assembly comprises said tapered body and a second tapered locking body and said tapered body has a wedge-shaped chamber therein and said tapered body has at its narrow end an orifice which extends from said wedge-shaped chamber therein to the exterior of said tapered body and said second tapered body is shorter than and is releasably held in the chamber of said tapered body, and the tapered body is movable into and out of wedging locking relationship with the receptacle in said guidance arm and said first and second tapered bodies then hold therebetween an extension of the length of floss extending from said spool to said orifice at the end of said tapered body.

7. Apparatus as in claim 6 wherein said locking means in said dispensing and holding assembly for releasably holding said floss against movement comprises a flexible cap engaging said chamber wall.

8. Apparatus as in claim 7 wherein said tapered bodies and said guidance arm are pyramidal in shape.

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