

Dec. 24, 1940.

C. L. SMITH

2,226,145

MOTOR DRIVEN TOOTH CLEANING DEVICE

Filed Jan. 17, 1938

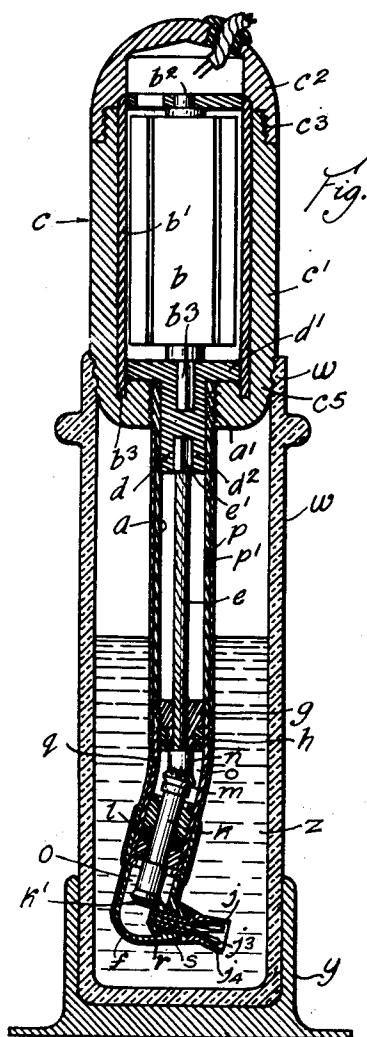


Fig. 1.

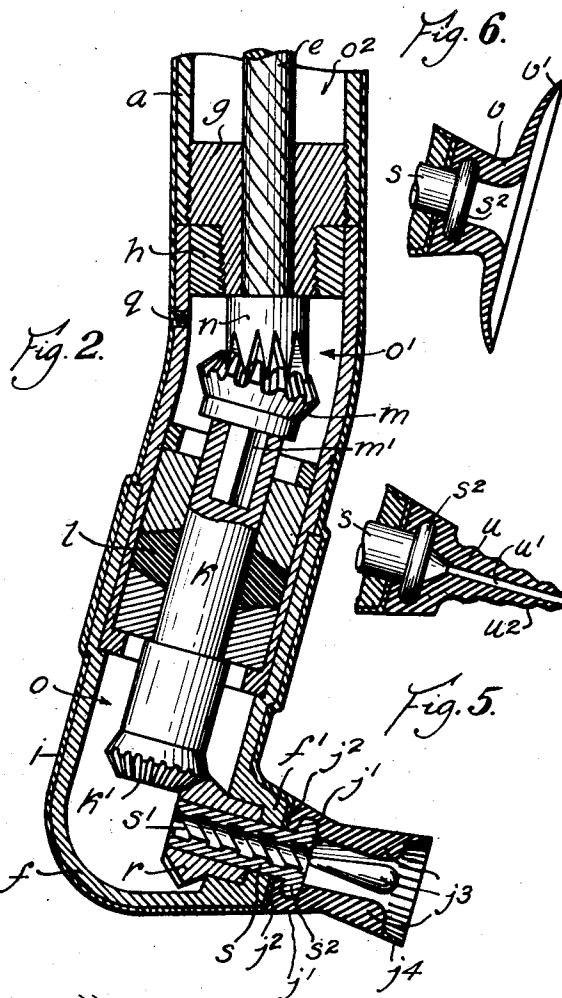


Fig. 2.

Fig. 6.

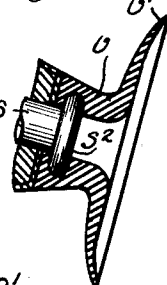


Fig. 5.

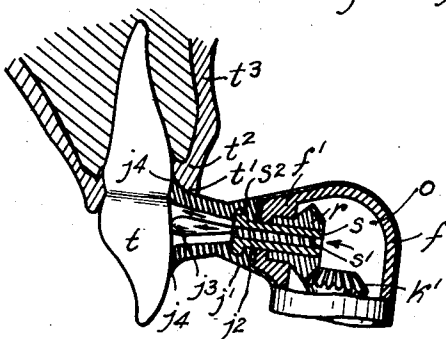


Fig. 4.

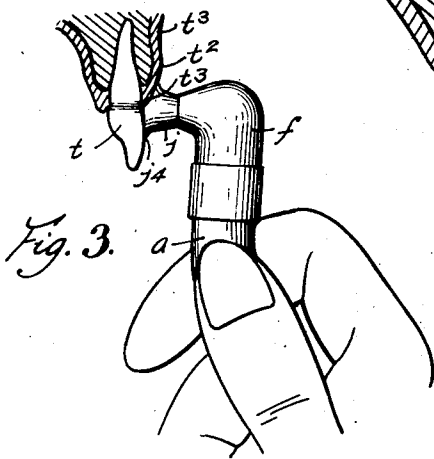


Fig. 3.

Inventor:
Calvin L. Smith
by *W. R. Ransley* Attorney

UNITED STATES PATENT OFFICE

2,226,145

MOTOR DRIVEN TOOTH CLEANING
DEVICE

Calvin L. Smith, Portland, Oreg.

Application January 17, 1938, Serial No. 185,424

2 Claims. (Cl. 15-29)

My invention relates to a mechanical device adapted for use in dentistry and particularly designed for self-use. In its broadest aspect, it comprises a dental hand piece to which is secured a driving motor, the entire device occupying a small compass and being conveniently arranged so that the possibility of injury is reduced to a minimum.

The object of my invention is to provide a device of this character with all of the operating parts completely housed or encased, insulated against electric shock if an electric motor is used, and with the applying device proportioned and arranged so that no moving part thereof made of metal or other hard material is exposed. My device, thus, is adapted to be used by an inexperienced person or even by a child without subjecting the user to possibility of injury.

It is generally appreciated that the toothbrush which is almost universally used for cleaning teeth in the home is inefficient and unsanitary. Many efforts have been made to so proportion toothbrushes as to increase their efficiency and many efforts have been made to improve the unsanitary conditions in which toothbrushes are used and stored. To sterilize a brush with heat, for example, renders the bristled portions of the brush unusable, and physically cleaning the brush is a difficult if not an impossible operation.

The tools and hand pieces used by dentists in prophylactic work are efficient but require a substantial amount of skill in their use, and if they are used unskillfully frequently produce traumatic injury to the teeth and to the gums so that more damage is done than good. The faces of the teeth can be cleaned with a brush and with a dentifrice but the marginal edges of the teeth will not readily be reached with a bristled brush. This is particularly true of that portion of a tooth which lies under the loose marginal lip or gingival lip overlying the neck of a tooth. If it is attempted to force the bristles of a brush under said lip, frequently the peridental membrane is injured to produce recession of the gum tissues and no substantial cleaning can be done with such a device as a bristled brush. It is generally accepted also that calculus or tartar is deposited upon teeth when a roughened surface is presented or after such a deposit has first become attached. That is, said deposit is cumulative, and thus a clean smooth surface inhibits the accumulation of said deposits. By a device embodying my invention, the teeth, including the marginal portions thereof, may be kept smooth and clean, the gums can be massaged to stimulate the flow of blood therethru and produce a healthy tone therein, and the possibility of injury is minimized.

A further object of my invention is to provide a device of this character and to improve dental hand pieces so that a germicidal agent or an antiseptic or other therapeutic aid or stimulant

can be directed onto the applicator carried by said device or hand piece and applied to the surface of the tooth being operated upon or to the adjacent gum surface at the time said applicator is operating over said surface to clean the same. This is particularly desirable and effective when the marginal edges of a tooth are being operated upon and particularly those lying under the gingival lip. If said lip or the peridental membrane is irritated, a medicinal preparation can be immediately applied to said affected tissue.

A further object of my invention is to provide a device of this character which may be easily and quickly cleansed, one which is completely insulated against transmission of electric shock, and one which is sturdily built so as to eliminate repair or replacement of the operating parts thereof.

A further object of my invention is to provide a device of this character with a container which may be easily but securely connected therewith. Said container preferably is designed to hold a liquid medicinal preparation in which the operating portion of said device may be immersed. Thus, said device can be held in a germicidal agent or the like so that sterilization tendencies are easily and automatically produced. I preferably select a liquid agent which has additional characteristics of lubrication for the operating portions of my device, one which has a pleasant taste and acts as a polishing and lubricating agency when said device is operated, and one which has a definite medicinal value to be applied automatically in operation to the surfaces adjacent the tooth being operated upon.

Further features of my invention are herein-after disclosed in connection with a detailed description thereof made with reference to the accompanying drawing, in which:

Fig. 1 is a longitudinal section thru a device embodying my invention, showing it housed within a container holding a quantity of liquid in which the operating end of said device is immersed, said receptacle also constituting a base or support for said device;

Fig. 2 is an enlarged sectional view taken thru the operating head of said device;

Fig. 3 is a diagrammatic view illustrating the manner in which said device is used;

Fig. 4 is a larger scaled detail view illustrating the manner in which a liquid medicinal preparation may be forced outwardly upon the surface of the tooth being operated upon and upon and beneath the adjacent tissue;

Fig. 5 is a sectional view of a modified type of applicator to be used in connection with my invention; and

Fig. 6 is a similar sectional view of a still further modification of an operating device.

A device embodying my invention comprises

a tubular body *a*, which is preferably elongated with respect to its diameter, which body carries an electric motor *b* at one end thereof. I specify an electric motor because it is more convenient than other types of motors, such for example as spring motors or water motors, but I do not wish to limit my invention to an electric motor. Said electric motor is preferably completely housed within an enveloping casing *c*, preferably made in two halves, *c'*—*c2*. *c'* preferably houses the major portion of the motor, and *c2* is a cap screw-threaded to the other half adjacent one end thereof. Said parts preferably are joined by screw threads *c3* so that access can be had to the motor which is contained therein but which screw threading securely joins said parts together. The motor itself is self-contained, that is, is housed within the usual casing *c'* and may be fitted into the casing *c*. The casing *c* is preferably made of some insulating material, such as hard rubber, Bakelite or any other composition which is considered a non-conductor of electricity. The motor casing *c'* preferably extends beyond the coils thereof and one end of the casing half *c'* is provided with an annular recess *c4* in which one end of the casing *c'* is lodged. The rotor shaft *b2* of the motor *b* is journaled in the casing *b'*, at one end, and in an insulating plug *d* at the other. Said plug is journaled within the casing *c* and the casing *b'*. It preferably is provided with a head *d'* of larger diameter than its shank *d2*. Said head overlies the end of the tubular body but it is journaled within the bore thereof as well as within the bore of the casing *b'* of the motor, as is illustrated in Fig. 1. The end *b3* of the rotor shaft *b2* is non-circular and is seated in a correspondingly formed recess in the plug *d*, and thus the plug *d* rotates with said rotor shaft *b2*. Also secured in said plug at the opposite side thereof is a shaft *e* extending within the bore of the tubular body. This may either be a solid shaft or a relatively flexible shaft, as I have illustrated in the drawing. The end *e'* which is seated in the plug *d* is also non-circular so that said shaft is fixed to rotate with said plug and with the shaft *b2* of the motor.

The tubular body *a* is threaded into the motor casing *c* by a threaded portion *a'*. Said tubular body preferably is made in two pieces, the angularly arranged head *f* forming a part of said body or a continuation thereof. Said head is secured to the body *a* by a threaded plug *g* in the end of the body *a* and a threaded bushing *h* in the end of the head *f*. This is shown most clearly in Fig. 2. Overlying said body and said head is a continuous sheathing *i* of an insulating material, such for example as one of the coating substances commonly used having a cellulose base. Said sheathing is preferably quite thick so that it cannot be pierced or broken and provides the body and the head with a smooth surface which may be easily kept clean and provides an electrical insulation over said body and head to prevent electric shock being transmitted from the motor *b* if an electric motor is provided. Said sheathing extends completely about the angularly arranged head, as is shown in Fig. 5, and preferably even behind the applicator *j* carried by said head.

Within said head is a short length of shafting *k* journaled in a packing element *l* fixed within the bore of the head *f*. At one end of said shafting is a bevel gear *m* meshing with a toothed cup *n* having relatively long teeth so that the driving connection is maintained between the shaft *e* and the shafting *k* even though said shafts are

slightly out of alignment because of the angular arrangement of the head *f*.

Bevel gear *m* is separate from the shafting *k* and is secured thereto by a squared shank *m'* seated within a recess at the end of said shafting. Said packing *l* defines two chambers within the head, said chambers being denominated *o*—*o'*. The chamber *o* lies at the end of the head, while the chamber *o'* lies adjacent the bevel gear *m* and the meshed toothed cup *n*. A still further chamber *o2* lies above the threaded plug *g* and the end of the plug *d*. That is, said chamber surrounds the shaft *e* and lies within the bore of the tubular body *a*.

The purpose of providing three separated chambers is to permit the chamber *o2*, for example, to be filled with oil or graphite which can be introduced thru an aperture *p* extending thru the walls of the tubular body *a*. Said aperture preferably is plugged with a screw fitting *p'* so that said oil or other lubricant will not flow from said chamber *o2*. The chamber *o'* is served by an aperture *q* leading from said chamber *o'* to the atmosphere. Thru said aperture a drop of oil can be admitted as needed to lubricate the bevel gear *m* and the toothed cup *n*.

I preferably provide no lubricant in the chamber *o* other than as later described in connection with a medicinal agent which is preferably contained in said chamber and is emitted therefrom by operating devices. The geared end *k'* of the shafting *k* extends into said chamber and meshes with a bevel gear *r* carried by the operating head *s* of my device. The operating head rotates about an axis normal to that of the shafting *k* and the head is provided with a neck *f'* in which said operating head is journaled. Said operating head is tubular and is provided with a helical groove *s'* which groove is adapted to direct the flow of the liquid content of the chamber *o* outwardly into the rotary applying cup *j* which is carried by said head. Said cup is provided with an internally arranged recess *j'* which engages the flanged end *s2* of the operating head.

It is to be noted that said applying cup is provided with a base portion *j2*, whose external face aligns with the outer face of the neck *f'*. Said base also fits snugly against said neck so that there is no space between them in which gum tissue or portions of the cheek or tongue could lodge. That is, a tight fit is maintained so that there is no possibility of tissue becoming wedged between the rotating cup *j* and the face of the neck *f'*. The alignment of the parts at this point and the maintenance of a smooth contour also are helpful in this regard.

I preferably provide an applying cup of more or less standard characteristics, and a cup of this character is provided with internal cusps *j3* and are relatively thin outwardly flaring skirt portion *j4*. The cusps give rigidity to said cup and provide polishing areas when the cup is pressed tightly against a tooth *t*, while the flaring skirt *j4* may slide under the gingival lip *t'* surrounding the neck of said tooth. Said cup preferably is made of pliant rubber which has sufficient body to maintain its shape. It is preferably quite resilient and thus has the ability elastically to adapt itself to the contour of a tooth. That is, the skirted portion thereof is adapted to slide under the gingival margin, as is illustrated in Fig. 4, and is also adapted to follow closely the contours of the bell of the crown and the concave mesial and distal surfaces of a tooth. Thus, the inner ribbed or cusped surface of the appli-

cator is brought into contact with the tooth while the skirted portion is distended to follow the irregular portions thereof. This produces efficient polishing and cleaning of both side walls as well as the occlusal surfaces of the teeth. The cup is rotated by the motor acting thru the motor driven operating head and the rubber cup is thus driven with a circular motion. Pressure tends to cause the material to follow the contour of the tooth and the skirted portion to move with a circular action under the free margin of the gum up to the attachment of the gingiva *t2*. The thinness, flexibility and resiliency of said skirted portion *j4* is such that it does not tend to injure the peridental membrane and said applicator cup thus enables the user to clean that area of a tooth which cannot be reached in any way by use of a bristled brush. The latter tends to tear the free gingival margin and also tends to force up under the free lip to tear the peridental fibres and to allow recession of the investing tooth membranes. The use of said applicator cup upon the gums *t3* or investing mouth tissue produces a gentle massage that brings to these tissues a stimulated flow of blood and generally tones up said tissue which is so necessary to mouth and dental health.

In Fig. 5 I illustrate an applicator which is more or less pointed. Said applicator *u* is provided with a hollow bore *u'* communicating with the operating head *f*. Said applicator is adapted to be used between the proximal surfaces of adjoining teeth. The outer surface *u2* is preferably ridged to aid in said cleaning. Said applicator also is made of a resilient substance, such as a soft rubber, so as to accommodate itself to the varying spaces between teeth.

In Fig. 6 I illustrate an applicator *v* which is cup-shaped and is provided with a relatively wide flaring skirt *v'*. Said applicator is used to massage the gums and is made of relatively thin section so as to accommodate the irregular contour of the gums. This applicator also is preferably made of relatively soft rubber so as to avoid injury and to secure such accommodation. Each of said applicators is easily removed from the flanged end of the operating head although tightly secured thereto by the resiliency of the rubber itself. To remove said applicator, it is necessary to pinch the forward edge together so as to release the base portion and to remove the flanged portion from the recess formed within said base which engages the flanged edge of the operating head.

The angularly arranged head *f* preferably is made in two pieces, as shown in Fig. 2, which are fitted tightly one upon the other. Such construction facilitates assembly and repair. When said two pieces are seated one upon the other, they act as an integral structure. It is to be noted that the sheathing *i* overlying the enlarged joint between said pieces is unbroken, and in normal use, it is not necessary to break said sheathing and separate said two pieces.

As I have illustrated in Fig. 1, I preferably arrange said device to be housed within and to engage a receptacle *w* which preferably is tubular and made of glass or other transparent material. The upper end of said receptacle is threaded as at *w'* and engages the threaded portions *c5* of the lower half *c'* of the insulating casing for the motor. The threaded connection between said receptacle and said casing permits said parts to be easily and quickly separated, but provides a fluid-tight joint when said parts are

in threaded engagement. Said receptacle is preferably provided with an annular outstanding shoulder *x* so that the receptacle with a device screw-threaded therein may be arranged in a hole formed in the shelf of a medical cabinet, for example. That is, the shoulder would overlie the upper surface of said shelf, and the tubular receptacle would extend thru said shelf, and the device with the receptacle would be held upright when thus arranged.

I preferably provide a separate base *y* for the receptacle so that if it is desired to stand the same upright, this may be accomplished, or if it is carried in a container, said base can be removed.

I deem it desirable to place a medicinal liquid *z* in said receptacle so that the operating end of the tubular body, the operating shaft and the applicator will be immersed in said liquid. I preferably select a liquid which has germicidal and medicinal values. I preferably select a liquid also which has a pleasant taste and which is adapted to lubricate the operating parts housed within the chamber *o*. When the parts are arranged, as in Fig. 1, and left over night, for example, said liquid will tend to flow into the chamber *o* and fill the same. Then when said device is operated, said liquid will tend to flow from said chamber *o* thru the bore of the operating head to the flared applicator and be applied to the tooth surface and to the adjacent tissues, as is indicated in Fig. 4. The flare of the skirt of the applicator aids in this outward flow, and it is further aided by the helical groove formed in the bore of the operating head, as has previously been commented upon.

I claim:

1. A dental device comprising an elongated handle, a motor, a shaft journaled longitudinally of said handle and operatively driven by said motor, an operating head carried by one end of said handle, a sealing element lying intermediate said head and handle thru which element one free end only of said shaft extends and in which said shaft is journaled, a tubular transverse shaft extending from said head, said tubular shaft being operatively joined with said first mentioned shaft, and an applicator cup releasably secured to said tubular transverse shaft, said operating head being hollow and the interior thereof constituting a reservoir for a fluid detergent material, said reservoir communicating with the inside of said cup thru the bore of said tubular shaft.

2. A dental device comprising an elongated handle, a motor, a shaft journaled longitudinally of said handle and operatively driven by said motor, an operating head carried by one end of said handle, a sealing element lying intermediate said head and handle thru which element said shaft extends and in which said shaft is journaled, a tubular transverse shaft extending from said head, said tubular shaft being operatively joined with said first mentioned shaft, and an applicator cup releasably secured to said tubular transverse shaft, said operating head being hollow and the interior thereof constituting a reservoir for a fluid detergent material, said reservoir communicating with the inside of said cup thru the bore of said tubular shaft, said tubular shaft having its bore provided with feeding means for directing the fluid content of said head outwardly to the interior of said cup.

CALVIN L. SMITH. 75