

[54] **TOOTHBRUSH STEM ATTACHMENT**

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[51] Int. Cl.² **A46B 13/02**

[58] Field of Search **15/176, 145, 22; 128/50,**
128/66; 403/315, 321, 326, 330, 377, 322

[56] **References Cited**

UNITED STATES PATENTS

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3,699,952	10/1972	Waters	15/22

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[57]

ABSTRACT

A molded plastic toothbrush stem attachment for a power hand appliance comprises a stem having an integral coupling at one end and laterally-extending bristles forming a brush at the other end. The coupling includes a flared section, a driving socket section and a pair of detent fingers. The fingers are disposed at rotational angles 90° from that of the brush, and their free ends have internal arcuate grooves and external arcuate projections. A portion of the flared section overlaps the socket section in spaced relationship and the socket is deeper than the overlap region, to facilitate one-piece molding. Tip portions of the flared section adjacent one finger are flat and non-symmetrical to the tip portions adjacent the other finger to enable proper orientation for automatic bristle insertion.

3 Claims, 4 Drawing Figures

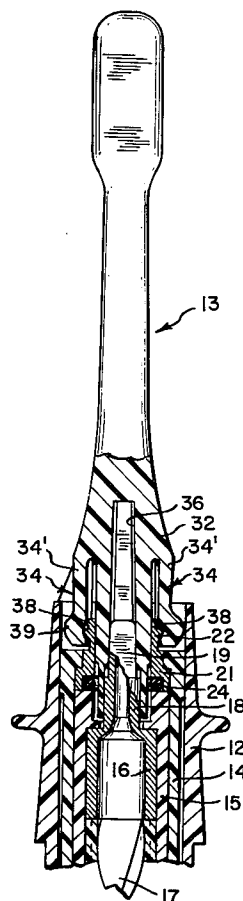


FIG. 1

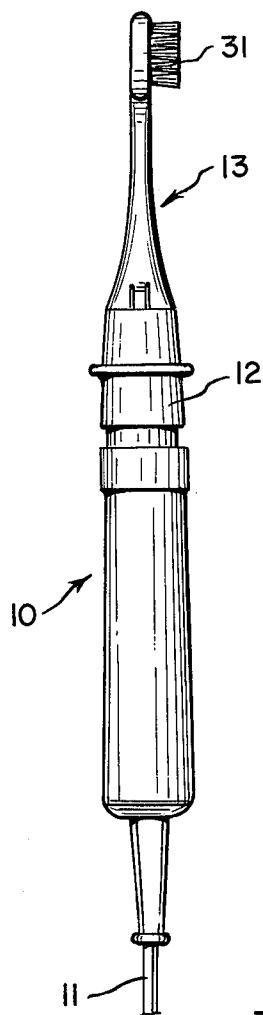


FIG. 2

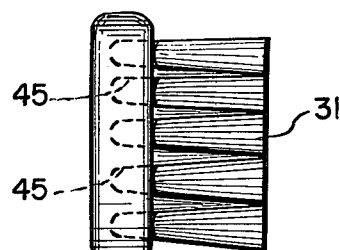
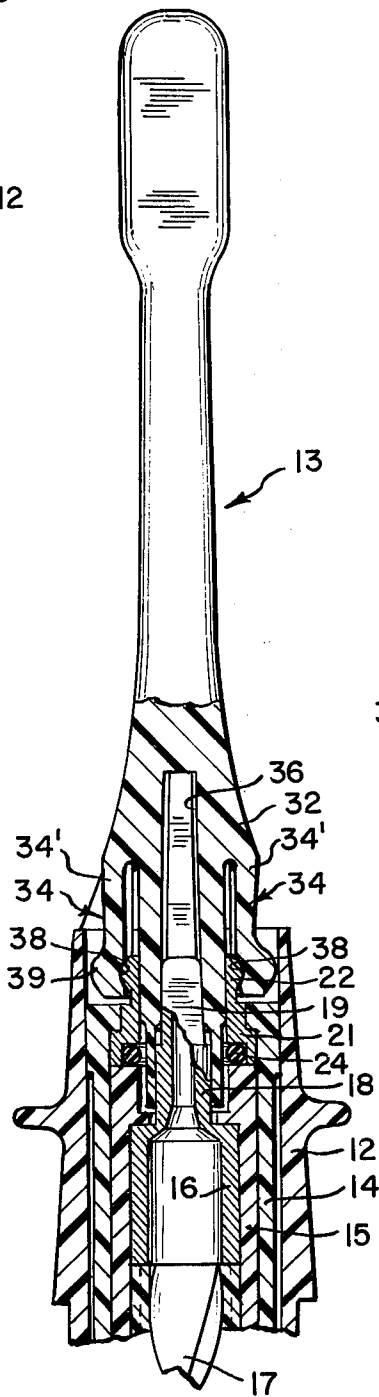


FIG. 3

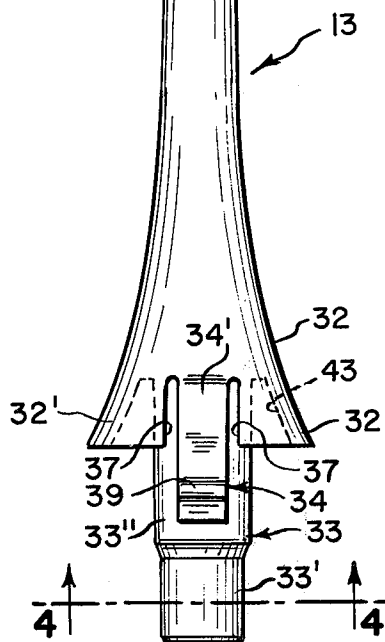
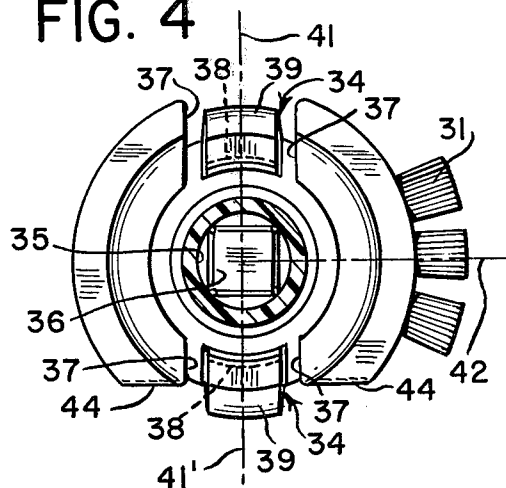


FIG. 4



TOOTHBRUSH STEM ATTACHMENT

BACKGROUND OF THE INVENTION

This invention relates to a toothbrush stem attachment for a hand appliance for oral hygiene. It provides an attachment which can be easily attached and removed, is securely held in place during use, and can be economically molded in one piece of plastic to which the bristles are subsequently affixed.

U.S. Pat. No. 3,536,065 describes a unitary hydraulically-operated hand appliance capable of both toothbrush and water jet operation by simply interchanging the appliance attachments. The appliance includes an hydraulic motor driven by liquid pressure pulses from a pump unit for toothbrush operation, and a separate conduit actuable by a manual valve for supplying the pressure pulses to a water jet attachment. Simple means for coupling attachments to the hand appliance are described.

Application Ser. No. 244,879 filed Apr. 17, 1972 now U.S. Pat. No. 3,771,186 as a continuing application of Ser. No. 117,466 filed Feb. 22, 1971 now abandoned, also describes an hydraulically-driven hand appliance for personal hygiene which is capable of alternatively rotationally oscillating a toothbrush attachment or supplying liquid pressure pulses to an appliance head such as a water jet attachment.

To permit attachment and removal, and use of different toothbrush attachments by different members of the family, a coupling arrangement is necessary. The coupling should be as simple and foolproof in operation as possible, so that it can easily be used by children and will not result in damage to the hand appliance or attachment if carelessly used. Also, it should be capable of rotational oscillation in a positive manner without undue wear, and should resist forces tending to detach the brush from the motor unit when the bristles are pressed against the teeth. Finally, inasmuch as worn bristles will require replacement attachments, the attachment should be economical to manufacture.

In the foregoing application coupling means are described in which the driving and detent functions are separated, driving being by means of a square socket in the toothbrush attachment and detent by means of spring arms having outwardly extending hooks which engage in an annular groove in the motor unit. To remove the attachment, the spring arms are pressed inward to uncouple the hooks from the groove. Although such removal is a simple operation, some users may simply pull on the attachment without depressing the spring arms. In such case the hook detents may be broken off, or become sufficiently worn so that they no longer function properly.

In application Ser. No. 228,574 filed Feb. 23, 1972 now U.S. Pat. No. 3,851,984 by Jean-Pierre Crippa, coupling means is described having a coupling section and a coupling retaining member slidable thereon. The retaining member includes a spring arm having an inwardly-extending hook which engages an annular lip on the motor unit. Cam surfaces on the spring arm and coupling section cooperate to disengage the hook as the attachment is pulled off. Although successful in operation, the use of separate parts require separate molding operations and then assembly, with resultant somewhat high manufacturing cost.

The present invention is directed to a toothbrush attachment which is simple and satisfactory in opera-

tion, and can be molded in one piece of plastic material with subsequent attachment of bristles.

SUMMARY OF THE INVENTION

In accordance with the invention, the toothbrush stem attachment comprises a molded plastic stem having an integral coupling at one end and laterally-extending bristles forming a brush at the other end. The coupling includes a flared section, a driving socket section extending beyond the flared section, and a pair of narrow longitudinally-extending resilient cantilever detent fingers radially spaced from the socket section and terminating between the ends of the flared and socket sections.

The socket section has a rotationally symmetrical exterior surface and an interior surface which is cylindrical at the open end thereof and is of non-circular cross-section deeper in the socket. The cylindrical portion aids in guiding the attachment onto the output member of a power hand appliance, and provides a pivot for rotating the attachment to mate with the output member.

The fixed ends of the detent fingers are integral with the flared section and spaced back from the end thereof, and the sides of the fingers are spaced from the adjacent portions of the flared section. The free ends of the fingers have respective detent grooves on the inside thereof which are curved in arcs which are rotationally symmetrical about the axis of the socket section.

Advantageously the free ends of the detent fingers have outward projections opposite the detent grooves which strengthen the ends and prevent distortion of the grooves. The outer faces of the projections are curved in arcs which are rotationally symmetrical about the axis of the socket section. Preferably the fingers are disposed on opposite sides of the socket section at respective rotational angles approximately 90° from the rotational angle of the brush. In case of play between the socket section and the appliance output member, this disposition guards against uncoupling when the brush is pressed against the teeth and possible jamming against an encircling member of the hand appliance if such is present.

Also, advantageously, a portion of the flared section overlaps a portion of the socket section in spaced relationship therewith, and the inside of the socket section extends into the stem beyond the portion overlapped by the flared section. This facilitates one-piece molding by promoting rapid and reasonably uniform cooling of all portions of the flared section, thereby avoiding distortion and reducing overall molding time. Preferably the tip portions of the flared section adjacent one of the detent fingers are flat and non-symmetrical with respect to the tip portions adjacent the other finger, to facilitate properly orienting the molded stem in automatic apparatus for inserting the bristles.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an overall view of an hydraulic hand appliance with toothbrush attachment in place;

FIG. 2 shows the front end of the hand appliance of FIG. 1 and the coupling portion of the toothbrush attachment in longitudinal cross-section;

FIG. 3 shows the toothbrush attachment rotated 90° from its position in FIG. 2; and

FIG. 4 is an end view and partial cross-section taken along the line 4—4 of FIG. 3.

DESCRIPTION OF THE SPECIFIC EMBODIMENT

Referring to FIG. 1, an hydraulic hand appliance 10 of the type described in the aforesaid application Ser. No. 244,879 is shown. Liquid pulses are supplied through flexible conduit 11 and the appliance is controlled by a slidable sleeve 12. In the position shown, sleeve 12 controls valves in the appliance 10 which cause the toothbrush attachment 13 to be rotationally oscillated. In its rearward position, sleeve 12 shuts off the appliance.

Referring to FIG. 2, the front end of the hand appliance is shown and is similar to that shown in FIGS. 14-16 of the aforesaid application Ser. No. 244,879 except for the coupling arrangement. Briefly, the casing has a cylindrical member 14 and a bearing 15 fixedly mounted therein. Sleeve 16 is rotationally oscillated by an hydraulic piston motor in the rear of the appliance and a motion converter including a helical cam screw 17 and cooperating nut section. Attached to the sleeve 16 is an output member having a cylindrical rear section 18 and a front section 19 which is square in cross-section so as to drive a toothbrush attachment in rotational oscillation. Member 21 is fixedly attached to 14 and 15 and has an annular projection 22 serving as a detent. An O-ring 24 provides a seal for a liquid jet attachment when used, but is out of contact with the toothbrush attachment here shown.

Referring to FIGS. 2-4, the toothbrush attachment comprises a stem having an integral coupling at one end and laterally-extending bristles 31 forming a brush at the other end. These ends may conveniently be termed "rear" and "front" ends, respectively. Several rows of tufts are used, as shown in FIG. 4, but only the center row is shown in FIG. 3 to avoid undue complexity of illustration. The coupling includes a flared section 32, a driving socket section 33 extending beyond the flared section, and a pair of narrow longitudinally-extending resilient cantilever detent fingers 34 extending beyond the flared section and terminating between the ends of the flared and socket sections.

The socket section 33 has a rotationally symmetrical exterior surface, with the end 33' reduced in diameter to clear O-ring 24 and eliminate friction therewith. The interior surface is cylindrical at the open end 33' thereof, as shown at 35 in FIG. 4. Deeper in the socket, at 36, the interior surface is square in cross-section to mate with section 19 of the appliance output member and, with the greater thickness of the socket wall at 33'', provides a strong driving connection. Although square cross-sections are preferred, other non-circular cross-sections could be used. The initial cylindrical inner wall 35 aids in guiding the coupling onto output member 19 and provides a pivot for rotating the attachment to mate the square sections. Chamfers may be employed at the beginning of square section 36, and on the end of member 19, to facilitate attachment.

The fixed ends 34' of the detent fingers are integral with the flared section 32 and spaced back from the end thereof to provide sufficient resiliency for outward movement of the finger ends during attachment to and removal from the appliance 10. Slots 37 provide spacing between the sides of the fingers and the adjacent portions of the flared section. The free ends of the fingers have respective detent grooves 38 on the inside thereof which are curved in arcs (FIG. 4) which are rotationally symmetrical about the axis of the socket section. This, together with the narrowness of the fin-

gers, allows the attachment to rotationally oscillate without undue friction with detent ring 22.

The free ends of the detent fingers have outward projections 39 opposite the detent grooves 38 which strengthen the ends and prevent distortion of the grooves. The outer faces of the projections are curved in arcs which are rotationally symmetrical about the axis of the socket section, as best seen in FIG. 4. This permits maintaining adequate thickness over the width of the finger, without contacting the control sleeve 12 in operation.

In FIG. 2 it will be noted that control sleeve 12 overlaps projections 39 in operation, and prevents sufficient outward movement of the fingers to disengage the detent surfaces. In a new attachment with well-fitting detent grooves and close mating of the socket on the output member 19 of the appliance, the strength of the fingers may be made sufficient to hold the attachment in place despite the forces exerted on the coupling as the bristles are pressed against the teeth. However, as wear occurs, or if manufacturing tolerances are not sufficiently close, the holding action may be weakened. In such case it is desirable to avoid any spreading of the fingers which will bring the projections 39 into contact with sleeve 12, since this would not only wear the attachment but would add to the load on the motor and, if jamming occurs, might seriously impair the rotational oscillation of the brush. If the attachment is used with an appliance in which a control sleeve does not encircle the finger ends, it is desirable to avoid sufficient spreading to uncouple the detents.

To guard against such adverse effects in case of play in the socket section, the resilient fingers 34 are advantageously disposed on opposite sides of the socket section 33 at respective rotational angles approximately 90° from the rotational angle of the brush formed by bristles 31. Thus, in FIG. 4 the rotational angles of the fingers, indicated by dot-dash lines 41, 41', are at 90° from the rotational angle of the brush, indicated by dot-dash line 42. From FIGS. 2 and 3, it will be appreciated that, as the brush is pressed against the teeth, the turning forces on the fingers are in the direction of the width thereof and are resisted by the side walls of the grooves. That is, the turning forces attempt to turn the attachment about an axis which passes diametrically through the grooves of the two fingers, and the clamping of the grooves against the annular detent 22 in the appliance resists these turning forces and maintains the coupling despite some play in the socket section.

On the other hand, if the brush were rotated 90° from that shown, the turning forces on the fingers would be parallel to the stem axis and the groove in each finger would serve as a fulcrum for the groove in the other. Also, for a given amount of rocking allowed by play in the socket section, there will be greater outward movement of the finger ends.

Thus, with the fingers and brush oriented as shown, if there is play in the socket section there is less danger of the ends of the fingers being forced outward to release the attachment, and less danger of the ends jamming against the control sleeve 12 when such a sleeve is employed in the hand appliance.

As seen in FIG. 3, the ends 32' of the flared section overlap a portion of the socket section 33 in spaced relationship, as indicated by dash lines 43. Also, as seen in FIG. 2, the inside of the socket section extends into the stem beyond the portion thereof overlapped by the flared section. This facilitates molding in one piece, as

5

by injection molding, by reducing the thickness of the plastic material in adjacent portions of the flared section so that rapid and reasonably uniform cooling can be obtained in all portions of the flared section. Thus distortions due to markedly different rates of cooling are avoided, and the overall molding time reduced. This is of considerable importance in promoting economical manufacture.

As best seen in FIG. 4, the tip portions of the flared section adjacent one of the fingers, indicated at 44, are flat and non-symmetrical with respect to the tip portions adjacent the other finger. This permits properly orienting the molded stem in automatic apparatus for inserting the bristles, without requiring the attention of the operator.

As will be recognized by those skilled in the art, the entire stem including the coupling may readily be molded in one piece of plastic material without complicated fixtures, thereby enabling economical manufacture. For example, a mold having a single inner member and a pair of mating outer members suffices. When the plastic has been injected and cooled, the outer members may be separated and the stem with the integral coupling pulled off the inner member, the resiliency of the fingers allowing the pulling off. Holes 45 may be formed by the molding operation so that the entire attachment can be made in one operation, ready for insertion of the bristles. Suitable plastics are known in the art, such as nylon or an acetal resin sold under the trademark DELRIN by duPont.

We claim:

1. A toothbrush stem attachment adapted to be attached to and driven by a hand appliance having an opening for receiving said toothbrush stem and an annular projection for retaining the toothbrush stem to said appliance, which attachment comprises
 - a. a molded stem having an integral coupling at the rear end thereof and laterally-extending bristles forming a brush at the front end thereof,
 - b. said coupling including a flared section flaring three-dimensionally outwardly and rearwardly, a

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driving socket section extending rearwardly beyond said flared section, and a pair of narrow longitudinally-extending resilient cantilever detent fingers radially spaced from the socket section and terminating between the rearward ends of the flared and socket sections,

- c. said socket section having a rotationally symmetrical exterior surface and an interior surface which is cylindrical at the open end thereof and is of non-circular cross-section deeper in the socket,
 - d. a portion of said flared section overlapping a portion of said socket section in spaced relationship therewith and the inside of the socket section extending into the stem beyond the region of said overlapping,
 - e. said resilient fingers being on opposite sides of the stem with the fixed ends of the fingers integral with said flared section and forward of the rear end of the flared section,
 - f. the sides of said fingers being spaced from the adjacent portions of the flared section,
 - g. the free ends of said fingers having respective detent grooves on the inside thereof which are curved in arcs which are rotationally symmetrical about the axis of said socket section, said fingers being adapted to extend over said annular projection, and
 - h. the free ends of said fingers having respective outward projections opposite said detent grooves with the outer faces curved in arcs which are rotationally symmetrical about the axis of said socket section.
2. A toothbrush attachment according to claim 1 in which said resilient cantilever detent fingers are at respective rotational angles approximately 90° from the rotational angle of said brush.
 3. A toothbrush attachment according to claim 1 in which the tip portions of said flared section adjacent one of said fingers are flat and non-symmetrical with respect to the tip portions adjacent the other finger.

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