

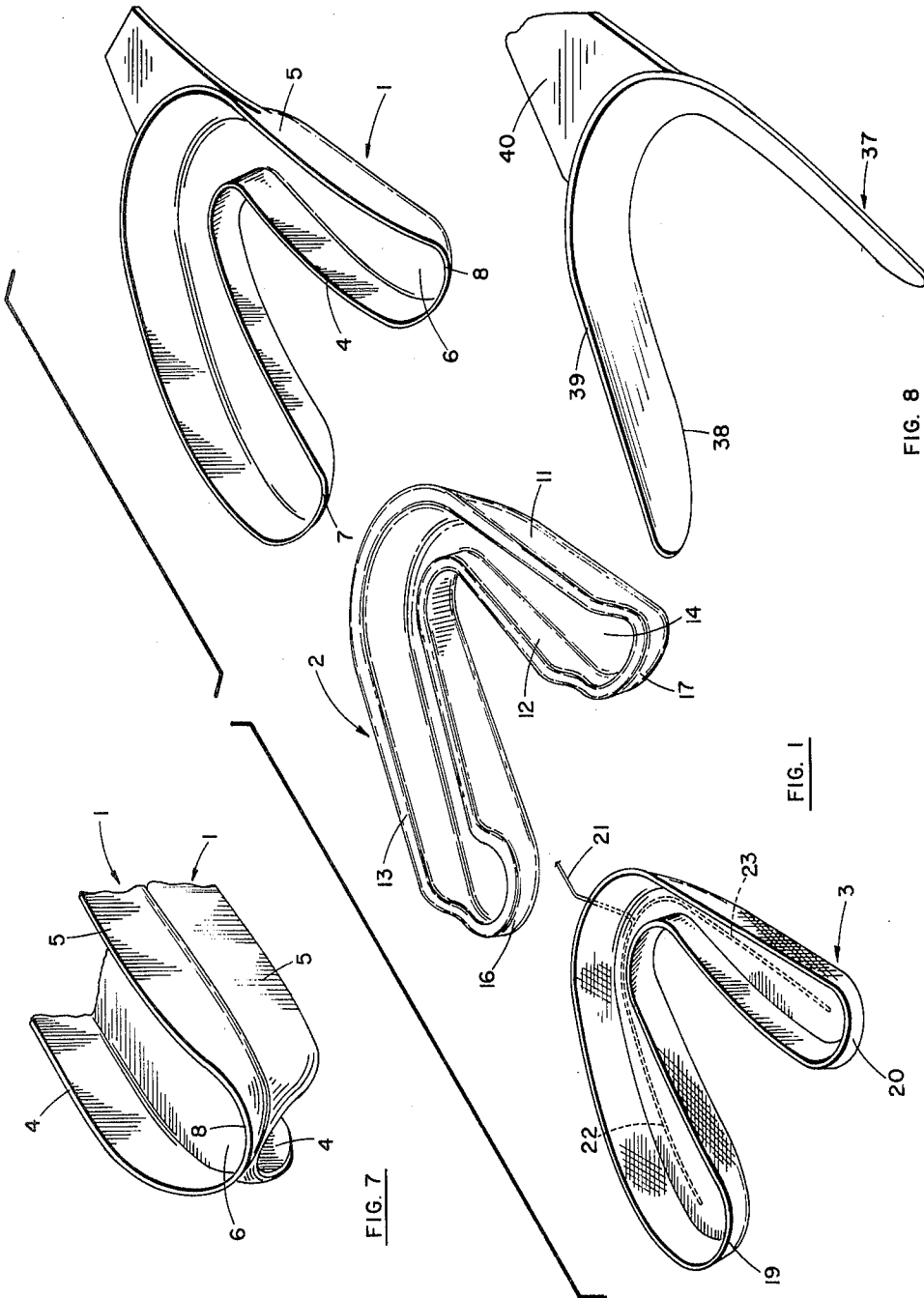
Feb. 15, 1966

G. G. SIMOR
TRAY ARRANGEMENT FOR TOPICAL APPLICATION
OF MEDICATION TO THE TEETH

3,234,942

Filed Sept. 3, 1963

4 Sheets-Sheet 1



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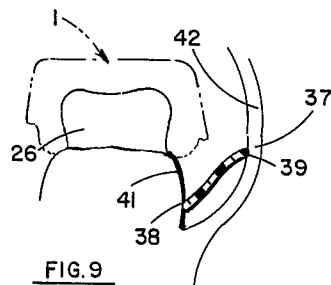
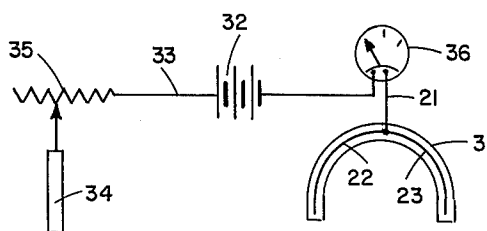
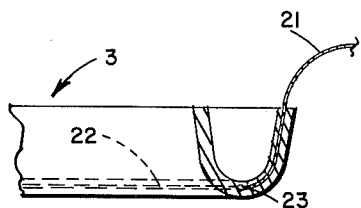
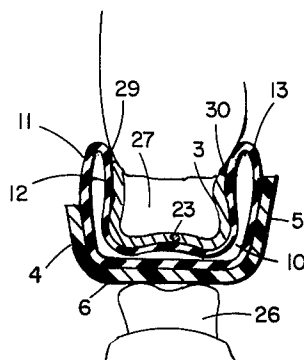
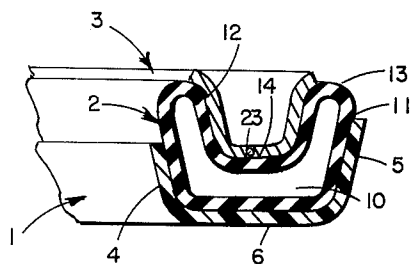
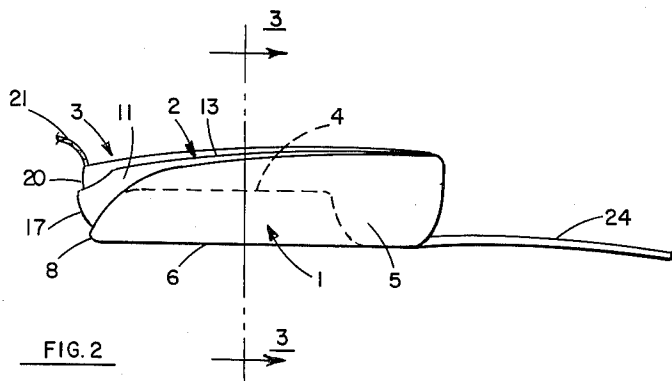
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4 Sheets-Sheet 3

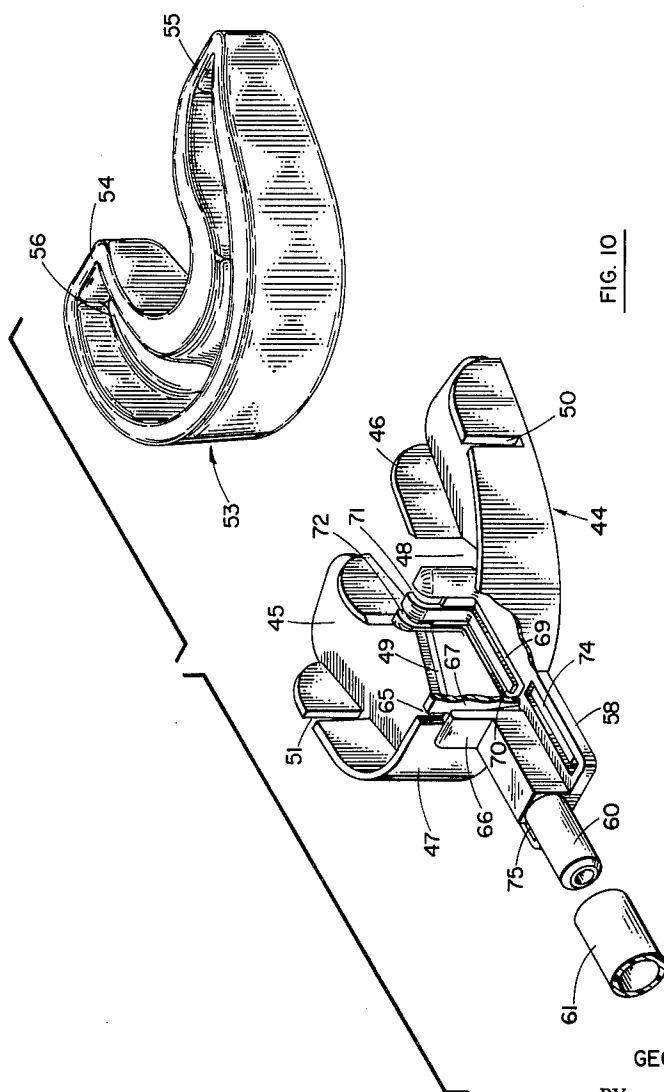


FIG. 10

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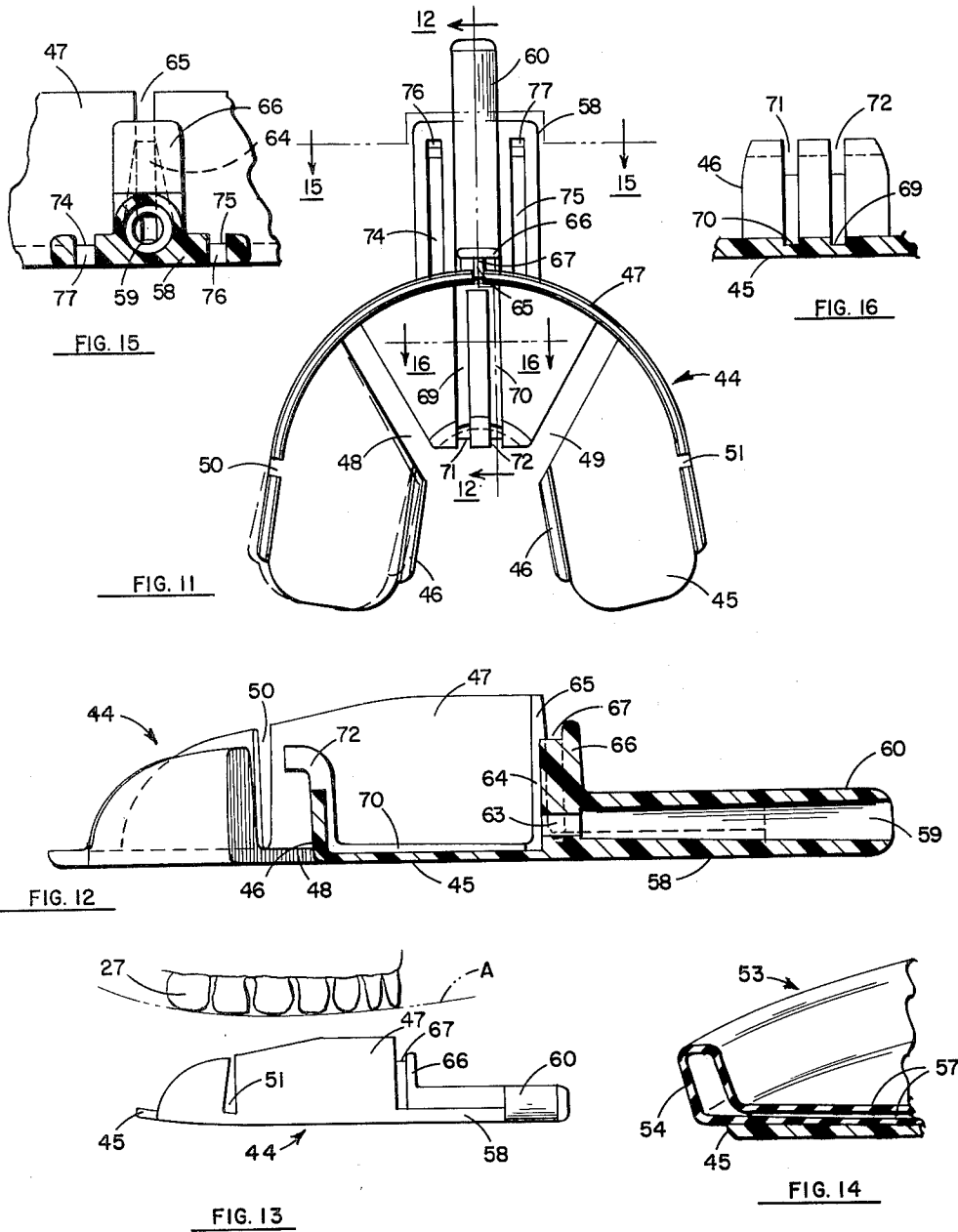
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4 Sheets-Sheet 4



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1

3,234,942

TRAY ARRANGEMENT FOR TOPICAL APPLICATION OF MEDICATION TO THE TEETH

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Filed Sept. 3, 1963, Ser. No. 306,661
17 Claims. (Cl. 128—172.1)

This application is continuation-in-part of my co-pending application for Arrangement for Treating Teeth, Serial No. 216,131, filed August 10, 1962, now abandoned.

This invention pertains to an arrangement for topical application of medication to the teeth.

In dentistry there are frequent occasions in which some sort of medication is applied to the exterior surfaces of the teeth. A particularly important use for the technique is in the application of fluoride solutions. Fluorides have long been known as advantageous in reducing painful sensitivity of the teeth. More recently it has been established that topical application of fluorides can materially reduce tooth decay. As a result, there has developed the treatment of teeth wherein the dentist bathes the teeth with a fluoride solution. For maximum effectiveness each tooth should receive the fluoride solution over its entire exterior surface for approximately five minutes.

The problems attendant external fluoride application have meant that at times it has become an imperfect treatment and has not accomplished the results theoretically possible. Partially this is occasioned by the inherent difficulty in properly administering a fluoride bath to the tooth surface. With conventional procedures it becomes a formidable task to cover all portions of each tooth, including the surfaces in the crevices between adjacent teeth. Also, any saliva present at the treatment area will react with the fluorine, converting it chemically and destroying its usefulness as a medicament. Of course, the dentist will block the salivary glands with cotton rolls at the time of treatment, but it is not a simple matter to assure a complete absence of saliva under all circumstances. Additionally, the length of the bath period and the hand application of the solution has made fluoride treatment a time-consuming and expensive operation. Therefore, topical fluoride application in the past frequently has resulted in an uneven and imperfect fluoride contact with the tooth's surface. Many teeth inevitably receive the bath for less than the prescribed time, while others have surfaces missed entirely.

Additional problems are encountered due to the natural conditions existing within the mouth. The tooth's surface normally has a slight negative electrical charge. Fluoride ions, on the other hand, are the most negative ions according to the periodic chart of elements. Hence, the negative fluoride ions in the fluoride solution used for treating the teeth are repelled by the negative charge existing at the tooth's surface. Consequently, it is difficult to assure that the fluoride will actually contact the tooth's surface where it is needed.

Such problems are overcome by the arrangement of this invention which includes a trough-like tray of more or less rigid material provided with the general shape of a set of teeth. Within this tray is placed a contoured bag or balloon having a recessed outer surface and containing a fluid such as air. A pad of absorbent material, likewise preferably contoured, is fitted within the depression in the bag. In use of the invention the pad is saturated with a predetermined amount of medicament such as a fluoride solution, and it is bitten into by the teeth of the patient. The fluid-filled bag thereby is caused to assume the precise contour of the exterior of the teeth. The bag fits closely around the teeth including the gum line where the pad and its contents are sealed from the remainder

2

of the mouth. Prior to introduction of the tray, bag and pad assembly, the lips and cheeks are maintained in a spaced relationship with the surface of the teeth by an additional and larger U-shaped member. This allows the teeth to be dried effectively and keeps them dry at all times prior to the application of the fluoride solution or other medicament. This arrangement assures that the medicament contained in the pad is both confined to the area of the teeth and is permitted to perform its function without dilution or dispersion. Where fluorides, or other medicaments having negative ions in solution, are involved usually the solution in the pad is given a negative electrical charge while the patient receives a positive charge. The result is a positive charge at the teeth which causes ionic transfer of the fluoride in the solution to the tooth's surface. This permits the entire set of upper or lower teeth to be treated effectively and rapidly.

In one version, the tray is made deflectable so that jaws of different curvatures and sizes may be accommodated without custom fitting the tray in each instance. This assures proper application of the medicament and saves time during treatment, while reducing manufacturing costs. In rendering the tray bendable it may be provided with slots appropriately positioned to allow deflection transversely and longitudinally.

Additionally, provision may be made to withdraw saliva by vacuum so that the mouth is kept dry throughout the treatment. To this end, there is included an exhaust opening at the front of the tray which communicates with grooves in the tray surface through which this saliva is drawn.

It is known that in the prior art trough-like devices for use in treating the teeth have been proposed. Typically, they have included units of sponge rubber or other such material to be engaged with the teeth. These will not accomplish the results of the present invention, however, because they will never fit tightly around the teeth or gum line to confine the medicament to the region of the teeth due to extreme variations found in oral cavities. Also, in such devices there has not been employed the use of ionic transfer for assuring that the active ingredients in the solution will be attracted to the tooth's surface.

Accordingly, it is an object of this invention to provide an effective means for topical application of a medicament to teeth.

Another object of this invention is to thoroughly and evenly apply a medicament to all exterior surface portions of the entire set of upper or lower teeth of the jaw, or both at the same time.

A further object of this invention is to effect ionic transfer to enhance the application of a solution to the surface of the teeth.

An additional object of this invention is to provide for the application of medicament to the teeth wherein the active liquid is confined to the area of the teeth and saliva is sealed out.

A further object of this invention is to provide a low cost unit providing superior results in much less time in the topical application of medicament to teeth.

Yet another object of this invention is to provide a single unit that is adapted for topical application of medicament to the teeth in various sizes of jaws.

A still further object of this invention is to provide a means of holding the lips and cheeks away from the teeth so that the teeth may be kept dry up to the time the medicament is applied.

An additional object of this invention is to provide for withdrawing saliva from the mouth during treatment.

These and other objects will become apparent from the

following detailed description taken in connection with the accompanying drawing in which:

FIG. 1 is an exploded perspective view of the basic components of the device of this invention,

FIG. 2 is a side elevation of the arrangement of the invention in assembled form,

FIG. 3 is an enlarged fragmentary transverse sectional view taken along line 3—3 of FIG. 2,

FIG. 4 is a view similar to FIG. 3 but showing the device within a patient's mouth in engagement with the teeth in topical application of medicament,

FIG. 5 is a fragmentary longitudinal sectional view of the absorbent pad illustrating the means of making electrical contact with the pad,

FIG. 6 is a wiring diagram of the circuit used when effecting ionic transfer during the application of medicament,

FIG. 7 is a fragmentary perspective view illustrating the manner in which two of the assemblies of this invention may be associated in simultaneous treatment of both upper and lower sets of teeth,

FIG. 8 is a perspective view of the device used in holding the patient's lips and cheeks away from the teeth before treatment,

FIG. 9 is a fragmentary sectional view illustrating the manner in which the device of FIG. 8 is used,

FIG. 10 is an exploded perspective view, partially broken away, of the tray and balloon where the tray is made bendable and includes provision for drawing saliva from the patient's mouth,

FIG. 11 is a top plan view of the tray of FIG. 10,

FIG. 12 is a longitudinal sectional view of the tray taken along line 12—12 of FIG. 11,

FIG. 13 is a side elevational view of the tray illustrating how the tray will bend to accommodate the curve of Spee,

FIG. 14 is a fragmentary sectional view showing the increased wall thickness at the end portions of the balloon to prevent distortion at those areas,

FIG. 15 is a fragmentary sectional view taken along line 15—15 of FIG. 11 illustrating the front saliva exhaust provisions, and

FIG. 16 is a fragmentary sectional view taken along line 16—16 of FIG. 11 showing the saliva exhaust provisions interiorly of the tray.

With reference to the drawing, the device of this invention is constructed of three main components including a tray or trough unit 1, a balloon or bag 2, and an absorbent pad 3. All of these elements are dimensioned to fit within the mouth and contoured generally to the shape of a set of teeth. Hence, the members 1, 2 and 3 are substantially U-shaped in plan.

The tray 1 is of a rigid or semi-rigid material. Preferably it is made of a suitable plastic because of the resulting low cost, lack of absorptivity, and the fact that it is not unpleasant to the patient when received within the mouth nor detrimental to health. It may be of relatively thin gauge, typically around .040 inch in thickness. As mentioned above, it is substantially U-shaped in plan so that it conforms in contour generally to the shape of a set of teeth in the jaw. The element 1 defines a trough or channel and hence is substantially U-shaped in cross section as well. Thus, side walls 4 and 5 project upwardly from a bottom wall 6. At the distal ends of the unit 1, there are portions 7 and 8 of the bottom wall that are inclined upwardly a small amount. The spacing between side walls 4 and 5 is substantially greater than the width of a tooth.

The balloon element 2 is dimensioned to fit within the channel defined by the tray 1. It is constructed of a fluid-impervious flexible material, such as a pliable plastic or rubber, usually the latter. The unit 2 is of thin-walled construction having a hollow interior 10 that is sealed and contains a fluid, which may be either a gas or a liquid. Air under atmospheric pressure is particu-

larly suitable, while water also may be used. It is possible to include both a liquid and a gas within the interior of the balloon 2.

The balloon element 2 likewise is contoured to define a channel having a substantially U-shaped cross section. The outer wall 11 joins spaced inner wall 12 at a curved upper edge 13. Wall 12 extends downwardly to define an elongated recess 14 in the upper surface of the balloon. The spacing across the width of the recess 14 is roughly equivalent to the width of a tooth. At its distal ends 16 and 17 the bag is upwardly inclined.

The absorbent pad 3 likewise is a contoured element and is dimensioned to fit within the channel defined by the recess 14 of the balloon 2. Hence, the pad, too, is substantially U-shaped in cross section. It also includes upwardly inclined end portions 19 and 20. Various absorbent materials may be utilized such as appropriate types of paper, cloth or sponge rubber. When paper is utilized, the pad 3 is expendable in nature and discarded after each use of the unit of this invention. Sponge rubber, on the other hand, may be cleaned after treatment of the teeth, permitting the pad to be permanently attached to the upper surface of the bag 2.

Where the device of this invention is to be utilized in applying fluorides, an electrical connection preferably is made to the pad. This may be, for example, a woven wire 21 separated into end strands 22 and 23 that are received within the plies of a paper pad as seen in FIG. 5.

In use of the device of this invention the elements 1, 2 and 3 are assembled to the relationship shown in FIGS. 2 and 3. That is to say, the balloon element 2 is fitted within the tray 1, while the pad 3 is received within the hollow portion 14 of the member 2. The assembled device then is inserted into the mouth of the patient. This is facilitated through the provision of a handle 24 projecting from the central portion of the tray 1. The unit is placed within the patient's mouth so that the trough-like recess at the pad 3 is adjacent a set of teeth to be treated. This may be either the upper or the lower teeth of the patient, being illustrated in FIG. 4 as applied to the upper set. The unit is dimensioned so that all of the teeth in the set are adjacent a portion of the recess within the pad 3.

Prior to the introduction of the unit into the mouth, the pad 3 is charged with a quantity of medicament. Thus, a predetermined amount of a solution to be applied to the teeth, such as a fluoride solution, is distributed throughout the pad 3.

With the device of this invention within the mouth the jaws are moved together by the patient. This causes the lower teeth 26, in the arrangement illustrated, to engage the bottom wall 6 of the tray 1 forcing it upwardly toward the upper set of teeth 27. With this movement, the pad 3 is wrapped firmly around the teeth, applying the medicament solution to the surfaces of the teeth. This results because the pad 3 is received within the flexible balloon element 2, while the latter unit is held in the tray 1. The force of the teeth 27 reacting within the fluid-filled balloon causes the balloon to contour itself precisely to the configuration of the teeth. The side walls 4 and 5 of the tray 1 confine the balloon 2 so that the inner wall 12 of the balloon must assume this shape. Hence, the side walls 4 and 5 prevent the balloon from being distorted outwardly away from the exterior of the teeth. The balloon in this manner wraps itself around all of the teeth of the patient, and also fits itself closely about the inner and outer gum lines 29 and 30 on either side of the teeth.

Even if the patient should have missing teeth, the use of a flexible fluid-filled balloon, together with a tray to hold the balloon, causes the pad to engage the teeth surfaces at the gaps between adjacent teeth where the teeth are missing. The upward inclination at the end portions 7 and 8 of the tray, 16 and 17 of the balloon 2, and 19 and 20 of the pad 2 means that the balloon and pad will assume the contour of the rear surface of the last molars

5

of the patient, as well as along the side surfaces of the teeth. Consequently, all of the liquid saturating the pad 3 is confined to the precise area where it is of value. The entire quantity of the medicament will be directed against the surfaces of the teeth rather than any other location in the mouth. As the solution is squeezed from the pad by the pressure of the teeth, it flows to the interproximal surfaces of the teeth. This forces the solution to contact the entire surface area of the teeth including that in between adjacent teeth. The close contact of the gum line of the patient prevents the medicament from being forced away from the area of the teeth, and also precludes saliva from entering the space within the recess of the device of this invention where it surrounds the teeth.

Accordingly, numerous advantages are realized. First, it is possible to charge the pad 3 with a precisely measured amount of the medicament to be applied. No guesswork is necessary, and a much more accurate treatment of the teeth may be accomplished. Where fluorides are to be applied, the pad 3 may be preimpregnated at the time of its manufacture. Some fluoride solutions have a relatively short effective life. The pads 3, therefore, may be impregnated with the dehydrated fluoride compound crystals or powder to which subsequently, at the time of treatment, is added a metered amount of water. Thus, a fresh and accurately compounded aqueous fluoride solution is obtained. Even where the medicament is less temporal in nature, the technique of preimpregnation greatly adds to the convenience of use assuring precise results with a minimum expenditure of time.

This arrangement also enables the dentist to treat an entire set of teeth simultaneously. The time savings by this technique are significant. All of the teeth are treated evenly in this manner, and no portions are missed. There is much greater assurance that the dentist will bathe the teeth with the medicament for the prescribed length of time when all of the teeth of a set are treated at once. At the same time, the treatment is less arduous for the patient involving no discomfort and a minimum period in the dental chair.

Moreover, both sets of teeth may be treated at once by using two of the assemblies of elements 1, 2 and 3. In that event, the walls 6 of the two trays will be in abutting relationship with the side walls projecting in opposite directions as seen in FIG. 7. One set of teeth then enters the recess 14 in one balloon 2 while the other set is received in the corresponding recess of the other balloon.

This arrangement is advantageous also in that it is not necessary to custom-fit the assembled elements 1, 2 and 3 to the jaw of the particular patient. The use of the fluid-filled balloon assures that the pad will be forced against the exterior surfaces of the teeth even in the presence of variations in tooth size and jaw dimensions. Therefore, the unit of this invention may be supplied in only a few different sizes rather than necessitating a tailor-made unit for each patient.

Where fluoride solutions are to be applied to the teeth, it is preferred to include the electrical connection 21 which is connected to the negative terminal of a source of electrical energy. A wire 33 extends from the positive terminal to an electrically conductive element 34. The latter member may be simply a bar of metal conveniently held in the hand of the patient. This permits the teeth of the patient to be given a positive charge rather than their normal negative potential. The negative fluoride ions of the solution, therefore, will be attracted to the positively charged teeth. Consequently, through ionic transfer the application of the active ingredients of the solution is enhanced. A more effective application of the fluoride is obtained in this manner, while even further reducing the time necessary for the treatment.

Preferably the electrical circuitry includes a potentiometer 35 in conductor 33 as well as an ammeter 36 that may be series connected in lead 21. This permits adjustment of the current flow to a valve sufficient to cause the neces-

6

sary movement of the ions in the solution. There is, of course, no danger to the patient from the electrical charge thus imparted. Only a low voltage, generally not exceeding 12 volts, is necessary to induce iontophoresis.

As pointed out above, the teeth should be dry prior to application of the medicament. This is particularly important where fluoride solutions are used because the reaction with saliva will chemically convert the fluorides and destroy their effectiveness. Even though the salivary glands may be blocked off by the dentist and the teeth dried by means of a current of air, it nevertheless is difficult to assure that the teeth will be dry when the unit 1 is inserted into the mouth. This is because the inner surfaces of the lips and cheeks always will retain some saliva which they will transfer to the teeth after the teeth have been dried.

The device illustrated in FIGS. 8 and 9 assures that the teeth can be kept dry at the time immediately prior to applying the medicament by means of the unit 1. This device consists of a member 37 which is substantially U-shaped in plan. It includes an inner edge 38 from which it flares at an angle to the outer edge 39. A handle 40 is included at the central portion of the unit for convenience in its use.

The edge 39 is wider than the tray 1 and dimensioned to fit around the gums at the root area of the teeth. Therefore, the member 37 is inserted into the mouth, as shown in FIG. 9, so that edge 38 is adjacent the gums 41. This causes the outer edge 39 of member 37 to contact the inner wall 42 of the cheeks and lips. This holds the cheeks and lips away from the teeth so that they may be thoroughly dried and kept in that condition.

In normal use the member 37 is inserted into the mouth following which the teeth are dried in the usual manner. The member 37 should be made of a flexible resilient material to facilitate its entry into the mouth. This allows the dentist to squeeze the ends of the member together so that it can be inserted into the mouth, and later removed from the mouth, without discomfort to the patient. After the element 37 is in place, the assembled tray, balloon and pad unit is placed over the teeth as described above, and the patient bites down to seal the medicament to the area of the teeth. Then the member 37 is removed from the mouth during the period while the medicament bathes the surface of the teeth. The fact that the flexible balloon seals along the gum line means that the presence of any residual saliva along the cheeks and lips no longer is a problem, because the saliva cannot then reach the area of the teeth.

The invention can be used more generally for different sizes and shapes of jaws if it is constructed as illustrated in FIGS. 9, 10 and 11. Here the tray unit possesses flexibility that allows it to be used even where there is considerable variation in jaw dimensions and curvatures.

The tray 44 is generally similar to the previously-described embodiment in that it is a channel member which is substantially U-shaped in plan. It includes a bottom wall 45, an upstanding inner side wall 46 and an outer side wall 47. Extending inwardly through the bottom wall 45 on either side of the midportion of the channel 44 are relatively wide slots 48 and 49. These slots continue through the inner side wall 46. In addition, the outer wall 47 includes a duality of substantially vertically extending slots 50 and 51. These two slots extend downwardly to the bottom wall 45 of the channel member 44. The provision of the slots 48, 49, 50 and 51, together with the use of a somewhat flexible plastic material, allows the unit to bend considerably in adapting to different jaw contours. For example, the side portions of the unit can bend inwardly toward the longitudinal axis for jaws that are relatively narrow, being permitted this movement by the clearance at the slots 48 and 49. Similarly, outward movement of the outer legs of the U-shaped channel also is allowed by the slots 48 and 49.

Thus, the tray member may either be opened up or closed in to fit jaws that are relatively wide or narrow.

The vertical slots 50 and 51 are usable in permitting flexure about a transverse axis to accommodate the curvature of the teeth of a patient. Upper teeth, for example, have a natural downward concavity when viewed from the side, rather than falling all in a straight line. This is known as the curve of Spee and is designated by line A in FIG. 13. By the provision of the vertical slots 50 and 51, together with the slots 48 and 49, the member 44 may be given a bowed configuration from the side, as illustrated, so that the teeth can be closely engaged regardless of the degree to which the curve of Spee is present.

The tray member 44 also is made flat throughout the length of the bottom wall 45, rather than having the slightly upturned ends as for the previously described arrangement. This gives the unit greater flexibility in use with jaws of different depths. The upturned ends 7 and 8 of the tray unit 1 previously described have the disadvantage of limiting the jaw length with which the tray is usable. However, the ends 7 and 8 serve the purpose of preventing the balloon 2 from having an unrestricted portion where it would tend to puff out and not conform closely to the teeth. In the present arrangement, however, this is taken care of by modifying the balloon so that it will not unduly distort toward the rear even in the absence of restraining walls. This is accomplished by constructing the balloon 53 so that the wall thickness at the outer ends 54 and 55 is greater than at the remaining portions of the balloon. This may be seen in FIG. 14, where it can be noted that the balloon wall at the end area 54 at the distal end of the balloon is considerably thicker than at the horizontal wall sections 56 and 57 inwardly of the ends. This heavier end wall to the balloon effectively eliminates any tendency for the balloon to puff out toward the rear even though it is unconstrained at that area.

The channel member 44 also is constructed to facilitate the removal of saliva from the mouth. As pointed out above, it is of utmost importance to keep saliva away from the fluoride solution being applied to the teeth. This is because saliva reacts chemically with the fluoride to completely change its composition and destroy all of its effectiveness. Consequently, the member 44 includes a forward extension 58 having an outwardly directed bore 59 and terminating in a cylindrical end 60. The latter portion is to fit within a vacuum hose 61 that is used to suck saliva from within the mouth of the patient.

The bore 59 connects to an aperture 63 through the central lower portion of the outer wall 47. This provides communication between the vacuum line and the interior of the member 44. A vertical groove 64 extends upwardly from the opening 63 the full height of the outer wall 47. This assures that there is a passage for the saliva in that area permitting it to enter the opening 63 despite the presence of the balloon 53 in the channel 44. Also, there is a slot 65 at the upper end of the wall 47 to which the groove 64 extends. Immediately forward of the slot 65 and carried by the extension 58 is a small barrier wall 66. This serves to hold the lip away from the exterior of the wall 47 at the front of the mouth. As a result, there is always an opening from the exterior of the member 47 through the gap 67 between the barrier 66 and the exterior of wall 47 through the slot 65 and into the groove 64, from which the saliva can be drawn outwardly through the opening 63 and the bore 59.

Additionally, a pair of grooves 69 and 70 extends across the bottom wall 45 from the groove 64 and upwardly along the inner surface of the inner wall 46. The grooves 69 and 70 terminate in slots 71 and 72. Hence, there is open communication provided from the area within the channel member 44 to the saliva exhaust port. The slots 71 and 72 will not be closed off by the balloon 53 or the tongue, and will assure an open passageway into the

grooves 69 and 70 which, in turn, lead to the exhaust opening 63.

This design, therefore, not only is more versatile in its scope of use but also affords improved results by permitting greater assurance that saliva will not contact the medicament being topically applied to the teeth.

This arrangement also provides a more convenient and satisfactory provision for positioning the lead wires used in imparting the proper electrical potential to the teeth of the patient. This is provided by a pair of grooves 74 and 75 in the upper surface of the forward extension 58 of the channel member, together with openings 76 and 77 at the ends of these grooves. Consequently, a lead wire may be arranged in either one of these grooves and directed downwardly through the opening 76 or 77 for connection to the source of electrical energy. This type of installation is less prone to damage than where the lead wires are unprotected. Also, it is more conveniently used and results in a neater arrangement.

From the foregoing it can be seen that I have provided an improved teeth treating arrangement having the unique capability of confining a medicament to the precise area where it is needed. It permits the tooth treatment to be accomplished more rapidly and with greater effectiveness than possible with the teachings of the prior art.

The foregoing detailed description is to be clearly understood as given by way of illustration and example only, the spirit and scope of this invention being limited solely by the appended claims.

I claim:

1. A device for treating teeth comprising a substantially U-shaped channel member, a flexible sealed balloon received in said channel member,

said balloon having an elongated recess in the upper surface thereof dimensioned and adapted to receive teeth therein,

said recess being contoured such that said balloon has a substantially U-shaped cross section with spaced opposed walls defining a chamber within said balloon,

said balloon having a fluid in said chamber at substantially atmospheric pressure,

and an absorbent member in said recess for receiving a medicament and applying the same to the surface of a set of teeth received in said recess.

2. A device for treating teeth comprising a channel member substantially U-shaped in plan and U-shaped in cross section,

a flexible sealed balloon in said channel member, said balloon being substantially complementary to said channel member on exterior surface portions thereof adjacent said channel member, and having an additional surface remote from said channel member,

said balloon having a substantially U-shaped contour in cross section to define an elongated recess in the outer surface of said balloon remote from said channel member, and to provide said balloon with opposed spaced walls defining a chamber within said balloon, a fluid in said chamber at substantially atmospheric pressure,

and a pad of absorbent material on said surface of said balloon remote from said channel member.

3. A device as recited in claim 2 including in addition an electrical lead connected to said pad, a source of electrical energy having a positive and a negative terminal,

said electrical lead being connected to said negative terminal,

and means connected to said positive terminal for applying a positive potential to the teeth of a patient.

4. A device as recited in claim 3 including in addition means for controlling the rate of current flow from said source of electrical energy whereby the current may be adjusted to effect iontophoresis of a solution of medicament in said pad. 5
5. An arrangement for treating teeth comprising a balloon,
 - said balloon being substantially U-shaped in plan and contoured to define an elongated substantially U-shaped recess in one principal surface thereof, 10
 - the width of said recess being approximately the same as the width of a tooth in a person's mouth, said balloon having spaced adjacent walls defining a sealed chamber within said balloon, said chamber containing a fluid, 15
- a tray receiving exterior portions of said balloon, said tray including upstanding side walls, said tray being substantially U-shaped in plan and in cross section to define an open upper wall, 20
 - the spacing between said side walls being greater than the width of a tooth, said recess in said principal surface of said balloon being adjacent said open upper wall, said balloon having sides extending above said side walls of said tray, 25
- and a pad of absorbent material received in said recess of said balloon, 30
- and a predetermined quantity of a medicament absorbed in said pad.
6. A device as recited in claim 5 in which said balloon is of rubber material, and in which for said fluid said balloon is charged with air under substantially atmospheric pressure. 35
7. A device as recited in claim 5 in which said tray is of substantially rigid plastic material, whereby said tray confines said balloon to substantially the area between the walls of said tray. 40
8. A device for treating teeth comprising a tray of substantially rigid plastic material, said tray having a substantially U-shaped configuration in plan and a substantially U-shaped configuration in cross section 45
 - defined by a bottom wall and two upstanding spaced side walls,
 - said tray having an open upper wall,
- a balloon loosely received in said tray, 50
 - said balloon being substantially U-shaped in plan, said balloon having a bottom wall engaging said bottom surface of said tray,
 - and a duality of outer side walls engaging said side walls of said tray, 55
 - said balloon being contoured to provide an elongated recess adjacent said open upper side of said tray,
 - said recess extending substantially the entire longitudinally dimension of said balloon to define a wall at the lower portion of said recess opposed and spaced from said bottom wall of said balloon, and a duality of inner side walls opposed to and spaced from said outer side walls of said balloon 60
 - so that said walls of said balloon define a sealed chamber, 65
 - and said balloon has a substantially U-shaped cross section,
- a fluid in said chamber, 70
- and a pad of absorbent material in said recess for receiving a medicament to be used in treating the teeth.
9. A device for treating comprising a channel member, said channel member being sub-

- stantially U-shaped in plan and in cross section and having an open upper wall,
- a flexible balloon having exterior wall portions substantially complementarily received in said channel member,
 - said balloon having an upper surface adjacent said upper surface of said channel member, said balloon having an elongated recess in the upper surface thereof providing said balloon with a substantially U-shaped cross section and opposed spaced side walls defining a sealed chamber, a fluid in said chamber,
 - and an absorbent member in said recess for receiving a medicament and applying the same to the surface of a set of teeth,
 - said channel member being deflectable transversely to accommodate sets of teeth of different widths, and deflectable longitudinally to accommodate the curve of Spee of a set of teeth.
10. A device for treating teeth comprising a channel member
 - substantially U-shaped in plan and U-shaped in cross section,
 - a flexible sealed balloon in said channel member, said balloon being substantially complementary to said channel member on exterior portions of said balloon,
 - and having a surface facing outwardly of said channel member said surface having a recess extending longitudinally of said balloon and providing said balloon with a substantially U-shaped cross section and opposed spaced side walls,
 - a fluid in said balloon at substantially atmospheric pressure,
 - and a pad of absorbent material on said surface of said balloon,
 - said channel member being deflectable transversely and longitudinally for accommodating sets of teeth of different dimensions and curvatures.
11. A device as recited in claim 10 in which said channel member has a substantially flat bottom wall and open outer ends,
 - said balloon at said outer ends having a greater wall thickness than the remaining portions of said balloon.
12. A device as recited in claim 10 in which for imparting deflectability to said channel member said channel member is provided with a duality of slots on either side of the central axis thereof, said slots extending through the bottom wall and inner wall of said channel member.
13. A device as recited in claim 12 in which said channel member additionally has a substantially vertically extending slot in either outer wall thereof adjacent and inwardly of the outer ends of said channel member.
14. A device for treating teeth comprising a substantially U-shaped channel member of deflectable material,
 - said channel member having an inner wall, an outer wall, and a bottom wall interconnecting said inner and outer walls,
 - a flexible sealed fluid-containing balloon in said channel member on said bottom wall intermediate said inner and outer walls,
 - said balloon having an outwardly facing recess therein, thereby providing said balloon with a substantially U-shaped cross section with opposed spaced walls,
 - an absorbent member in said recess for receiving a medicament and applying the same to a set of teeth,
 - said channel member having slot means therein for facilitating the deflection thereof,

11

whereby said channel member can accommodate sets of teeth of different dimensions and curvatures.

15. A device as recited in claim 14 including in addition

exhaust means for removing saliva from a patient's mouth,

said exhaust means connecting to said outer wall of said channel member,

said channel member being provided with aperture means therein for providing passageways to transmit saliva to said exhaust means.

16. A device as recited in claim 15 in which said aperture means includes at least one groove in said inner and bottom walls connecting to said exhaust means,

and at least one groove in said outer wall connecting to said exhaust means.

17. A device as recited in claim 15 in which said aperture means includes at least one groove in said inner and bottom walls,

said inner wall having a slot therein, said groove at one end connecting to said slot and at the other end to said exhaust means,

and at least one groove in said outer wall,

said outer wall having a slot therein,

said groove in said outer wall at one end connecting to said slot in said outer wall

12

and at the other end connecting to said exhaust means,

and including in addition a barrier outwardly of said slot in said outer wall

for holding the lip away from said slot in said outer wall.

References Cited by the Examiner

UNITED STATES PATENTS

730,184	6/1903	Whitter	128—20
767,553	8/1904	Edgelow	128—260
1,093,125	4/1914	Guilford	32—17
1,389,662	9/1921	Irwin	128—172.1
1,934,688	11/1933	Ackerman	128—260
2,123,980	7/1938	Warwick	128—172.1
2,151,738	3/1939	Buhse	128—172.1
2,427,546	9/1947	Brooks	128—118
2,493,406	1/1950	Hicks	128—96
2,564,167	8/1951	McLaughlin	32—17
2,832,336	4/1958	Davis et al.	128—38
2,834,344	5/1958	Musakuni Kanai	128—172.1
2,884,646	5/1959	Alber	2—232
3,019,787	2/1962	Simmons	128—172.1
3,060,935	10/1962	Riddel	128—260

FOREIGN PATENTS

270,981 12/1950 Switzerland.

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