This invention relates to a means for the application of various substances or medicaments in therapeutics, and more especially in the treatment of teeth.

Teeth may be treated for numerous reasons—as, for example, in active disease, for the prevention of disease, or, for purposes of gaining immunity to disease, and, in the treatment, various materials or drugs may be employed. Also, very frequently it is desirable, in dental practice, to apply medicaments not only to diseased areas, such as the surface of cavities, etc., but also to entirely sound portions of the teeth.

At present, when specific areas of teeth are treated, the procedure is generally to dry the surfaces to be treated with the patient's mouth propped open, after which the medicament is applied to a portion of the tooth or to the whole tooth. The patient is asked to keep his mouth open for as long as possible to allow the solution to act.

After a few minutes, however, saliva begins diluting the medicament. Should the solution applied be poisonous, as are the fluorides—used of late for the possible prevention of decay—it is essential that the patient wash the solution away before dribbling saliva carries it past cotton dams or other blocking means into the throat and stomach where serious harm may result.

At best these medicaments can only be applied to the teeth for a few short minutes, making necessary frequent reapplication, which is costly, inconvenient, and not entirely satisfactory since it is nigh impossible to determine how much medicament was retained and just where on the tooth for the results desired before saliva washed it all away.

Because of the short treatment period only a small amount of the therapeutic value of the drug is obtained by the patient and in many cases the value received is questionable. Furthermore, because of the shortness of the treatment period much more concentrated solutions than are otherwise considered safe are often employed in the hope that concentration may make up in some slight measure for the short exposure in the treatment.

Keeping the teeth dry and exposed to air also necessitates protection of some areas—like plastic jacket crowns and synthetic porcelain and plastic fillings—from the ill effects of drying. Special precautions, like coating these fillings, etc., with cocoa butter or vaseline must be taken, all of which also interferes to some extent, with the therapeutic effect of any local application.

It is an object of this invention to provide a means for applying medicaments to an area in a manner which provides the area to be treated with the proper contact for the desired length of time.

Another object of this invention is to provide a means for sealing the medicament on a specific tooth or area on a tooth so that it cannot be interfered with by saliva, air, food, or other substances common to the oral cavity.

Still another object of this invention is to provide a means for limiting medication to only a given spot or area so that the danger of a strong drug's spreading where it is not needed and can cause irritation, is eliminated.

This device contemplates sealing the medicament against the tooth by means of a thin sheath of cellulose film or the like, one surface of which has been coated with a medicated adhesive. Physically, this tape resembles what is commonly called "Scotch tape."

Other objects, advantages, and features of the invention will become apparent from the following description read in connection with the accompanying drawings in which similar elements are designated by like numbers.

Figure 1 is an enlarged view of the front or labial surface of an upper central incisor.

Figure 2 is a sectional view of the same tooth made along the lines A—A' of Figure 1.

Figure 3 is also a sectional view of an upper central incisor.

Figure 4 is an enlarged view of the front or labial surface of an upper left central incisor.

Figure 5 is also an enlarged view of the front or labial surface of an upper left central incisor.

Figure 6 is an enlarged view of the buccal or check surface of a lower first molar.

Figure 7 is a diagrammatic cross sectional view of the construction of the medicated tape.

Figure 8 is a diagrammatic cross sectional view of another modification of the medicated tape.

In Figure 7 is illustrated the novel construction of the medicament-carrying means. It is a flat tape of several layers.

At 15 is an outer layer or backing. At 17 is a medicated adhesive layer which may be placed directly on the backing, as illustrated in Figure 8, or, on a primer coat 16, which is used to advantage when great strength between the medicated adhesive layer and backing is required.

The primer layer is composed of two parts resin, two parts crepe rubber, dissolved in about thirty-two parts benzol, by weight. This layer should be applied very thin and allowed to dry before adding the medicated adhesive layer.

17. It is preferred that the outer layer 15, or backing to which the medicated adhesive coating is united, be transparent. The medicated adhesive coat, itself, is also generally somewhat transparent, thus lending an appearance of transparency or unnoticability to the entire application rendering the teeth to which an application has been made, not conspicuous.

The backing 15 is generally a non-fibrous film of gelatinized cellulose material, such as regenerated cellulose, cellulose esters, cellulose ethers, or composites of such materials as, for example, a film of regenerated cellulose coated on one or both surfaces with a water-proofing film of a cellulose derivative, as a cellulose ester or ether.

However, backings can be utilized comprised of materials other than gelatinized cellulose materials and which are either non-fibrous or are coated with non-fibrous films, preferably waterproof, composed of cellulose or other suitable material, including varnishes, lacquers, etc.

In accordance with this invention, sheets of such film material are provided with coatings of normally tacky and pressure-sensitive medicated adhesive firmly united thereto. By "naturally tacky and pressure-sensitive" it is meant that under ordinary atmospheric conditions the medicated adhesive is stable in a condition such that it does not need to be activated by solvents or heat or otherwise prepared in order to secure good adherence to surfaces against which the medicated adhesive coating, with its backing, may be pressed when used.

The medicated adhesive may be made in a number of ways. There are quite a few formulas for adhesive and
any number of them can be compatible with medication according to the teachings of this invention. The formulas for the primer and adhesive here given are merely illustrative and but examples. There are numerous formulas for adhesive bases which would lend themselves satisfactorily for holding a medicament. Below is an example of a suitable medicated adhesive tape. A rubber compound and a tackiness-augmented agent in the form of a synthetic resin are used together with the medicament, sodium fluoride. Proportions suitable for ordinary temperate climates may comprise:

Percent
Plasticized, first quality plantation rubber
Cumaron gum or resin
Zinc oxide pigment
Sodium fluoride

The cumaron gum or resin is an artificial resinous material coming under the group name of cumaron and indene resins, which is the polymerization product of coal tar derivatives. The above ingredients are compounded on a rubber rolling mill to a plastic condition and then cut to desired body or consistency, using a rubber solvent such as benzol or a petroleum solvent, such as high test gasoline. In lieu of a synthetic resin, low melting point natural resin may be employed, such as Burgundy pitch or pine oil foots. Burgundy pitch is soluble in both alcohol and benzol.

The sodium fluoride may be varied from $\frac{2}{5}$ of 1% to 18% by weight, depending on which it is to be used in the mouth and on whom it is to be used. In the case of patients where there is a likelihood of a child's dislodging the medicated tape and perhaps even swallowing it during sleep, very low percentages of concentration are indicated. Where it is to be applied as the base in a cavity or in a position where it cannot come loose, the percentage can be increased for greater effectiveness.

Sodium fluoride is used to illustrate this invention because it has been found that the application of this medicament against the tooth has the effect of greatly increasing the tooth's resistance to decay. Some research even indicates that decay in a tooth could be almost eliminated if the teeth could be treated with sodium fluoride prior to their becoming carious. Present means of washing a tooth with 2% sodium fluoride for two minutes, at the longest, has seemingly decreased the amount of subsequent decay but it has not eliminated it. The use of this sodium fluoride medicated tape enables the dentist to place sodium fluoride for long periods where it is needed to obtain significant results. Although sodium fluoride has been here illustrated as a medicament for immunizing teeth against caries, it is clearly understood that any medicament may be used for this purpose—stannous fluoride, calcium fluoride (fluorospar), cryolite, which is a double fluoride of sodium and aluminum, or zinc fluoride.

Where it is not desirable, for some reason, to incorporate the medicament throughout the adhesive, then ordinary, unmected adhesive can be spread on the tooth backing to its proper thickness and medicament sprinkled or sprayed over the outer surface of the adhesive where it will eventually come in direct contact with the surface to be treated. Not only the fluorides, but many other medicaments can be carried by adhesive to the teeth to very great advantage. For example, if $\frac{2}{5}$ of 1% of silver nitrate is added to the adhesive, the tooth will receive a thorough silver nitrate treatment. Similar to various bleaching agents, such as potassium chlorate, can be used in small quantities, such as 1%, with gratifying results for stained spots on teeth. It has also been found that teeth carrying orthodontia bands often decay below the bands. When fluoride medicated tape is placed around the teeth for a few days prior to setting the bands, the chance of decay will be greatly lessened. The medicated adhesive tape should be placed for this purpose as is illustrated in Figure 5.

In Figure 1, a central incisor has a medicated adhesive strip 4 attached to the labial surface 2 of the tooth. The reason for placing a patch of strip, as illustrated, may be that the root has a labial decayed portion. Due to cutting away a large portion of the tooth, he has decided to try to immunize the tooth against further decay. In most cases, an immunity thereby results, which not only is present at the area of the patch, but may extend to the entire tooth. If it contains 1% sodium fluoride, the patch should be permitted to stay on the tooth for a minimum of three or four days, if possible.

Figure 2 is a cross section of the same tooth along the lines A—A' of Figure 1. At 4 is the medicated adhesive strip, at 2 is the crown of the tooth, and 3 is the root. In Figure 3 the patch 4 has been made to cover the labial surface of the tooth, excepting that it was desired that the tape not touch the area 8, so a small piece of cotton was inserted underneath the tape at the point 8 and this part of the tooth consequently is not in contact with the medicament.

In Figure 4 a patch 4 has been placed over the area 7 of the root 3 and the gingival area 6 of the labial surface 2. The patch of this type is especially valuable in treating sensitive dentine and enamel which frequently exists or occurs where gums recede. The preferred medicament for sensitivity is a 5% sodium fluoride adhesive mixture, and, instead of cutting away a large portion of the tooth, he has decided to try to immunize the tooth against further decay.

In Figure 5, the medicated adhesive band completely encircles the crown 18 of the tooth and laps over at the point 5 on the labial surface 2. This treatment is used to prepare a tooth for orthodontia bands or where decay or "white" spots may be forming on numerous places in the crown. As mentioned above, wherever caries prevention is desired, sodium fluoride is the preferred medicament in the adhesive.

Figure 6 is a lower first molar where the medicated adhesive tape 4 covers the gingival portion 12 of the crown 9 and the gingival portion 11 of the root 10. The medicament in the adhesive tape of this nature would be indicated by what condition was being treated.

To apply the medicated adhesive tape, the tooth is first thoroughly dried with cotton and warm air. While the surface is dry, the medicated tape is applied with sufficient pressure to seal the tape on the tooth surface. After the tape has served its purpose, it is peeled off by engaging a corner with a sharp instrument or the finger nail. Should any of the adhesive adhere to the tooth structure it can be removed with any organic solvent such as zylol, benzine, acetone, alcohol—or a dry piece of cotton, where no solvent is available, will suffice through mere friction.

Having described preferred forms of my invention and methods of use, it will be understood by those skilled in the art that wide variations may be made from the foregoing detailed disclosures without departing from the spirit of my invention as set forth in the terms of the appended claims. Accordingly what is desired to be secured by Letters Patent of the United States and is claimed as new is:

1. A device for sealing a medicament on a tooth surface so that it cannot be interfered with by saliva, air, food, or other substances common to the oral cavity comprising an easily removable inconspicuous laminated patch of tooth size, said patch consisting of an outer layer in the form of a thin sheath of transparent, water insoluble cellulose film and a transparent inner layer in the form of a pressure sensitive adhesive containing a fluoride salt, in the amount of $\frac{2}{5}$ of 1% to 18% by weight.

2. A device as in claim 1 in which a primer layer is
interposed between the outer and inner layers, said primer
layer being composed of two parts rosin, two parts crepe
rubber, dissolved in about 32 parts benzol by weight.

3. A method of preventing tooth decay which com-
prises sealing a medicament against a tooth by means
of a patch of tooth size, said patch comprising a thin
sheath of cellulosic film, one surface of which has been
coated with a pressure sensitive medicated adhesive con-
taining a fluoride salt, in the amount of ½ of 1% to 18%
by weight, allowing the patch to remain upon the tooth
for a desired time interval, and then peeling the patch off.

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