

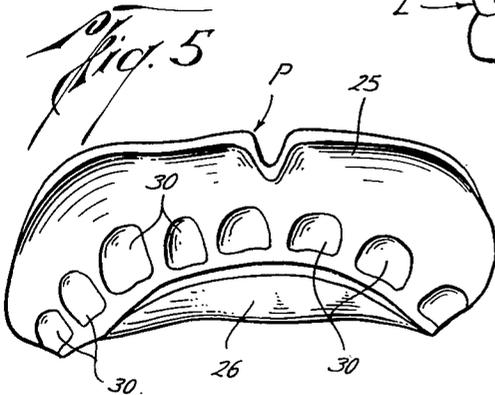
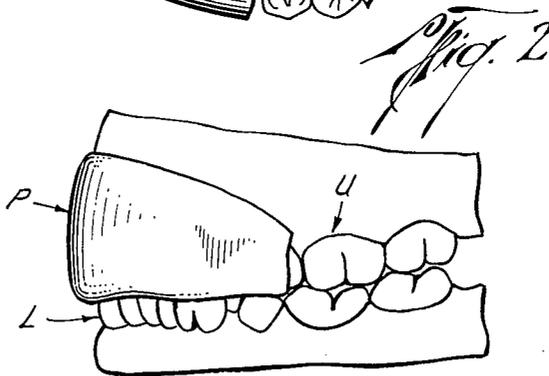
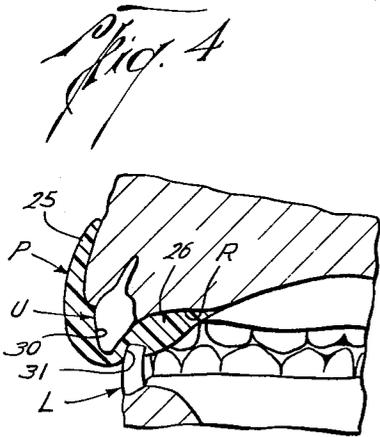
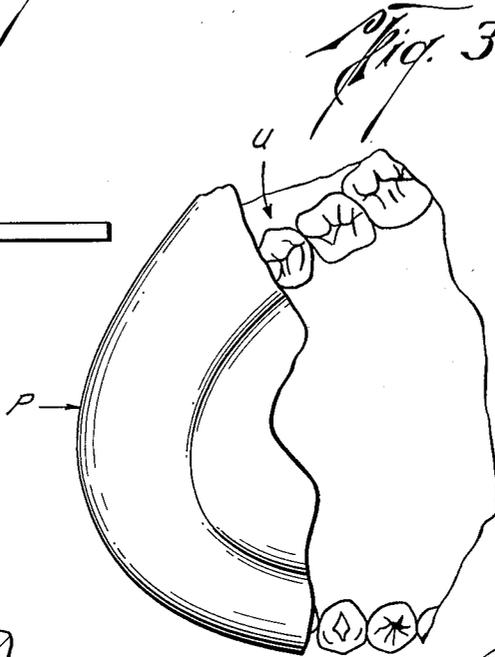
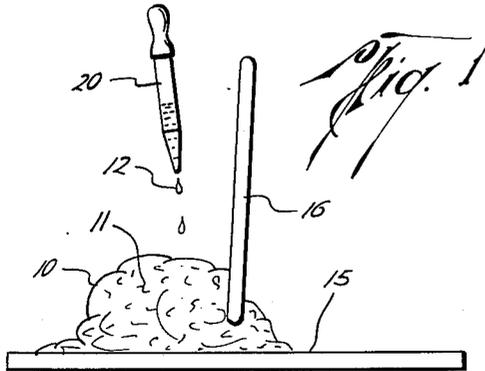
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3,224,443

TEETH PROTECTOR AND METHOD OF FORMING SAME

Original Filed July 13, 1961



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3,224,443
**TEETH PROTECTOR AND METHOD
 OF FORMING SAME**

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 Continuation of application Ser. No. 123,879, July 13, 5
 1961. This application Feb. 24, 1965, Ser. No. 439,508
 4 Claims. (Cl. 128-136)

This application is a continuation of my copending U.S. application Serial No. 123,879, filed July 13, 1961, now abandoned. 10

This invention relates to a new and improved teeth protector or mouthpiece and to a new and improved method for making same.

Heretofore, various efforts have been made to provide 15 teeth protectors or mouthpieces which conform with the teeth of the user, examples of which are U.S. Patents 2,705,492 and 2,919,693. However, so far as is known, all of the prior teeth protectors have employed a channel of rubber or similar material which generally conforms to the curvature of either the upper or lower set of teeth. With such prior constructions, a deformable material was disposed within the channel so that the final mouthpiece or protector included the channel, which in itself is undesirable due to the mass of the channel in the mouth 20 which is uncomfortable to the user if used for any length of time. Furthermore, the mouthpieces heretofore known have been so constructed that they prevent the jaws from closing together. When the jaws are separated, the hinge for the lower jaw is subject to movement laterally and therefore cracking or other very serious damage. 30

Such damage to the jaw hinge and the lower jaw itself is often far more serious than the loss of a tooth, and therefore, the prior mouthpieces have introduced a danger which is potentially far greater than the loss of teeth, as serious as that is. 35

Besides the forgoing primary defects of the prior art mouthpiece constructions, there are also others which have been overcome with the present invention, but the foregoing defects are believed sufficient to make it clear that there is a definite need for a satisfactory mouthpiece or teeth protector. 40

It is therefore an object of this invention to provide a new and improved teeth protector which overcomes the aforesaid defects of the prior known teeth protectors. 45

Another important object of this invention is to provide a new and improved teeth protector which is so constructed that it provides protection against loss of teeth and also permits the closing of the jaws by the user when the protector is in the mouth.

A further object of this invention is to provide a new and improved method of making a mouthpiece or teeth protector which enables a user to make same to conform to the teeth to be protected very quickly and easily.

A particular object of this invention is to provide a new and improved teeth protector and method of making same wherein the protector is made without a preformed channel of rubber or similar material while at the same time being so constructed in its final form as to inhibit biting through the protector with normal usage. 55

A still further object of this invention is to provide a new, and improved dental guard plate of high tensile strength which is nontoxic, tasteless and which can be formed by the user with a minimum of instructions.

A specific object of this invention is to provide a new and improved teeth protector and an in situ method of making same, wherein a silicone elastomer having fibers incorporated therein is molded or shaped by the user to conform with the user's teeth without using a channel or mold. 60

The preferred embodiment of this invention will be

described hereinafter, together with other features thereof, and additional objects will become evident from such description.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown, and wherein:

FIG. 1 is a view which schematically illustrates one of the steps in the method or process of this invention;

FIG. 2 is a view in elevation of the mouthpiece of this invention in position on the upper set of teeth of a user;

FIG. 3 is a bottom plan view looking upwardly at the mouthpiece in position on the upper set of teeth as shown in FIG. 2;

FIG. 4 is a sectional view illustrating the mouthpiece of this invention in position on the upper set of teeth; and

FIG. 5 is a plan view of the mouthpiece or teeth protector of this invention as viewed from the inside thereof and illustrating in particular the impression made therein by the teeth of the user.

In the drawing, the letter P designates generally the teeth protector or mouthpiece of this invention. As illustrated in the drawings, the protector or mouthpiece P is adapted to be formed on the front teeth of the upper jaw, which set of teeth are designated with the letter U. However, due to the construction of the mouthpiece P, as will be more fully explained, the front teeth of the lower set L are also protected. The entire upper set U may be protected with the protector P by extending same from the size shown in the drawings so as to cover all of the upper teeth, but in most sports such as football, boxing and similar contact sports, it is only front teeth which are knocked loose or out and therefore it is only necessary to protect such teeth in the front of the mouth of the user. As will be explained in detail hereinafter, the method or process of forming the protector or mouthpiece P involves a preparation of the material of the mouthpiece or protector P and then the forming of the mouthpiece or protector P in situ in the mouth of the user. The mouthpiece or protector P is formed without the use of a mold or channel such as heretofore commonly employed. The final protector or mouthpiece P is of such a construction that the teeth in the upper set U and the lower set L can close together even when the protector or mouthpiece P is in its normal position of protective use. For this reason, the lower jaw of the user is firmly held by the contact between the lower set L and the upper set U just as if no mouthpiece were in place. This prevents damage to the hinge of the jaws and the lower jaw itself which might otherwise occur if the mouthpiece held the lower jaw spaced away from its normal closed position with the upper jaw. Also, as will be more evident hereinafter, the mouthpiece or protector P of this invention is adapted to be made or formed by the user himself with a minimum of instructions and so that the mouthpiece particularly conforms with his teeth to be protected. 65

Considering the invention more in detail, the mouthpiece or protector P is made from a silicone rubber or elastomer which has been prepared and mixed in a particular way, as explained hereinafter. Thus, the silicone rubber or elastomer which is illustrated by the numeral 10 in FIG. 1 is first mixed with fibers 11. The fibers 11 are preferably nylon and normally would have a length of from about 1/4 of an inch to about 1 inch and would be of a diameter from about .0004 mil to 1.7 mils, although such length and diameter may be varied with the scope of this invention. Other types of fibers may be employed in place of the nylon. For example, Orlon and Dacron are suitable substitutes since they are also hydrophobic and are easily compatible with the silicone 70

gum. Also, glass fibers, cotton and cellulose acetate fibers may be employed, although they are not as desirable as the other fibers heretofore named. The silicone rubber is commercially available and should be of the type which vulcanizes at room temperature by the addition of a curing agent or catalyst within a relatively short time. Such types of silicone rubber which are available are largely made up of a plastic methyl polysiloxane. Such siloxane is in the form of a relatively thick paste or putty at room temperature and is available from the Dow-Corning Company under their identification number "RTV-501" and also under their number "RTV-502."

Prior to the forming or making of the mouthpiece or protector P of this invention, the paste-like mass of the silicone rubber 10 and the fibers 11 are maintained separately from a hardening agent 12 which is added to such silicone rubber 10 and fibers 11 just prior to the making of the protector or mouthpiece P. The hardening agent 12 may be prepared in advance and may stand for relatively long periods of time without deterioration. The hardening agent includes the known curing agent, stannous octoate which has a metallic tin content of 28%. Such stannous or tin octoate is first mixed with an ester and then they are mixed with a liquid solution of methyl siloxane. It is important to mix the stannous octoate and the ester together first before adding the methyl siloxane because otherwise an unstable mixture is produced.

In the preferred form of the invention, 50% of the hardening agent or liquid 12 is formed of the stannous octoate (28% solution), 20% of ethyl laurate, and 30% of the liquid methyl siloxane. Such percentages are by volume and the materials may be obtained commercially. For example, the stannous octoate is sold by the Nuodex Company under the identification name "Nuodex T773." The liquid methyl siloxane is sold by the Dow-Corning Company under the designation "Dow-Corning 200" fluid. The ethyl laurate is a common ester of the simple type and is also non-poisonous. Other esters may be used such as ethyl butrate, isoamyl valerate, octyl acetate, amyl iso valerate, and amyl butrate. Each of such simple esters may be obtained from the Florasynth Corporation commercially. When the heavier esters are used, the amount of such esters which is employed is reduced. Therefore, the 20% by volume of ethyl laurate would be a maximum amount for normal use in connection with any of the other esters, but it will be appreciated that some variation is possible within the scope of this invention.

After the hardening agent 12 is prepared, it is kept separately from the silicone rubber 10 and fibers 11 until it is desired to form or make the mouthpiece or protector P of this invention. Then, the silicone rubber 10 with the fibers 11 dispersed throughout are placed on a table or other surface 15 and are worked to form a small ball-like mass with a stick or spatula 16. The type of stick normally used by doctors for holding the tongue down when examining a patient's throat is especially suitable for this mixing operation. The hardening agent 12 is preferably added to the silicone rubber 10 and fibers 11 by means of an eyedropper 20, but it will be appreciated that any other means of applying the liquid 12 to the rubber 10 and fibers 11 may be employed. When using an eyedropper 20, the hardening liquid 12 may be distributed over the surface of the rubber and fibers and may be added in relatively small quantities, generally five to ten drops, and continuously mixed therein with the mixing stick 16 so that an even distribution of the hardening agent with the rubber 10 and fibers 11 is more easily obtained.

After the hardening agent 12 has been added to the silicone rubber 10 and the fibers 11 and the mixture has then been worked for a matter of a few minutes, normally not more than five minutes, the mixture is still in a solid state but is getting somewhat stiffer than before the hardening liquid 12 was added. At that stage, the mass or mixture of the rubber 10, fibers 11 and the hard-

ening liquid 12 is placed in the mouth of the user and is positioned with the tongue of the user adjacent the upper set of teeth U. The user works the mass of the material inserted into his mouth with his tongue to form a ball and it is then forced around the front part of the upper front teeth with the tongue to shape the mixture of the silicone rubber 10, fibers 11 and hardening agent 12 into the shape shown in FIGS. 2, 3 and 4. The user's finger may be employed to smooth the exterior of the mouthpiece P prior to the time that it has hardened or set, but primarily, such positioning of the material and smoothing of same is accomplished with the tongue of the user. Such material for the mouthpiece P is handled by the tongue much in the same manner as bubble gum has been handled for many years by both children and adults alike in the blowing of bubbles. In any event, it is a relatively simple matter for the user to form or shape the mixture of the silicone rubber 10, fibers 11 and hardening agent 12 around the teeth as desired.

Before the rubber 10 hardens due to the action of the hardening agent 12, the jaws of the user are brought together so that the lower set of teeth L close into contact with the upper set of teeth U as best seen in FIGS. 2 and 4. The lower front teeth below the teeth which are covered by the mouthpiece P embed into the mouthpiece P as best seen in FIG. 4 so that such lower teeth are also partially covered and are sufficiently protected to prevent breakage or loosening thereof in the normal contact sports. The rubber 10 forming the mouthpiece P has then been fully formed to the desired shape and is left in the mouth until it hardens. Such hardening period will vary to some extent depending upon the amount of the hardening agent 12 added when mixing, but normally it will take approximately five to ten minutes for the complete process.

The mouthpiece P as finally formed has an outer front portion 25 which extends over the outer portion of the front teeth in the upper set U. The protector P also extends rearwardly to form an inner portion 26 which is inwardly of the front teeth of the upper set U (FIG. 4). Such inner portion 26 normally extends into the roof R of the mouth of the user so as to increase the gripping action of the mouthpiece when it is in position in the mouth of the user. The front teeth which are covered by the mouthpiece P during the forming thereof have an impression of such teeth made in the mouthpiece P as best seen in FIGS. 4 and 5. Such impressions are seen in FIG. 5 as indentations 30, each of which corresponds with the shape of the teeth of the particular user so that the mouthpiece P is especially designed for a particular person and therefore fits comfortably and naturally in the mouth. Also, the lower teeth form corresponding impressions 31 (FIG. 4) in the lower side of the mouthpiece P.

After the mouthpiece has hardened, it is removable easily from the mouth, but it retains the shape formed by the foregoing process. Also, it is relatively flexible like rubber, soft, non-toxic, and sufficiently strong to prevent the user from biting through it in normal usage. It is also to be noted that the manner of forming the mouthpiece P by impressing the lower teeth into it as well as the upper teeth prevents the biting through of the mouthpiece P in normal use.

If desired, additional layers may be built up on the mouthpiece P, or it may be extended by the same process as heretofore described. The lower teeth are protected sufficiently with the mouthpiece P of this invention when it is located on the upper set of teeth U, but if desired, a mouthpiece may be made for the lower set of teeth L also by the same process as heretofore described.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be

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made within the scope of the appended claims without departing from the spirit of the invention.

What I claim is:

1. A teeth protector comprising, a silicone elastomer, fibers and a hardening agent intimately dispersed in said elastomer to provide a hardened but flexible silicone elastomer, and said elastomer, fibers and hardening agent being shaped to provide a protective unsupported external cover over the front teeth on the upper jaw of the user, said hardening agent including an ester selected from the group consisting of ethyl laurate, isomyl valerate, actyl acetate, amyl iso valerate, and an amyl butrate.

2. A method of making a teeth protector, comprising the steps of, intimately mixing fibers with a silicone elastomer, first mixing stannous octoate with an ester selected from the group consisting of ethyl laurate, ethyl butrate, isomyl valerate, octyl acetate, amyl iso valerate, and amyl butrate, and thereafter preparing a hardening agent from the stannous octoate and the ester together with methyl siloxane separately from the silicone elastomer, thereafter mixing the hardening agent with the elastomer, inserting the mixture of the hardening agent and the elastomer into the mouth of the user, and then shaping such mixture in the mouth prior to the hardening of such mixture so as to provide a removable protective external cover over the front teeth on the upper jaw of the user.

3. A method of making a teeth protector, comprising the steps of, positioning a material in the mouth of the user while in a plastic formable condition, distributing and shaping such material in the mouth using the tongue and while the material is in the plastic formable condition to cover the upper front teeth and also over a portion of the front of the gum above the front teeth, confining the material to the front teeth to thereby leave the rear teeth free of such material to enable the jaws of the user to close, closing the jaws of the user together to the normally closed position which the user's teeth would assume in the absence of any teeth protector to embed most of the upper front teeth and the upper portions of the lower front teeth into such material so that the upper cutting edges of the lower front teeth extend above and behind the lower cutting edges of the upper front teeth to such an extent that the rear teeth which

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normally contact each other in the absence of a teeth protector are in substantial contact, also bringing the rear teeth of the upper and lower jaws into contact with each other upon the closing of the jaws, shaping the exterior surface of the material in front of the upper front teeth and gum portion thereabove, and allowing said material to set to a fixed shape with the shape of the teeth impressed therein while retaining a flexible resiliency.

4. A method of making a teeth protector, comprising the steps of, positioning a material in the mouth of the user while in a plastic formable condition, distributing and shaping such material in the mouth using the tongue and while the material is in the plastic formable condition to cover the upper front teeth and also over a portion of the front of the gum above the front teeth, closing the jaws of the user together to the normally closed position which the user's teeth would assume in the absence of any teeth protector to embed most of the upper front teeth and the upper portions of the lower front teeth into such material so that the upper cutting edges of the lower front teeth extend above and behind the lower cutting edges of the upper front teeth to such an extent that the rear teeth which normally contact each other in the absence of a teeth protector are in substantial contact, shaping the exterior surface of the material in front of the upper front teeth and gum portion thereabove, and allowing said material to set to a fixed final shape in the mouth of the user with the shape of the teeth impressed therein while retaining a flexible resiliency.

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45 RICHARD A. GAUDET, *Primary Examiner.*