METHOD OF FORMING A TEETH PROTECTOR

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This invention relates to new and useful improvements in teeth protectors and to new and improved methods for making same.

In my copending U.S. patent application, Serial No. 123,879 filed July 13, 1961, a tooth protector is disclosed which for the first time provides for the protection of the teeth of a user while allowing the jaws of the user to close together, thus avoiding cracking and other serious damage which has resulted from the use of prior teeth protectors in the past.

An object of the present invention is to provide a new and improved teeth protector and method of forming same which has all of the advantages described in said application Serial No. 123,879, and in addition thereto may be formed from a sheet or strip of material.

An important object of this invention is to provide a new and improved teeth protector and method of forming same, wherein a sheet or strip of material is softened by heat at a temperature which is low enough to be comfortable in a person's mouth and thereafter such material is shaped while in the softened state to embed the upper front teeth and receive an impression of the lower front teeth while the jaws of the person are closed, and wherein such material is subsequently cooled to the normal mouth temperature so that it retains such shape while still remaining flexible and tough.

A further object of this invention is to provide a new and improved teeth protector and method of forming same, wherein an elastomer composition having a softening point below about 180° F. is provided for the protector so that the protector is in a plastic formable condition at a temperature which does not burn or otherwise cause discomfort in the mouth of a user, and wherein the composition also sets to a fixed shape at a temperature at or above the normal temperature in the mouth of the user and without the necessity for any external support.

A particular object of this invention is to provide a new and improved teeth protector made from a copolymer of ethylene vinyl acetate having mineral oil or the like therewith and in some cases fibers also, all in sufficient quantity to provide a composition with a softening point below about 180° F., whereby such material may be softened by heat and molded in the mouth without burning or becoming otherwise uncomfortable in the user's mouth.

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 an elevation of the strip or sheet of material which has been cut to the desired shape for use in carrying out the method of this invention to form a teeth protector;

FIG. 2 is a side elevation illustrating the protector of this invention in position on the upper front teeth of a user, and showing the upper and lower sets of teeth closed together;

FIG. 3 is a bottom view of the teeth protector of this invention, with the protector on the upper front teeth and illustrating the impressions made by the lower front teeth in the inside lower portion of the protector;

FIG. 4 is a sectional view of a portion of the teeth illustrated in FIG. 2, and particularly showing the embedding of the front upper teeth in the teeth protector and the impression of the lower front teeth into such teeth protector while the upper and lower sets of teeth are closed together in contact with each other; and

FIG. 5 is a view of the inside portion of the teeth protector of this invention illustrating the protector after it has been set to a fixed shape and removed from the mouth of the user.

In the drawing, the letter P designates generally the teeth protector or mouthpiece of this invention. FIG. 4 illustrates the drawing, 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 jaw of a user 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 the front teeth which are knocked loose or out and therefore it is only necessary to protect such teeth in the front portion 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 jaw and the lower jaw 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.

Considering the invention more in detail, the mouthpiece or protector P of this invention is made from a strip 10 or similar sheet of material which is preferably cut or otherwise formed to the length desired for the mouthpiece or protector P. The strip 10 is formed of a thermoplastic material which is adapted to be softened by heat at a temperature above about 180° F. It has been found that materials which have a softening point above about 180° F. are too hot to be used for this invention since they are too hot for position in the mouth of a user. When the temperature of the material inserted in the mouth of a user exceeds about 180° F, the mouth is either burned or is made so uncomfortable that the process of this invention cannot be performed, and therefore, the mouthpiece or protector P of this invention cannot be made. The material forming the strip 10 and ultimately the mouthpiece P must also be a material which is capable of setting to a fixed shape after it has cooled below its softening point, while still retaining a flexibility and toughness. One of the most satisfactory materials for the strip 10 which is ultimately formed into the protector P is sold under the trade name "Elvax," and it is a copolymer of ethylene vinyl acetate. It was found that such elastomer had too high a melting point to be usable as a mouth protector since the temperature at which it
softened caused burning or extreme discomfort when placed in the mouth of a user. Therefore, with the present invention, the melting point of the composition of the material forming the strip 10 has been provided at a temperature below about 180°F. By forming a mixture of the copolymer of ethylene vinyl acetate and mineral oil. The particular quantity of mineral oil added to the ethylene viny acetate may be varied to some extent, but in order to provide the material which has a low enough melting point to be usable in the mouth of a user while still being tough enough to withstand the biting action when employed as a teeth protector, the mineral oil is combined with the ethylene vinyl acetate in an amount from about 10% to about 20%, by weight.

The melting or softening point of the composition may be lowered below 180°F so as to make the material much easier to work with in forming the teeth protector by having the mineral oil present in an amount of from about 30% to about 60% by volume with the ethylene vinyl acetate. In such instance, however, in order to provide the toughness required to prevent the teeth from biting through the mouthpiece or teeth protector P in the finished form, fibers are added in a amount of from about 2% to about 5% by volume. These fibers are preferably nylon, but any non-toxic fiber which mixes with the basic mixture of the material used for the strip 10 may be used. Other examples of suitable fibers are Orlon, Dacron, glass, cotton and cellulose acetate.

In order to provide a white color for the material of the strip 10 and also to add additional strength thereto, calcium carbonate or titanium dioxide in an amount up to about 10% by weight may be added to the other constituents enumerated above. Also, a coloring mixture composed of about 65% of silicone rubber sold under the trade name "Rtv Silastic" by Dow Corning Company and 35% of titanium dioxide may be employed. The coloring mixture specified above which includes the silicone rubber and the titanium dioxide is added in an amount of about 1/20% by weight and it provides an extremely white color to the material.

In carrying out the method of this invention in order to make the teeth protector P of this invention, the strip 10 of the material is initially cut or shaped as shown in FIG. 1 to approximately the length and general dimensions of the ultimate teeth protector desired for a particular individual. It is preferable to provide for covering approximately the front six teeth, although the extent of protection may vary to include all of the teeth if desired.

Since the material forming the strip 10 is thermoplastic, it is initially heated, preferably by dropping the material in boiling water to quickly soften it and then cooling the material with cool water to about 150°F. The material is left in the boiling water approximately two or three minutes in the usual case before it is placed in the cool water. It will of course be appreciated that other heating means may be employed, but hot or boiling water seems to be the most convenient and satisfactory for the average individual carrying out the method of this invention.

At 150°F, the material is still somewhat uncomfortable to the touch, but not so uncomfortable as to prevent usage. It has been found that the material may be used so long as the melting point or softening point is below 180°F., as expressed above, but it is preferable to have the material at about 150°F. or below when placing it in the mouth of the individual for whom the teeth protector-P is to be made.

The material of the strip 10 may be kneaded like dough with the hands, or it may even be chewed to get the material into a rope-like shape for shaping in the mouth about the upper front teeth as shown in FIGS. 2-4 of the drawings.

The material may be heated again if it becomes too cool or stiff for working purposes after it has been initially placed in the mouth. In fact, the mouthpiece may be repeatedly heated and softened and thereafter cooled so that it may be formed in stages if desired.

The shaping of the material to that shown in FIGS. 2-4 is obtained by the use of the fingers, the tongue, lips and cheeks so that the upper front teeth are embedded and the lower front teeth are impressed in the lower external surface of the mouthpiece P. It is particularly preferable to place the material so that the jaws of the user are actually closed when the mouthpiece is being formed. Therefore, when the final mouthpiece is set to the fixed shape, it has the impressions of both the upper teeth as indicated by the numerals 12 in FIG. 3. The teeth protector P of this invention thus protects both the upper and the lower front teeth while also permitting the jaws to fully close when the protector P is in the position for use in the mouth. The protector P is formed without any supporting form.

When the temperature of the mouthpiece P drops to a point below its softening temperature, the mouthpiece P sets to a fixed shape. This occurs at a temperature somewhat above the normal mouth temperature, but the rate of setting may be increased by running cooling water into the mouth after the mouthpiece has reached the shape desired. After the mouthpiece P has reached its set condition, it is still resilient, soft and tough enough to prevent biting through with the teeth under normal conditions of use. The mouthpiece P is removable from the mouth after it has set as shown by the separate mouthpiece illustration in FIG. 5. The shape of the mouthpiece is thus retained unless it is heated above its softening point, which may be done to change the shape of the mouthpiece in the event of dental work or other changes in the shape of the teeth or their alignment.

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

What is claimed is:

1. A method of forming a teeth protector, comprising the steps of, providing a strip of thermoplastic material of a length to fit the upper and lower front teeth of a user, heating the strip to soften same, forming such strip into a rope-like shape, shaping the material while in the mouth of the user using the tongue and while in the softened state to cover the upper front teeth and a portion of the front surface of the gum therefrom, also positioning behind the upper front teeth to receive at least a portion of the lower front teeth when the jaws are closed, closing the jaws of the user together to the normally closed position which the user's teeth would assume in the absence of any tension in the material, and embedding most of both the upper and lower front teeth into such material while in the softened state 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 thereabove, and allowing the material to set to a fixed shape with the shape of the teeth impressed therein and while retaining a flexible resiliency.

2. A method of forming a teeth protector, comprising the steps of, providing a strip of thermoplastic material of a length to extend across the front upper teeth of a user, heating the strip to soften same, kneading such strip into a rope-like shape, thereafter inserting the softened strip into the mouth of the user, shaping the material while in the mouth of the user using the tongue and while in the softened state to cover the upper front teeth and the front surface of the gum thereabove, also positioning some of the material behind the upper front teeth to receive at least a portion of the lower front teeth when the jaws are closed, 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 both the upper and lower front teeth into such material while in the softened state 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 thereabove, and allowing the material to set to a fixed shape with the shape of the teeth impressed therein and while retaining a flexible resiliency.

3. A method of forming a teeth protector, comprising the steps of, providing a strip of thermoplastic material of a length to extend across the front upper teeth of a user, heating the strip to soften same, thereafter inserting the softened strip in the mouth of the user, chewing the strip to form it into a rope-like shape, shaping the material while in the mouth of the user using the tongue and while in the softened state to cover the upper front teeth and the front surface of the gum thereabove, also positioning some of the material behind the upper front teeth to receive at least a portion of the lower front teeth when the jaws are closed, 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 both the upper and lower front teeth into such material while in the softened state 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 thereabove, and allowing the material to set to a fixed shape with the shape of the teeth impressed therein and while retaining a flexible resiliency.

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