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MOUTH PROTECTOR DEVICE

FIG. 1 through FIG. 8 are various views of a dental appliance. FIG. 1 is a perspective view of the appliance 20, showing a U-shaped body 40 with a textured inner surface 42 and a smooth outer surface 44. A strap 62 is attached to the sides 48. FIG. 2 is a cross-sectional view of the appliance 20, showing the inner surface 42, the outer surface 44, and the strap 62. The appliance is shown in a U-shaped configuration with a central opening 50. FIG. 3 is a perspective view of the appliance 20, showing the inner surface 42, the outer surface 44, and the strap 62. FIG. 4 is a cross-sectional view of the appliance 20, showing the inner surface 42, the outer surface 44, and the strap 62. FIG. 5 is a perspective view of the appliance 20, showing the inner surface 42, the outer surface 44, and the strap 62. FIG. 6 is a cross-sectional view of the appliance 20, showing the inner surface 42, the outer surface 44, and the strap 62. FIG. 7 is a perspective view of the appliance 20, showing the inner surface 42, the outer surface 44, and the strap 62. FIG. 8 is a cross-sectional view of the appliance 20, showing the inner surface 42, the outer surface 44, and the strap 62.

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MOUTH PROTECTOR DEVICE

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This invention relates generally to mouth protector devices for use by athletes and more particularly, relates to improvements in a mouth protector device of the character described whereby the same is more comfortable during use and affords better protection to the wearer than prior devices. Further, the invention relates to a novel method of fitting and forming the protector to an individual wearer with greater speed, accuracy and efficiency.

Protective devices in the form of mouthpieces for use by athletes engaged in contact sports are well known. Such devices generally are intended for insertion and retention in the mouth of the wearer during use and comprise U-shaped, trough-bearing body members formed of thick, but resilient material such as rubber or plastic compositions. The devices are shaped to conform to the dental structure of the user whereby the walls thereof are contoured to conform to the labial and palate while the trough or channel is provided with resilient bearing surfaces shaped to receive the teeth. Thus, the shock of a blow applied to the jaw area will be absorbed or distributed over the entire mouth area relieving the danger arising from the concentrated impact power of the blow and resultant damage to the teeth, lips, gums or tongue sometimes occurring as a result of an involuntary reflex reaction of the jaw to the said impact.

While devices heretofore provided have been satisfactory, several disadvantages have been encountered both in their use and in the forming and fitting thereof. Among such disadvantages are the need for the wearer to exercise substantial bite pressure in order to retain the mouthpiece in position, resulting interference with breathing in the installed position of the mouthpiece due to its bulkiness, and substantial difficulty in forming and fitting the device to each individual. A common result traceable to the aforementioned characteristics was that the athlete quickly became tired in the efforts required to retain prior devices in the mouth.

It is the principal object of the invention to provide a mouth protecting device for use by athletes which substantially eliminates the disadvantages enumerated above.

Another object of the invention is to provide a mouth protector of the character described having a thin walled, preformed flexible outer shell and a resilient lining in said shell, the said lining formed with a first dental impression of the upper teeth of the individual wearer, said device shell portion also having a second dental impression of the lower posterior teeth of the wearer whereby to realize registration of the upper and lower posterior teeth of the wearer in the installed position of said device.

In connection with the above mentioned object, the invention provides means for forming such lower second dental impression with a minimum bite opening so as to prevent bulkiness, "chew through," and reducing the occurrence of tongue and breathing interference.

In addition, an important object of the invention is the provision of a thin walled, preformed outer shell for a mouth protector device which shell is adapted to serve as a fitting device and impression receiving tray during formation of the device, and an outer supporting wall for the device subsequent to the formation thereof, said shell comprising a flexible U-shaped member of molded plastic composition having a channel therein defined by a pair of upstanding marginal walls, said walls adapted to seat respectively on the upper labial and palate sections within the mouth, the channel having means for forming simul-

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taneously said above mentioned first and second dental impressions.

Further, an object of the invention is to provide the last mentioned shell of the character described with a severable and removable connecting web between the two arms thereof, said web serving as a fitting aid and prevent spreading of the shell during the formation of the mouth protector device, and being optionally severable subsequent to the formation thereof.

Another important object of the invention is the provision of a pre-formed, flexible shell of thin wall construction adapted to serve as a fitting and forming impression tray and which is adapted to be permanently incorporated as the outer wall of the finished mouthpiece, and shell being provided with a mesh-like formation and said formation being so located to permit a semi-solid plastic material to flow therethrough, whereby to permit a second impression of the lower posterior teeth to be formed simultaneously with a first impression of the upper set of teeth, and means being provided to retain the plastic material within the peripheral edge of the mesh-like formation.

The objects of the invention also include the provision of a novel filler composition for the mouthpiece of the character described as well as a novel method of fitting and forming the said mouthpiece.

Other objects and advantages will become apparent as a detailed description of a preferred embodiment of the invention is set out below. It is evident that minor changes in construction, composition, dimensions and the like may be made without departing from the spirit and scope of the invention as defined in the claims appended hereto.

Referring now to the drawings, where identical parts are designated by like reference characters throughout:

FIG. 1 is a perspective view of the preformed flexible outer shell for the mouth protector formed according to the invention, said shell being utilized in the fitting and in situ formation of the said mouth protector.

FIG. 2 is a top plan view of the shell illustrated in FIG. 1.

FIG. 3 is a side elevational view of the shell illustrated in FIG. 1.

FIG. 4 is a section taken along line 4—4 of FIG. 2 and in the direction indicated by the arrows.

FIG. 5 is a section taken along line 5—5 of FIG. 2 and in the direction indicated by the arrows.

FIG. 6 is a top plan view of the mouth protector device formed in accord with the invention in a manner utilizing the shell illustrated in FIG. 1, and prior to removal of a severable connecting web provided thereon.

FIG. 7 is a front view of the finished mouth protector ready for installation.

FIG. 8 is a diagrammatic section taken along lines 8—8 of FIG. 6 and in the direction indicated by the arrows, but with the mouth protector installed in operative position in the mouth of the wearer.

The mouth protector device embodying the features of the invention is generally illustrated in FIGS. 6—8 and designated by reference character 10. The flexible shell utilized as a combined fitting aid and impression tray during formation of the mouth protector 10 is illustrated generally in FIGS. 1—5 inclusive, and will be designated by reference numeral 20.

Generally, the mouth protector device 10 comprises a U-shaped body member 12 having a channel portion 14 extending substantially the entire length thereof. There are provided a pair of marginal walls, 16 and 18 respectively and a pair of curved end walls closing off the channel 14. The marginal wall 16 serves as the labial wall of the mouthpiece while the marginal wall 18 is de-

defined as forming the palatal wall thereof. The body member 12 comprises a flexible, thin walled outer shell 20 and an inner lining 22, the inner lining being formed of a resilient formable plastic composition hereinafter described. Said inner lining defines a first dental impression 23 of the upper set of teeth of the wearer and is formed as a series of cavities, 24 and 26, and a pair of opposed wall linings 28 and 29. The cavities 24 and 26 are intended to accommodate the anterior or incisal upper teeth of the wearer and the posterior teeth respectively. A second impression 25 is provided on the undersurface of the body 12 coextensive with the length of the arms thereof and in registry with the lower posterior teeth of the wearer. The labial wall 16 is canted only slightly rearwardly so as to define an angle only slightly less than 90 degrees relative said channel 14. In fact, said wall 16 may be defined as sloping only slightly over the periphery of channel 14. The palatal wall 18, however, is severely canted outwardly at an angle much greater than 90° in a direction away from the channel 14 whereby to form an arcuate palatal cover for the mouth protector 10.

The wall lining 28 extends above the labial wall 16 so that the entire labial section of the wearer's jaw is covered with the resilient material.

The inner bight 30 of the U-shaped member 12 is provided with a shallow cavity 32 extending into the palatal wall 18 and along the adjacent edge of the channel formation 14. This cavity shall be defined as forming an incisal shelf in view of its function to provide a contact or bearing surface for the lower anterior teeth when the mouth protector 10 is installed.

The shell 20 is formed of molded construction preferably of thin gauge vinyl-plastic material. The said shell 20 comprises a U-shaped body 40 having a channel 42 defined by a labial wall 44, a palatal wall 46, and end walls 48 closing off same. The labial wall 44 is canted only slightly inwardly with its greater height located adjacent the bight 50 of the U-shaped shell and then gradually tapering toward ends thereof. The palatal wall 46 extends from end walls 48 and is canted severely. The height of wall 46 increases in a direction toward the bight 50 of the U-shaped shell 20. The palatal wall 46 is intended to act as a palatal cover and it is contemplated that only about one-third of the hard palate of the user is engaged during formation and use of the mouthpiece, thereby assuring a good fit without interference with tongue action, breathing and like body processes under the strain of exertion, competition and impact.

The U-shaped floor 52 of the channel 42 comprises an imperforate web 56 at the bight 50 of the shell 20 and a mesh web portion 58 provided along the length of each of the arms of the floor 42. Coextensive with the said mesh web portion 58, and depending downwardly from the marginal edges thereof, a rim or fence 60 is provided. The fence 60 aids in retaining filler material in a restricted area as it is forced through the mesh web portion 58 during the taking of the first and second dental impressions. The fence 60 also serves to limit the occlusal thickness of the filler material to reduce the occlusal thickness or bite area of the mouthpiece at the areas concerned.

The shell 20 is also provided with a connecting web 62 integral with the palatal wall 18 and joining the arms of the U-shaped body 40 closely adjacent the ends thereof. Since the shell member 20 is light weight and flexible, the same, when used as an impression tray, has a tendency to distort and/or spread during even the short period of time it is held in the mouth as the dental impressions are taken. Such spreading or distortion is substantially reduced by the restraining action of connecting web 62. Web 62 also aids in positioning the shell in the mouth as will be later described so that accurate adjustments of the labial and palatal walls may be made during fitting and the exact dental impressions taken. Subsequent to forma-

tion of the mouth protector, the web 62 may be severed and removed.

Attention is now directed to the composition of the filler or mastic material comprising the impression bearing lining 22 of the mouth protector 10. Primary requisites of such material include capability of same to adhere to the wall surfaces of the shell member, freedom from deleterious physiological effects on the wearer, capability to be formable so as to act as a carrier for a dental impression, ability to have a semi-solid state which will harden to a second state in which the same is resilient and shock resistant, but capable of retaining the impression formed therein, and capable of setting to the second state within the mouth at body temperature and within a short length of time.

A composition discovered to have the properties described above comprises a flexible polymerized acrylic resin compound. Said compound preferably may be supplied in the form of a powder, for example, consisting entirely of an ethyl methacrylate resin in powder form, and a liquid consisting of methyl methacrylate monomer, a suitable plasticizer, for example, of the group dibutyl phthalate, and a solvent, such as ethyl alcohol. An example of the composition which was successfully used to form a mouthpiece of the invention is as follows.

Powder:	Percent
Ethyl methacrylate resin -----	100
Liquid:	
Methyl methacrylate monomer -----	2
Di-butyl phthalate -----	68
Ethyl alcohol -----	30

The powder and liquid were mixed in equal quantities to form a semi-solid flowable paste taking great care to avoid incorporation of air in the paste. This may be done by the well known dental technique of spatulating and may be accomplished within a very short period of time. The composition thus compounded is now ready for use.

In forming the mouthpiece 10, the shell member 20 is first tried on or preliminarily fitted to the conformation of the wearer's upper oral cavity. The shell 20 is inserted in the wearer's mouth and the labial wall 44 is examined to determine the extent of coverage of the labial sector of the upper jaw formation. The wearer is instructed to bite upon the floor 52 to discover any impingement of tissue at the upper edges of the wall 44. If necessary, and because the entire shell is of thin flexible material, the wall 44 may be trimmed with a scissors so as to insure a denture-like fit. The palatal wall 18 is then inspected to insure that the palate tissue is covered to the extent desired. The said palatal wall 18 may be similarly adjusted with the aid of a scissors by trimming same or merely by cutting down the middle of the wall 18 to insure coverage.

The wearer is then instructed to open his mouth and the occlusal fit is inspected, that is the registry of the end walls 48 with the posterior border of the upper set of teeth so as to enclose same. Should the arms of the U-shaped shell member 20 not be spread far enough to assure proper occlusal fit, then the connecting web 62 must be severed.

With comfort being generally determined through manipulation of the shell 20, the dental impression is now ready to be taken and the mouthpiece formed.

A composition such as described above is formulated and mixed. Although the composition is a thick semi-solid, it is still flowable due to the presence of the solvent therein. The composition is then poured into the fitted shell 20 until the channel 42 is filled to about three quarters of its capacity. The composition is permitted to flow through the mesh portions 58 to the level of the fences 60. Some of the composition may be used to cover the underside of the mesh portion 58 to the level of the fence 60, same being applied preferably by spatula to prevent air bubbles from being trapped therein.

The solvent is permitted to evaporate to a degree where the paste becomes thicker, resistant to touch and no longer flows freely. This action generally takes about one or two minutes. The shell 20 with the composition therein is inserted into the mouth of the wearer so that the end walls 48 clear the last molars at the posterior section of the upper set of teeth. The shell 20 is then swung upward so that the posterior teeth are seated therein, with the anterior teeth subsequently engaged by way of a continued upward and forward movement, taking care to lift the upper lip formation of the wearer whereby to insure correct labial wall contact.

The wearer is then instructed to place his tongue upon the connecting web 62 and press the said web against the upper palate. This action aids in properly seating the shell 20 and establishes the correct bite. The wearer then closes his mouth until full contact is reached between the lower teeth and the undersurface of the said shell. With the bite of the wearer, the filler material is forced through the mesh portion 58 to form the lower impression 25. Thus the normal bite distance is maintained with only the slight thickness of the mesh between impressions 23 and 25. Using steady but not undue bite pressure, the wearer then moves his cheeks from side to side for about ten seconds to adjust the impression being taken, and the shell 20 is then retained in position until the filled composition has set, generally five minutes elapsing.

The shell 20 with the inner lining 22 now formed is subsequently trimmed to remove any excess filler material particularly gathered around the fence 60. The connecting web 62 may be then removed. Now the mouthpiece 10 is formed and ready for use.

It should be noted that the filler composition of the invention may be utilized as a repair mixture in the event that future repairs are required.

It is believed that the invention has been described in sufficient detail to permit the skilled artisan to practice same. It is believed that minor variations in the construction of the device and in the method of fitting and forming thereof without departing substantially from the concept and scope of the invention as defined in the appended claims.

What it is desired to be secured by Letters Patent of the United States is defined as follows:

1. A mouth protector device to be used by athletes and the like wearers and capable of in situ, custom fitting to the wearer, said mouth protector device comprising a U-shaped body member having a frontal arcuate portion and rearwardly extending lateral arm portions integral with the frontal arcuate portion and forming the said U-shaped body member thereby, said U-shaped body member having a relatively flat planar U-shaped floor, upstanding marginal U-shaped labial and palatal walls and connecting end walls about the floor to provide a channel formation in cooperation with said floor, and said channel formation having a lining permanently adhered

therein and adapted to carry an impression of the upper teeth of the wearer, said body member comprising, a thin walled, flexible, preformed shell of substantially uniform thickness adapted to serve as a fitting device and impression receiving tray during formation of the mouthpiece and incorporated permanently in the protector device during the fitting and formation of the device, said marginal walls and end walls having their exterior surfaces exposed in the finally formed device, said labial and palatal walls being canted in similar directions, but the palatal wall being canted at a greater degree relative to the plane of said floor than the labial wall, that part of the floor in the frontal arcuate portion of the body member being imperforate, those parts of the floor in each of the lateral arm portions having a perforate, mesh-like structure throughout substantially the full length thereof and extending substantially the full width of said arm portions between marginal walls whereby when installed in the wearer's mouth said mesh-like structure will be disposed only above the lower posterior teeth of the wearer, the lining being self-adherent to the shell and comprising a mastic material disposed in the channel formation during fitting and formation of the device and upon the biting by the wearer adapted to set shortly to form said lining in the channel formation with the wearer's upper teeth impressed therein, and a portion of the mastic material adapted simultaneously and freely to flow through said mesh-like structure to the bottom of the shell and into engagement only with the wearer's lower posterior teeth whereby to provide additionally an impression thereof in set mastic on the underside of said floor.

2. The mouth protector device claimed in claim 1 in which there is a depending peripheral fence on the underside of the floor generally conforming in configuration with the outline of said mesh-like structure and providing a shallow retainer for the portion of mastic material which flows through said mesh-like structure during formation of the device.

3. The mouth protector device claimed in claim 1 in which there is a removable palatal web bridging the ends of the lateral arm portions opposite the frontal portion to serve as guide means during fitting and to prevent spreading of the arm portions during formation of said device.

References Cited by the Examiner

UNITED STATES PATENTS

2,695,366	11/53	Savarese	128—136
2,705,492	4/55	Chandler	128—136
2,750,941	6/56	Cathcart	128—136
3,016,052	1/62	Zurben	128—136
3,073,300	1/63	Berghash	128—136
3,103,217	9/63	Butler et al.	128—136

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