April 14, 1970 S. GREENBERG 3,505,995

MOUTHGUARD WITH COMPRESSIBLE CHAMBER IN OUTER FLANGE

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Fig. 1

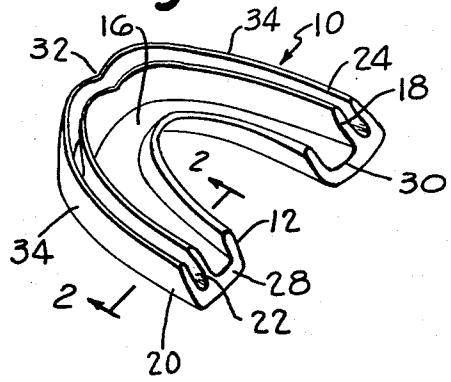


Fig. 2

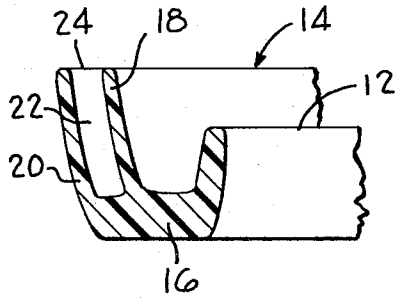


Fig. 3

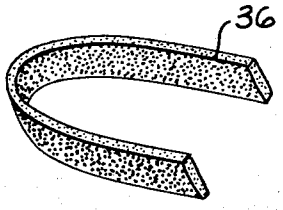


Fig. 4

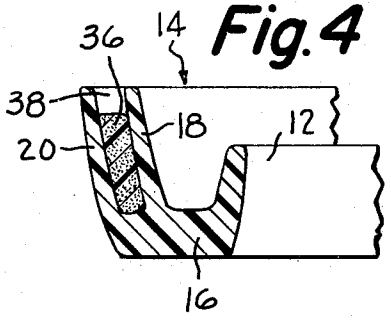


Fig. 5

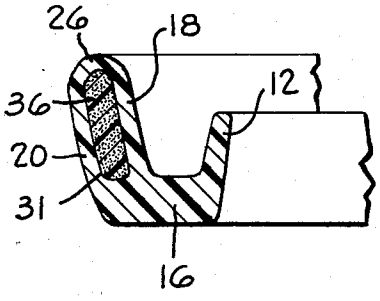
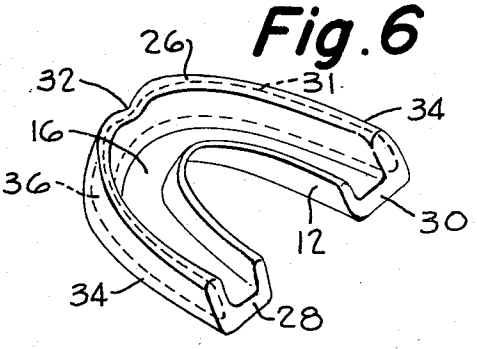


Fig. 6



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MOUTHGUARD WITH COMPRESSIBLE CHAMBER IN OUTER FLANGE

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Fig. 7

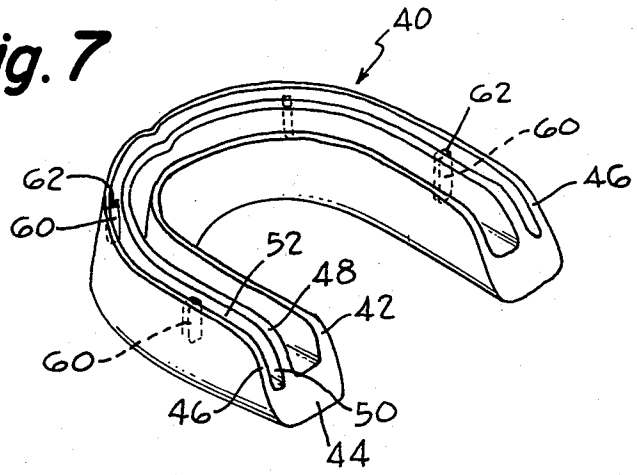
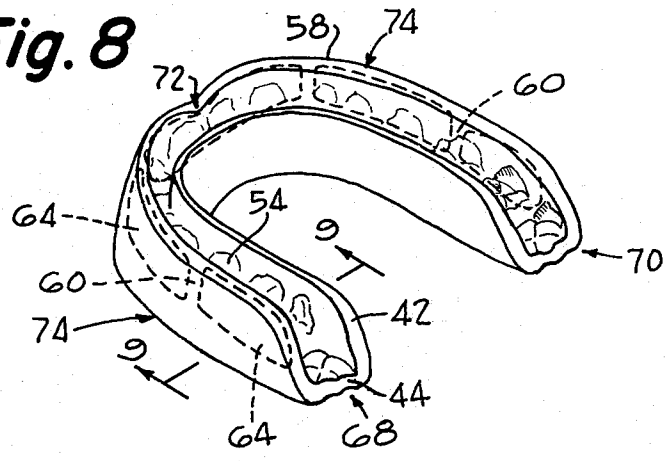


Fig. 8



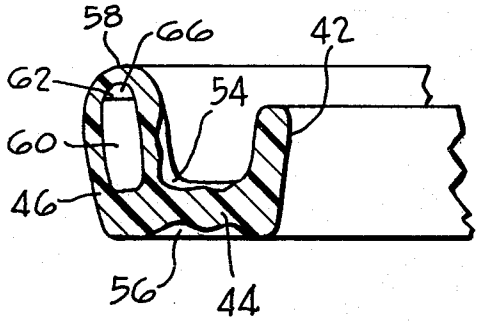


Fig. 9

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United States Patent Office 3,505,995 Patented Apr. 14, 1970

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MOUTHGUARD WITH COMPRESSIBLE CHAMBER IN OUTER FLANGE

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Filed Aug. 21, 1967, Ser. No. 662,128
Int. Cl. A61f 5/56
U.S. Cl. 128—136 10 Claims

ABSTRACT OF THE DISCLOSURE

A mouthguard in the form of a substantially U-shaped member of channel cross-section adapted to receive and shield the upper or lower set of teeth with a chamber in the outer flange to render the same compressible so that an impact thereto will be softened before it is transmitted to the teeth and lips.

This invention relates to a mouthguard to protect the teeth, mouth and lips of athletic contestants. Heretofore, mouthguards were solid members worn over the teeth, and although made of tough resilient plastics, nevertheless a blow to the mouth or jaw of the wearer would be directly transmitted to the teeth and lips.

The primary object of this invention is to provide a chamber in the outer flange of such guards in the labial and buccal areas so that the flange is rendered compressible to thus absorb and soften the impact of such blows before it is transmitted to the teeth and lips.

Another object of the invention is to provide a guard of the character described which contains a compressible outer flange and is fabricated either as a standard unfitted substantially U-shaped member of channel cross-section or as such a unit capable of being custom fitted to the particular set of teeth of the wearer.

Another object of the invention is to provide a mouthguard with a compressible outer flange containing a chamber continuously or intermittently extending from distal end to distal end of the guard and disposed at the labial and buccal areas, which chamber may contain air or a resilient foam material.

Yet another object of the invention is to provide an efficient method of making both fitted and unfitted mouthguards with compressible outer flanges.

These and other objects of the invention will become more apparent as the following description proceeds in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of a molded horseshoe shaped channel member in the initial stage of making unfitted guards of the instant invention;

FIG. 2 is an enlarged sectional view taken on the line 2—2 of FIG. 1;

FIG. 3 is a perspective view of a foam filler employed in one form of the present invention;

FIG. 4 is a view similar to FIG. 2 showing the filler of FIG. 3 in place in the member of FIG. 1;

FIG. 5 is a view similar to FIG. 4 showing the upper edge of the outer flange sealed off to provide a chamber with the foam material therein;

FIG. 6 is a perspective view of the complete unfitted guard of FIG. 5;

FIG. 7 is a view similar to FIG. 1 of a modified member in the initial stage of making the fitted guard of the instant invention;

FIG. 8 is a view similar to FIG. 7 showing the sealing of the upper edge of the outer flange to provide the chamber therein; and

FIG. 9 is an enlarged sectional view taken on the line 9—9 of FIG. 8.

Specific reference is now made to the drawings wherein

similar reference characters are used for corresponding elements throughout.

The fitted guard of the instant invention shown in FIGS. 7–9 may be made of a tough resilient thermoplastic resin which can be softened to take teeth impressions in the mouth and to be cooled to fix these impressions, of the type disclosed in Patent No. 3,250,272 or of the high molecular weight binary ethylene-vinyl-acetate copolymers disclosed in my copending application Ser. No. 531,123 filed Mar. 2, 1966 and commercially available from Du Pont under the trademark Alathon. The unfitted guard of FIGS. 1–6, that is one which will shield the teeth as a standard unit and will not contain teeth impressions, can be made of the same thermoplastic resins but of thinner gauge or of other resilient plastic materials known in the art such as polyvinyl chloride, polyurethane, etc.

Coming now to FIGS. 1–6, a precursor member **10** in the form of a substantially U- or horseshoe-shaped unit of channel cross-section is formed of a suitable plastic by casting or preferably injection molding techniques. This the member will contain a shorter inner or lingual flange **12**, an outer two-part flange **14** and a web **16** connecting the lingual and outer flanges at their lower edges. Using a suitable male member during injection molding, the outer flange **12** will be formed to contain an inner portion **18**, an outer portion **20** and a cavity **22** therebetween corresponding to the male member and opening through the upper edge of the outer flange **14** as at **24**.

The opening **24** is then sealed peripherally as at **26** as are the distal ends **28** and **30** to thereby provide one form of guard in which the cavity **22** becomes a sealed chamber **31** which extends substantially from one distal end **28** to the other **30** and thus covers the labial area **32** and the buccal areas **34**. If the chamber should partially collapse during the sealing of the upper edge, one distal end can be sealed to provide a pinhole for the insertion of a needle through which air can be pumped to inflate the chamber. Such a guard when placed over the upper and/or lower teeth will have an air chamber **31** around the labial and buccal areas of the outer flange rendering the latter compressible so that the impact of blows thereto will be softened before being transmitted to the teeth. If desired the chamber **31** may be partially filled with a liquid.

Prior to sealing the opening **24** peripherally as at **26**, a compressibly resilient filler strip of material **36**, such as polyurethane foam, rubber or equivalent materials, may be inserted into the cavity **22** through the upper opening **24**. Desirably, the length of the strip **36** is that of the overall length of the cavity **22**. Its height, however, is shorter so that when inserted in the cavity there will be peripheral free space **38** above the strip up to the open upper edge **24** allowing the latter to be sealed to enclose the filler strip **36** without adversely effecting the filler strip itself. This form of the invention with compressibly resilient filler strip **36** has the advantage of providing compressibility and minimizing possible breaks through the inner and outer portions **18** and **20** of the outer flange **14**.

In the fitted form of the guard, as shown in FIGS. 7–9, the precursor member **40** is similar to member **10** in that it is horseshoe-shaped and contains an inner or lingual flange **42**, a web **44**, and a two-part outer flange having an outer portion **46** and an inner portion **48** separated by a cavity **50** which is open through the upper edge of the outer flange as at **52**. However, since the guard will be softened and inserted over the teeth to take teeth and gum impressions **54** in the inner surface thereof, the inner flange portion **48** is thicker than the outer flange surface **46**. If one wishes to take im-

pressions **56** of the bite surfaces of the opposite teeth as well, as described in Patent No. 3,250,272, then the web **44** should also be comparatively thick.

As in the form of the invention shown in FIGS. 1–6 and described above, the precursor member is completed by sealing the open upper end **52** of the cavity **50** as at **58**. Before doing so however, to prevent collapse of the thinner outer flange portion **46** during heat sealing, the pre-cursor unit **40** is molded to contain spaced bars **60** in the cavity **50** connecting the inner and outer flange portions **46** and **48**, the upper edges **62** of the spacer bars terminating below the upper open edge **52** of the cavity so that the peripheral seal **58** can be effected without interference from the bars **60**. When sealed, the guard will be seen to contain chambers **64** between the spacer bars **60** and a continuous chamber **66** above the spacer bars from one sealed distal end **68** to the other **70**, thus providing compressible chambers in the outer flange at the labial and buccal areas **72** and **74**. The unit is softened, applied to the teeth and cooled to fix the teeth impressions therein in the manner set forth in Patent No. 3,250,272 so that the final guard ready for use will contain the aforementioned features plus the teeth indentations **54** on the inside thereof and/or the outer bite indentations **56**. The chambers **64** and **66** can contain air, can be partially filled with liquid or can contain strips of compressibly resilient, i.e. foam, material.

While preferred embodiments of the invention have been shown and described, it will be understood that skilled artisans may make variations without departing from the spirit of the invention and the scope of the appended claims.

I claim:

1. A mouthguard comprised of a substantially U-shaped resilient member of channel cross-section adapted to receive and shield the upper or lower set of teeth and including an outer flange, lingual flange and a web joining them, said outer flange including a completely sealed chamber extending from one distal end to the other of said outer flange and covering the labial and buccal areas rendering said outer flange compressible in response to an impact thereto.

2. The combination of claim **1** wherein said chamber includes a compressibly resilient filler.

3. The combination of claim **1** wherein said mouthguard is made of a material capable of being softened sufficiently to take tooth impressions in the mouth and of fixing them upon cooling to form a fitted guard.

4. The combination of claim **3** wherein said chamber separates said outer flange into outer and inner portions, the latter portion being thicker than the former to permit formation of tooth impressions while retaining the structural integrity of the guard and compressible chamber therein.

5. The combination of claim **4** and spaced bars in said chamber connecting said outer and inner portions of said outer flange.

6. A method of making a mouthguard comprised of forming resilient material into a substantially U-shaped member of channel cross-section with a lingual flange, an outer flange and a web joining them, the outer flange including inner and outer portions spaced by a cavity open along and through the upper edge of the outer flange opposite the web and at its distal ends, and sealing the opening along the upper edge of the outer flange and its distal ends to close off the cavity and form a compressible chamber.

7. The method of claim **6** and the step of inserting a compressibly resilient filler in the open cavity below the upper edge of the outer flange before sealing it.

8. The method of claim **6** and the step of forming the member so that the inner portion of the outer flange is thicker than its outer portion so that the mouthguard will be capable of taking inner teeth impressions without impairing the structural integrity of the outer flange and the compressible chamber therein.

9. The method of claim **8** and the step of providing spaced bars in the open cavity connecting the inner and outer portions of the outer flange which extend below the upper edge thereof before sealing it to prevent collapse of the outer thinner portion of the outer flange during the sealing operation.

10. A precursor unit for a mouthguard with a compressible impact-absorbing chamber comprising a substantially U-shaped resilient member of channel cross-section made of a material capable of being softened sufficient to take tooth impressions in the mouth and of fixing them upon cooling to form a fitted guard, said member including an outer flange, a lingual flange and a web joining them, said outer flange including a chamber extending from one distal end to the other thereof and opening through the upper edge of said outer flange.

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U.S. Cl. X.R.

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