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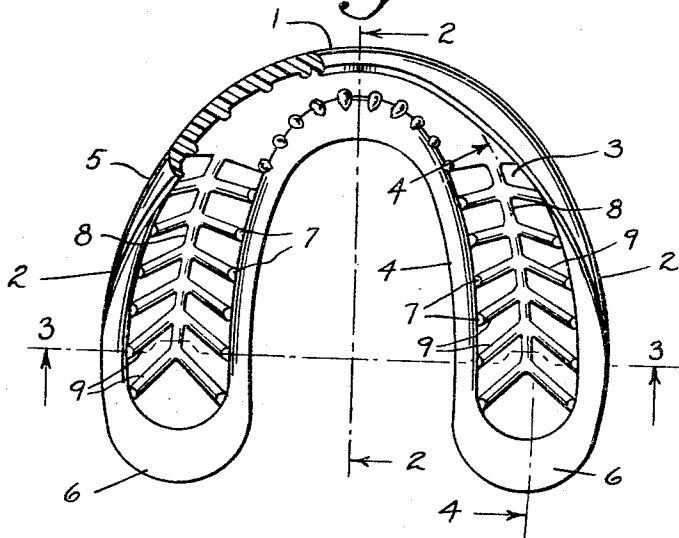
D. K. LINDSAY

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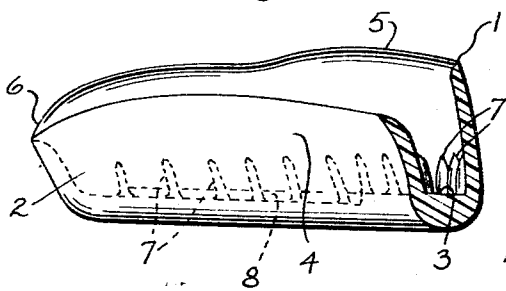
MOUTH PROTECTOR

Filed April 8, 1965

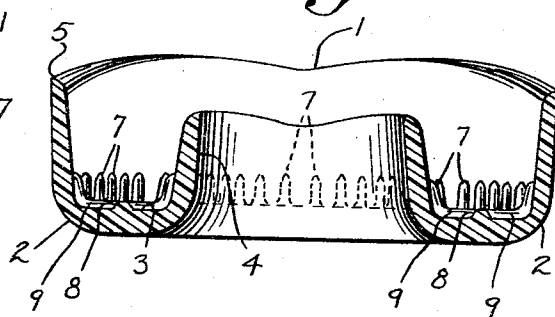
*Fig. 1*



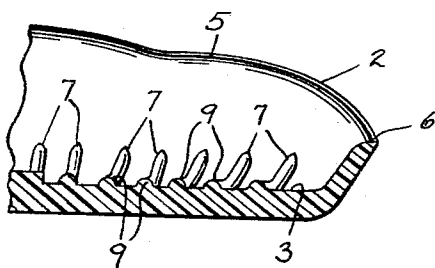
*Fig. 2*



*Fig. 3*



*Fig. 4*



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**MOUTH PROTECTOR**

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8 Claims. (Cl. 128—136)

This invention relates to mouth protectors of the type comprising a U-shaped, trough-like tray member and a filler of impression material. It resides more particularly in a protector of the type having an improved tray that is provided with centering ribs to insure proper distribution of the filler material when an impression is taken.

Mouth protectors of the type contemplated herein are widely used for athletic and other applications, and are especially suitable when it is desired to provide an individually fitted protector at relatively low cost. The trays are formed of a relatively soft resilient material such as polyethylene or polyvinyl chloride and are usually provided in several basic sizes. The filler material is also a soft resilient material that is capable of bonding to the tray and is usually supplied as a powder and liquid which may be mixed to form a paste which sets rapidly at room temperatures. When the protector is to be fitted, the user simply mixes the filler material, places it in the tray and bites down to develop an impression, which impression is maintained when the filler sets.

Although such mouth protectors have proven very satisfactory, care must be taken during fitting to insure that the tray is properly centered with respect to the user's teeth so that there will be filler material below and on both sides of the teeth, especially in the molar region. If the tray is not properly centered, the user's teeth may, for example, be up against one wall of the tray when the impression is taken, and the depth of protective material over that portion of the teeth would be only the thickness of the tray itself. This reduced protection could well result in serious injury. Further, the lack of impression material in even a small area could result in a faulty fit which would make it difficult to hold the protector in the mouth.

It is the general object of this invention to provide a tray having centering ribs which center the tray over the user's teeth, laterally and vertically, as the protector is being fitted. The ribs are arranged to insure contact with the sides and bite surfaces of the teeth so that these surfaces cannot bottom on the tray floor or come against the tray walls. It has been proposed before to use ribs formed in the tray for this general purpose, and U.S. Patent No. 3,073,300 shows such a construction. In that patent, however, the ribs are formed only on the tray floor in the frontal bite portion. There is, therefore, no provision for lateral centering action. Also, the teeth in the frontal bite portion are relatively thin and sharp so that it is difficult to place ribs in positions where they will not fall between the teeth of at least some users with the result that the biting edges of the teeth bottom on the tray floor. Protection in the frontal bite portion is, therefore, better achieved by having a thickened floor portion in this region as will be discussed hereinafter. Still further, the said patent shows radial transverse ribs which are not particularly suitable, especially in the molar region since they may easily fall between teeth or between cusps.

It is one specific object of this invention to provide a protector having a tray member in which there are a plurality of vertical ribs formed on the side walls of the tray to provide for lateral centering action. In the preferred embodiment of the invention shown herein, the ribs are inwardly inclined from top to bottom to

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provide enhanced centering and the ribs in the molar region are canted to eliminate the possibility that a rib will fall between two teeth.

It is another object of this invention to provide a tray in which the floor in the rear leg or molar portions is provided with upstanding ribs arranged in herringbone fashion to insure that they will engage the bite surfaces of the molars and pre-molars.

It is a further object of this invention to provide a protector in which the tray has a thickened floor portion in the frontal bite region to provide increased protection for the sharp teeth in this area.

Other objects and advantages will appear from the description to follow. In the description, reference is made to the accompanying drawing, forming a part hereof, in which there is shown, by way of illustration and not of limitation, a preferred embodiment of the invention.

In the drawing:

FIG. 1 is a top plan view, partially broken away, of a mouth protector tray formed according to this invention,

FIG. 2 is a view in cross-section in the plane 2—2 shown in FIG. 1,

FIG. 3 is a view in cross-section in the plane 3—3 shown in FIG. 1, and

FIG. 4 is a partial view in cross-section in the plane 4—4 shown in FIG. 1.

The tray shown in the drawing is of rather conventional overall configuration and may be formed of any suitable soft resilient material such as polyethylene or polyvinyl chloride. It is generally U-shaped to define a central bite portion 1 which covers the frontal bite area of the user's mouth, and rearwardly extending leg portions 2 which receive the pre-molars and molars. The tray is generally trough-like and has a relatively flat base or floor 3, an inner side wall 4, an outer side wall 5 and end walls 6.

It will be appreciated by those skilled in the art that a suitable filler material will be placed in the trough formed by the floor 3 and walls 4, 5 and 6. The filler material should also be soft and resilient in nature, adapted to set rapidly at room temperatures, and capable of forming a chemical bond with the material of the tray, and should also have a pleasant or neutral taste. A number of such materials are commercially available. A suitable polymer for the filler material might, for example, be ethyl methacrylate in powder form, and a suitable plasticizer might be dibutyl sebacate dissolved in ethyl alcohol. Suitable accelerators and other ingredients, such as disinfecting agents, coloring agents or the like, may of course be added as desired.

Spaced along substantially the entire lengths of the facing inner surfaces of the walls 4 and 5 are a plurality of generally vertical upstanding ribs 7 which have bottom ends at the floor 3 and which extend upwardly to terminate at upper ends on the walls 4 and 5. As can be seen most clearly in FIG. 3, the bottom ends of the ribs 7 are somewhat thickened so that the ribs 7 are inwardly inclined from top to bottom. As can be seen most clearly in FIGS. 2 and 4, the ribs 7 in the leg portions 2 are canted from front to rear.

The ribs 7 engage the inner and outer sides of the teeth of a user to center the tray in a lateral plane. That is, the teeth of the user are held off the walls 4 and 5 to provide a space for the filler material therebetween. The inward incline of the ribs 7 helps in guiding the teeth to a centered position.

In the preferred embodiment of the invention shown herein, there are twenty-two ribs on each of the walls 4 and 5, and these are arranged in pairs with the ribs

of one wall being substantially radially opposite those of the other. The exact number of ribs 7 to be provided for any tray will depend to some extent on the overall size of the tray. There should, however, be enough ribs 7 to insure engagement with the side surfaces of the teeth along substantially the entire jaw line. At the same time, there should not be so many ribs that there will be insufficient space between them for filler material. In this respect, the rearward cant of the ribs 7 in the leg portions 2 is important in that it virtually eliminates the possibility of a rib 7 falling into the vertical space between two teeth, and thus helps in providing for adequate engagement with a minimum number of ribs.

As can be seen most clearly in FIG. 1, the floor 3 in the leg portions 2 is provided with upstanding medial ribs 8, there being one rib 8 along approximately the centerline of each leg 2 that extends for substantially entirely the length of the leg 2. Branching from the ribs 8 are a plurality of cross ribs 9 which terminate at and merge with associated vertical ribs 7, the ribs 7 in the leg portions 2 being extensions of the ribs 9. The ribs 9 are arranged in angled pairs to have a herringbone pattern. The angles between the members of each pair of ribs 9 vary from the rear to the front of the tray. The angle between the rearmost pair of ribs 9 in each leg 2 is approximately 90° and the angle between the members of succeeding pairs increases by approximately 7½° for each pair.

The ribs 8 and 9 engage the biting or grinding surfaces of the teeth in the pre-molar and molar regions to keep these teeth off the floor 3 to provide space for filler material underneath them. The herringbone arrangement of the ribs 9 insures against a rib 9 falling into the space between two teeth, which space is generally radial, and also minimizes the possibility of a rib falling between two cusps. This construction is, therefore, important in insuring that each tooth will be supportingly engaged by a rib 9 while still allowing for the use of a minimum number of ribs. The gradually increasing angle between each pair of ribs 9 helps to compensate for the gradually decreasing thickness of the teeth from the rear to the front of the mouth, and it will be noted that the angles of the ribs 7, which are extensions of the ribs 9, vary in approximately the same fashion.

As can be seen most clearly in FIGS. 1 and 2, the floor 3 is substantially thicker in the front bite portion 1, to have a thickness approximately equal to the total thickness of the floor 3 and ribs 8 and 9 in the leg portions 2. This provides added protection under the relatively sharp frontal teeth to prevent the user from biting through the tray. In this portion of the tray, the frontal teeth of the user may bottom against the floor 3, but the extra thickness provides added protection superior to having filler material, which is usually softer than the material of the tray, under these sharp teeth.

In conclusion, with a tray formed according to this invention, the tray is centered laterally with respect to the teeth of the user by the ribs 7, and is centered vertically with respect to the teeth in the pre-molar and molar regions by the ribs 8 and 9. There is, therefore, sufficient space for filler material between the teeth and the tray to insure that the teeth will be surrounded by the filler material to provide adequate protection and an accurate fit. In the frontal bite portion, however, there is a thickened floor portion to provide added protection for the sharp frontal teeth. The herringbone configuration of the ribs 9 and the rearwardly canted posture of the ribs 7 in the molar region insures for adequate engagement with a minimum number of ribs. Although these specific features provide a particularly satisfactory tray, it will be obvious that variations may be made within the scope of the invention. The invention is not, therefore, intended to be limited except insofar as limitations specifically appear in the following claims.

I claim:

1. A mouth protector comprising: a tray member adapted to receive a filler of impression material, said tray member being generally U-shaped to have a frontal bite portion and rearwardly extending leg portions, said tray having a floor and inner and outer side walls; a pair of upstanding medial ribs extending along the floor in both leg portions; and a plurality of upstanding cross ribs on the floor in both leg portions, said cross ribs being arranged in pairs branching from said medial ribs and extending toward the rear of said leg portions to have a herringbone configuration.

2. A mouth protector comprising: a tray member adapted to receive a filler of impression material, said tray member being generally U-shaped to define a frontal bite portion and rearwardly extending legs, said tray having a floor and generally vertical inner and outer side walls, the floor being substantially thickened in the frontal bite portion; a pair of upstanding medial ribs, there being one rib extending substantially the entire length of each leg; and a plurality of upstanding cross ribs on the floor of each leg, said ribs being arranged in pairs branching from said medial ribs with the members of each pair extending laterally and rearwardly from the associated medial ribs toward the side walls.

3. A mouth protector comprising: a tray member adapted to receive a filler of impression material, said tray member being generally U-shaped to define a frontal bite portion and rearwardly extending leg portions, said tray having a generally flat floor and generally vertical inner and outer side walls, the floor in the frontal bite portion being substantially thicker than the floor in the leg portions; a plurality of generally vertical ribs spaced along substantially the entire lengths of the inner surfaces of both side walls that are adapted to centeringly engage the teeth of the user; a pair of upstanding medial ribs extending along the floor in both leg portions; and a plurality of upstanding cross ribs on the floor in both leg portions, said cross ribs being arranged in pairs branching from said medial ribs with the cross ribs extending laterally and rearwardly from the medial ribs.

4. A mouth protector comprising: a tray member adapted to receive a filler of impression material, said tray member being generally U-shaped to define a frontal bite portion and rearwardly extending leg portions, said tray having a generally flat floor and generally vertical inner and outer side walls, the floor in the frontal bite portion being substantially thicker than the floor in the leg portions; a plurality of generally vertical ribs spaced along substantially the entire lengths of the inner surfaces of both side walls that are adapted to centeringly engage the teeth of the user along substantially the entire jaw line, said ribs having their lower ends at the floor and their upper ends on the walls and being inwardly inclined from top to bottom, the ribs in the leg portions being canted from front to rear; a pair of upstanding medial ribs on the floor in both leg portions that extend substantially the entire length of said leg portions; and a plurality of upstanding cross ribs on the floor in both leg portions, said cross ribs being arranged in pairs branching from said medial ribs with the cross ribs extending laterally and rearwardly from the medial ribs, the outer end of each cross rib terminating at and merging with the bottom end of an associated vertical rib.

5. A mouth protector comprising: a tray member adapted to receive a filler of impression material, said tray member being generally U-shaped to define a frontal bite portion and rearwardly extending leg portions, said tray member having a generally flat floor and generally vertical inner and outer side walls with facing inner surfaces; and a plurality of generally vertical ribs spaced along substantially the entire lengths of the facing inner surfaces of the side walls in both the bite and the leg portions, the ribs having lower ends at the floor and upper ends on the side walls and being adapted to engage the

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side surfaces of the teeth of a user to center the user's teeth between the inner surfaces of the side walls, there being sufficient ribs to insure that there will be such centering engagement along substantially the entire jaw line of the user.

6. A mouth protector according to claim 5 wherein said vertical ribs are inwardly inclined from top to bottom.

7. A mouth protector according to claim 5 wherein the vertical ribs in the leg portions are canted from front to rear.

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8. A mouth protector according to claim 7 wherein the vertical ribs are inwardly inclined from top to bottom.

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10	ADELE M. EAGER, <i>Primary Examiner.</i>			

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,319,626

May 16, 1967

David K. Lindsay

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 33, for "bite", first occurrence, read -- bight --; column 6, line 2, for "to", first occurrence, read -- top --.

Signed and sealed this 21st day of November 1967.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

EDWARD J. BRENNER

Commissioner of Patents