

June 30, 1953

J. F. CATHCART

2,643,652

MOUTH PROTECTOR

Filed April 9, 1951

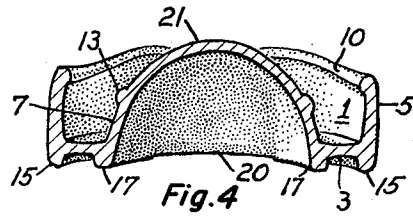
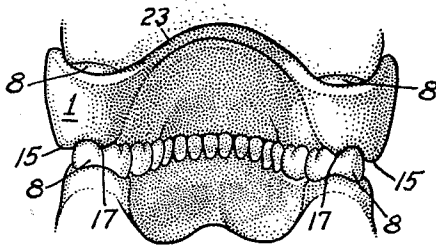
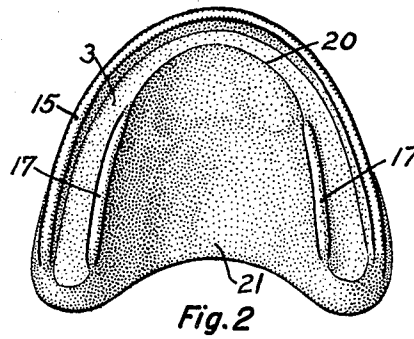
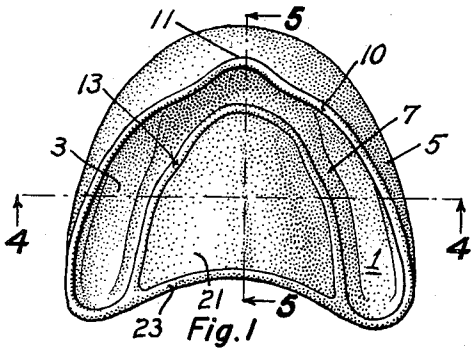


Fig. 3

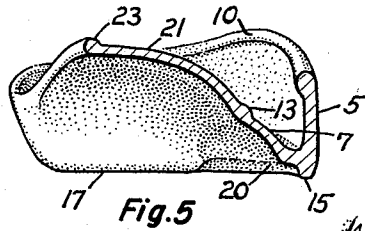


Fig. 5

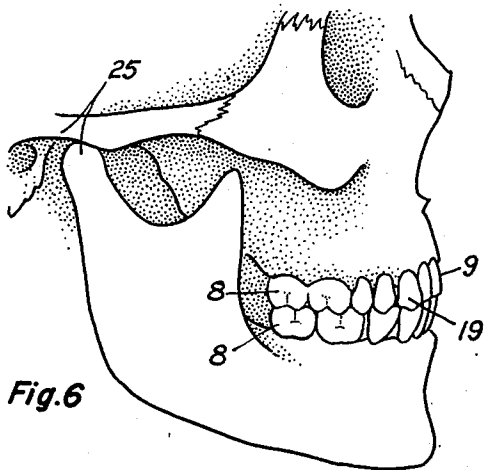


Fig. 6

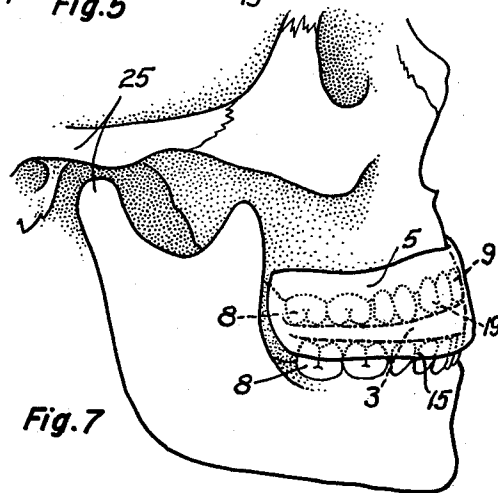


Fig. 7

Jack F. Cathcart

Inventor

By *Bruce & Bivler*

Attorneys

UNITED STATES PATENT OFFICE

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MOUTH PROTECTOR

Jack F. Cathcart, Berkeley, Calif., assignor of
one-half to Fred P. Moffett, Berkeley, Calif.

Application April 9, 1951, Serial No. 220,061

16 Claims. (Cl. 128—136)

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My invention relates to mouthpieces and more particularly to devices in this category adapted for use by those engaged in sports or other pursuits to prevent possible injury to the teeth, lips, or other regions of the mouth, as well as to protect the user against dislocation of or injury to the temporo-mandibular joint and its articulating capsule.

Mouthpieces for the aforementioned purposes are not in and of themselves broadly new, but those with which I am familiar suffer from many limitations and drawbacks. Some lack adequate retention ability and are readily dislodged in response to a blow to the chin or jaw which, aside from exposure to possible injury resulting from its temporary loss, may result in the device falling into the throat of the wearer and causing choking. Other mouthpiece devices of the prior art necessitate maintaining a continual bite thereon to hold the same in place, but this type proves quite uncomfortable to the wearer, particularly when engaged in a strenuous undertaking, which normally necessitates auxiliary breathing through the mouth to obtain one's full quota of air under such conditions. Still other mouthpieces require tailoring to one's individual specifications, to avoid improper fit and resulting discomfort and irritation, while essentially all of them render articulation difficult.

Among the many objects of the present invention are:

1. To provide a novel and improved mouthpiece;
2. To provide a novel and improved mouthpiece capable of fitting mouths differing substantially from one another within a wide range;
3. To provide a novel and improved mouthpiece which, in three different sizes, is capable of covering the entire range of mouth sizes regardless of teeth characteristics;
4. To provide a novel and improved mouthpiece offering a multiple gripping action to assure against dislodgment under most adverse conditions;
5. To provide a novel and improved mouthpiece allowing free and easy mouth breathing with no danger of becoming dislodged;
6. To provide a novel and improved mouthpiece which offers full protection to the lips, cheeks and teeth of the wearer;
7. To provide a novel and improved mouthpiece which will protect the temporo-mandibular joint and its articulating capsule from trauma, dislocation or fracture;
8. To provide a novel and improved mouth-

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piece capable of being worn by orthodontic patients having braces or other orthodontic appliances on their teeth;

9. To provide a novel and improved mouthpiece which may be worn comfortably, despite the fact that it is not tailored to one's individual specifications;

10. To provide a novel and improved mouthpiece which may be standardized to three sizes for commercial production and which will be capable of being produced most economically.

Additional objects of my invention will be brought out in the following description of a preferred embodiment of the same taken in conjunction with the accompanying drawings wherein—

Figure 1 is a plan view of a mouthpiece of the present invention as viewed from above;

Figure 2 is a plan view of the device of Figure 1 as viewed from below;

Figure 3 is a view from the rear depicting a mouthpiece of the present invention in installed position and illustrating certain characteristic features of the present invention;

Figure 4 is a view in section taken in the plane 4—4 of Figure 1;

Figure 5 is a view in section, taken in the plane 5—5 of Figure 1;

Figures 6 and 7 are comparable views illustrating the action of the mouthpiece in its relationship to the temporo-mandibular joint.

Referring to the drawings for details of my invention in its preferred form, the mouthpiece illustrated is for application to the upper teeth. It is of soft flexible material, such as soft vellum or pure Pará rubber, elastic resin, soft plastic or the like, and formed to provide a U-shape trough 1 involving a floor 3 which lies in the surface of a sphere of substantially eight inch diameter, such floor being bordered along its outer or buccal-labial edge by a smooth continuous wall 5, and along its inner or lingual edge by a smooth continuous wall 7. These walls are inclined inwardly and join distally of the positions destined for the second molars 8. The floor gradually increases in thickness from the positions to be occupied by these molars, to the anterior portion which will be occupied by the front or incisor teeth 9 to conform to a normally existing angle of approach of the upper and lower jaws in the act of closing the mouth, thus to assure engagement of the floor of the mouthpiece by the incisors of the lower jaw simultaneously with the molars thereof. I have found that a gradual increase in such thickness from

a matter of three millimeters at the second molar positions to approximately a thickness of five millimeters at the position of the incisors is most satisfactory for average conditions.

As to the exact width and shape of the trough floor as well as the contour and angular inclination of the bordering walls, these factors are somewhat critica to achieve a device capable of satisfactorily fitting individuals of differing teeth and mouth structure within the ranges of small, medium and large, and may best be explained by the process of their derivation.

Following a prolonged study and analysis of the mouth and teeth structures of several thousands of individuals, the results were averaged out in the form of castings in the three ranges of small, medium and large. With each such casting, the high spots or outermost points on both the outer and inner surfaces of the teeth were delineated and the teeth blocked out using such high spot delineations as a guide in determining the wall surfaces of the casting. The resulting modified casting then served to determine the contour and inclination of each trough wall and the spacing between them.

The walls as thus determined, represent maximum lateral extent of tooth surfaces to either side of the gum axis, to be expected in an average normal mouth within the range to be considered, with the result that the trough portion of the device will comfortably and substantially snugly fit the average mouth within the range for which intended, and any unusual deformities or departures from a normal mouth within such range will be accommodated readily by reason of the inherent flexibility and resiliency of the material employed in fabricating the mouthpiece.

The outer or buccal-labial wall 5 is carried up to a point above the height of contour of the teeth supporting bony tissue, and is bordered along its upper edge by an inwardly directed bead 10 of the same material, the bead being preferably formed on a radius of the order of one millimeter for best results. A V-notch 11 centrally of the labial portion allows clearance for the labial frenum of the mouth and thus avoids impingement thereon.

The inner or lingual wall 7 rises only to a point just below the junction line of the crest of the gingival gum tissue attachment, but like the outer wall, is bordered by a bead 13 directed inwardly toward the teeth and gums.

Each wall thus beaded, is adapted to engage mouth structure along a line offering excellent anchorage, and through cooperation of the two walls, will furnish a substantial gripping action in the mouth of the wearer, substantially independently of the specific teeth structure and characteristics of the individual.

Depending from the floor along its outer edge and forming a depending continuation of the buccal-labial wall of the trough, is a continuous rib 15 which, in the installed position of the mouthpiece, is adapted to overhang the teeth of the lower jaw when the two jaws are brought together into biting relationship against the mouthpiece. As such it offers protection to the teeth of the lower jaw and minimizes any possibility of biting the cheeks or lips. In addition to such protection, said rib will serve as a buffer in resisting lateral displacement of the lower jaw in response to a shock or blow directed against the lower jaw.

Depending from the inner edge of the trough floor along each half of the trough, is another

rib 17. Each such rib extends from the distal of a second molar 8 to the distal of a cuspid 19, at which point it tapers off sharply and merges into the floor of the trough, leaving a free space 20 along the front lingual edge. Such ribs are so disposed with respect to the teeth of the lower jaw as to be in alignment with the line dividing the buccal and lingual cusps of molars and bicuspids of said lower jaw, whereby in the act of bringing the two jaws together, the molars and the bicuspids will mesh with and strike these ribs, just prior to engaging the under surface of the trough floor. The significance of this lies in the fact that by making these ribs of proper height and cross-section, they may be relied on to absorb light blows to the chin, and to further function as preliminary bumpers in the matter of blows of sufficient force to bring both jaws into biting relationship against the floor of the trough portion. In cooperation with the outer rib 15, they will aid in resisting lateral displacements of the lower jaw. These ribs when approximately of two millimeters height and two millimeters width will fulfill all these functions satisfactorily.

By terminating these preliminary shock absorbing ribs 17 at the distal of the cuspids, as previously indicated, the tongue is free to reach the lingual surfaces of the lower incisors and approach the upper incisors within the thickness of the lingual wall 7 of the trough portion, thereby permitting substantially normal articulation in the matter of speech, besides adding to the comfort of the wearer in providing greater latitude for tongue movements.

Spanning in its entirety, the lingual area bounded by the aforementioned trough and defined by the lingual wall bead 13, is a palatal membrane 21 preferably of the same soft flexible material employed in molding the trough portion, such membrane terminating posteriorly in a bead 23 along an arch extending from the distal of the second molar on one side of the upper jaw to the distal of the second molar on the other side, and adapted to engage the surface of the hard palate of the wearer, in a line contact. Such line contact should be just anterior or to the front of the junction of the soft and hard palates, by an amount sufficient to take care of variations in normal individuals, as it is essential in the present device that the bead contact be against the hard palate to avoid gagging.

The aforementioned palatal membrane is of prime importance in the realization of the objects of the present invention. Being of a relatively thin flexible material, it is readily deformable to conform to the contour and irregularities of the roof of the wearer's mouth. Such deformation may be accomplished by sucking in the air that may be trapped between the membrane and the roof of the mouth following installation of the mouthpiece, or by squeezing out such entrapped air by finger pressure against the membrane. In either event, palatal suction will result, and an effective seal will be established by the cooperative effect of the lingual wall bead 13 and the palatal membrane bead 23, which connect with one another and serve to maintain such palatal suction condition until overcome by forcibly lifting such beads and palatal membrane out of contact with the roof area of the wearer's mouth and blowing or permitting air to flow in behind the membrane to "break" the suction.

Thus very effective retention of the mouthpiece will be realized, aside from the gripping action

of the beaded walls previously considered, but in addition to all this, a cooperative relationship of prime importance will have resulted between the palatal membrane and the trough portion of the above described device.

As was previously pointed out in connection with the prior art devices, such devices as a rule, could readily be dislodged by a blow to the jaw of the wearer, and it is not uncommon, when viewing a boxing match, to witness such a mouthpiece fly from a contestant's mouth when such contestant receives a severe blow to the jaw.

The palatal membrane, when considered merely as a medium connecting the two ends of the trough portion of my mouthpiece, serves to resist to a degree, such spreading and twisting of the trough portion as would be necessary to dislodge such a mouthpiece, but of much greater significance in this connection is the realization that when such membrane is anchored by palatal suction to the roof of the wearer's mouth, it becomes in effect, an immobilized rigid arch and as such will securely stabilize the trough portion of the mouthpiece against shifting or accidental dislodgment, even in the absence of the holding ability attributable to the beaded trough walls.

This palatal membrane, when of pure Pará rubber, may be of the order of two millimeters thickness, though such thickness will necessarily vary somewhat with the degree of flexibility possessed by the material from which the device is molded.

The device of the present invention, when installed in an individual's mouth, will serve to protect the individual against injury to the temporomandibular joint 25 and such other serious injuries as may be occasioned by transmission of the shock of a heavy blow to the joint in question. A glance at the comparative Figures 6 and 7 will show that with the mouthpiece installed and the jaws in close position, the mouthpiece serves to separate and maintain separation of the components of the joint, and accordingly the mouthpiece will necessarily absorb and cushion the shock of a blow before the components of the joint can come together and transmit the shock of such blow to the brain or produce any injury to the joint structure itself.

In this connection, the aforementioned gradual increase in thickness of the trough floor is of considerable importance and significance, because by bringing the anterior teeth of the lower jaw into contact with the mouthpiece simultaneously with the molars, the shock of a blow is not only distributed throughout the mouthpiece whereby it may be more readily cushioned and absorbed, but fulcruming of the lower jaw with its molars as fulcrum points is avoided, and this is important because through such fulcruming, dislocation of the temporomandibular joint could readily occur.

Further probable injury to the temporomandibular joint and environment is avoided by the function of the depending ribs in minimizing lateral displacements of the lower jaw as previously discussed.

From the above description of my invention in its preferred form, it will become apparent that the same will fulfill all the objects of my invention as previously recited, and while the same has been illustrated and described in considerable detail, the invention is subject to modification and alteration without departing from the underlying principles involved, and I accordingly do not desire to be limited in my protection to such de-

tails except as may be necessitated by the appended claims.

I claim:

1. A mouthpiece for application to the upper teeth, comprising a U-shape trough portion adapted to accommodate the upper teeth of individuals within a substantial range of variations in mouth size and shape; and a soft flexible palatal membrane spanning the lingual area defined by said U-shape trough portion, said palatal membrane terminating in a rear edge adapted to engage the hard palatal region of an individual just anterior of the junction of the hard and soft palates and being sufficiently thin to conform to the contour of the roof of the mouth of a wearer upon removal of air from between said palatal membrane and said roof.

2. A mouthpiece for application to the upper teeth, comprising a U-shape trough portion; a palatal membrane of soft flexible material spanning the lingual area defined by said U-shape trough portion, said palatal membrane terminating in a rear edge adapted to engage the hard palatal region of an individual just anterior of the junction of the hard and soft palates; and a continuous bead integral with and bordering said palatal membrane to provide a seal around said membrane during use thereof.

3. A mouthpiece for application to the upper teeth, comprising a U-shape trough portion; a palatal membrane of soft flexible material spanning the lingual area defined by said U-shape trough portion; and a continuous bead integral with and bordering said palatal membrane to provide a seal around said membrane during use thereof.

4. A mouthpiece for application to the upper teeth, comprising a U-shape floor of gradually increasing thickness from the molars to the incisors; a palatal membrane of soft flexible material spanning the lingual area defined by said U-shape floor; and a continuous bead of like material integral with and bordering said palatal membrane to provide a seal around said membrane during use thereof.

5. A mouthpiece for application to the upper teeth, comprising a U-shape trough portion including a floor of gradually increasing thickness from the molars to the incisors; a palatal membrane of soft flexible material spanning the lingual area defined by said U-shape trough portion; and a continuous bead of like material integral with and bordering said palatal membrane to provide a seal around said membrane during use thereof.

6. A mouthpiece for application to the upper teeth comprising a U-shape portion involving a floor, and a resilient rib depending from said floor along each inner side of said U-shape portion, each of said ribs, in the installed position of said mouthpiece, being in substantial alignment with the line dividing the buccal and lingual cusps of molars and bicuspid of the lower jaw to provide shock-absorbing cushions against blows to the lower jaw.

7. A mouthpiece for application to the upper teeth comprising a U-shape portion involving a floor, and a pair of ribs depending from said floor along each side of said U-shape portion, with the ribs of each pair in substantially parallel relationship, the inner of each said pair of ribs being of resilient material and, in the installed position of said mouthpiece, being in substantial alignment with the line dividing the buccal and lingual cusps of molars and bicuspid of the lower jaw to

provide shock-absorbing cushions against blows to the lower jaw.

8. A mouthpiece for application to the upper teeth, comprising a U-shape trough portion including a floor; and a pair of resilient ribs depending from said floor, each of said ribs being adapted to extend along the inner edge of said floor from the distal of a second molar to the distal of a cuspid and in substantial alignment with the line dividing the buccal and lingual cusps of molars and bicuspids of the lower jaw when said mouthpiece is applied to the upper teeth to provide shock-absorbing cushions against blows to the lower jaw.

9. A mouthpiece for application to the upper teeth, comprising a U-shape floor of gradually increasing thickness from the molars to the incisors; a rib depending from said floor along the outer edge thereof; and a pair of additional ribs of resilient material depending from said floor, each of said ribs being adapted to extend from the distal of a second molar to the distal of a cuspid and in substantial alignment with the line dividing the buccal and lingual cusps of molars and bicuspids of the lower jaw when said mouthpiece is applied to the upper teeth to provide shock-absorbing cushions against blows to the lower jaw.

10. A mouthpiece for application to the upper teeth, comprising a U-shape trough portion including a floor of gradually increasing thickness from the molars to the incisors; a rib depending from said floor along the outer edge thereof; and a pair of additional ribs of resilient material depending from said floor, each of said ribs being adapted to extend from the distal of a second molar to the distal of a cuspid and in substantial alignment with the line dividing the buccal and lingual cusps of molars and bicuspids of the lower jaw when said mouthpiece is applied to the upper teeth to provide shock-absorbing cushions against blows to the lower jaw.

11. A mouthpiece for application to the upper teeth, comprising a U-shape trough portion including a floor of gradually increasing thickness from the molars to the incisors; a rib depending from said floor along the outer edge thereof; and a pair of additional ribs of resilient material depending from said floor, each of said ribs being adapted to extend along the inner edge of said floor from the distal of a second molar to the distal of a cuspid and in substantial alignment with the line dividing the buccal and lingual cusps of molars and bicuspids of the lower jaw when said mouthpiece is applied to the upper teeth to provide shock-absorbing cushions against blows to the lower jaw.

12. A mouthpiece for application to the upper teeth comprising a U-shape portion involving a floor, said floor being of increasing thickness from the second molar positions to the position of the incisors, a rib depending from said floor along the outer edge thereof, a pair of additional ribs of resilient material depending from said floor, each of said ribs being adapted to extend along the inner edge of said floor from the distal of the second molar to the distal of the cuspid position and in substantial alignment with the line dividing the buccal and lingual cusps of molars and bicuspids of the lower jaw when said mouthpiece is applied to the upper teeth to provide shock-absorbing cushions against blows to the lower jaw.

13. A mouthpiece for application to the upper teeth comprising a U-shape trough portion in-

volving a floor, a wall along the outer edge of said floor adapted, when said mouthpiece is applied to the upper teeth, to reach a point above the height of contour of the teeth supporting bony tissue, a wall along the inner edge of said floor and adapted to reach a point just below the junction line of the gingival gum tissue attachment, and a bead along the upper edge of each of said walls.

14. A mouthpiece for application to the upper teeth comprising a U-shape trough portion involving a floor, a wall along the outer edge of said floor adapted, when said mouthpiece is applied to the upper teeth, to reach a point above the height of contour of the teeth supporting bony tissue, a wall along the inner edge of said floor and adapted to reach a point just below the junction line of the gingival gum tissue attachment, both said walls joining distally of the second molar and being inclined inwardly, a bead along the upper edge of each of said walls with each said bead directed inwardly of said trough portion, and a rib depending from said floor along the outer edge thereof.

15. A mouthpiece for application to the upper teeth comprising a U-shape trough portion involving a floor lying in the surface of a sphere of substantially eight inch diameter, a wall along the outer edge of said floor adapted, when said mouthpiece is applied to the upper teeth, to reach a point above the height of contour of the teeth supporting bony tissue, a wall along the inner edge of said floor and adapted to reach a point just below the junction line of the gingival gum tissue attachment, both said walls joining distally of the second molar and being inclined inwardly, said floor being of a thickness varying from approximately three millimeters at the second molar positions to approximately five millimeters at the position of the incisors, a rib depending from said floor along the outer edge thereof, and a pair of additional ribs of resilient material depending from said floor, each of said ribs being adapted to extend along the inner edge of said floor from the distal of the second molar to the distal of the cuspid and in alignment with the line dividing the buccal and lingual cusps of molars and bicuspids of the lower jaw with said mouthpiece so applied to provide shock-absorbing cushions against blows to the lower jaw.

16. A mouthpiece for application to the upper teeth, comprising a U-shape trough portion involving a floor lying in the surface of a sphere of substantially eight inch diameter, a wall along the outer edge of said floor adapted, when said mouthpiece is applied to the upper teeth, to reach a point above the height of contour of the teeth supporting bony tissue, a wall along the inner edge of said floor and adapted to reach a point just below the junction line of the gingival gum tissue attachment, both said walls joining distally of the second molar and being inclined inwardly, said floor being of a thickness varying from approximately three millimeters at the second molar positions to approximately five millimeters at the position of the incisors, a rib depending from said floor along the outer edge thereof, a pair of additional ribs of resilient material depending from said floor, each of said ribs being adapted to extend along the inner edge of said floor from the distal of the second molar to the distal of the cuspid and in alignment with the line dividing the buccal and lingual cusps of molars and bicuspids of the lower jaw with said mouthpiece so applied to provide shock-absorbing cushions against blows to the lower jaw, a palatal

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membrane of soft flexible material spanning the lingual area defined by said U-shape trough portion, a continuous bead of like material integral with and bordering said palatal membrane to provide a seal around said membrane during use thereof.

JACK F. CATHCART.

Number
2,192,558
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345,006
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Name Date
Poindexter ----- Mar. 5, 1940
Carpenter ----- Sept. 5, 1950

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Country Date
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