

May 24, 1960

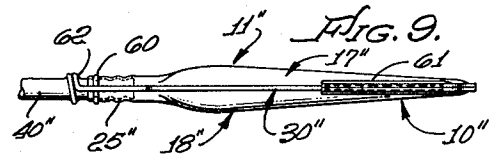
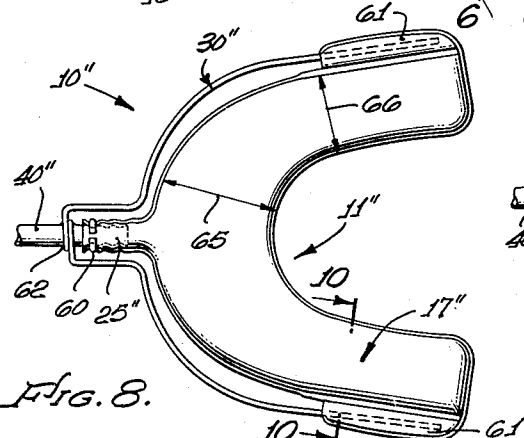
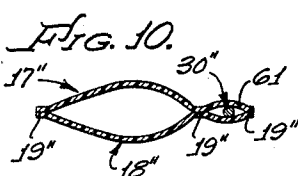
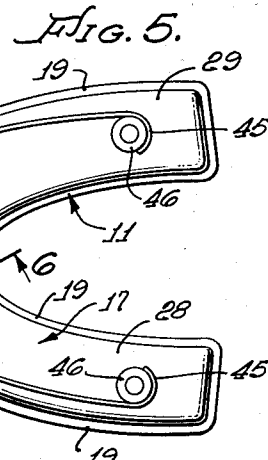
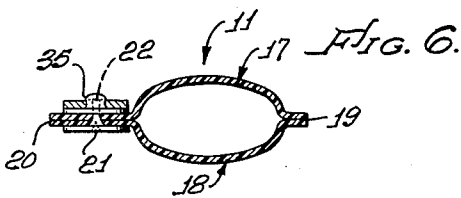
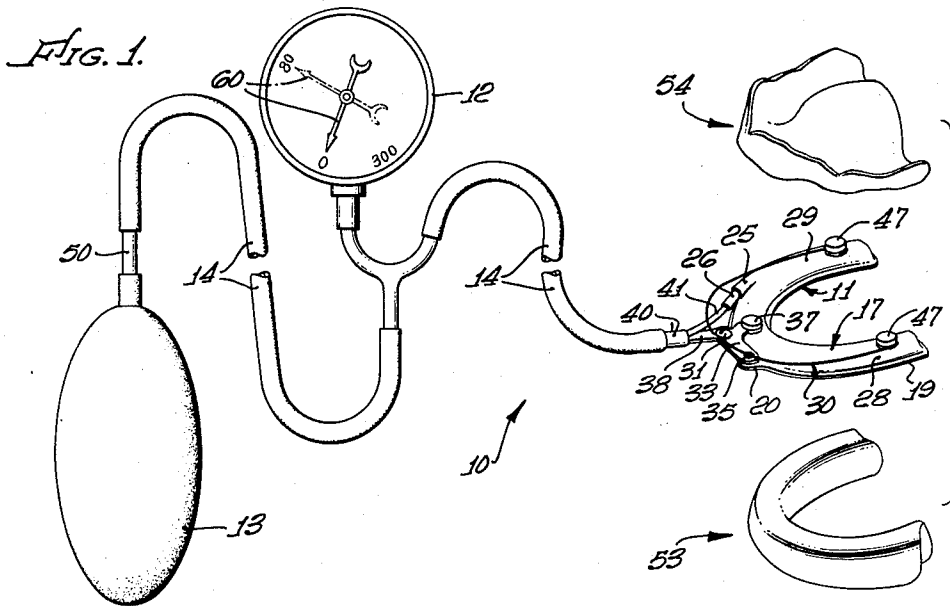
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2,937,443

PHYSIOLOGIC DENTURE ADAPTER APPARATUS

Filed May 8, 1959

2 Sheets-Sheet 1



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PHYSIOLOGIC DENTURE ADAPTER APPARATUS

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2 Sheets-Sheet 2

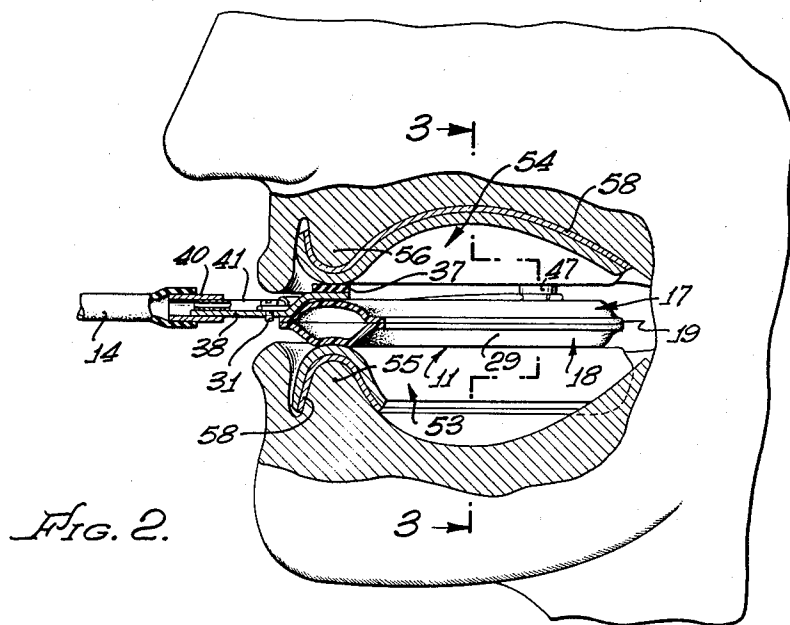


Fig. 2.

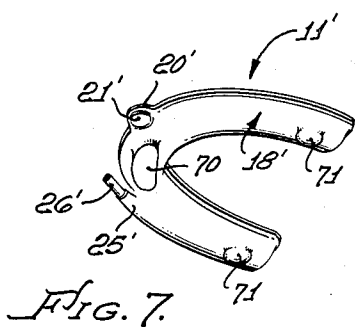


Fig. 7.

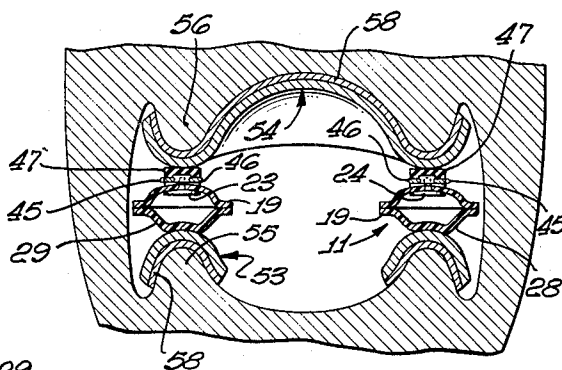


Fig. 3.

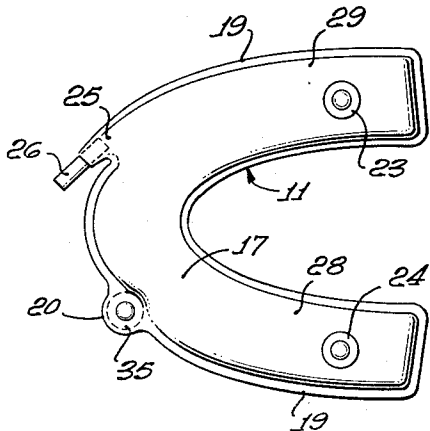


Fig. 4.

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2,937,443

PHYSIOLOGIC DENTURE ADAPTER APPARATUS

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9 Claims. (Cl. 32—19)

This invention relates to apparatus for adapting artificial dentures and more particularly to a physiologic method and apparatus of novel construction for coordinating impressions being formed on impression trays with mandibular relations, and more specifically the accurate positioning and fitting of such trays for use in constructing dentures.

In a joint invention of myself and others related in United States Patent 2,773,308, granted December 11, 1956, there is disclosed a technique and apparatus for fitting and coordinating mandibular and maxillary impression trays in such manner that a desired physiological force is distributed uniformly over supportive structures opposed to the trays. For this purpose there was utilized a flexible walled U-shaped chamber conforming to the shape of the alveolar ridges and arranged to be inflated with air to apply vascular pressure to the impression trays as the maxilla and mandible are approximately in their normal centric occlusal relation.

Though the apparatus and technique referred to has been quite satisfactory in use, it has been subject to certain disadvantages and shortcomings sought to be obviated by the improved apparatus herein disclosed and claimed. For example, it has been found in practice that the referred to prior patent structure is needlessly complex and awkward to use. Moreover, it is lacking in flexibility and versatility in respects avoided by the apparatus of this invention. It is well known that the shape of the alveolar ridges transversely of the mouth varies considerably and it is desirable that the flexible walled pressure chamber be adjustable to accommodate these varying shapes and sizes of mouth structures. Furthermore, it sometimes happens that the dentist wishes to mount the pressure device against the inner side of either or both the maxillary and mandibular dental structures.

By the present invention there is provided a simple, lightweight, inexpensive pressure chamber easily and instantly adjustable to any desired shape as necessary to accommodate it to the particular patient as well as to permit its support against the inner side walls of the teeth. Essentially, the device comprises a hollow, flexible-walled U-shaped inflatable chamber conforming generally to the shape of the maxilla and mandibular alveolar ridges and features a readily bendable supporting frame including means for detachably securing the same to the inflatable chamber. The reinforcing frame can be adjusted readily by the fingers to hold the pressure chamber in a desired configuration adapting it to the prevailing conditions of use for a given patient. Unlike the previous apparatus, the present pressure chamber is adjusted for the use intended and is held in operative position through slight pressure applied by the patient against the opposite sides of the chamber as the pressure chamber is inflated to apply diastolic vascular pressure to the opposed alveolar ridges or to impression trays supported thereon. Preferably the adjustable shape retaining means is secured to the inflatable chamber by suitable connector means to the end that the same may be readily re-

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placed or substituted by another carrying attached pads of different height to accommodate the particular vertical height requirements of a given patient.

Accordingly, it is a primary object of the present invention to provide an improved physiologic denture apparatus for use by dentists in making and fitting artificial dentures.

Another object of the invention is the provision of an improved inflatable chamber adapted to be inserted between the maxilla and mandibular alveolar ridges and usable to apply and maintain a uniformly distributed pressure against parts bearing against interior surfaces of the patient's mouth at a pressure corresponding substantially to diastolic vascular pressure of the patient when the maxilla and mandible are in centric occlusal relationship.

Another object of the invention is the provision of a flexible-walled, inflatable, pressure chamber adapted to be supported between the alveolar ridges and which is readily adjustable in shape to accommodate the same to the particular operating environment of a given patient.

Another object of the invention is the provision of a physiological impression device adapted to be inflated to apply diastolic vascular pressure to surfaces of a patient's mouth and including a readily adjustable reinforcement adapted to be readily substituted by another accommodating a different vertical height condition in a patient's mouth.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawings to which they relate.

Referring now to the drawings in which a preferred embodiment of the invention is illustrated:

Figure 1 is an exploded view of a preferred embodiment of this invention showing upper and lower impression trays disposed above and below the pressure device;

Figure 2 is a side elevational view fractionally broken away showing the device of this invention supporting maxillary and mandibular impression trays in a patient's mouth, parts of the impression chamber being broken away to show constructional details;

Figure 3 is a transverse sectional view taken along the broken line 3—3 on Figure 2;

Figure 4 is a top plan view of the pressure chamber per se after the reinforcing member and anchor for the air-conveying inflating tube has been detached;

Figure 5 is a view similar to Figure 4, but showing the adjustable reinforcing member and inflating tube connected to the pressure chamber;

Figure 6 is a cross-sectional view taken along line 6—6 on Figure 5;

Figure 7 is a perspective view from the lower side of the pressure device and showing the pressure chamber on a reduced scale;

Figure 8 is a plan view of another and simplified embodiment of the invention;

Figure 9 is a side elevation view of the device while inflated; and

Figure 10 is a view on an enlarged scale taken on line 10—10 on Figure 8.

Referring more particularly to Figures 1 and 2, there is shown a physiologic denture and pressure device incorporating features of the present invention and designated generally 10. The device proper comprises an inflatable pressure chamber 11, a pressure gauge 12, an air pump 13, all connected together by suitable flexible tubing 14. As is best shown in Figures 1, 5, and 6, pressure chamber 11 is generally U-shaped in configuration and suitably formed from a pair of similar thin-walled flexible sheets 17, 18 of rubber, plastic or the like placed in superimposed relation and sealed together along their

contacting peripheral edges 19. The exterior rim of the anterior or bight portion of chamber 11 is provided with an extension or lug 20 providing an anchorage for a male snap fastener 21, the resilient post 22 of which projects through lug 20. Prior to sealing edges 19 together, upper wall 17 of the pressure chamber is preferably provided with a pair of male snap fasteners 23, 24 similar to fastener 21 and having their resilient ball tipped ends protruding through the exterior side of chamber 11 for a purpose to be described presently. Walls 17 and 18 include a short extension formed to provide a tubular inlet 25 having sealed therewithin a metal or plastic tube 26 through which pressurized air may be supplied to inflate chamber 11.

The adjustable means for supporting legs 28 and 29 of pressure chamber 11 in a desired configuration comprises a generally U-shaped lightweight, deformable wire 30 having its midportion looped about the shank of a screw 31 threaded into a T-shaped anchor plate 33 in the manner illustrated in Figures 1 and 5. The opposite ends of the head portion of plate 33 have fixed thereto portion 35 of a snap fastener mating with complementarily shaped fastener members 21, 22 secured to lug 20 of chamber 11. Stem portion 36 of anchor member 33 is shaped to fit about and overlie the upper central portion of chamber 11 and has fixed to its upper end surface a bearing pad 37 of hard wax or the like. Projecting oppositely from stem 36 and integral with anchor member 33 is a lug 38 having its outer end soldered or otherwise firmly secured to a tubular coupling 40. A tube 41 extends between coupling 40 and tube 26. It will be understood that lug 38 serves to receive any strain imposed on this device by air tube 14 thereby safeguarding against the possibility of coupling tube 41 being unintentionally disconnected from inlet tube 26 of chamber 11.

The free ends of the reinforcing member 30 are suitably shaped for connection to the snap fasteners as by curling the ends 45 to embrace female halves 46 of snap fasteners adapted to interfit with fastener halves 23, 24 fixed to the upper wall of the pressure chamber. The upper side of snap fastener elements 46 are provided with flat surfaced pads 47, 47, the exposed surfaces of which lie in the same plane as the top of pad 37 which is likewise formed of hard wax or the like. Pads 37 and 47 may be increased in thickness or pared down as may be necessary and desirable to accommodate the device to different vertical heights between the alveolar ridges of the patient. Pads 47 have been omitted in Figure 5 but are present in Figures 1, 2 and 3.

As pointed out above, the means for inflating chamber 11 to a pressure corresponding to the diastolic vascular pressure of the particular patient includes the flexible tubing 14 having one end connected to coupling 40 and its other end in communication with the outlet 50 of a bulb type air pump 13. It will be understood that outlet 50 has secured therewithin the usual checkvalve preventing backflow and escape of air delivered to tubing 14 and chamber 11. The air pressure within chamber 11 is measured by gauge 12 having its pressure sensing mechanism in communication with the interior of chamber 11 through tubing 14.

Referring now more particularly to Figures 2 and 3, device 11 is shown in use in a patient's mouth to hold a pair of impression trays 53, 54 in place on the mandibular and maxillary alveolar ridges of a patient lacking his natural teeth. Note that reinforcing wire 30 has been bent in such manner to position pressure pads 37 and 47, 47 properly between the upper and lower alveolar ridges 55, 56. In accordance with customary practice, each of the impression trays 53, 54 has a coating of soft impression material 58 applied to its outer surfaces prior to the positioning of these trays on the respective alveolar ridges. As initially applied, material 58 is soft and easily worked. Accordingly, it is free to flow as necessary to fill irregularities in the juxtaposed mouth surfaces as pres-

sure is applied to the facing surfaces of the impression trays under uniform pressure as controlled by pressure device 11 in a manner now to be described in detail.

The physiologic denture impression apparatus described above may be used in various ways and will be readily understood from the following description of the mode of using the same in fitting impression trays 53, 54 to the alveolar ridges of a patient. When not in use, the inflatable pressure chamber 11 is preferably disconnected from gauge 12 and bulb 13 by disconnecting one of the several junctions of tubing 14, such as the junction of the right hand section of tube 14 as viewed in Figure 1 with the Y-shaped coupling member in communication with gauge 12. After each use, chamber 11 is cleaned, sterilized, and stored under suitable sterile conditions. To facilitate sterilization, chamber 11 may be detached from the reinforcing member 30 and anchorage plate 23 by disengaging the three snap fasteners holding these components assembled. When this has been done, chamber 11, which is quite sensitive to high temperature conditions, may be sterilized differently than the remainder of the components.

To use the device the dentist snaps the wire reinforcing and anchorage unit 30, 33 to the three mating snap fasteners fixed to upper wall 17 of chamber 11 and reconnects tubing 14 to gauge 12 and to bulb 13. Impression trays 53 and 54 are then prepared by coating them with suitable impression material 58 in a manner well known by those skilled in taking impressions. The coated trays are then assembled upon the maxillary and mandibular alveolar ridges and held in position momentarily while pressure device 11 is installed therebetween in a position made clear by Figures 2 and 3. If reinforcing wire 30 is not properly shaped to hold pressure pads 37 and 47 centrally between the juxtaposed ridges, the device is removed and the legs of the U-shaped reinforcing member 30 are deformed by the fingers to the extent required whereupon the device is reinstalled between the impression plates.

The patient is then requested to close the jaws as bulb 13 is manipulated to pump inflating air into chamber 11. During inflation of chamber 11, the patient is requested to hold the jaws slightly open until the needle 60 of pressure gauge 12 starts to move away from its zero position toward a dial reading corresponding to the diastolic blood pressure of the patient. As soon as needle 60 starts to move, the dentist may cease pumping air into the chamber as the patient is requested to close to approximately the centric occlusal relationship of the maxilla and mandible. Both the dentist and the patient observe gauge needle 60 closely and the patient is instructed to cease closing the jaws when the needle settles on a specific reading corresponding to the predetermined diastolic vascular pressure of the patient. The patient is cautioned to maintain this specific reading, such as 80 for example, while coating 58 is taking a preliminary set. Assurance is thereby provided that the inflated chamber 11 will apply a uniformly distributed pressure against both impression trays 53 and 54 causing the fluent impression layer 58 to distribute itself in a manner conforming to the opposed surface areas of the mouth. After coating 58 has taken a set, the patient is instructed to relax the jaws permitting the dentist to remove the pressure device as well as impression tray 53, 54.

In Figure 7 there is illustrated a slightly modified embodiment of the pressure chamber only, this form being designated generally 11'. The parts similar to or identical with those in the first described embodiment are designated by the same reference characters but are distinguished by the addition of a prime. The principal difference resides in the fact that lower wall 18' of chamber 11' includes as an integral part of its bight portion a wide area boss 70 and two similar but smaller bosses 71, 71 located near the free ends of the leg portions thereof. The flat surfaces of these bosses lie in a common plane

and, as will be recognized, may be positioned against either a maxillary or a mandibular impression tray. Accordingly, it will be apparent that bosses 70 and 71 correspond to pads 37 and 47, respectively, of the first described embodiment, it being understood that these bosses 70 and 71 may be used along with bosses 37 and 47 carried by the reinforcing member, or the latter bosses may be omitted from the reinforcing member at the option of the dentist and to best suit the needs of particular conditions.

Referring to Figures 8 to 10, there is shown another and simplified embodiment of the physiologic denture and pressure device designated generally 10". The inflatable pressure chamber 11" is formed of two identical thin-walled flexible sheets of rubber, plastic or the like 17", 18" fused together along their opposed perimeter edges to form a U-shaped hollow chamber closed except at the cylindrical inlet 25", the latter being adapted to be detachably coupled to a coupling tube 40" and held assembled thereto, as by a spring keeper ring 60.

The one-piece deformable reinforcing wire 30" has its opposite ends seated in pockets formed between tabs 61 projecting laterally from the outer ends of the sheets 17", 18". It will be understood that the contacting rim edges of tabs 61 are sealed together to form pockets to seat the ends of the reinforcing wire 30", and that these pockets are sealed from the main chamber of the device.

The bight portion of reinforcing wire 30" is formed as shown in Figure 7 and preferably is anchored to chamber 11" as by soldering the wire to coupling tube 40" as is indicated at 62. Accordingly, when the inflatable chamber 11" is held assembled to coupling tube 40" by ring 60, the ends of the reinforcing wire 30" are held assembled in the seating pockets of tabs 61. However, when the snap ring 60 is removed, inflatable chamber 11" may be withdrawn from wire 30" and from coupling tube 40" simultaneously.

Owing to the shape of sheets 17 and 18, and the appreciably greater width of these sheets in the bight portion of the device, as is indicated by arrow 65, than across the leg portions of the device, as is indicated by arrow 66, chamber 11" is wedge-shaped as viewed from the side as is illustrated in Figure 9. In other words, the inflation is much more pronounced in the bight portion than in the two legs, with the result that, with the device properly positioned in the mouth, it is relatively thick in the incisor area and relatively thin opposite the area normally occupied by the molars. Although not so shown, it will be understood that a similar wedged chamber may be employed in the first described embodiment by making the bight portion of chamber 11 wider than the leg portions.

In use, device 10" is employed in substantially the same manner and for the same purposes as described above in connection with Figures 1 to 6, it being pointed out that sphygmometer tube 14 is connected to coupling 40" in order that chamber 11" may be inflated to the diastolic pressure of the patient when the maxillary and the mandible are properly positioned by the patient in their centric occlusal relation.

While the particular physiologic denture adapter apparatus herein shown and disclosed in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

I claim:

1. A physiologic denture impression device comprising a flexible walled closed tubular chamber of generally U-shaped configuration conforming generally to the occlusal area between the maxillary and the mandible of the human mouth and adapted to be positioned against at least one impression plate seated on one of the alveolar ridges of the mouth and to be maintained inflated at the

diastolic cardiovascular pressure characteristic of the patient while impression material on the flesh-contacting surfaces of said plates is taking a set, said chamber including bendable reinforcing extending therealong from points of attachment near the opposite ends of said U-shaped chamber, said reinforcing being readily deformable to adapt the chamber to fit properly the occlusal area of different patients and to retain a desired shape while said chamber is inflated at diastolic pressure.

2. A denture impression device as defined in claim 1 characterized in the provision of flexible tube means in communication at one end with said chamber and including means attached thereto for inflating said chamber to a desired fluid pressure corresponding to the observed diastolic pressure of a dental patient.

3. A denture impression device as defined in claim 2 characterized in the provision of anchorage means for anchoring said tube to said flexible walled chamber in a manner relieving the tubular connection to the chamber proper from strain.

4. A physiologic denture impression device comprising a U-shaped hollow chamber having soft flexible walls of non-porous material and adapted to be inflated with air under a pressure corresponding to the diastolic blood pressure of a patient undergoing fitting for a denture base plate, said flexible-walled chamber having an anchorage member firmly secured thereto along the outer edge of bight portion, said anchorage including a deformable reinforcing member secured thereto and including extensions along either leg of said U-shaped chamber, said deformable extensions being bendable to hold the legs of said chamber spaced apart different distances as necessary to conform to different alveolar shapes of different dental patients, and flexible tube means secured to said anchorage means and useful for inflating said chamber to a pressure corresponding to the diastolic vascular pressure of a particular dental patient.

5. A denture impression device as defined in claim 4 characterized in that said deformable reinforcing comprises soft bendable wire having its mid-length secured to said anchorage means and its opposite ends secured adjacent the end portions of said U-shaped chamber.

6. A denture impression device as defined in claim 4 characterized in the provision of a plurality of separable fastener means for detachably connecting said anchorage means and said deformable reinforcing to said flexible walled chamber.

7. A denture impression device for use in the fitting of dentures and adapted to maintain uniformly distributed pressure corresponding to the diastolic vascular pressure of the pressure applied to the mandible and maxillary alveolar ridges which device comprises a pair of U-shaped strips of thin-walled flexible material conforming generally to the shape of the alveolar ridges, means securing the adjacent edges of said superimposed strips together to form a fluid-tight hollow U-shaped chamber, tubular inflating means extending from said chamber for use in inflating the same to diastolic vascular pressure of a particular patient, and deformable reinforcing means generally coextensive with the legs and bight portion of said chamber and bendable to maintain the legs thereof suitably spaced to fit between the alveolar ridges of a particular patient.

8. A physiologic denture impression device as defined in claim 1 characterized in that the bight portion of said U-shaped chamber is wider than the leg portions thereof whereby, upon inflation, the walls of the bight portion bulge outwardly further than do the leg portions so that the inflated chamber is wedge-shaped.

9. An inflatable physiologic denture device comprising a closed chamber of generally U-configuration adapted to be inserted between the alveolar ridges of the mouth, said chamber being formed of upper and lower thin-walled flexible sheets bonded together along their periph-

eral edges and including a tubular inlet opening from the exterior rim of the bight portion, the exterior rim edges of the leg portions of the chamber being formed to seat the ends of a U-shaped bendable reinforcing member bordering the exterior rim of said chamber, and means for anchoring the midportion of said reinforcing member to the adjacent portion of said chamber.

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