METHOD AND MEANS FOR SIZING TOOTH CROWNS

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This invention relates to an improved method and means for sizing tooth crowns to reduce the size proportionally throughout the circumference of the crown and adapt a given crown to fit teeth of varying sizes.

It is the present practice to form tooth crowns and furnish them to dentists in sets, each set of which may number as many as two hundred separate crowns differing from each other in size and shape to correspond with the different types of teeth, such as, incisors, cuspids, bicuspids and molars, as well as the sizes of such teeth which may be encountered in the practice of dentistry.

The necessity for carrying such a considerable number of tooth crowns in stock by a dentist who uses only a small number of such crowns in the course of a year involves a considerable investment and is especially burdensome since a large proportion of such stock may never be used, but the failure to carry a complete set might well result in the omission of the particular size of crown which would be required. The necessity of carrying such a considerable number of tooth crowns in stock is due mainly to the fact that teeth of a similar type differ from each other very greatly in size, and that in order to provide a suitable crown for a particular tooth a formed crown which approximates very closely the size of the tooth must be provided since no adequate means exists at the present time for either increasing or decreasing to any considerable extent the size of a previously formed crown. It happens also, that teeth are occasionally found which cannot be fitted exactly even from a complete set of formed crowns, and while the difference in size between the tooth to be crowned and the crown most nearly approaching the tooth in size is comparatively slight, the manipulation of the crown by the usual manual means now employed for adapting it to the size of the tooth requires considerable time and a great deal of care in order to obtain a proper fit without injuring or destroying the crown.

One object of the present invention is to overcome the difficulties enumerated above and provide a simple and efficient means for quickly and easily adapting a formed crown to the required size for fitting a tooth to be crowned, thus rendering it unnecessary for a dentist employing this system to carry a great number of unusable crowns constantly in stock.

A further object of the invention is to provide a means for reducing tooth crowns which are adapted for use in connection with teeth of a certain type, such as incisors, cuspids, bicuspids, or molars or either of them, through a wide range of size differences without changing the characteristic shape of the crown.

Another object of the invention is to provide a simple, efficient and easily operated means for changing the size of formed tooth crowns either to a considerable degree or only slightly without the expenditure of a great deal of time and labor, as in the manual manipulation of the crowns, and in such a manner as to preserve the crown against injury or distortion.

A further object of the invention is the provision of a novel adapter member for reducing the size of the formed crown to the proper size to fit a tooth to be crowned.

Another object of the invention is to provide an improved mechanism for operating the adapter member manually and in such a manner that the formed crown will be reduced in size uniformly throughout its extent and its initial shape corresponding with that of the tooth to be crowned will be retained at all stages of the operation.

A further object of the invention is the provision of an improved method for manipulating formed tooth crowns to adapt them for teeth of varying size.

Referring to the drawing:

Fig. 1 is an elevational view of one form of my improved mechanism which is adapted for use in changing the size of tooth crowns to adapt them to fit teeth of different sizes.

Fig. 2 is a vertical sectional view of the mechanism shown in Fig. 1, illustrating the arrangement of the parts and the manner of operating the same as well as the position of a formed tooth crown as it is being reduced in size by the adapter member.
Fig. 3 is a perspective view of the adapter member employed in varying the size of formed tooth crowns, and, Fig. 4 is an elevational view of a formed tooth crown as it appears after having been reduced in size through operation of the adapter member.

In the embodiment of the invention illustrated herewith I have shown a manually operated crown sizing mechanism which comprises a casing 1 provided with a central bore 2 extending therethrough, that portion of the bore located adjacent to one end of the casing being internally beveled, as at 4, to give it a substantially conical shape. That portion 5 of the bore which is located adjacent to the conical portion 4 may be beveled slightly or may be of substantially uniform circular cross-section throughout its extent and is of somewhat smaller diameter than the conical portion. The conical portion 4 of the bore may be provided with a spline groove 6 for the reception of a spline 7, which may be carried by the adapter member or be formed as a separate element. That portion 8 of the bore which is located adjacent to the end of the casing 1 opposite to the conical portion 4 of the bore is of circular cross-section and of less diameter than the remaining portion of the bore, and forms an internal shoulder 9 for a purpose which will be more fully described hereinafter.

An operating member 10, the outer surface of which may be knurled, is provided with a hub 11 which may be formed integral therewith or firmly secured thereto, and which is internally threaded at 12, to receive the reduced threaded end portion 13 of a connecting member 16 which is provided with an external shoulder 17 adapted to seat firmly against the outer face of the hub 11 for rigidly securing the connecting member 16 to the operating member 10. The connecting member 16 is also provided with an intermediate portion 18 of circular cross-section and of suitable size to properly fit within the restricted portion 8 of the bore 2, and has an enlarged externally threaded end portion 19 forming an external shoulder 20 with the intermediate portion 18 which is adapted to engage the internal shoulder 9 of the casing. An adapter member 24 is provided which comprises a cylindrical base portion 25 internally threaded as at 26 to receive the enlarged externally threaded end portion 19 of the connecting member 16, and has a plurality of upstanding contractile arms 27 which are preferably formed integral with and extend from one end of the cylindrical portion 25 thereof. The contractile arms 27 may be reduced in size as at 28 to increase their resiliency or freedom of movement, and they are separated from each other by radial slots 29. The adapter member 24 is preferably formed from metal having a sufficient degree of resiliency to permit the movement of the arms towards and from each other radially to a sufficient extent to entirely close the slots 29 at points adjacent to the free end of the contractile arms. The outer surfaces of the contractile arm are so shaped as to provide a common frustro-conical external surface 30 substantially conforming with the conical portion 2 of the bore 2, and the external surface of one of the contractile arms may be provided with an external spline groove 31 upon the conical outer surface thereof to receive the spline member 7.

A common recess 32 is formed in the free ends of the contractile arms 27 at a point adjacent to the intersection of the radial slots 29, which recess has its internal surface shaped to conform with the external surface of a tooth crown such as is adapted for use upon one of the several general types of teeth, such as, for example, a bicuspid tooth. Indicating lines 34 may be applied to the outer inclined surface 35 of the casing 1, and a cooperating indicating line 38 may be suitably formed upon the outer surface of the hub portion 11 of the operating member 10 in such a manner as to cooperate with the indicating lines 34 in designating the degree of contraction imparted to the walls of the recess 32. Suitable and progressively arranged indicia 37 may be associated with the indicating lines 34 whereby the amount of contraction imparted to the contractile arms 27 may be indicated by the position of the indicating line 36 relative to the indicating lines 34, and the indicating lines 34 and indicia 37 associated therewith may be so arranged as to provide for a direct reading in mms or other desired units of measure, of the internal circumference of the recess 32, or such portion thereof as is intended to conform with that portion of the tooth crown which is to be located adjacent to the gum line of the tooth to be crowned.

The operating parts may be assembled by first inserting the connecting member 16 within the bore 2 of the casing 1 so that the external shoulder 20 of the connecting member 16 seats on the internal shoulder 9 of the casing and the threaded end 15 of the connecting member is then turned into the threaded opening 12 of the hub 11 until the shoulder 17 seats firmly and securely against the outer face of the hub member. The adapter member 24 may then be inserted in the conical end 4 of the bore 2 and the operating member rotated to thread the enlarged end of the connecting member 16 into the cylindrical portion 25 of the adapter member a sufficient distance to bring the outer conical surfaces of the contractile arms 27 into engagement with the conical portion 4 of the bore 2, the spline member 7 having previously been positioned in the cooperating spline grooves 8 and 31. In this position of the parts
the indicating line 36 carried by the hub 11 coincides with that indicating line 34 which is designated by zero if the indicating system employed is intended merely to register the degree of contraction of the contractile arms, or with the largest numeral upon the scale if the indicating system employed is one designed to provide a direct reading of the internal circumference of the recess 32 in mils or other suitable units. Upon turning the knurled operating member 10 the adapter member 24 will be drawn within the conical portion 4 of the bore 2 whereby the contractile arms 27 will be forced inwardly uniformly towards each other to reduce the diameter of the recess 32 by forcing the recess walls into closer engagement with each other through partially or wholly eliminating the slots 30 and drawing the ends of the contractile arms towards each other adjacent to the recess 32.

The contractile arms 27 are so formed that their maximum resiliency is at a point 28 adjacent to their junction with the cylindrical portion 25 of the adapter member, and that portion of each arm adjacent to the recess 32 is relatively thick and non-resilient. As a result the contractile arms 27 approach each other substantially uniformly throughout the entire portions of those arms which provide walls for the recess 32 whereby the circumference of the recess is reduced in size substantially uniformly throughout the entire depth of the recess thus contracting the formed crown substantially uniformly throughout its length.

As the operating member 10 is rotated the free ends of the contractile arms are gradually brought into close relation with each other whereby the wall portion of the tooth crown 40 is reduced uniformly throughout its extent without forming bends or folds in the thin metal of the crown wall. If it is desired to effect a considerable reduction in the size of the crown, the crown may first be annealed in order that the necessary reduction in size may be effected more readily and without any distortion of the crown wall, but where only a slight or relatively moderate reduction in the size of the crown is required it may be reduced without first annealing the crown.

The form of crown shown herein as being reduced in size through the means and by the method above set forth is of the class known as contoured crowns, they being each provided with a contour line 41 corresponding in position with the gum line of the tooth to be crowned, but the mechanism and method disclosed herein is equally applicable for use with any form of tooth crown.

While I have shown the adapter member 24 as provided with a frustro-conical outer surface for engagement with the conical portion 4 of the bore 2, and the adapter member 24 and casing 1 as held against relative rotation by means of a spline member 7 it is to be understood that the outer inclined surface of the adapter member and the internal inclined surface of the casing cooperating therewith may be of non-circular cross-section or that any other suitable means may be employed for preventing relative rotation of the adapter member 24 and casing 1.

While I have shown and described one form of operating mechanism and one manner of connecting the operating parts so as to render the adapter member actuable by the operating member, it is to be understood that various other actuating means may be employed and the operating parts may be associated together in a variety of ways without departing from the spirit and scope of my invention.

What I claim is:—

1. In a device of the character described, a casing provided with a conical bore, an adapter member fitting within the bore of said casing provided with an internally threaded cylindrical portion and comprising contractile arms provided with a common recess located entirely within said arms and shaped to conform with the exterior surface of a tooth crown, and a member rotatably mounted in said casing and having an externally threaded portion engaging the internally threaded portion of said adapter member to move the adapter member within said casing a sufficient distance to reduce the cross-sectional area of a tooth crown positioned within said recess to any desired extent within the limits of movement determined by the contractile arms.

2. In a device of the character described, a casing provided with a central bore having a portion thereof inclined radially, and a member fitting within the bore of said casing and having arms the outer surfaces of which are shaped to conform substantially with the radially inclined portion of the bore, said arms having segmental end portions and resilient portions, the segmental end portions being cut away centrally of the casing to form a common recess of inconstant variable cross-sectional area and having side and end walls shaped to conform with the side and end surfaces of one type of formed tooth crown, means for retaining said member against rotation relative to said casing, and means rotatably mounted in said casing for moving said member axially of said casing to actuate said arms for diminishing the cross-sectional area of a formed tooth crown located within the recess in said arms without injury to the end wall of a tooth crown.

3. In a device of the character described, a casing provided with a central bore having an inclined portion, an adapter member having an inclined portion fitting within the inclined portion of the bore and having contractile
arms provided with a common recess located within said arms and shaped to conform with the exterior surface of a tooth crown, means for holding said adapter member against rotation relative to said casing, an adapter operating member mounted for rotation relative to said casing, and means carried by said operating member and engaging a portion of said adapter member for imparting a uniform longitudinal movement to said adapter member relative to said casing proportioned to the degree of angular movement imparted to said operating member.

In a device of the character described, a casing provided with a central bore having an inclined portion, an adapter member having an inclined portion fitting within the inclined portion of the bore and having contractile arms provided with a common recess located within said arms and shaped to conform with the exterior surface of a tooth crown, means for holding said adapter member against rotation relative to said casing, means carried by said operating member and engaging a portion of the adapter member for imparting a uniform longitudinal movement to said adapter member relative to said casing proportioned to the degree of angular movement imparted to said operating member, and means carried by said casing and operating member respectively for indicating directly the inner circumference of the recess upon a predetermined line of cross-section in each adjusted position of the adapter member.

5. The method of reducing the size of formed tooth crowns without materially changing their external configuration which comprises, exerting substantially uniform pressure upon the outer longitudinal surface of the crown wall throughout substantially its entire extent to contract the wall uniformly while supporting the end wall of the crown externally.

6. The method of reducing the size of formed tooth crowns which comprises, forcing the side walls of said crown inwardly radially to a uniform extent throughout substantially their entire area while supporting the closed end portion of the crown externally.

7. The method of reducing the size of a tooth crown which comprises, forcing the side walls of the crown inwardly substantially uniformly throughout their extent through the application of uniform pressure exerted substantially equally upon all portions of the side walls while supporting the end wall of the crown externally to reduce uniformly the circumference of the crown to any desired extent.

8. The method of reducing the cross-sectional area of a tooth crown which comprises, forcing the side walls of the tooth crown inwardly uniformly throughout substantially