April 5, 1955 J. D. BERKE 2,705,367

ORTHODONTIC APPLIANCE

Filed Jan. 18, 1954

FIG. 1.

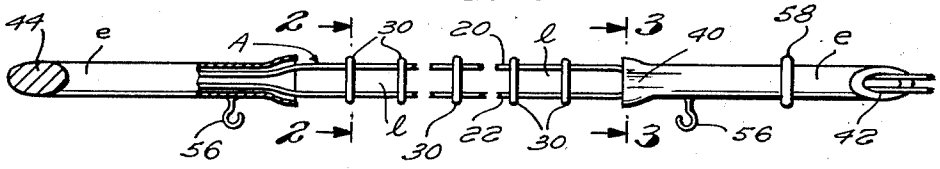


FIG. 7.

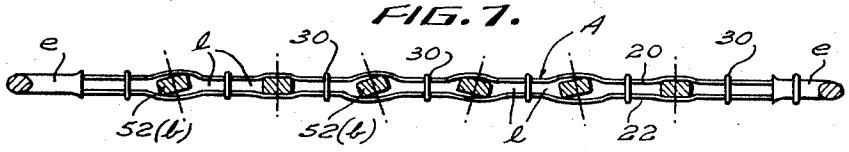


FIG. 5.

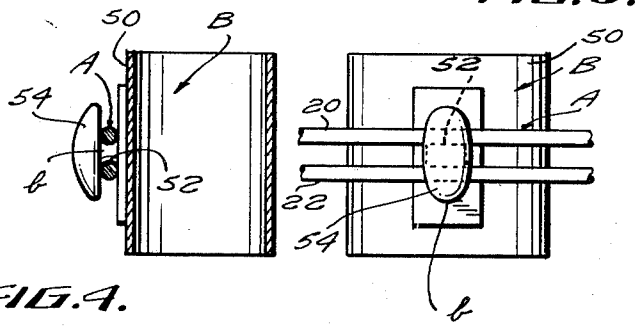


FIG. 4.

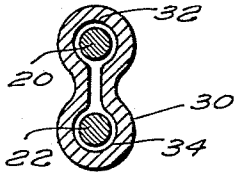


FIG. 2.

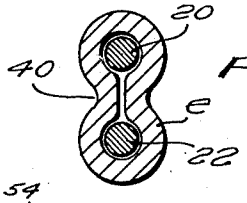
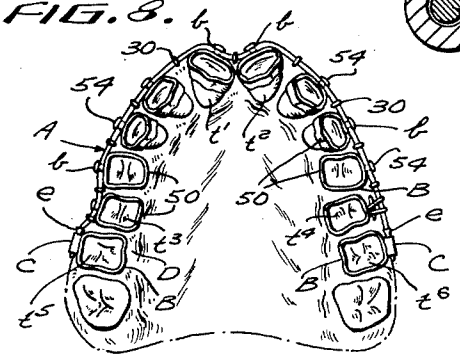


FIG. 3.

FIG. 8.



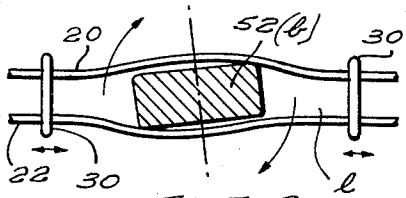


FIG. 6.

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ORTHODONTIC APPLIANCE

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5 Claims. (Cl. 32—14)

This invention relates to an orthodontic appliance employed in the art or technique of orthodontia.

The prime object of my present invention centers about the provision of improvements in the orthodontic appliance invention set forth in my Patent No. 2,406,527, patented August 27, 1946.

In my said patent there is disclosed for practicing an improved orthodontia technique an orthodontic appliance comprising in combination, button brackets attachable to the teeth of a denture requiring correction, and a resilient and flexible arch wire comprising two transversely spaced resilient and flexible wire strands united at longitudinally spaced intervals to form connected, resilient and flexible loop members which loop members are individually adapted to co-act with the button brackets to apply the corrective forces to the teeth of the denture. In this orthodontic appliance the button brackets are each mounted on a band which is attachable to a tooth requiring correction, the button bracket having a button shank and a head, and the construction of the arch wire is such that the resilient and flexible loop members formed therein are each receivable by the button of a bracket, the loop member expanding as it is slipped over the head of the button and contracting itself into engagement with the shank of the button, the said loop member thereby flexibly and resiliently acting on the button bracket to apply the individual corrective forces to the tooth.

As disclosed in said patent, the orthodontic appliance constructed and designed in this manner accomplishes generically the following results and advantages:

1. The arch wire is directly mountable on and receivable by the bracket, without prebending or distortion or any other adjustment and without the use of ligature wires or other locking or connecting means;

2. The forces come into play by the relationship automatically assumed between the arch wire and the bracket by dint of their structure; and these forces that become applicable are substantially correct, both directionally and magnitudinally, for producing the desired corrective movement or movements of the teeth; and

3. The forces vary in the right directions and in the right magnitudes as the corrective movements take place in the use or wearing of the appliance, whereby self-adjustment takes place.

These results and advantages are secured in the improved orthodontic appliance of the present invention, in addition to which, the appliance is so modified in design and structure as to permit various kinds of readjustments to be made with the same appliance as corrective movements of the teeth take place. In this improved orthodontic appliance: (*a*) the wire strands of the arch wire are united at longitudinally spaced intervals by links which, while maintaining the transverse spacing of the wire strands, are movable longitudinally along the wire strands, for adjustment to meet and solve various changing conditions which are met with in the application of the technique involved, and (*b*) the arch wire is provided with end members for attachment to the opposite ends of the wire strands, at least one, and preferably both, of these end members being constructed so that they are receivable by the wire strand for longitudinal adjustment thereon and facile attachment thereto.

With the provision of these structural modifications, the following added prime advantages and results are obtained:

1. The same arch may be reused and it becomes unnecessary to change to or supply a new arch as to the corrective movements in the denture exhibit a stepped progress;

2. Greater ease by link adjustments is afforded in engaging the arch wire loops with the button brackets;

3. The loops may be varied in size initially or from time to time to regulate the corrective pressures applied to the individual teeth, and

4. The overall length of the same arch wire together with its varying application to a progressively corrected denture may be changed from time to time by adjustment of the uniting links and the end members.

To the accomplishment of the foregoing objects and such other objects as may hereinafter appear, my invention relates to the improved orthodontic appliance as sought to be defined in the appended claims and as described in the following specification taken together with the accompanying drawing, in which:

Fig. 1 is a vertical elevational view of the improved orthodontic appliance in a condition ready for its use application;

Fig. 2 is a view of the appliance on an enlarged scale and taken in cross-section in the plane of the line **2—2** of Fig. 1;

Fig. 3 is a view of the appliance also shown on an enlarged scale, and taken in cross-section in the plane of the line **3—3** of Fig. 1;

Fig. 4 is a side elevational view with parts in section, showing the interrelation between a tooth-attachable band and bracket and a component part or segment of the arch wire of the appliance of Fig. 1;

Fig. 5 is a front elevational view of the part shown in Fig. 4;

Fig. 6 is a schematic view illustrating the relationship between a loop of the arch wire and its mating part of the button bracket for effecting a corrective situation of the tooth;

Fig. 7 is a schematic view drawn to a reduced scale showing the application or use of the arch wire as a whole; and

Fig. 8 is a plan view of a denture showing the improved orthodontic appliance of the present invention applied thereto for applying a number of types of corrections.

Referring now more in detail to the drawings, and having reference first to Figs. 1 to 5 thereof, the improved orthodontic appliance of the present invention comprises a resilient, flexible arch wire generally designated as A, embodying a construction as shown in Figs. 1 to 3 of the drawings for use with a plurality of button brackets such as the bracket generally designated as B, which brackets are attachable to the teeth of a denture requiring correction, the said arch wire A and the button brackets B being designed to cooperate or become inter-related as schematically shown in Figs. 4 to 7 of the drawings, and as exemplified by the denture application as shown in Fig. 8 of the drawings in the practice of the involved orthodontic technique.

The arch wire A of the improved construction comprises two transversely spaced resilient and flexible wire strands **20** and **22**, and means uniting the wire strands at longitudinally spaced intervals, said uniting means comprising links **30**, **30** spaced along the length of the wire strands and movable thereon for adjustment longitudinally of the wire strands, the said links together with the wire strands forming a plurality or series of connected, resilient and flexible loop members *l*, *l*, variable in size or dimensions due to the longitudinal adjustments of the links **30**, **30**. The uniting link members **30** preferably comprise apertured members, each link being formed with the spaced apertures **32** and **34**, the said apertures being freely received by the spaced wire strands **20** and **22**, as best shown in Fig. 2 of the drawings, the said links thereby maintaining the transverse spacing of said wire strands and being at the same time movable for adjustment longitudinally of the wire strands. These link members may be conveniently made from tubing pressed into the form shown in Fig. 2 of the drawings.

The arch wire is further provided with the end members *e*, *e* for attachment to the opposite ends of the wire strands, at least one or both of said end members being receivable by the wire strands as best illustrated in Fig.

1 of the drawings for longitudinal adjustment with reference to, as well as for attachment to, the wire strands in a manner to be detained hereinafter. For this purpose each of the end members may simply comprise a tubular element having its inner end contracted as at **40** for holding the wire strands **20** and **22** in transversely spaced relation, as best shown in Fig. 1 of the drawings and having its outer end bevelled or skived as at **42**, this structure permitting the desired adjustments of the end members *e*, *e* with reference to the wire strands for attachment thereto as by soldering or welding, as indicated at **44** for the left end member (Fig. 1).

Referring now to Figs. 4 and 5 of the drawings which show a unit segment or component part of the orthodontic appliance, the button bracket B is shown to comprise a tooth band **50** bearing an attachment in the form of a button *b*. The button *b* comprises a shank **52** and a head **54**. The shank elements **52** of the buttons *b* and the formed loop elements *l*, *l* are elongated and preferably in the horizontal direction, as clearly shown in Fig. 6 of the drawings. With this construction a loop member *l*, when slipped over the head **54** of a button *b* distends or expands, and then contracts itself into engagement with the button shank *b* (**52**), as shown in Figs. 4 to 7 of the drawings, the normal configuration of the loop *l*, the resiliency of the strands thereof and the anchorage of the strands at the links **30**, **30**, all contributing to cause the loop member *l* and particularly the strands thereof to come into tensioning engagement with the opposite sides of the button shank *b* (**52**), as well as with the button head **54**, to apply all of the desired corrective forces, as will also be further described more in detail hereinafter.

In Fig. 8 of the drawings, I show the arch wire A applied to a denture D and to a number of band brackets B, B mounted on various teeth of the denture. In this figure I illustrate a number of different types of teeth dislodgements requiring different characters of correction. Thus, the central incisors t' and t^2 are shown as requiring an uprighting correction for a mesial inclination and also a rotative movement for axis orientation. The second bicuspid, left, t^3 is shown as requiring a bodily movement to arch aligning position and the second bicuspid, right, t^4 is shown requiring a similar correction but one of larger degree. The application of the principles of the invention to the production of these different corrections will, it is believed, exemplify the basic principles of operation of the present construction. In Fig. 8 the arch wire A is also shown anchored on the first molars t^5 and t^6 by means of the usual anchor clamps C, C.

The manner of assembling the elements of the arch wire A for application to a given denture further exemplifies the inter-relation of the described parts and particularly the wire strands, the longitudinally adjustable links **30**, **30** and the attachment of the end members *e*, *e*. Two lengths of the wire strands **20**, **22** (which preferably are .010" hard stainless steel wires) are cut to measure from second molar to second molar on the buccal aspect. These wire strands are first threaded through one end piece *e* (e. g., left hand end piece shown in Fig. 1). Several millimeters of the wire strands are permitted to project distally. They are then welded at the bevel of the end piece *e* and the latter is rounded to prevent tissue irritation. Five or more links **30**, **30** are passed over the free end of the wire strands **20**, **22**; and then the wire ends are passed through the other end member *e*. This latter end member is slid mesially or distally to the desired length and the arch wire is tried in the mouth. The wire ends extending through the end opening **42** of the other end member *e* are then welded at the distal bevel (**42**) and ground smooth. The completed arch is now placed in the molar buccal tubes *c*, *c*, as illustrated in Fig. 8 of the drawings; and the loops *l*, *l* are then applied to the individual teeth requiring correction in a manner individually dictated by each individual case.

The procedure of securing the arch and its loop elements depends on the individual case. Usually the third link is placed between the central incisors. The arch is snapped over one central. The next link is moved mesially towards the distal of the engaged bracket. The other central is similarly engaged. The laterals and cuspids are attached to the arch in the same order and manner. On completion, the links **30**, **30** are adjusted to points generally corresponding to the inter-dental spacing. In most instances there is no link corresponding to the cuspid-bicuspid contact. The mesial of the end piece completes the sectional unit.

Each anterior tooth is now positively but gently engaged in the arch wire. Each segment (loop) of the arch wire has individual actions and general directional forces related to the other segments. The intensity of the forces are dependent on: (1) the mesio-distal width of the segment (which can be varied by regulating the placement of the links), (2) the malposition of the individual teeth, (3) the angulation and width of the bracket (which can be varied), (4) the location of the bracket on the tooth, and (5) arch length. The horizontal and vertical distortion in engaging the teeth is cushioned by each unit.

For intermaxillary attachments hooks **56**, **56** attached to the end members *e*, *e* near the mesial ends thereof may be employed, these intermaxillary hooks being soldered or welded to the end members. The molar buccal tubes *c*, *c* are also preferably soldered or welded to the molar attachable bands B, B. A stop element such as **58** is welded to one of the end members *e*, mesial to the molar buccal tube.

The provision of the adjustable links **30**, **30** and the tubular adjustable end members *e*, *e* enable a variety of adjustments to be made to meet and solve many different situations which are met with in applying the orthodontic technique; and a number of such different situations may be described, as illustrative thereof.

The number and position of the banded teeth and the corresponding segments of the arch vary with the case. Molar anchorage is generally used. Most malocclusions can be treated by banding the six anterior teeth. Other teeth are banded or ligated to the arc A, as necessary. The bands are measured and adapted in the mouth. Molar bands are placed in the usual manner. Buccal tubes are soldered in proper position. Lingual tubes are soldered or welded when necessary. Other bands are placed with the buttons *b*, *b* at the centers of the crowns. This position may be slightly altered with the individual arch and tooth formation. In a dentition having long flat anterior crowns, the bands and buttons are placed more gingivally. The length of the arch thus depends on the number of banded teeth. When only the anteriors bear the button brackets, the end pieces are measured from the middle of the first bicuspid, extending approximately 2 mm. distal to the molar tube.

Sections of molar tubing or coil spring can be added distal to the stop. These are not welded, so that the length of the arch can be easily altered. Where the dental arch is to be contracted, the molar stop is placed proportionately mesial to the molar tube. Sections are placed on the end member to approach contact with the molar buccal tube. These are cut smaller as the length of the arch is reduced. This technique avoids excessive movement of teeth, especially when using intramaxillary and intermaxillary elastics. In increasing the arch length, the sections added should not cause marked distortion of the seated arch. If the posterior teeth are badly distorted, the end members *e*, *e* are bent to conform until space is created, or correction initiated.

In some instances, it is necessary to alter arch construction to decrease or increase torque action. Such variation is accomplished by increasing (or decreasing) the length of one of the arch wires. The resultant arch will be slightly curved. This may be advisable where there is a marked labial inclination of the incisors.

When there is very large inter-dental spacing, more than one link may be used between teeth and the necessary link adjustments made. This will make the arch more secure and will increase corrective pressures on the button bracket by decreasing the length of the arch segment. Hooks may be soldered to the links to permit attachment of intermaxillary elastics, this being very effective in open-bite cases. In such cases the links are adjustably placed on the wire strands with the hook towards the occlusal plane.

The structure, use and operation of the orthodontic appliance of my present improvement and the numerous facilities in the orthodontic technique enabled to be practiced therewith, only a few of which have been indicated by the above, will be understood from the above detailed description. It will be further understood that changes may be made in the described construction without de-

parting from the spirit of the invention defined in the following claims.

I claim:

1. An orthodontic arch wire, for use with a plurality of button brackets attachable to the teeth of a denture requiring correction, comprising two transversely spaced resilient and flexible wire strands and means uniting the wire strands at longitudinally spaced intervals to form connected, resilient and flexible loop members, said loop members being individually adapted to co-act with the button brackets to apply the corrective forces to the teeth of the denture, said uniting means comprising links spaced along the length of the wire strands and movable thereon for adjustment longitudinally of the wire strands.

2. An orthodontic arch wire, for use with a plurality of button brackets attachable to the teeth of a denture requiring correction, comprising two transversely spaced resilient and flexible wire strands and means uniting the wire strands at longitudinally spaced intervals to form connected, resilient and flexible loop members, said loop members being individually adapted to co-act with the button brackets to apply the corrective forces to the teeth of the denture, said uniting means comprising apertured links spaced along the length of the wire strands and the apertures of which are freely received by the wire strands, said links thereby maintaining the transverse spacing of said wire strands and being movable for adjustment longitudinally of the wire strands.

3. An orthodontic arch wire, for use with a plurality of button brackets attachable to the teeth of a denture requiring correction, comprising two transversely spaced resilient and flexible wire strands, means uniting the wire strands at longitudinally spaced intervals to form connected, resilient and flexible loop members, said loop members being individually adapted to co-act with the button brackets to apply the corrective forces to the teeth of the denture, said uniting means comprising links spaced along the length of the wire strands and movable thereon for adjustment longitudinally of the wire strands, and end members for attachment to the opposite ends of the wire strands, at least one of said end members being receivable by said wire strands for longitudinal adjustment thereon.

4. In the orthodontic arch wire of claim 2, end members for attachment to the opposite ends of the wire strands, at least one of said end members being receivable by said wire strands for longitudinal adjustment thereon.

5. An orthodontic arch wire, for use with a plurality of button brackets attachable to the teeth of a denture requiring correction, comprising two transversely spaced resilient and flexible wire strands and means uniting the wire strands at longitudinally spaced intervals to form connected, resilient and flexible loop members, said loop members being individually adapted to co-act with the button brackets to apply the corrective forces to the teeth of the denture, said uniting means comprising apertured links spaced along the length of the wire strands and the apertures of which are freely received by the wire strands, said links thereby maintaining the transverse spacing of said wire strands and being movable for adjustment longitudinally of the wire strands, and tubular end members for attachment to the opposite ends of the wire strands, said tubular end members being receivably by and being longitudinally movable on said wire strands for adjustment and attachment.

No references cited.