April 9, 1940. S. R. ATKINSON 2,196,515

ORTHODONTIC APPLIANCE AND METHOD OF PRODUCING THE SAME

Filed Nov. 24, 1937

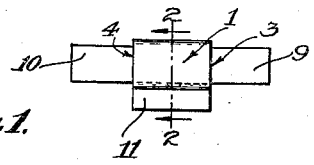


Fig. 1.

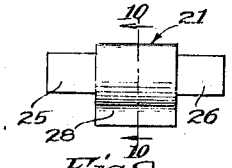


Fig. 9.

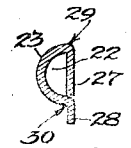


Fig. 10.

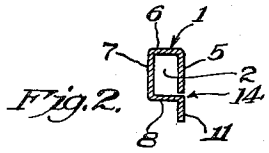


Fig. 2.

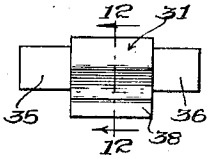


Fig. 11.



Fig. 12.

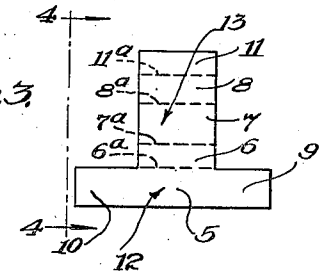


Fig. 3.

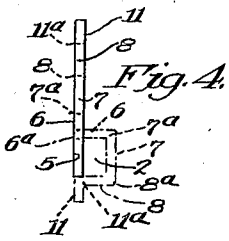


Fig. 4.

Fig. 5.

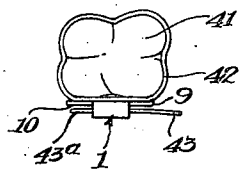


Fig. 7.

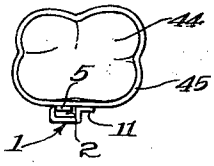


Fig. 6.

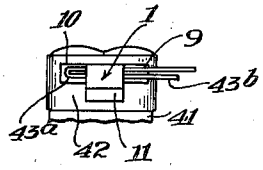
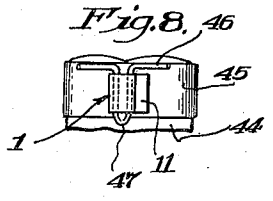


Fig. 8.



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Patented Apr. 9, 1940 2,196,515

UNITED STATES PATENT OFFICE

2,196,515

ORTHODONTIC APPLIANCE AND METHOD OF PRODUCING THE SAME

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Application November 24, 1937, Serial No. 176,315

4 Claims. (Cl. 32—14)

This invention relates to orthodontic appliances and pertains more particularly to a device adapted for attachment to a tooth band to provide an anchorage or means of attachment for a wire or other like member used in orthodontic treatment, and to an advantageous method of producing such a device.

The appliance of this invention, while useful for attachment to tooth bands in general, is primarily adapted for attachment on the lingual side of a molar tooth band, for engagement with a lingual wire, and when so employed is known as a single channel lingual molar sleeve.

The appliance of this invention is constructed to provide a single channel which may be alined either horizontally or vertically or at any other angle on a tooth band. When alined horizontally it is preferably used so that an arch wire may be passed through it on the lingual side of the tooth band and the channel is preferably of sufficient width to permit a wire to be bent back on itself and the doubled wire to be passed through the channel. When the bracket is arranged vertically it may be used as a base to hold a lingual wire which has been bent back on itself and passed through the channel in a U-shape to provide a point of anchorage or attachment for the lingual wire. In general, the device may be used to provide a means of attachment or anchorage for any suitable orthodontic device.

The single channel lingual molar sleeve of this invention presents a marked advantage in that it is fabricated from a single piece of thin metal and may be formed into the required shape with a minimum of simple bending operations.

The appliance of this invention also presents a further advantage in that the wires or other means attached thereto are always spaced from the tooth band by the thickness of metal used in the appliance.

A tooth band is necessarily made of relatively thin and soft metal so that it may be bent easily to conform to the shape of a tooth. Such bands are easily strained when stresses are imparted thereto. Thus, if the arch wires, which present a relatively small bearing surface, directly contact the bands, distortion of the band is liable to occur. This distortion is liable to break the cement bond between the band and tooth and promote tooth decay, and may also cause undue localized pressure on the tooth.

It is a particular and important object of this invention to provide an orthodontic appliance having a wire-receiving channel in the form of a sleeve which is provided with a "floor" or rear wall which is positioned between the arch wire and the tooth band, and which is formed of sufficiently rigid metal to resist deformation or distortion by pressure of the wire against it. This floor or rear wall distributes the stresses produced by the arch wire over a large area of the tooth band and minimizes strains.

An important object of the invention is to provide an appliance which may be bent to conform to the shape of a tooth band so as to distribute the load or stress imparted by the appliance over a large area of the tooth band and which may be readily attached to said band.

Another object of the invention is to provide an appliance having tab members which may be easily attached to a tooth band by spot welding.

A further object of the invention is to provide an appliance which when mounted in the preferred manner on a tooth band is provided with three mounting tabs of extended area which are separated from one another in such manner as to provide a high resistance to both vertical and horizontal loads.

Further objects and advantages of the invention will be brought out more specifically in the following description or will be apparent therefrom.

The appliance of this invention comprises in general a single piece of sheet metal formed to provide a longitudinally extending wire-receiving passage which is open at its ends to permit the passage of a wire or the like therethrough, a portion of said metal providing a rear wall of said channel, which is adapted to lie against and be secured to a tooth band. The walls of said channel are preferably formed to completely surround the sides of said channel so as to limit relative transverse movement of the wire or other member with respect to the appliance, and one or more mounting tabs are provided which extend beyond the position of the portions defining the channel and which are joined to such portions at positions adjacent the corresponding edges of the rear wall.

In a preferred embodiment, the device is provided with three mounting tabs, one at each end formed as a continuation of the rear wall of the channel beyond the ends thereof, and another formed as a continuation of the channel-enclosing wall means and extending transversely to the length of the channel. The three tabs are preferably formed to lie substantially in a common plane, although it is desirable to form the

device from sheet metal so that the tabs may be bent to conform to the curved surface of a tooth band. Thus when the device is mounted on a tooth band, the tabs are not strictly in a common plane, nor is the surface of any one of the tabs necessarily strictly planar. It will then be understood when the tabs are defined as having plane surfaces or as lying in planes, in the description and claims, that such a definition is broad enough to include any reasonable curvature which may be imparted to these tabs either during or after fabrication to make them conform to the surface of a tooth band.

The sheet metal from which the appliance is fabricated is relatively thin, from a practical standpoint, and tough, and bendable, so that it may be bent into the desired form. At the same time the metal is relatively thick and rigid as compared to the metal used in the tooth band, which is ordinarily formed of very thin soft metal. Thus the tooth band may be fabricated from soft stainless steel of 0.006 inch thickness while the appliance of this invention may be fabricated from hard stainless steel of 0.012 inch thickness which becomes harder during the bending operations. It will be seen then that the relatively rigid appliance provides a rigid support for the arch wire and provides for a better control of the stresses imparted by an arch wire. It is believed apparent that other metals may be used for the bands and appliances, such as gold-platinum alloys, and appliances of this invention are not limited to any particular metal.

I have illustrated my invention in the accompanying drawing, and referring thereto:

Fig. 1 is a side elevation of an appliance according to my invention;

Fig. 2 is a vertical section thereof taken on line 2—2 in Fig. 1;

Fig. 3 is a plan view of the blank used to form the appliance of this invention;

Fig. 4 is a side elevation taken on line 4—4 in Fig. 3, illustrating the method of bending the same to form the completed appliance;

Fig. 5 is a top view of an appliance of this invention with its channel extending horizontally, mounted on the lingual side of a tooth band encircling a lower molar tooth;

Fig. 6 is a side elevation thereof;

Fig. 7 is a view corresponding to Fig. 5 in which the channel is alined vertically;

Fig. 8 is a side elevation thereof;

Fig. 9 is a side elevation of a modified form of the device;

Fig. 10 is a sectional view thereof taken on line 10—10 in Fig. 9;

Fig. 11 is a side elevation of another modified form of the device; and

Fig. 12 is a sectional view thereof taken on line 12—12 in Fig. 11.

Referring to Figs. 1 and 2, the appliance of this invention is indicated generally at 1 and comprises a relatively thin sheet metal blank formed to provide a longitudinally extending wire-receiving passage 2 which is open at its ends as indicated at 3 and 4 to allow the passage of a wire or other comparable orthodontic appliance therethrough, and whose sides are completely enclosed by rear wall 5, front wall 7, and transverse walls 6 and 8. The walls 5, 6, 7, and 8 of said channel or passage are preferably formed to completely surround the sides thereof so as to limit the relative transverse movement of the wire or other appliance with respect to the device. The relative dimensions of the wire-receiving channel may be varied over rather wide limits according to the use of the device. Thus, if the device is used with a doubled-back wire, the height of the channel (distance between walls 6 and 8) would be approximately twice the width (distance between walls 5 and 7). If the device is used with a single wire the height may be approximately equal to the width.

In a preferred embodiment of the device as shown in Figs. 1 and 2, three mounting tabs are provided. One tab is provided at each end of the channel 2, a tab 9 adjacent the end 3 and a tab 10 adjacent the end 4. The tabs 9 and 10 are conveniently formed as a continuation of the rear wall 5 in a longitudinal direction beyond the ends 3 and 4 of the channel 2. A third tab indicated at 11 is shown as extending transversely to the length of the channel 2 and is formed as a continuation of the bottom transverse wall 8 which is bent parallel to the rear wall 5. The three tabs are preferably formed to lie in a common plane which is the plane of the rear wall 5. However, it is an important feature of this invention to form this appliance from sheet metal so that these tabs may be bent to conform to the curved surface of a tooth band.

The method of forming appliances according to this invention is illustrated in Figs. 3 and 4, and referring particularly to Fig. 3, a relatively thin sheet metal blank is shown as comprising a relatively narrow, longitudinally extending portion indicated generally at 12 which forms the rear wall portion 5 and the tabs 9 and 10 of the completed appliance shown in Figs. 1 and 2. The blank also comprises a portion 13 extending laterally and centrally from the portion 12 which comprises the material necessary for the top and bottom transverse walls 6 and 8, the front wall 7 and the mounting tab 11. The two portions 12 and 13 are preferably substantially rectangular in shape. The length of the portion 12 determines the total longitudinal extent of the appliance and the width of this portion controls the width of the channel portion 2 since the rear wall 5 thereof is equal in width to the portion 12. The width of the member 13 in the direction of the greatest length of the member 12 determines the longitudinal extent of the channel 2, and the transverse length of the member 13 determines the cross-sectional size of the channel and the transverse extent of the tab 11.

A blank such as above described may be subjected to any suitable mechanical or manual forming operations to form the same to the shape shown in Figs. 1 and 2. For example, assuming that a blank of the general shape shown in Fig. 3 has been formed from sheet metal as by cutting, stamping, or the like, the transversely extending portion 13 may then be bent forwardly along the dotted line 6*a*, then bent in the same direction along the dotted line 7*a* to form the top wall 6 shown in Fig. 2, and then again bent in the same direction along the dotted line 8*a* to form the front wall 7; the portion 13 is then bent in the opposite direction to the other bends along the line 11*a* to form the bottom wall 8 and the transversely extending mounting tab 11. It will be seen that the bottom transverse wall 8 extends to a position adjacent the edge of the rear wall 5 opposite the edge thereof to which the top transverse wall 6 is joined, and that the tab 11 is secured to the wall 8 at said position and extends away from the rear wall and substantially in the plane thereof. The dotted lines along which the bends are made are indicated in

the view of the blank in Fig. 3 and the portions included between the dotted lines are numbered to correspond to the various portions of the finished appliance shown in Figs. 1 and 2. Dotted lines along which the bends are made are also indicated in the full line portion of Fig. 4 and in the dot-dash portion thereof which indicates the bends required to form the finished appliance from the flat blank.

It will be noted from an inspection of Figs. 1 to 4 that the finished device may be derived from a flat blank by a small number of simple bending operations. The bends are preferably made at right angles and three of the bends are made in the same direction, while the fourth bend is made in a direction opposite to the other bends. The bending or forming operations may be performed manually with suitable instruments such as pliers or hand-operated dies or they may be performed automatically with suitable dies, as will be apparent to those skilled in the art. Thus the appliance of this invention lends itself to production procedures whereby a ribbon of sheet metal may be fed into a die machine which stamps the blanks indicated in Fig. 3 and performs the necessary forming operations automatically.

The walls of the channel are preferably formed so as to completely surround the channel **2**, and the clearance indicated at **14** in Fig. 2 between the wall **8** and the wall **5** is preferably kept at a minimum to prevent the wire carried in the channel **2** from entering this clearance space and contacting the tooth band.

It will be appreciated that the cross-section of the channel **2** shown in Figs. 1 through 4 is not necessarily rectangular and that the wall portions (such as 6, 7, and 8 in the above-described form) which cooperate with the rear wall **5** to form the channel need not be formed by right angle bends. Examples of other cross-sections which may be utilized are shown in Figs. 9 through 12. Referring to Figs. 9 and 10, an appliance is indicated generally at **21** and is shown as comprising a channel **22** extending longitudinally thereof and having side and front wall portions formed as a curved surface as indicated at **23** and spaced from the rear wall **27** intermediate the edges thereof. As in the previously described embodiment of the device, mounting tabs are provided which extend beyond the positions of the portions defining the channel. Thus mounting tabs **25** and **26** are formed as a continuation of the rear wall **27** of the channel **22** in a longitudinal direction beyond the ends thereof, and a third tab indicated at **28** is formed as a continuation of the wall portions **23** of the channel and extends transversely to the direction of extent of the channel **22** and lies substantially in the plane of the tabs **25** and **26**.

The appliance above described may also be formed from the blank shown in Fig. 3, the portions **25**, **26**, and **27** thereof being formed from the portion **12** of the blank and the curved wall indicated at **23**, and the tab **28** may be formed from the portion **13** of the blank. The appliance could be formed by bending the blank along a line indicated at **29**, which corresponds to the line **6***a* in Fig. 3, and then bending in a plurality of positions to form the curved wall portions **23**, all the bends thus far described being in a single direction. The blank would then be bent at the position indicated by **30**, which corresponds to the line **11***a* in Fig. 3, in a direction opposite to the above-mentioned bends to form the tab **28**.

Referring to Figs. 11 and 12, an appliance is indicated generally at **31** and is shown as comprising a longitudinally extending channel **32** of substantially triangular cross-section. This appliance may be formed in exactly the same manner as the appliance shown in Figs. 1 and 2 with the exception that one of the bending operations may be omitted, the channel having three walls instead of four. The longitudinally extending mounting tabs at each end of the channel **32** are indicated at **35** and **36**, and the transversely extending mounting tab is indicated at **38**.

Referring to Figs. 5 and 6, a tooth is indicated at **41** and is encircled by a tooth band **42** to which is attached an appliance **1** as shown in Figs. 1 through 4. The appliance of this invention is preferably intended for use on bands which encircle molar teeth and is generally used for attachment to the lingual side of such bands, although it may be used at various positions on a tooth band and at any required angle to a tooth, according to the particular orthodontic problem to be solved. A wire indicated at **43**, such as a lingual arch wire, is shown passing through the channel **2** of the appliance **1**. The wire **43** is shown bent back on itself at **43***a* so as to pass back through the channel or sleeve as shown at **43***b*. In some applications of the device, however, the wire **43** may pass only once through the channel or passage **2**. The longitudinally extending mounting tabs **9** and **10** are in engagement with the tooth band **42**. These tabs may be bent to conform to the shape of the tooth band and may be secured thereto by spot welding or soldering or by other suitable means. The tab **11** is also secured to the band **42** at a position below the wire **43**, this tab being fastened to the tooth band in the same manner as the tabs **9** and **10**. It will be seen that the walls of the channel completely surround the sides of the channel so as to limit the relative transverse movement of the wire **43** with respect to the bracket and that the wire **43** is separated from the tooth band **42** by the rear wall **5** of the appliance **1**.

It will also be seen that the three tabs **9**, **10**, and **11** provide extended mounting areas which distribute the stresses produced by the wire **43** over a wide area of the tooth band **42** and that these three tabs are separated from one another in such a manner as to provide a high resistance to both vertical and horizontal loads which may be imparted by the wire **43**. The tab **11** which is formed as a bent extension of the bottom wall **8** of the channel, serves particularly to tie said bottom wall to the tooth band. Thus the tab **11** when connected to the tooth band serves not only to anchor the appliance to the band but also serves to strengthen the appliance by preventing separation of the front and rear walls when stresses are applied thereto by a wire. The wire **43** is also spaced from the band **42** by the thickness of the metal in the bracket **1** so that if the bracket is mounted on a tooth band in such a manner that the wire **43** tends to produce forces in a direction toward the tooth band the load produced by such wire will be distributed along the length of the back wall **5** and the mounting tabs **9** and **10**. This will prevent a centralization of the load which is liable to cause undue stresses on the tooth **41** and pain to the wearer.

In Figs. 7 and 8 I have shown a molar tooth **44** surrounded by a tooth band **45** to which is attached an appliance **1**. In this instance the longitudinally extending, wire-receiving channel thereof extends vertically and the mounting tabs **9** and **10** have been omitted. It will be simpler

to take a bracket as shown in Fig. 1 and clip off the mounting tabs 9 and 10 to adapt this bracket to vertical mounting on a tooth band, than to supply two or more types of brackets. It is appreciated that it will not always be necessary to clip off all of the mounting tabs 9 and 10 but that portions thereof may be clipped off to fit a particular situation. In this instance the bracket 1 is secured to the tooth band 45 through the mounting tab 11 which may be soldered or spot welded to the band. It will also be appreciated that the bottom wall 5 also may be secured to the tooth band 45 by spot welding, soldering, or brazing. This is usually done even in the cases when the mounting tabs 9 and 10 are employed. The back wall 5 may be spot welded to a tooth band by placing one welding electrode within the band at a position opposite the rear wall 5 and placing the other welding electrode against the outside of the front wall 7.

A wire has been shown at 46 in Fig. 8 and has been omitted in Fig. 7 for the purpose of clarity. The wire 46 has been bent back on itself in a U-shape as indicated at 47 and the U-portion has been passed through the channel 2 of the appliance. When the device is used in this manner it may serve as an anchorage for the wire 46 or it may be used for exerting directed forces on the tooth 44.

The appliance of this invention is characterized by its simplicity, comparative rigidity, and its adaptability to numerous mounting conditions on the tooth band. Numerous modifications and changes will appear to those skilled in the art and I do not choose to be limited to the modifications shown and described herein, but rather to the scope of the appended claims.

I claim:

1. An orthodontic appliance formed from thin sheet metal and defining a longitudinally extending wire-receiving channel, said channel having walls forming substantially enclosed sides and open ends, a portion of one of said walls extending beyond one end of the channel in said longitudinal direction to provide a mounting tab at that end of the channel, and another mounting tab formed as an extension of one of said walls and extending transversely to said direction and substantially in the plane of the first-named tab.

2. An orthodontic appliance formed from thin sheet metal and defining a longitudinaly extending, wire-receiving channel, said channel having walls forming substantially enclosed sides and open ends, a portion of one of said walls extending beyond each of said ends in said longitudinal direction to provide a mounting tab at each end of said channel, and another of said walls having a portion extending outwardly from said channel and substantially in the plane of said tabs to provide a third mounting tab.

3. An orthodontic appliance formed from thin sheet metal and defining a longitudinally extending, wire-receiving channel, said channel having walls forming substantially enclosed sides and open ends, a portion of one of said walls extending beyond each of said ends in said longitudinal direction to provide a mounting tab at each end of said channel, and a third mounting tab formed as an extension of said walls and extending transversely to said direction and substantially in the plane of said first-named tabs.

4. The method of producing an orthodontic appliance from thin sheet metal which comprises: cutting a blank having a longitudinally extending portion and a portion extending laterally and centrally therefrom; forming the top and side wall portions of a longitudinally extending, wire-receiving channel from said second-named portion by a plurality of bends in a single direction, said first-named portion remaining substantially unbent and comprising the bottom wall portion of said channel and a pair of longitudinally extending mounting tabs extending beyond the ends of said channel; and bending the outermost portion of said second-named portion at a position adjacent said bottom wall, in a direction opposite to said other bends to form a laterally extending mounting tab.

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