Feb. 3, 1953 H. J. RUSSELL 2,627,112

ORTHODONTIC APPLIANCE

Filed Feb. 20, 1952 2 SHEETS—SHEET 1

Fig. 1.

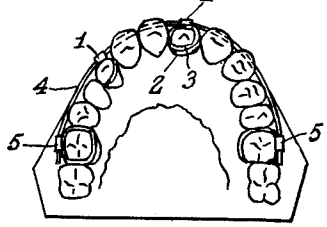


Fig. 2.

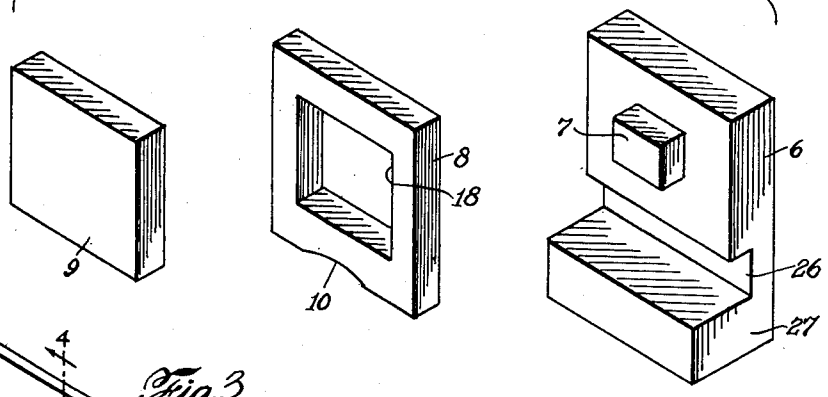


Fig. 3.

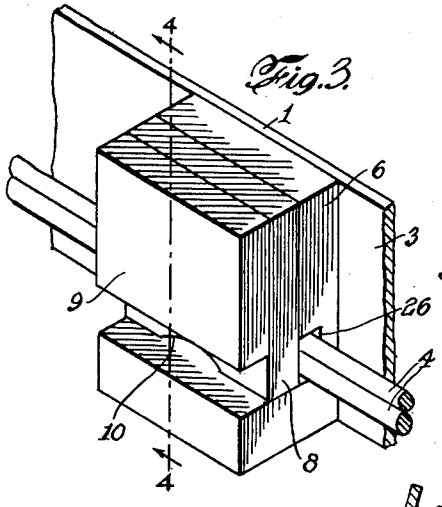


Fig. 4.

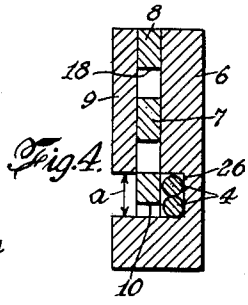


Fig. 5.

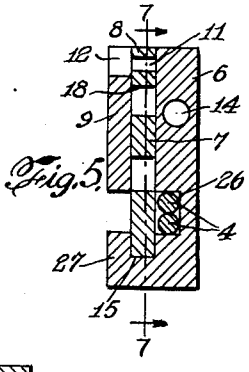


Fig. 6.

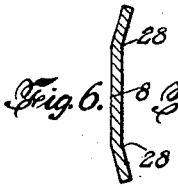
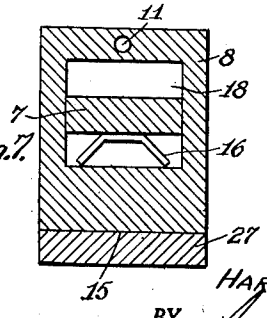


Fig. 7.



INVENTOR.
HARRY JOHN RUSSELL
BY
ATTORNEY

Feb. 3, 1953 H. J. RUSSELL 2,627,112

ORTHODONTIC APPLIANCE

Filed Feb. 20, 1952

2 SHEETS—SHEET 2

Fig. 8.

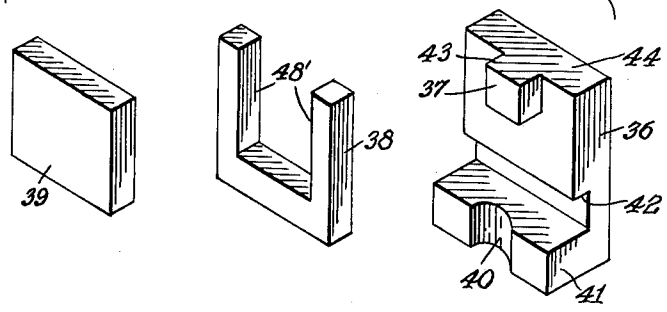
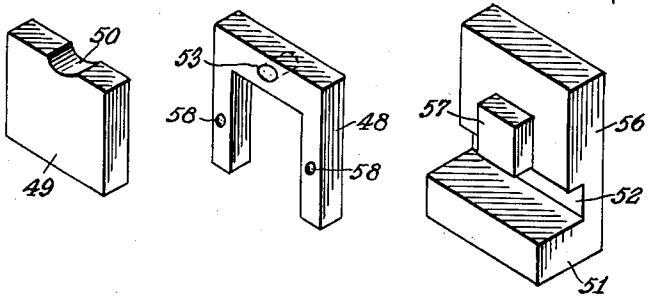


Fig. 9.



INVENTOR.
HARRY JOHN RUSSELL
BY
ATTORNEY.

Patented Feb. 3, 1953

2,627,112

UNITED STATES PATENT OFFICE

2,627,112

ORTHODONTIC APPLIANCE

Harry J. Russell, Newark, N. J., assignor to Baker & Co., Inc., Newark, N. J., a corporation of New Jersey

Application February 20, 1952, Serial No. 272,615

23 Claims. (Cl. 32—14)

1

This invention is directed to the orthodontic appliance art and is more specifically directed to a lock device for attaching an arch bow to the teeth for the correction of irregularities in the tooth formation on the dental arch.

This application is a continuation-in-part of my prior application Serial No. 235,594, filed July 7, 1951 now abandoned.

An arch bow usually comprises a spring wire curved to conform approximately to the normal dental arch, the ends of the wires being anchored and the intermediate portion of the bow being connected to a tooth or to the teeth to be moved by means of a lock clamping device attached to a tooth band. Various types of lock devices have been proposed and used for the correction of irregularities of teeth. Such a device is disclosed in my Patent #2,549,528, issued on April 17, 1951. These devices are positioned anteriorly of the teeth and are placed into a locking position either by a locking member moved transversely with respect to a tooth, by tying or otherwise fastening the arch bow to the lock device in a series of operations before the arch bow is correctly positioned or by a locking member moved vertically with respect to a tooth as disclosed in my aforementioned patent.

It is an object of the present invention to provide an orthodontic lock which secures an arch bow thereto by a single operation. It is another object of the present invention to provide an orthodontic lock which will not become disassembled upon rough and careless handling by the operator. It is a still further object of the present invention to provide an orthodontic lock which controls the distance which the clamping member can be raised.

Other objects and advantages of the invention reside in certain novel features of construction, combination and arrangement of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming part of this specification, and in which:

Fig. 1 is a plan view of a dental arch equipped with an orthodontic device according to my invention,

Fig. 2 is an exploded view of one embodiment of my orthodontic lock device,

Fig. 3 is a perspective view of an assembled orthodontic lock according to the present invention,

Fig. 4 is a cross-sectional view along lines 4—4 of Fig. 3 showing a preferred embodiment of my invention,

2

Fig. 5 is a cross-sectional view similar to Fig. 4 but showing another embodiment of my invention,

Fig. 6 is a cross-sectional side view of a modification of the spring lock plate of my invention,

Fig. 7 is a cross-sectional view as taken along lines 7—7 of Fig. 5 but showing still another embodiment of my invention,

Fig. 8 is an exploded view of another embodiment of my orthodontic lock device, and

Fig. 9 is an exploded view of still another embodiment of my lock device.

According to my invention, I provide a substantially flat orthodontic lock comprising a unitary structure having a clamping member cooperating with the main body portion to provide a vertical locking action, said member being retained in cooperating position by portions of the main body structure which also serve to limit movement of said member and to prevent complete disengagement thereof from the body structure at all times. The vertical locking action is advantageous in that it enables the application of the lock to a tooth regardless of the degree of irregularity of the teeth on the dental arch. The entire lock is dimensioned so that the contact area with an arch bow is comparatively small, which allows the arch bow to retain its inherent resiliency to a great extent and also provides the arch bow with sufficient free length to follow an irregular contour of the teeth on the dental arch depending upon the predetermined correction plan for the teeth. An outstanding advantage of my invention is that a more positive retaining and positioning means for the clamping member of my lock device is provided which ensures a quicker positioning of the arch bow and enables easier manipulation of the arch bow since it may be adjusted without entire disengagement of the cooperating lock components.

As shown in Fig. 1, my lock device is positioned anteriorly of a tooth 2 by means of a tooth band 3 to which the lock is secured, as by soldering or welding. A plurality of similar locks 1, each related to a single tooth, are thus positioned by securing each tooth band to its respective tooth, as by crimping, and each lock retains the wire arch bow 4, which can be a single or twin strand, substantially in conformity with a dental arch. The ends of the arch bow, as is well known in the art, are secured to a suitable anchor means 5, e. g. anchor tubes, which are soldered or welded to tooth bands secured to a pair of molars as illustrated.

Fig. 2 is an exploded view showing the rela-

tionship or order of assembly of the various parts of a preferred embodiment of my invention, and Figs. 3 and 4 show such a lock in assembled locked position with the arch bow secured thereto. In connection with these figures it is seen that a metal lock base **6** having a lower upturned flange **27** formed thereon is provided with a slot **26** positioned above said flange as shown. Where a twin arch bow is utilized the slot is substantially broader than in the case where a single wire is positioned side-wise into said groove. A rectangular guide boss member **7** is centrally secured to the base **6** on its inner surface above flange **27** or it may be integral therewith. A spring lock plate **8** is provided to slidingly engage boss **7** and is formed with a rectangular opening **18** of such dimensions as to engage the sides of the boss with a close sliding fit and to provide sufficient vertical freedom of motion to allow the plate to be raised a distance sufficient to uncover a passageway to the slot **26** to enable the arch bow to be accommodated therein. For example, the length of opening **18** may be made equal to the height of boss **7** plus twice the dimension "*a*" shown in Fig. 4. The lock plate may also be provided with a means such as notch **10** in its lower extremity into which any suitable pointed instrument may be inserted for raising said plate to disengage an arch bow wire from the lock. A retaining plate **9** is secured to the boss **7** thus providing a slide passageway in the base structure **6, 7, 9** in which the plate **8** is free to slide vertically.

The base **6** may be manufactured from flat stock material preferably a non-corrosive metal such as stainless steel or a precious metal, by blanking out or machining the slot **26** and forming the flange **27** substantially perpendicular to the base **6** as by swaging. The boss and retainer plate may be assembled onto the base **6** as by welding or if the base is to be integral with the base **6** it may be formed by swaging, it being apparent that the lock plate must be positioned on the boss prior to the final welding of plate **9** thereto.

It is to be understood that the illustrations are considerably enlarged and slightly exaggerated to clearly show the lock structures, the actual lock being dimensioned to form a substantially flat structure against a tooth. As indicative of the small size and flatness of the device the lock may be .125'' wide by .120'' high and the tooth band to which it is affixed and sold as a unit may be .004'' thick by .125'' wide and 1¾'' in length. It is apparent therefrom that a device of this sort is easily handled by an operator in its assembled condition thus avoiding the time consuming operations required in assembling some of the prior art devices.

Alternatively, as shown in Fig. 5 the notch **10** may be eliminated and the lock plate **8** provided with a small drilled hole **11** at its upper end cooperating with a notch **12** in the top of the retainer plate to allow a pointed instrument to be inserted therein to manipulate plate **8**. To ensure a more positive locking action the plate **8** may be extended at its lower end to enter a groove **15** in the flange **27** aligned therewith.

In the event of a very irregular tooth is to be corrected the base may be provided with a hole **14** drilled completely therethrough. In the event a tooth is widely divergent from the true dental arch, the lock may be secured to the tooth and a ligature passed through hole **14** and around the bow wire. By gradually drawing the ends of the ligature together the bow wires may be brought into the slot **26** thus avoiding any snapping of the bow or unnecessary repeated tuggings at the bow wires.

It is to be noted that the slot **26** is dimensioned in such a manner that upon closing of the lock plate the arch bow wires are enclosed in a space substantially corresponding in size therewith. Thus, due to the curvature of the bow wire sufficient centrifugal and frictional bearing force is exerted by the bow wires against the spring lock to insure a friction lock and negative the possibility of the lock plate slipping upwards while in use and thus releasing the arch bow.

To further insure against unwanted and premature release of the lock plate it can be provided with a bend or bends to increase the locking friction as shown in Fig. 6 at **28, 28**.

Fig. 7 shows a further embodiment wherein a bent plate or wire spring member **16** is provided in the passageway, specifically in the space between the bottom of boss **7** and the lock plate within opening **18** thereof to continually urge the lock plate into closed position and thus prevent premature opening of the lock.

It is apparent from the drawings that the boss **7** serves as an abutment or stop for the lock plate and further serves as a guiding means to ensure accurate vertical raising and lowering of the plate **8**. This is desirable in order to prevent a protrusion of one of the edges of the plate **8** from the lock structure thus presenting a source of discomfiture to the wearer thereof.

Fig. 8 depicts an embodiment of the lock device wherein the metal lock base **36** has a lower upturned flange **41** with slot **42** provided above the flange. The rectangular guide boss member **37** is secured centrally of the base but with upper surface **43** planar to the surface **44** of base **36**. The lock plate **38** is substantially in a U or fork shape and the inner surfaces **48', 48'** are adapted to slidingly engage boss **37** when retaining plate **39** is affixed to the boss member. To facilitate the raising and lowering of the lock plate **38** a notch **40** is provided in flange **41** to allow a pointed instrument to be inserted therein for the manipulation of plate **38**.

Fig. 9 is another exploded view of a still further embodiment of a lock device. A substantially U-shaped lock plate **48** is used in inverted position. The boss member **57** is secured centrally of base **56** with its lower surface planar with the upper surface of the walls of slot **52**. To facilitate the raising and lowering of lock plate **48** a drilled hole **53** in the upper part of plate **48** and a notch **50** in the upper part of retainer plate **49** are provided. To ensure a more positive locking action a groove such as **15** in Fig. 5 may be provided in flange **51** to receive the forks of plate **48**. To prevent the escape of plate **48** from its confined passageway two teat-like projections **58, 58** are positioned centrally of each fork to seat in depressions formed in the retainer plate **49** (not shown). The projections **58, 58** may alternately be positioned facing the base **56**.

It is to be understood further that the modifications shown in Figs. 5, 6, 7 and as described above in detail are also applicable to the embodiments of Figs. 8 and 9.

In practice, it is obvious that the lock of my invention is especially adapted for use with orthodontic arch bows to readily and securely fasten said bow in proper position upon the tooth bands and maintain said bow fastened against displacement by release of said lock due to the

action of food or other forces tending to dissociate the lock plate from the body structure. Furthermore, due to the arrangement of structure accomplished by an internal positioning of the lock plate within the body structure the wearer is subjected to less discomfort or annoyance than he would encounter by the use of the prior known lock devices.

While I have shown and described my invention as embodied in certain details of construction, it should be understood that this is primarily for the purpose of clearly illustrating the principles of the invention and that many modifications and changes may be made in the details of construction (e. g. placing the ligature hole 14 (Fig. 5) in the locks of Figs. 8 and 9), without departing from the spirit and scope of the invention as defined by the following claims.

What I claim is:

1. An orthodontic lock device comprising a lock base body structure and a locking member of substantially equal width, said body having front and rear surfaces and a lateral slot in its lower end to accommodate an arch bow, a vertical passageway formed in said body intermediate its front and rear surfaces and extending the complete width thereof to accommodate said locking member for vertical sliding movement, a lower end portion on said base for restricting downward movement of said locking member, said base structure being provided with means integral therewith and disposed in said passageway engageable with said locking member in a vertical guiding relationship and so positioned in said passageway as to allow said locking member to be raised a sufficient distance to uncover said slot, said passageway being positioned a sufficient distance transversely of the body from the base of said slot as to provide a chamber for frictional reception of said arch bow when said locking member rests against said end portion, the side edges of said locking member cooperating with the sides of said body member to form externally smooth side surfaces.

2. The locking device of claim 1 wherein said vertically positioned guiding means consists of a rectangularly shaped boss affixed to said base member centrally of and extending completely transversely across said passageway.

3. The locking device of claim 2 wherein said locking member is a rectangular spring plate frame shaped member having an opening therein of substantially the same width as said boss to ensure a vertical guiding action as said plate is reciprocated in said body and wherein the height of said opening is so dimensioned as to permit said chamber to be alternately completely closed or completely opened when said plate is in its alternate extreme positions respectively.

4. The device of claim 3 wherein said plate has a portion thereof provided with a means enabling the release of said arch bow from said chamber.

5. A device as in claim 4 wherein said means in said plate is an aperture formed therethrough at its upper end, and the front top portion of said body structure is provided with a notch aligned with said aperture to enable a tool to be inserted therein to vertically move said plate.

6. A device as in claim 1 wherein there is provided a notch at the lower end of said locking member for cooperation with an instrument insertable therein for disengaging an arch bow wire from said lock.

7. A device as in claim 1 wherein said means is a rectangularly shaped boss affixed to said base member and extending completely transversely across said passageway and said locking member is a rectangular spring plate having an opening therein into which said boss projects and wherein said lower end portion of said base is provided with a groove aligned with said passageway, and said plate is extended at its lower end to enter said groove when in its lowered position.

8. An orthodontic lock device comprising a lock base body structure and a thin locking spring plate member, said body having front and rear surfaces and a laterally extending slot in its lower end to accommodate an arch bow, a vertical passageway formed in said body substantially perpendicular to said slot intermediate the front and rear surfaces and extending the complete width thereof to accommodate said locking plate for vertical sliding movement, a lower end portion on said base for restricting downward movement of said base member, a boss integral with said base structure and interconnecting opposed portions thereof in spaced relationship interjecting into said passageway, said plate being in close fitting engagement with the sides of said boss, an opening in said plate of sufficient height as to allow said locking member to be raised a sufficient distance to uncover said slot, said passageway being of a sufficient distance from the base of said slot as to provide a chamber for frictional reception of said arch bow when said plate is in its lowered position and rests against said end portion, the side and top edges of said locking plate cooperating with the sides of said body member to form externally smooth side and top surfaces, said base portion being provided with a hole extending width-wise thereof and through which a ligature may be threaded to engage said bow for gradual insertion in said slot.

9. The device of claim 8 wherein the lower end portion of said base is provided with a groove aligned with said passageway, and said plate is extended at its lower end to enter said groove when in its lowered position.

10. The device of claim 9 wherein said plate has an upper end portion thereof provided with a means enabling the release of said arch bow from said chamber.

11. The device of claim 10 wherein said means in said plate is an aperture formed therethrough at its upper end and wherein the front top portion of said body structure is provided with a notch aligned with said aperture to enable a tool to be inserted therein to vertically move said plate.

12. The device of claim 8 wherein a spring means is provided to mechanically resist upward motion of said plate to avoid its premature release.

13. The device of claim 12 wherein said means is a flat spring member placed in said passageway in engagement with the lower end of said boss within the opening of said plate and with a laterally extending surface of the plate to urge said plate towards its closed position.

14. An orthodontic lock device comprising a lock base body structure and a thin locking spring plate member of substantially equal width, said body having front and rear surfaces and a lateral slot in its lower end to accommodate an arch bow, a vertical passageway formed in said body substantially perpendicular to said slot intermediate the front and rear surfaces and extending the complete width thereof to accommodate said locking plate for vertical sliding movement, a lower end portion on said base for restricting downward movement of said base member, a boss

integral with said base structure and interconnecting opposed portions thereof in spaced relationship to form said passageway, said plate being adapted to be placed in close fitting engagement with the sides of said boss, a rectangular opening in said plate of sufficient height as to allow said locking member to be raised a sufficient distance to uncover said slot, said passageway being spaced a sufficient distance transversely from the base of said slot as to provide a chamber for frictional reception of said arch bow when said plate is in its lowered position and rests against said end portion, the side and top edges of said locking plate cooperating with the sides of said body member to form externally smooth side and top surfaces, said base portion being provided with a hole extending width-wise thereof and through which a ligature may be threaded to engage said bow for gradual insertion in said slot, there being at least one bend in said spring plate across the width thereof so that said plate frictionally engages the sides of said passageway to resist upward motion of said plate.

15. The locking device of claim 1 wherein said vertically positioned guiding means consists of a rectangularly shaped boss affixed to said base member centrally of and extending completely transversely across said passageway, and wherein said locking member is a substantially U-shaped plate with the distance between the legs of the U being substantially equal to the width of said boss to ensure a vertical guiding action as said plate is reciprocated in said body, the height of said boss is so dimensioned as to permit said chamber to be alternately completely closed or completely opened when said plate is in its alternate extreme positions respectively.

16. The locking device of claim 15 including a means enabling the release of said arch bow from said chamber.

17. The locking device of claim 16 wherein said means consists of a notch in the lower end portion of said base arranged to allow for the access of an instrument to engage the lower end of said plate for disengaging an arch bow wire from said lock.

18. The locking device of claim 16 wherein said means consists of an aperture formed in the laterally extending portion of said plate at its upper end, and the front top portion of said body structure is provided with a notch aligned with said aperture to enable a tool to be inserted therein to vertically move said plate.

19. The locking device of claim 18 wherein there is provided a holding means including cooperating elements on said plate and body to prevent their separation.

20. The locking device of claim 19 wherein said holding means on said locking plate includes at least one projection formed on at least one of the surfaces which slidably engage the walls of the passageway and a cooperating recess formed on the mating surface of said body to prevent separation of said plate from said body.

21. In an orthodontic lock device having a lock base body structure provided with a laterally extending slot for the reception of an arch bow, a partially enclosed passageway formed in said body intersecting said slot, locking means including a member adapted for sliding movement within said passageway and adapted to be alternately positioned to cover and uncover said slot, said passageway and slot being so arranged that when said member covers said slot a chamber is thereby defined for frictional reception of said arch bow.

22. The orthodontic lock device of claim 21 including guiding means extending within said passageway and engageable with said member in a guiding relationship and so positioned in said passageway as to allow said member to be raised a sufficient distance to uncover said slot.

23. The lock device of claim 22 wherein said guiding means consists of a rectangularly shaped boss affixed to said member and extending completely transversely across said passageway.

HARRY J. RUSSELL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,204,113	Angle	Nov. 7, 1916

FOREIGN PATENTS

Number	Country	Date
685,981	Germany	Dec. 29, 1939