United States Patent [19]

Wallshein

[11] **3,871,096**

[45] **Mar. 18, 1975**

[54] **ORTHODONTIC SPRING CLIP**

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[21] Appl. No.: **304,731**

[52] **U.S. Cl.** ..... **32/14 A**
[51] **Int. Cl.** **A61c 7/00**
[58] **Field of Search** ..... 32/14 A

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Primary Examiner—Robert Peshock
Attorney, Agent, or Firm—Flynn & Frishauf

[57] **ABSTRACT**

A spring clip for use in association with both an arch wire and an orthodontic bracket includes a collar which is at least partially resilient, and a retaining finger integral with the collar which extends at least partially across an expandable loop defined by the collar. The collar is releasably secured to the bracket with a spring clip retaining finger abutting against the front surface of the bracket which retains the arch wire in position in the channel of the bracket. Two biassing fingers are integral with the collar and extend on a side of the loop so as to engage the arch wire when mounted on a bracket. The biassing finger is arranged in pressure transmitting relationship with the wire when the biassing finger is flexed from a normally unstressed position on the opposite side to a stressed position on the same side of the wire as the collar.

19 Claims, 21 Drawing Figures

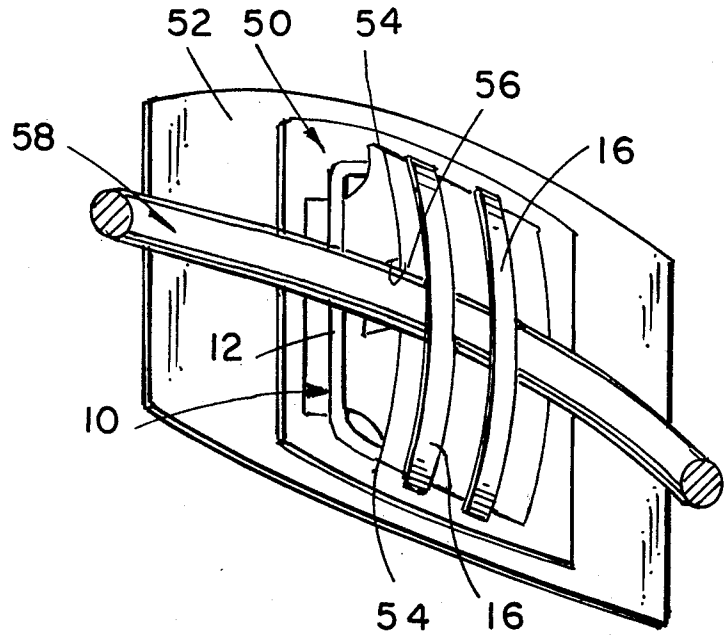
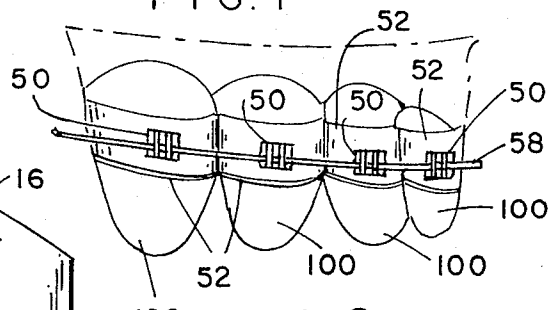


FIG. 1



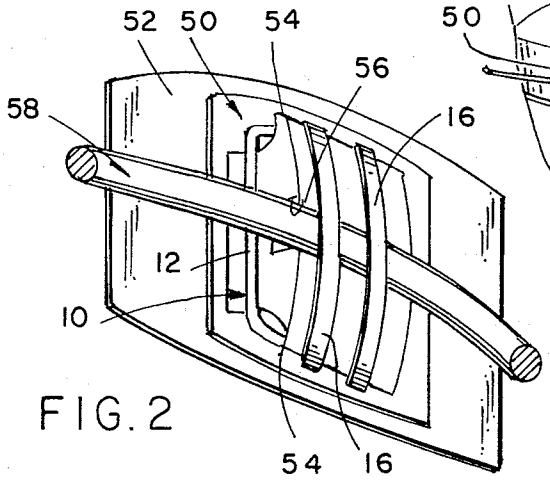


FIG. 2

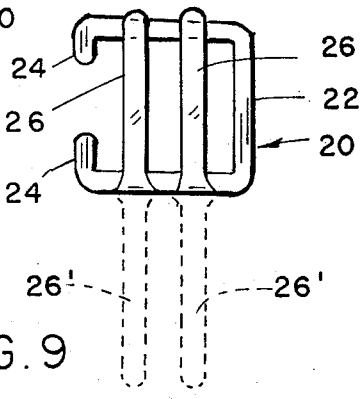
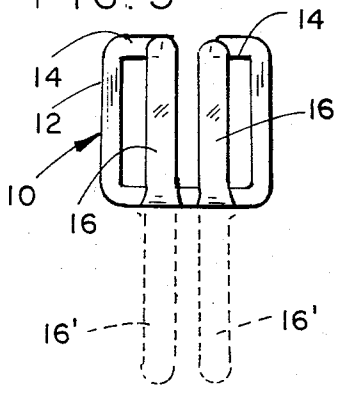


FIG. 9

FIG. 3



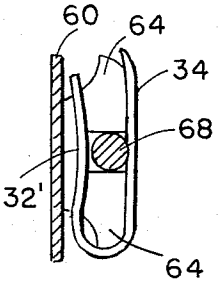


FIG. 5

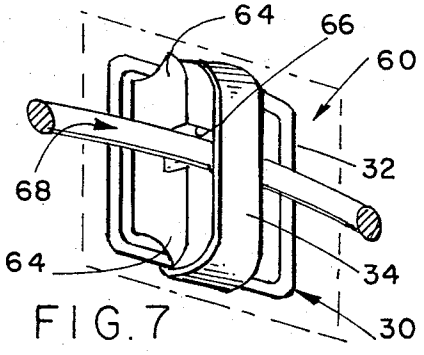
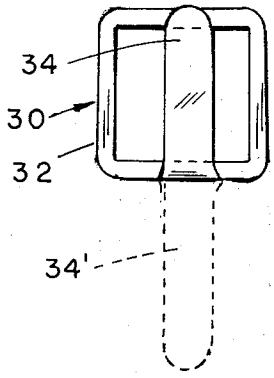


FIG. 7

FIG. 4



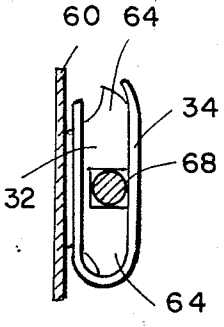


FIG. 6

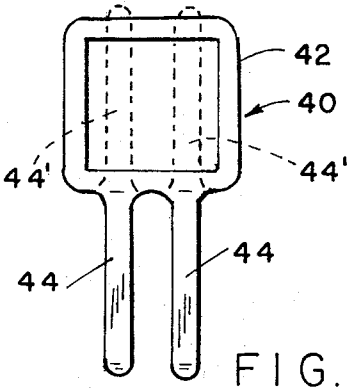


FIG. 8

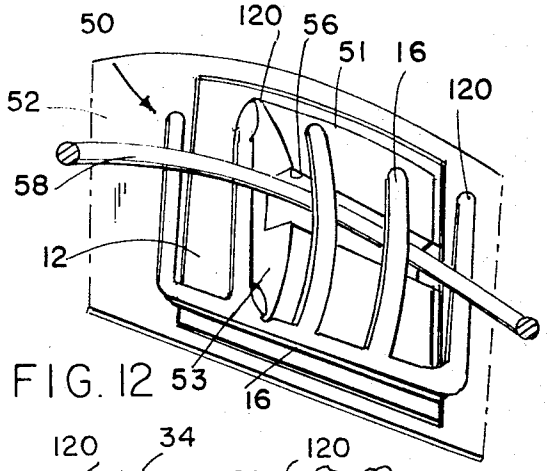


FIG. 12

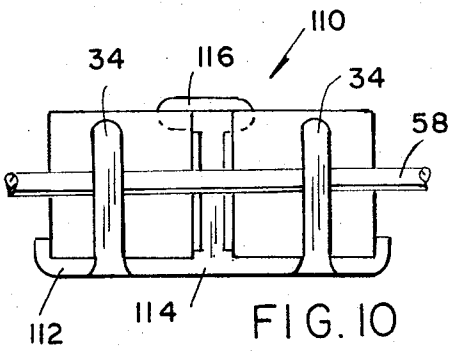


FIG. 10

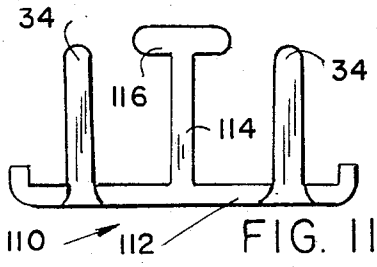


FIG. 11

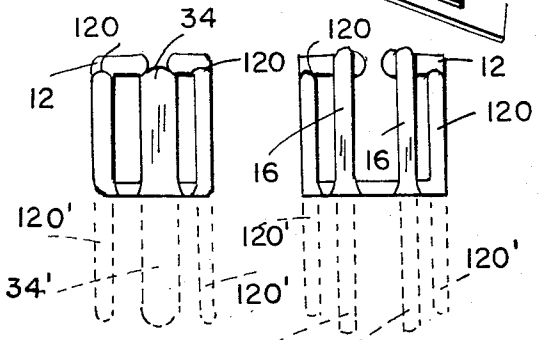


FIG. 13 FIG. 14

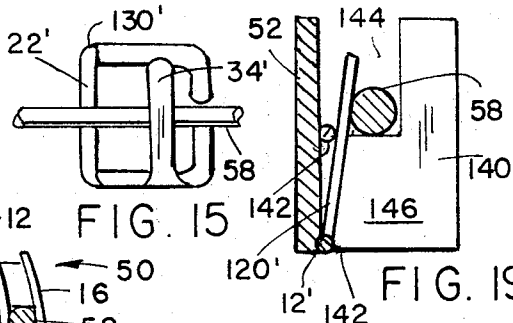


FIG. 15 FIG. 19

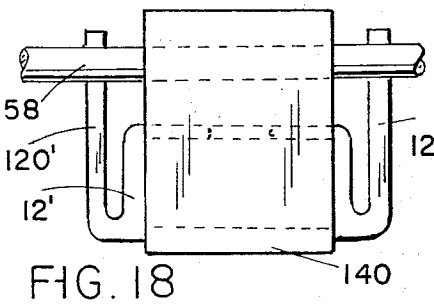


FIG. 18

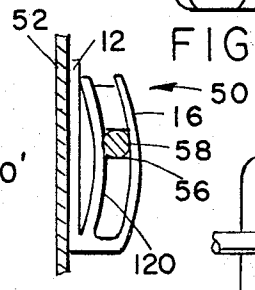


FIG. 17

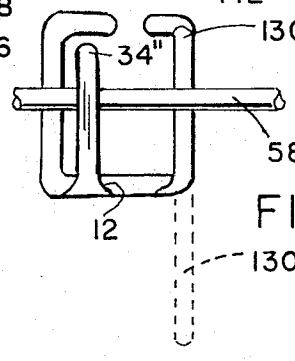


FIG. 16

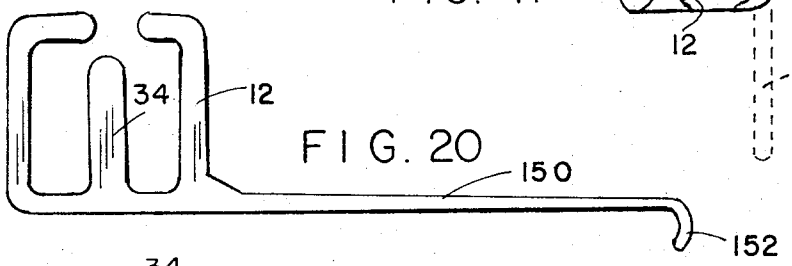


FIG. 20

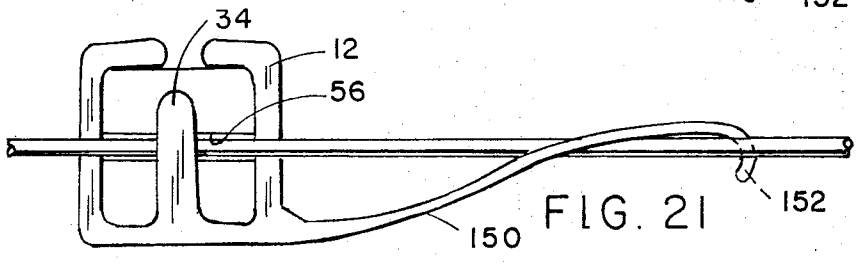


FIG. 21

ORTHODONTIC SPRING CLIP

BACKGROUND OF THE INVENTION

The present invention relates generally to the orthodontic field and more particularly to a spring clip which is to be used in association with an orthodontic bracket and arch wire.

Generally speaking, orthodontic procedures involve the securing of an orthodontic bracket to a maloccluded tooth, the bracket having a channel for receiving an arch wire. In order to properly confine the arch wire within the channel of the bracket, a tie wire is utilized which is non-resilient in nature.

The tie wire of this variety defines what may be characterized as a loop which is wrapped around the flanged ears or wings of the bracket, so that two parallel segments of the loop underlie the flanged wings respectively of the bracket while the other two parallel segments of the loop transversely overlie the arch wire so as to confine the latter within the channel of the bracket.

A disadvantage associated with this prior art type of loop is that the tie wire must be wrapped around the bracket wings and then the ends of the tie wire must be twisted for securement thereof, after which the twisted ends must be tucked away so as not to cause any damage in the patient's mouth. Additionally, the tie wire must be cut in order to change same, and a new tie wire must be used for replacement thereof.

A still further disadvantage of the prior art tie wire is that segments thereof, which transversely overlie the arch wire, are biased directly against the arch wire itself to cause friction which effects a binding therebetween, thereby limiting the movement of the bracket and the tooth associated therewith along the arch wire so that the arch wire is not effective to properly align the maloccluded teeth.

In addition to the above-mentioned disadvantages in the use of tie wires, these tie wires have the still further disadvantage that they serve the single function of preventing the arch wire from leaving the channel of the bracket. Accordingly, up to now, when movement of a tooth was required, e.g., tipping, root movement or the like, it has been necessary to attach additional devices to the arch wire which applied forces to the tooth relative to the almost fixed arch wire. In addition to being inconvenient, the necessity of utilizing additional orthodontic devices for this purpose is time-consuming. Since the additional orthodontic biasing devices are manually connected to the arch wire, the extent to which the device is securely connected to the arch wire depends on the individual who forms the connection. Also, since the relative positions of the biasing devices are not predictably and repeatably fixed relative to the brackets along the arch wire, the forces which are applied to the teeth are not easily predictable and vary from case to case depending on how and where the devices are attached.

SUMMARY OF THE INVENTION

Accordingly, in order to achieve the above objects, as well as others which will become obvious hereafter, it is an object of the present invention to provide an orthodontic appliance which does not have the disadvantages which exist in connection with such known appliances.

It is another object of the present invention to provide an orthodontic appliance as described above which is simple in construction and economical to manufacture.

It is still another object of the present invention to provide an orthodontic appliance in the form of a new and improved spring clip for use with an orthodontic arch wire and a bracket in which the arch wire is to be confined.

It is yet another object of the present invention to provide an orthodontic appliance of the type under discussion in the form of a spring clip for an orthodontic arch wire and bracket which can be effectively secured and easily removed from the bracket upon which the clip is to be mounted.

It is a further object of the present invention to provide a spring clip for an orthodontic bracket which, while mounted on the bracket, will effectively confine an orthodontic arch wire within the bracket channel, yet will not cause undesirable friction between itself and the arch wire to effect a binding therebetween which would limit the movement of the bracket and tooth associated therewith along the arch wire.

It is yet a further object of the present invention to provide an orthodontic appliance which clips onto an orthodontic bracket and cooperates with an arch wire to selectively apply forces to the bracket in relation to the arch wire.

It is an additional object of the present invention to provide an orthodontic spring clip which cooperates with an edgewise bracket and which serves both to retain the arch wire in the channel of the bracket as well as to selectively apply forces to the bracket relative to the arch wire. In this manner, tooth movements, including torqueing, tipping, uprighting, rotation, etc., can be simply effected without the use of arch wire loops.

To achieve the above objects, as well as others which will become obvious hereafter, a novel orthodontic appliance is introduced which cooperates with an orthodontic arch wire which is arranged in a channel of an orthodontic bracket. The orthodontic appliance comprises mounting means having at least one resilient portion for securely mounting the appliance on the bracket. Elongated finger means is provided having at least one resilient portion, said finger means being in cantilevered relation thereto. Said finger means is at least resiliently movable and arranged to apply forces to the arch wire relative to the bracket.

According to a presently preferred embodiment, said mounting means comprises a collar configurated in the shape of an expandable loop. Said loop has dimensions to correspond to the external dimensions of the bracket to thereby permit the collar to releasably snap onto the bracket. Said finger means may comprise a retaining finger extending at least partially across said loop defined by said collar. Said collar loop may be open or closed. When the loop is open, a pair of free end portions are provided which are mutually directed at one another. Although said loops are generally of squared-like configuration, any other configuration may be utilized if the material from which the loops are made is sufficiently elastic.

One or two retaining fingers may be provided which extend substantially parallel to each other and are biased to abut against the front surface of the bracket when the appliance is mounted thereon.

Instead of or in addition to the retaining resilient fingers, the orthodontic appliance is advantageously provided with biasing fingers which are arranged to apply forces upon the bracket and the tooth relative to the arch wire. These forces are applied by positioning the biasing fingers to the sides of the bracket and extending these fingers from the top or bottom of the collar loop towards the arch wire. The biasing fingers may extend directly upwardly, downwardly or may extend laterally.

The present invention may be utilized with orthodontic edgewise brackets, the bracket comprising a generally U-shaped guide channel into which an arch wire is insertable lengthwise. The bracket has a pair of flanged wings over and beyond which the collar is expandable and under which the collar is detachably disposed for confinement. The spring clip collar includes a retaining finger which is resiliently cantilevered thereon so as to extend across a loop defined by the collar to thereby overlie both the arch wire and guide channel in which the arch wire is confined. The collar itself is confined under both the arch wire and the flanged wings of the bracket.

The present invention may also be utilized with a modified form of a bracket commonly designated as the Begg bracket or any other bracket on which a collar can be securely engaged. The invention is used with the modified Begg bracket in which grooves or slots are provided in the narrow bracket portion which defines the wire containing channel. The grooves serve the same function as the flanged wings of the conventional edgewise bracket over which the loop of the collar may be snapped on and releasably connected.

BRIEF DESCRIPTION OF THE DRAWINGS

With the above and additional objects and advantages in view, as will hereinafter appear, this invention comprises the devices, combinations and arrangements of parts hereinafter described and illustrated in the accompanying drawings of a preferred embodiment in which:

FIG. **1** is a schematic view of adjacent maloccluded teeth as interconnected to one another through the intermediary of an arch wire and respective orthodontic brackets mounted on the maloccluded teeth;

FIG. **2** is a fragmented perspective view of an orthodontic bracket, the arch wire and one embodiment of the spring clip pursuant to the present invention;

FIG. **3** is a front elevational view of the spring clip pursuant to the embodiment of FIG. **2**;

FIG. **4** is a second embodiment of the spring clip pursuant to the present invention;

FIG. **5** is a cross-sectional side elevational view of the association of the orthodontic bracket, the arch wire and a spring clip pursuant to a third embodiment of the present invention;

FIG. **6** is a view similar to that of FIG. **5** illustrating a side elevational view of the spring clip pursuant to the embodiment illustrated in FIG. **4**;

FIG. **7** is a fragmented perspective view of an orthodontic bracket, arch wire and spring clip pursuant to the embodiment illustrated in FIG. **4**;

FIG. **8** is a front elevational view of the spring clip pursuant to a fourth embodiment of the present invention;

FIG. **9** is a front elevational view of the spring clip pursuant to a fifth embodiment of the present invention.

FIG. **10** is a front elevational view of a sixth embodiment of the present invention, useful with double brackets.

FIG. **11** is a view similar to that shown in FIG. **10** showing the open loop construction of the sixth embodiment;

FIG. **12** is a fragmented perspective view of an orthodontic bracket, arch wire and spring clip pursuant to a seventh embodiment of the present invention, showing both retaining and biassing fingers;

FIG. **13** is a front elevational view of an eighth embodiment having one retaining and two biassing fingers;

FIG. **14** is a front elevational view of a ninth embodiment having two retaining and two biassing fingers;

FIG. **15** is a tenth embodiment of the invention wherein one biassing finger and an offset retaining finger are provided;

FIG. **16** is similar to that shown in FIG. **15**, showing the loop opened on top instead of the side and the positions of the biassing and retaining fingers interchanged;

FIG. **17** is a side elevational view of the invention mounted on the bracket shown in FIG. **12**;

FIG. **18** is a front elevational view of a Begg-type orthodontic bracket, arch wire and spring clip pursuant to an eleventh embodiment of the invention, showing two biassing fingers acting on the arch wire;

FIG. **19** is a side elevational view of the invention shown in FIG. **18**, showing the manner in which the collar loop snaps on and is retained by the bracket;

FIG. **20** is a front elevational view of a twelfth embodiment of the present invention, wherein a lateral spring finger projects from the collar; and

FIG. **21** is a view similar to that shown in FIG. **20**, showing how the lateral spring finger cooperates with the wire.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, and more particularly to FIG. **3** thereof, there is illustrated a first embodiment of the orthodontic spring clip of the present invention as denoted generally by the reference character **10**. The spring clip **10** includes a collar **12** which defines what may be characterized as an open loop terminating in a pair of spaced free end portions **14** which are generally mutually directed at one another. Extending from the collar **12**, or in effect integrally associated therewith in cantilevered relation, are a pair of resilient retaining fingers **16** which extend at least partially across and preferably entirely across the open loop of the collar **12**.

The spring clip **10** as illustrated in solid line in FIG. **3** is generally derived from a flat metal stamping wherein the retaining fingers **16** initially lie in a common plane with that of the collar **12**, as illustrated in phantom in FIG. **3** and denoted by the reference characters **16'** respectively. The fingers **16'** are bent upwardly upon the collar **12** into the position illustrated in solid line before the collar **12** is secured to the bracket to thereby form a transition between the collar **12** and fingers **16** which is generally of U-shaped contour. The nature of the metallic content of the spring clip **10** is such that the loop defined by the collar **12** may be characterized as being expandable so as to be easily snapped on and secured to an orthodontic bracket in a manner as will be clarified below. The fingers **16** are resilient for biassing, in a cantilevered fash-

ion as a leaf spring, against the front face of an orthodontic bracket.

An embodiment, very much similar to that embodiment of the spring clip **10** illustrated in FIG. **3**, is illustrated in FIG. **9** and denoted generally by the reference character **20**. The spring clip **20** includes a collar **22** terminating in a pair of mutually directed closely spaced free end portions **24** and a pair of retaining fingers **26** extending across the open loop of the collar **22**. The retaining fingers **26**, as shown, are generally parallel to the free end portions **24**. In this embodiment, likewise to the showing of FIG. **3**, the retaining fingers **26** are derived from being bent out of the positions denoted by the reference characters **26'** respectively, from the plane of the collar **22** into a position overlying the collar **22**, as illustrated in solid line in FIG. **9**.

Referring now to FIG. **4**, there is illustrated still another embodiment of the present invention and denoted generally by the reference character **30**. The clip **30** includes a collar **32** which defines an entirely closed loop and is provided with a single retaining finger **34**. The retaining finger **34** is derived in a similar manner as discussed above for the embodiments illustrated in FIGS. **3** and **9**. The retaining finger **34** is bent from a first position, denoted by the reference character **34'** which is co-planar with the collar **32**, into a second position overlying the collar **32**, as shown.

Still another embodiment is illustrated in FIG. **8**, denoted generally by the reference character **40**. The clip **40** is very similar to the clip **30** illustrated in FIG. **4**, in that it is provided with a collar **42** which is entirely closed, yet differs from the clip **30** of FIG. **4** in that the clip **40** includes a pair of fingers **44** which are illustrated in solid line in a position prior to their being bent, in a similar manner as described above, out of the plane of the collar **42** into a position overlying the collar **42** as illustrated in phantom and denoted by reference character **44'**, respectively.

Referring now to FIG. **2**, the embodiment **10** illustrated in FIG. **3** is shown in its operative condition upon an edgewise orthodontic bracket **50** as provided on a maloccluded tooth band **52**. The bracket **50** includes a front portion in the form of a pair of oppositely extending flanged wings **54** between which is disposed a channel **56** for receiving an arch wire **58**. The collar **12** of the clip **10** is confined behind or below both the flanged wings **54** thereof and the arch wire **58** on a rear mounting portion. However, the pair of retaining fingers **16** of the clip **10** are biased against the front face of the bracket **50** and overlie both the arch wire **58** and the channel **56** in which the arch wire **58** is seated. Because of the relationship of the retaining fingers **16** being biased against the front face of the bracket **50**, the retaining fingers **16** in effect do not bias directly against the portions of the arch wire **58** disposed just outside the opposite ends of the channel **56**. Thus, the retaining fingers **16** effectively lock the arch wire **58** within the channel **56** without any undesirable friction between the fingers **16** and the arch wire **58**. Accordingly, the bracket **50** and the band **52** disposed on the maloccluded tooth can move along the arch wire **58** for correction of the maloccluded tooth.

Because of the open loop defined by the collar **12**, as the collar **12** is snapped or pressed upon the face of the bracket **50**, the loop will tend to expand somewhat in that the free end portions **14** of the collar **12** will move slightly away from one another, thereby, permitting the collar **12** to be effectively snapped or positioned on the rear portion of the bracket behind the flanged wings **54**. In this position, the arch wire **58** may, thereafter, be inserted between the fingers **16** and the face of the bracket wings **54** and slidingly moved into the channel **56** so as to be retained therein by the pair of fingers **16** of the clip **10**.

Thus, with the collar **12** snapped behind the flanged wings **54** and the fingers biased against the front face or surface of the bracket **50**, the spring clip **10** retains the arch wire **58** inside the channel **56**. To insert or remove the arch wire **58**, it is only necessary to bend the retaining fingers **16** forwardly away from the front surface of the bracket **50**. This permits the movement of the arch wire **58** out of the channel **56**.

The clip **20** of the embodiment illustrated in FIG. **9** is to be utilized in a manner substantially similar to that of the use of the spring clip illustrated in FIG. **3** and, thus, description of the clip **20** in its operation is omitted herefrom for the sake of brevity and clarity.

Referring now to FIG. **7**, the spring clip **30**, pursuant to the embodiment illustrated in FIG. **4**, is confined in its operative condition upon an edgewise bracket **60** likewise having a front portion in the form of pair of oppositely extending flanged wings **64** between which is disposed a channel **66** for receiving an arch wire **68**. In this instance, the collar **32** is in fact a closed loop and, thus, is not provided with end portions which can be slightly separated from one another as the collar **32** is forced over the flanged wings **64** of the bracket **60**. However, the collar **32** is made from a material sufficiently flexible and resilient so that those segments of the collar **32** which contact the wings **64** on the sides of the bracket **60** are adapted to be bowed slightly outwardly. Accordingly, the segments of the collar **32**, which extend parallel to the arch wire **68**, are displaced slightly away from one another when the bowed segments are straightened to thereby permit the loop defined by the collar **32** to expand and capture the collar **32** behind or beneath the wings **64** of the bracket **60** by engaging the rear mounting portion of the bracket.

In this embodiment, likewise, the collar **32** entirely underlies both the flanged wings **64** and the arch wire **68**, while the single retaining finger **34** thereof biases against the front face of the bracket **60** and overlies both the arch wire **68** and the channel **66** in which the arch wire **68** is confined. The arch wire **68** is inserted into the channel **66** in a similar manner as set forth above with respect to the arch wire **58** of FIG. **2**.

In order to permit a more effective expansion of the closed loop defined by the collar **32** of the clip **30** illustrated in FIG. **4**, or for that matter, the collar **42** of the embodiment **40** illustrated in FIG. **8**, the collar of the clip **30** may be characterized as lying in a plane having a slight curvature such that the segments **32'**, shown in FIG. **5**, of the collar **32** which extend transversely across the wire **68** are normally, bent slightly. Thus, because of the curvalinear and resilient nature of those segments **32'** of the embodiment illustrated in FIG. **5**, the segments **32'** can be forced or straightened so as to lie in a flat plane under pressure, thus increasing the space or distance, to some degree, between the segments of the collar **32** which extend transversely of the finger **34** as the latter segments are forced over the flanged wings **64** of the bracket **60**. Preferably, the segments **32'** are curved or bowed toward the finger **34**, as shown, and will return to this curvature once secured

behind the wings **64** with no straightening pressure being exterted thereon.

The embodiment **40** illustrated in FIG. **8** is substantially the same as that of the embodiments illustrated in FIGS. **4** and **5**, differing only in the number of retaining fingers, as set forth above. Thus, for purposes of clarity and brevity, description of the use of the spring clip **40** is omitted herefrom.

It should be pointed out, however, that each and every one of the embodiments described above can be readily mounted in succession upon respective orthodontic brackets **50** or **60**. As illustrated in FIG. **1**, the orthodontic brackets **50** are mounted upon respective malocclusion teeth **100**, thereby permitting insertion of the arch wire **58** within the respective guide channels of each of the brackets **50**. There is no necessity to first insert a portion of the arch wire **58** into one bracket and to, thereafter, mount an appropriate spring clip upon that particular bracket. Each of the spring clips, pursuant to the present invention, can be mounted earlier in succession upon their respective brackets. The relationship of the cantilevered fingers of each of the spring clips permit rapid insertion of the arch wire necessary, as set forth above.

It is noted, that the force required to move the spring fingers of each clip away from the front face of the bracket wings, once the clip is mounted on the bracket, is greater than the normal external forces which tend to force the arch wire out of its respective bracket channel. Accordingly, the spring retaining fingers of each clip effectively holds the arch wire within the bracket channel. Preferably, the spring clip loop is generally of square-like configuration, as shown.

It is also noted that the spring clip of the present invention can be used with well-known, commercially available twin brackets provided with two sets of wings (not shown). The spring clip of the present invention may either be mounted individually on each of the two sets of wings of the twin bracket in a similar manner as set forth above, or the collar of the spring clip of the present invention may be made larger of rectangular-like configuration so as to be positionable behind both sets of wings of the twin bracket. In the latter case, it would be preferable to use a spring clip having two resilient retaining fingers similar to any one of the embodiments shown in FIGS. **3**, **9** and **8**, wherein a spring retaining finger would be provided for each of the two sets of wings of the twin bracket, with each spring retaining finger bearing against the face of its associated set of wings.

In FIG. **10**, a double retaining clip **110** is shown mounted on a double edgewise orthodontic bracket. The clip **110** has an open collar **112**. Forming a part of the collar **112** is a center portion **114** having an enlarged transversely directed head **116**. Each end of the head may be similar to a free end portion, e.g. free end portion **14** in FIG. **3**. Extending from the lower portion of the collar **112** are a pair of upwardly extending spaced retaining fingers **34** each biased to abut against a respective front surface of one of the adjacent brackets. The details of the construction of the double clip **110** is shown in FIG. **11**. To mount the clip **110** on a double bracket, the center portion **114** is placed between the two brackets and the head **116** is forced behind the flanged wings **54** of the two brackets by at least partially deforming the head **116**. Simultaneously, while forcing the head **116** behind the brackets, the lower horizontal portions of the open collar **112** are positioned behind the lower flanged wings of the two brackets. Once mounted, the center portion **114** and head **116** are sufficient to maintain the clip on the brackets. The manner of inserting or removing a guide wire is the same as that described in connection with FIG. **7** above. It should be pointed out that if the clip **110** is provided with a closed collar or one partly open such as collar **12** in FIG. **3**, the portion **114** can be adapted, if the head **116** is removed, to act as a center biassing finger.

It is further noted, that the arch wire can be easily removed from its respective bracket channel by merely exerting enough pressure on the wire to force the resilient retaining fingers of the spring clip away from the face of the bracket wings. The arch wire is then slidably moved between the resilient fingers and the front face of the bracket wings from the bracket channel to a freed position away from the bracket. Additionally, the collar of the spring clip can also be easily removed from the bracket by exerting enough force thereon to expand the loop, in a similar manner as mentioned above, so that the collar can be moved passed the bracket wings to a freed position. Obviously, the removed spring clip can be used again, when desired, wherein because of its resilient nature, its structural characteristics have not altered during the removal thereof.

In each of the above embodiments, the retaining fingers abut against the front face of a bracket in its mounted position. Also, when mounted, the collar of the spring clip appears on the other side of the arch wire **58** from the retaining fingers. With the retaining fingers biased towards the collar, no direct forces are applied to the arch wire with these configurations, relative to the bracket, except when the fingers apply retaining forces on the arch wire when the latter attempts to leave the channel or when a tooth is misaligned about its long axis. In the latter case the retaining finger pulls on the wire to generate a rotating force which tends to align the tooth. Otherwise, the described clips hug the brackets without normally applying continuous forces to the arch wire.

The embodiments thus far described have performed primarily an arch wire retaining function. However, the collars in accordance with the above described embodiments can further be furnished with biassing fingers which cooperate with the arch wire and the bracket to selectively apply forces to the teeth.

The principal involved is generally illustrated in FIG. **12**. Similar reference numerals have been designated to identify like or identical parts throughout. Thus, the collar **12** is provided with retaining fingers **16** as illustrated in FIG. **2**. The fingers **16** are shown to abut against a front surface **51** of the bracket **50**. The channel **56** opens in the front surface **51**. The bracket **50** is also provided with sides **53** only one being visible in FIG. **12**. The embodiment illustrated in FIG. **12** is additionally provided with a pair of biasing fingers **120** which are respectively disposed to each side of the front surface **51** or at points just slightly beyond the sides **53**. Each biassing finger extends from the lower portion of the collar **12**, as viewed in FIG. **12**, sufficiently upwardly so as to come into the region of the arch wire **58**. As shown, the biassing fingers **120** are positioned on the same side of the arch wire **58** as is the collar **12** in the operative mode. This is the stressed or biassing position of the fingers **120**. Initially, the bias-

sing fingers **120** are disposed on the other side of the arch wire **58** than the collar **12** when they are in their unstressed state. During or subsequent to the mounting of the clip **10**, the biassing fingers **120** are moved to the same side as the collar **12** in relation to the arch wire **58.** This generates stresses in the biassing fingers **120** which generate forces which attempt to separate the collar **12** from the biassing fingers **120.** Since the arch wire, for all practical purposes, is generally fixed and behaves as a fixed anchoring or reference point, the biassing fingers **120** cannot move. Consequently, forces are applied to the collar **12** which tend to move the same rearwardly with relation to the wire **58.** More specifically, the collar **12** tends to pivot rearwardly about the lower portion of the collar **12** to which the biassing fingers are attached. Such forces applied to a tooth cause torqueing. Such forces tend to move the roots of a tooth about a pivot axis generally defined by the arch wire **58** while the crown of the tooth is held substantially fixed. It is clear that the clip **10** can also be mounted on the bracket **50** when it is turned 180° in its own plane. In this case, the retaining and the biassing fingers extend downwardly from the top of the bracket and the torqueing takes place in the other sense about the arch wire.

FIGS. **13** and **14** illustrate two different embodiments of combination torqueing and retaining clips as discussed above. In each case, the clip is provided with biassing fingers **120** as described above. The two embodiments differ in that the clip shown in FIG. **13** is provided with a single retaining finger **34** as shown in FIG. **4,** whereas the clip shown in FIG. **14** is provided with two retaining fingers **16** as shown in FIG. **3.** In each case, the clip provides torqueing as described in connection with FIG. **12.**

In FIG. **15,** a collar **22'**, similar to collar **22** in FIG. **9** but open on the other lateral side, is provided with a single biassing finger **130'**. A retaining finger **34'** is slightly offset to the other side of the center than the side on which the biassing finger is provided. As with the biassing fingers **16** shown in FIG. **12,** the biassing finger **130'** is forced from a first position wherein it is on the other side of the arch wire from the collar **22'** to a stressed second position where both the collar **22'** and the biassing finger **130'** are on the same side. Since the arch wire **58** is relatively fixed, a separating force is applied to the left-hand side of the collar **22'**, as viewed in FIG. **15.** This force is enhanced by the slight offset of the retaining finger **34'**. The application of a force on only one side of the collar **22'** has two effects. Firstly, there is a tendency of the bracket and the tooth to rotate about its longitudinal or long axis. Secondly, there is the torqueing effect described in connection with FIG. **12.** However, because of the nature of the tissues which maintain the position of the teeth, the rotating effect occurs at a much faster rate than does the torqueing effect. Consequently, the spring clip as shown in FIG. **15** may be utilized to rotate a tooth subsequent to which it may be removed to thereby minimize the amount of torqueing which takes place. Looking at a tooth from the top, a tooth will rotate clockwise when a spring clip such as shown in FIG. **15** is mounted thereon. Referring to FIG. **16,** which is similar to FIG. **15,** except that the break in the loop is at the top instead of on the side, and the biassing finger **130** and a retaining finger **34''** are interchanged in positions. The rotating and torqueing effects, however, are similar except that the rotation in this case, looking at a tooth from the top, will be counterclockwise. It should be noted that in each case the positions of the biassing fingers must be sufficiently to the sides of the collars so that they can abut externally accessible end portions of the arch wires on the sides of the bracket and not abut against the front surface. The further that the biassing fingers are positioned from the center of the bracket, the greater is the moment arm and the greater is the torque which will cause rotation.

In FIG. **17,** a collar **12** is shown snapped over a bracket **50.** A retaining clip is shown to abut on the front surface of the bracket to thereby retain an arch wire **58** in a channel **56.** Also shown is a biassing finger **120** on the same side of the arch wire as the collar **12.** The arch wire **58** can be described as defining a rigid reference point so that the biassing finger **120** causes the band and the tooth to move relative to the arch wire when the biassing finger pushes on the arch wire **58.** This pushing or biassing action by the biassing finger **120** is caused by forcing the biassing finger **120** to move to the same side as the collar **12** from an unstressed position wherein it extends to the same side of the arch wire as do the retaining fingers **58.**

FIGS. **18** and **19** illustrate a collar **12'** in accordance with the present invention which has extending therefrom biassing fingers **120** as used in connection with a modified Begg-type bracket. The bracket has a channel **144** and a rear mounting portion on a flange **146** which is cemented to a band or directly to a tooth. In order to use the spring clip in conjunction with the bracket **140,** the bracket is slightly modified by providing elongated slots or grooves **142** in the region of the channel **144** or the flange **146.** However, the grooves **142** may be provided at any convenient locations on the bracket **140,** or any other bracket, so that the collar segments may be securely placed therein subsequent to being snapped on the bracket. As before, the mounting procedure of the collar **12'** involves spreading the two free ends so as to snap the collar over the front portion of the bracket to position the collar **12'** in the slots **142.** Once mounted, the biassing fingers **120'** may be positioned on the same side of the arch wire **58** as the collar **12'** as described above in connection with FIG. **12.** In this case, by providing two biassing fingers, the predominant effect on the tooth will be that of torqueing. For rotation, only one biassing finger **120'** need be provided.

FIGS. **20** and **21** illustrate a collar **12** in accordance with the present invention which is further provided with a retaining finger **34** similar to that shown in FIG. **4.** Extending to one side of the collar **12** there is provided an elongated lateral biassing finger **150** having a hook **152** at a free end thereof. The lateral biassing finger **150** is integral with the collar **12** and is punched from a flat plate of metal. In order to increase the resiliency of the lateral biassing finger **150** upwardly and downwardly in the plane of FIG. **20,** the lateral finger **150** is twisted at a point intermediate the hook **152** and the collar **12.** In FIG. **21,** the spring clip as shown in FIG. **20** is illustrated mounted on a bracket. An arch wire **58** is contained in the channel of the bracket as described above and is retained in the channel by the retaining finger **34.** The lateral biassing finger **150** is flexed upwardly in such a manner that the hook **152** engages the arch wire **58.** The effect of the lateral biassing finger stressed in this manner will be to cause the collar

12 to rotate in a counter-clockwise direction as viewed in FIG. 21. This process is commonly known as uprighting of a tooth in which a tipped tooth is returned to its normal inclination without moving the crown. It is clear that with this, as well as with the other above described embodiments, fingers which have been shown and described as being on one side of the collar can also be positioned on the other side of the collar to obtain similar but reverse or complementary action.

In connection with all the above described embodiments, the subject invention provides simplicity with which orthodontic attachments may be attached or removed from both edgewise or modified Begg-type brackets or other similar brackets. Each orthodontic appliance is in the form of a spring clip or snap ring which is removably connected to a bracket and which has projecting therefrom resilient fingers. In connection with the edgewise bracket, centrally located retaining fingers may be provided which retain an arch wire in the channel of the bracket. With both of the different types of brackets, vertical biassing fingers may be provided on one side or on both sides or a lateral finger may be provided on the collar of the spring clip to resiliently abut against the arch wire. In this manner, one can selectively apply forces to a tooth which will cause it to rotate, torque, or become upright respectively. Once corrective action has taken place, the biassing type of spring clip can be replaced with a spring clip which only includes a retaining finger. As described above, however, retaining fingers are also biassing fingers when an arch wire is not in the channel of a bracket. Generally, the present invention provides increased versatility with which orthodontic appliances may be removably connected to a bracket to effect a desired result.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of the invention which is for purposes of illustration only and is not to be construed as a limitation of the invention.

What is claimed:

1. An orthodontic appliance for use with an orthodontic arch wire, comprising an orthodontic bracket having a front portion and a rear portion of reduced cross-sectional area connectable to an orthodontic band, whereby said bracket forms with the band at least one channel extending along the latter, the arch wire extending proximate said bracket; a resilient collar configurated in the shape of an open and substantially planar loop having a pair of opposing free end portions proixmate to one another and normally spaced from one another a distance smaller than the transverse dimensions of said rear portion, said loop having dimensions corresponding to the external dimensions of said rear portion and being made of a resilient material to permit separation of said free end portions to increase the size of said loop to thereby permit the same to be releasably snapped onto said rear portion and at least partially received within said channel; and elongated finger means in the form of a biassing finger extending from said loop and having a biassing portion spaced to one side of said loop and being at least partially and resiliently movable in directions generally transverse to the plane defined by said loop and arranged to apply forces to the arch wire relative to said bracket, whereby said biassing finger is placed in a biassing condition when said free end portions are separated and said loop snapped onto said bracket.

2. An orthodontic appliance as defined in claim 1, wherein said bracket is in an edgewise bracket and said front portion is provided with a transverse arch wire receiving channel, and wherein said biassing finger is in the form of a retaining finger extending from said loop across the arch wire-receiving channel and being at least partially and resiliently movable in directions generally transverse to the plane defined by said loop and arranged to apply forces to the arch wire relative to said bracket when the arch wire moves out of said arch wire-receiving channel, whereby said retaining finger retains the arch wire within said arch wire-receiving channel of said bracket.

3. An orthodontic appliance as defined in claim 1, wherein said front portion is provided with a transverse arch wire-receiving channel, and wherein the arch wire has two portions respectively disposed exteriorly of said bracket at each end of said arch wire-receiving channel, said biassing finger being arranged on one side of said loop to resiliently abut against one of the exterior wire portions, whereby a force is applied to the arch wire by said biassing finger relative to said bracket.

4. An orthodontic appliance as defined in claim 1, wherein said biassing finger extends entirely across said loop and is substantially parallel to said free end portions.

5. An orthodontic appliance as defined in claim 1, wherein said biassing finger extends entirely across said loop generally transversely of said free end portions.

6. An orthodontic appliance as defined in claim 1, wherein said loop is generally of square-like configuration.

7. An orthodontic appliance as defined in claim 1, wherein said biassing finger extends entirely across said loop and is substantially parallel to said free end portions.

8. An orthodontic appliance as defined in claim 1, wherein said biassing finger extends entirely across said loop generally transversely of said free end portions.

9. An orthodontic appliance as defined in claim 1, wherein said loop is generally of square-like configuration.

10. An orthodontic appliance as defined in claim 1, wherein said collar and said finger are constructed from a one-piece flat metal stamping.

11. An orthodontic appliance as defined in claim 1, wherein said biassing finger and said loop are angularly positioned relative to each other and define an angle therebetween, said angle being normally greater in the unstressed state of said biassing finger than when said biassing finger abuts against the arch wire in pressure transmitting relationship.

12. An orthodontic appliance as defined in claim 1, wherein said finger means comprises an elongated lateral biassing finger extending from said loop in a direction substantially parallel to the direction of the arch wire, said lateral biassing finger having a curved hook free end portion configurated to engage the wire after the appliance is mounted on the bracket.

13. An orthodontic appliance for use with an orthodontic arch wire, comprising an orthodontic bracket having a front portion and a rear portion of reduced cross-sectional area connectable to an orthodontic band, whereby said bracket forms with the band at least

one channel extending along the latter, the arch wire extending proximate said bracket; a resilient collar configurated in the shape of a resilient loop formed in a curved plane, said loop having dimensions when curved corresponding to the external dimensions of said rear portion, and said loop having larger dimensions corresponding to the external dimensions of said front portion when said loop is deformed into a flat plane to thereby increase the size of said loop and permit the same to be releasably snapped onto said rear portion and at least partially received within said channel; and elongated finger means in the form of a biassing finger extending from said loop and having a biassing portion spaced to one side of said loop and being at least partially and resiliently movable in directions generally transverse to the plane defined by said loop and arranged to apply forces to the arch wire relative to said bracket, whereby said biassing finger is placed in a biassing condition when said loop is enlarged by urging the same into a substantially flat plane and said loop is snapped onto said bracket.

14. An orthodontic appliance as defined in claim **13,** wherein said bracket is an edgewise bracket and said front portion is provided with a transverse arch wire-receiving channel, wherein said biassing finger being in the form of a retaining finger extending from said loop across the arch wire-receiving channel and being at least partially and resiliently movable in directions generally transverse to the plane defined by the said loop and arranged to apply forces to the arch wire relative to said bracket when the arch wire moves out of said arch wire-receiving channel, whereby said retaining finger retains the arch wire within said arch wire-receiving channel of said bracket.

15. An orthodontic appliance as defined in claim **13,** wherein said loop is entirely closed and of square-like configuration.

16. An orthodontic appliance as defined in claim **13,** including a second finger having a resilient portion integral and in cantilevered relationship with a portion of said collar, said second finger extending in tandem with said first retaining finger entirely across said loop.

17. An orthodontic appliance as defined in claim **13,** wherein said collar and finger are constructed from a one-piece flat metal stamping.

18. An orthodontic appliance as defined in claim **13,** wherein the arch wire has two portions respectively positioned exteriorly of the bracket at each end of the channel, and wherein said finger means comprises a biassing finger is arranged to resiliently abut against one of the exterior wire portions, whereby a force is applied to the arch wire by said biassing finger relative to the bracket.

19. An orthodontic appliance as defined in claim **18,** wherein two biassing fingers are provided each respectively arranged to abut against another exterior wire portion on another side of the bracket.

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