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ORTHODONTIC PLIERS

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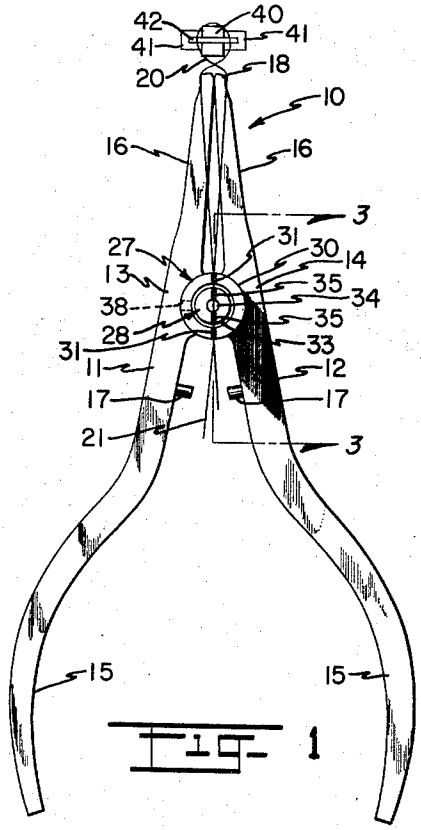


FIG. 1

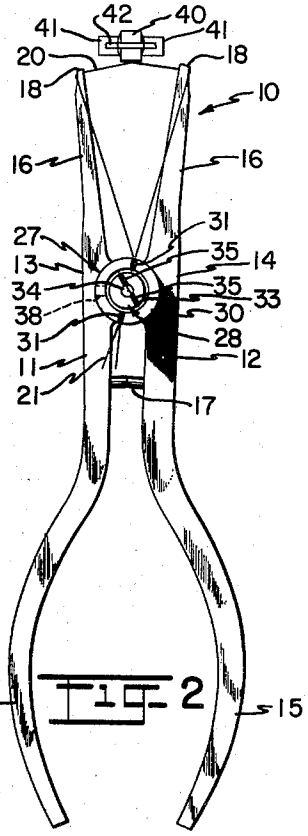


FIG. 2

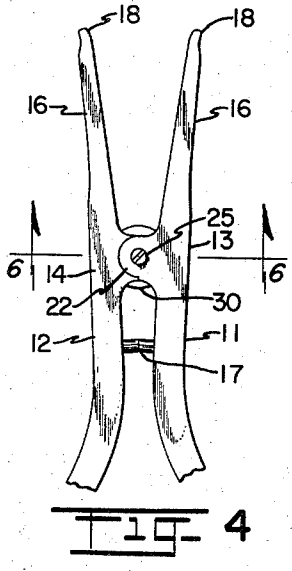


FIG. 4

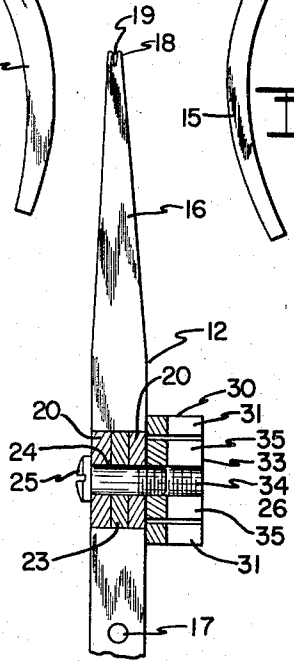


FIG. 3

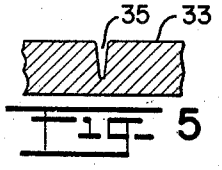


FIG. 5

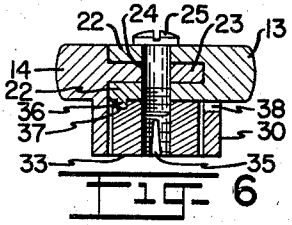


FIG. 6

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ORTHODONTIC PLIERS

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10 Claims. (Cl. 32—66)

This invention relates to an improved dental tool and more particularly to orthodontic pliers readily usable with orthodontic appliances to facilitate the correction of irregularities of the teeth.

In dentistry, especially that phase directed to orthodontics, it is common to employ ligature wires and the like which may be wrapped around an orthodontic bracket or the like secured to a band mounted on a tooth and then tied with a predetermined degree of tension within the mouth of the patient to, for example, secure an arch wire relative to the bracket and band. Since it is necessary to work in such a confined area, a manipulation of the wire, particularly tying and applying a predetermined tension to the wire, may of course become very difficult and uncertain. Generally a loop is formed in the wire for disposing it about the edges of the bracket and arch wire after which tension may be applied to the free ends of the loop to tighten it, then the free ends are twisted together and cut off. In accomplishing this operation a plier arrangement is normally used for grasping and applying tension to the wire and also twisting the ends of the wire together.

For example it is known to employ a plier arrangement wherein the wire is passed over the ends of the jaws of the pliers and the free ends are wound around a head or post on the pliers to secure the wire as tension is being applied. In addition, various other ways have been devised for anchoring the free ends of the wire but, to the best of my knowledge, all necessitate some positive manual securing operation, such as winding or clamping. It has been found that this operation may cause much difficulty and uncertainty since the plier elements, including the wire and securing means, are preferably made compact. Also, it is necessary to perform the securing operation in or near the mouth or the patient and at the same time to properly regulate the initial tension in the wire prior to tightening and thus the entire operation may become very time consuming and tedious and in some instances inaccurate.

Accordingly, the present invention has as its primary object to obviate the foregoing difficulties and disadvantages and in so doing so to provide for cooperative securing elements which may be adapted and disposed to loosely receive the ends of a ligature wire and to semi-automatically and simultaneously tighten the free ends of the wire as the jaws of the pliers are moved to tighten the ligature wire, and with additional movement of the jaws to permit easy release of the wire, and to accomplish the above in such a way as to eliminate winding or otherwise manually securing the free ends of the ligature wire.

It is another object to provide for a compact, improved plier arrangement for holding, tightening and releasing a ligature wire in or near a confined working area and which may be so constructed and arranged as to provide for the application of a predetermined degree of tension to the wire.

It is a further object to provide for a set of slot members which may be arranged in combination with a pair

of dental pliers in such a way as to allow loose positioning and release of the free ends of a ligature wire and, as the pliers are being manipulated to tighten the intermediate length of the wire, are adapted to move in a direction to snugly engage and to impart further tension to the wire.

It is still a further object to provide for a compact dental plier arrangement, reliable in operation, to provide for the rapid and positive, semi-automatic securing of the free ends of a ligature wire, and further to permit the rapid release of the ends once the wire is disposed in the desired position.

With the above and other objects in view, as will be presently understood, the invention consists in general of certain novel features of construction and combinations of parts as hereinafter more fully described and illustrated in the accompanying drawings, in which:

Figure 1 is a side elevational view in accordance with the present invention and wherein there is further illustrated a first position for applying a ligature wire about a bracket member;

Figure 2 is a side elevational view similar to Figure 1 illustrating a second position for securing the ligature wire about a bracket in accordance with the present invention;

Figure 3 is an enlarged section view taken about the line 3—3 of Figure 1;

Figure 4 is an elevational view of the opposite side of a preferred form of the invention as shown in Figures 1 and 2;

Figure 5 is an enlarged, fragmentary section view of a slot element forming a part of the present invention; and

Figure 6 is a view taken along the lines 6—6.

With more particular reference to the drawings, there is illustrated in Figures 1 to 6 an application of the present invention to an orthodontic plier arrangement **10** which may be broadly comprised of a pair of lever members **11** and **12** interconnected at intermediate body sections **13** and **14** and including gripping handles **15** extending rearwardly from the body sections **13** and **14** and a pair of tightening jaws **16** tapering forwardly from the intermediate body sections. Spaced rearwardly of the body sections **13** and **14** and extending inwardly from the inner surfaces of the handles are a pair of pins **17** which serve as abutments or stop members to regulate the extent of inward movement of the handles **15**. Defining the extremity of each of the jaws **16** is a wire receiving tip or end portion **18** which may be of any conventional type and which is shown bent or flared outwardly and provided with a wedge-shaped, inclined groove or notch **19** to receive and carry a ligature wire **20**.

The lever members **11** and **12** are pivotally connected together about the body sections **13** and **14** so as to permit limited, but free, movement of the jaws **16**. For this purpose the body section **13** is formed of a pair of spaced, circular flanges or plates **22** and the body section **14** is in turn made up of a complementary plate **23**, the plates **22** and **23** projecting laterally from the inner surfaces of the respective levers with the plate **23** being insertable between the spaced plates **22**. Each of the plates **22** and **23** is provided with centrally located openings **24** to receive a pivot pin or screw **25** extending upwardly through the opening so as to interconnect the plates. In addition, to permit relative rotation of the plates about the pivot pin **25**, the surface between the plates **22** of the body section **13** is given a curved slotted configuration and the inner surface of the body section **14** on either side of the plate **23** is given a similar slotted configuration generally conforming to the lateral exterior surfaces of the respective plates.

A primary feature of the present invention is the way

in which ends 21 of the ligature wire 20 may be easily disposed and automatically secured in position so as to cooperate with the jaws 16 to tighten the wire 20. In order to eliminate the necessity of winding or otherwise manually securing the ends 21 prior to tightening the wire, there are provided cooperative securing means made up essentially of a set of grooved or slotted elements 27 and 28. Preferably the element 27 may be formed of an outer ring or annular disk 30 extending upwardly from the surface of the body section 14 and provided with a pair of diametrically opposed guide slots 31 which are relatively deep and extend vertically into the disk from the top surface thereof. As shown, one side of the disk 30 is integrally formed with the body section 14 with the remainder of the disk projecting laterally from the body section 14 so as to lie in axially spaced relation over the plate 23 and with the projecting side resting on the surface of the body section 13 when the levers 11 and 12 are disposed in connected relation. The slots 31 are preferably disposed in general alignment with the length of the lever 12 with which the disk 30 is integrally formed, and are wedge shaped and relatively wide at the top surface to permit easy insertion of the ends 21.

In turn, the element 28 may be formed preferably of an inner, concentric disk 33 provided with a threaded opening 34 for connection to the end of the pivot pin 25 and also includes a pair of diametrically opposed gripping slots 35 which extend vertically through the thickness of the inner disk 33 and to a depth approximately equal with the depth of the outer slots 31. The slots 35 in addition are wedge shaped and, although it will be evident that they may be dimensioned to the same approximate size as the outer slots 31, it is preferred to make the slots 35 more narrow so as to establish a more positive gripping action with the free ends 21. When connected to the pivot pin 25 the top surface of the inner disk is substantially flush with the top surface of the outer disk 30 and the slots 35 are disposed in general alignment with the longitudinal axis of the lever 11, the latter being accomplished by an index pin 36 projecting upwardly from the uppermost plate 22 for insertion into an aperture 37 disposed on the under side of the inner disk 33.

In assembling the levers 11 and 12 together with the pivot pin 25 and the inner disk 34, the plates 22 may first be slipped into interlocking relation with the plate 23 by means of the pivot pin 25. It will be noted that the under surface of the projecting side of the outer disk 30 may be recessed as at 38 to permit easy passage of the index pin 36. The inner disk 33 may then be connected to the pivot pin 25 with the index pin 36 seated in the depressed portion 37. In this way, with the jaws in the closed position shown in Figure 1, the slots 35 are aligned with the slots 31 and together extend in a common direction generally parallel to the length of the pliers. Of course, as the jaws are manually opened by squeezing the handles 15, each pair of slots 31 and 35 will follow the movement of the levers 11 and 12 respectively so as to turn in opposite directions. Accordingly, with the jaws closed and the slots aligned, the ends 21 of the ligature wire 20 may be led rearwardly from the tips 18, brought together, then loosely disposed across the slots. The outer slots 31 will serve to initially guide the ends into desired position within the slots merely by pulling the wire against the beveled edges of the forward guide slots whereupon the ends will easily slip into place in engagement with the sides of the slots 31 and 35. Moreover, as shown in Figure 5, the inner slots 35 although preferably made more narrow than the outer slots 31, are wedge shaped in order to accommodate several diameters of ligature wire.

In practice, the intermediate portion of the ligature wire 20 may either be wrapped directly around a tooth and attached directly into a main support or arch wire (not shown), or as illustrated in Figures 1 and 2, the arch wire may be looped into engagement with slotted wings 40 provided on a suitable bracket 41 so as to secure an arch wire 42 in position against the bracket 41, all of which is well known in the art. To properly secure and tighten the ligature wire in position, the loop is first formed and guided through the slotted wings 40. The loose lengths of wire leading away from the loop are then slipped into the notches 19 of the pliers and the free ends 21 passed through the slots 31 and 35 as shown in Figure 1. In this position the free ends, together with the entire ligature wire, may be pulled by hand to the desired initial tension since they are loosely disposed in the slots. When the handles 15 of the pliers are squeezed, as shown in Figure 2, the tips 18 will move apart to tension the wire 20 and at the same time cause the slots 31 and 35 respectively to move in opposite directions so as to bend or hold the wire in the annular space between the outer disk 30 and the inner disk 32. With the ligature wire 20 thus locked and taut, the pliers may then be twisted several times to tighten, wind the wire and lock the same about the bracket 41. To release the wire from the pliers, it is only necessary to return the jaws to the closed position as shown in Figure 1 and remove the ends 21 from the slots, after which the loose ends may be cut off to the desired length. In this connection it is to be noted that with the inner slots made narrower than the outer slots, the wire will continue to be pulled through the outer guide slots 31 and will be tightly gripped by the inner slots 35 as it is bent, so as to apply increased tension to the wire as the jaws are being spread apart. Moreover, it will be seen that both the forward and rearward set of inner and outer slots will cooperate for a double gripping action.

It will be apparent from the above that many variations may be made within the scope of the present invention, such as the levers may be connected in crossed relation; other means for pivoting the levers may be utilized; and of course the exact disposition and alignment of the cooperating slots may be varied. For instance, the slots 31 and 35 need not be wedge shaped and may be of the same dimensions and still provide the necessary gripping action since the movement of the slots to bend the wires between the closely spaced disks is primarily responsible for the positive securing action obtained. At the same time, however, the wedge shaped slots may accommodate various sizes of wire and by forming the inner slots of a smaller dimension than the outer slots it is also possible to apply a predetermined degree of tension on the ends of the wire in cooperation with the tightening action of the jaws, as previously explained.

It will accordingly be apparent from the foregoing description that a compact plier arrangement is provided which will establish a rapid and positive means for anchoring the free ends of the ligature wire, which may be utilized to apply an increased predetermined tension to the wire as desired, yet at the same time permit easy release of the wire once secured in position. It is to be further understood that various changes in the construction and arrangement ofthe present invention may be made without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. In a dental tool of the character described, a pair of lever members pivotally connected together including handle means extending in one direction and jaws extending in the other direction providing ligature receiving openings adjacent to the ends thereof, and cooperative securing means disposed on said tool to loosely receive the ends of the ligature and to move in response to the movement of said jaws to tightly engage the ends of the ligature as said jaws are being moved to tighten the ligature.

2. In a dental tool of the character described, a pair of lever members pivotally connected together including handles extending in one direction and jaws extending in the other direction providing ligature wire receiving

openings adjacent to the ends thereof, and cooperative securing elements disposed on said tool, said elements being so constructed and arranged as to provide for laying the end of the ligature wire into loose engagement therewith and to move in relation to one another to tightly engage the ends of the wire as said jaws are being moved to tighten the intermediate length of the ligature wire.

3. In a dental tool of the character described, a pair of lever members pivotally connected together including handles extending in one direction and jaws extending in the other direction providing ligature receiving openings adjacent to the ends thereof, and cooperative securing elements defining at least one pair of slots aligned in one position to loosely receive the ends of the ligature wire, said elements being disposed to move in response to the movement of said jaws in such a way that said slots will operate to tightly engage the ends and to simultaneously apply tension to the ligature wire as said jaws are being moved to tighten the ligature.

4. In a dental tool of the character described, a pair of lever members pivotally connected together including handles extending in one direction and jaws extending in the other direction providing ligature receiving openings adjacent to the ends thereof, and a pair of cooperative securing elements defining a series of slots aligned in a first setting in a common direction generally parallel to the length of said tool whereupon the free ends of the ligature wire may be loosely inserted into engagement with said slots, each of said elements being arranged to rotate in response to the movement of said jaws whereupon the slots of one element will move in a direction to hold the ends of the ligature wire in cooperation with the slots of the other element as said jaws are being moved to apply tension to the intermediate length of the ligature wire.

5. In orthodontic pliers for inserting and locking a ligature wire, a plurality of slotted disk members arranged for rotation about a common axis, the slot portions on said disk members being normally aligned to loosely accommodate the ends of the ligature wire when the jaw portions of said pliers are disposed to loosely carry the intermediate portion of the ligature wire, and the slot portions being further rotatable in opposite directions to grip the ends of the ligature wire against release and to cooperate with the jaws to simultaneously apply tension to the ligature wire.

6. In orthodontic pliers for inserting and locking a ligature wire in a predetermined position, a plurality of slotted, spaced concentric disk members arranged for rotation about a common axis defined by the pivot point of a pair of jaw members of said pliers, the slot portions on said disk members being normally disposed for loose insertion of the ends of the ligature wire when the jaws are disposed to loosely carry the intermediate portion of the ligature wire, and the slot portions turning in opposite directions in response to the movement of the jaws to bend the ends of the ligature wire into locked position in the annular space between said disk members as said jaws are moved to tighten the ligature wire.

7. In a dental tool for inserting and semi-automatically locking a ligature wire wherein there is provided a pair of levers including handles extending in one direction

and jaw members extending in the other direction having notched ends for carrying a length of ligature wire, the combination therewith comprising means including a pivot pin for pivotally connecting said levers together intermediate said handles and said jaws, an outer ring associated with one lever provided with diametrically opposed slots, an inner concentric ring associated with the other lever provided with diametrically opposed slots, said slots being aligned to provide for slipping the ends of the ligature wire thereacross when said jaws are disposed to loosely carry the intermediate portion of the ligature wire, and said inner slots being movable in relation to said outer slots to hold and pull the ligature wire when said jaws are moved for tightening the ligature wire.

8. In a dental tool for inserting and locking the free ends of a ligature wire wherein there is provided a pair of levers including handles extending in one direction and jaw members extending in the other direction having notched ends for carrying a length of ligature wire, the combination therewith comprising means including a pivot pin for pivotally connecting said levers together intermediate said handles and said jaws, an outer ring associated with one lever having a pair of diametrically opposed radial guide slots, an inner concentric ring associated with the other lever having a pair of diametrically opposed radial gripping slots, said slots being aligned in a direction generally parallel to the length of said pliers for slipping the ends of the ligature wire thereacross when said jaws are disposed to loosely carry the intermediate portion of the ligature wire, and said inner slots being movable in relation to said outer slots to hold and pull the ligature wire when said jaws are moved for tightening the ligature wire.

9. In a dental tool for inserting and locking the free ends of a ligature wire wherein there is provided a pair of levers including handles extending in one direction and jaw members extending in the other direction having notched ends for carrying a length of ligature wire, the combination therewith comprising means including a pivot pin for pivotally connecting said levers together intermediate said handles and said jaws, an outer ring associated with one lever having diametrically opposed radial slots, an inner disk disposed in concentric spaced relation within said outer ring having diametrically opposed radial slots, said slots being wedge shaped and aligned in one position for slipping the ends of the ligature wire thereacross when said jaws are disposed to loosely carry the intermediate portion of the ligature wire, and said inner slots being movable in relation to said outer slots to bend the free ends of the ligature wire into the annular space formed between said disk and said ring so as to lock the ligature wire as said jaws are being moved for tightening the wire.

10. The dental tool according to claim 9 wherein said inner disk and said outer ring are arranged for movement about said pivot pin.

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