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ORTHODONTIC PLIERS
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Fig. 1

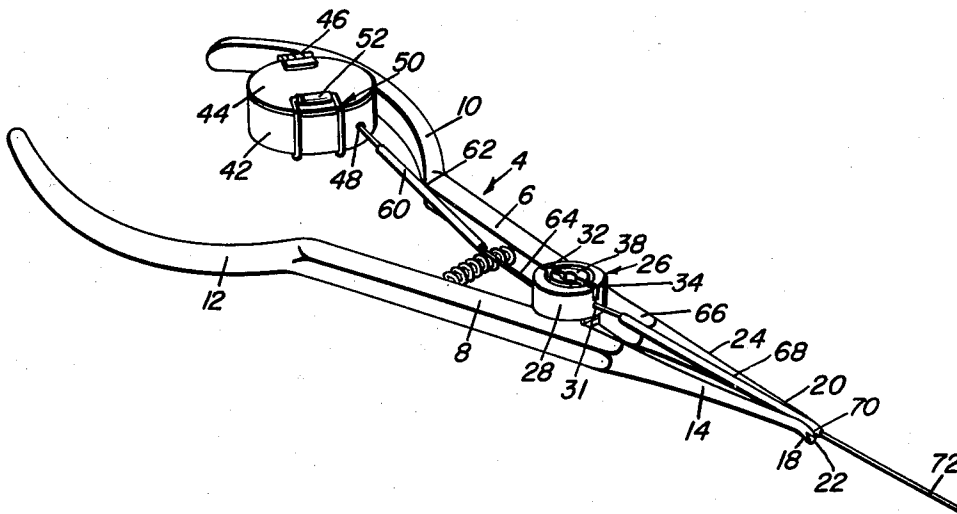


Fig. 2

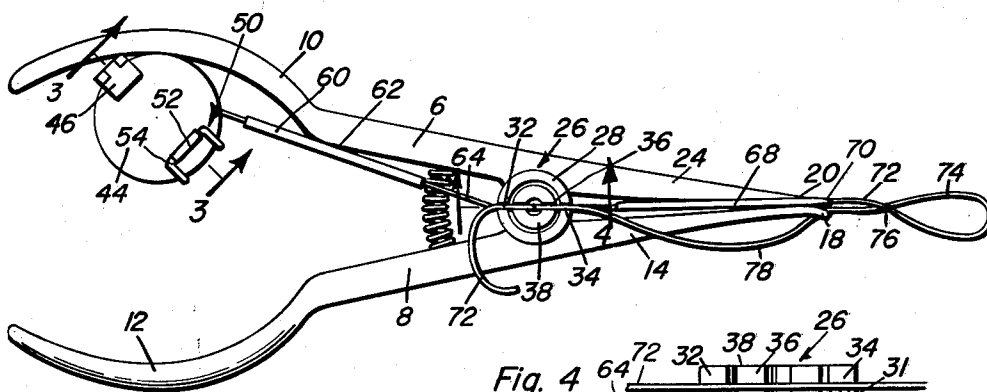


Fig. 3

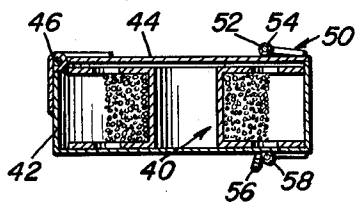
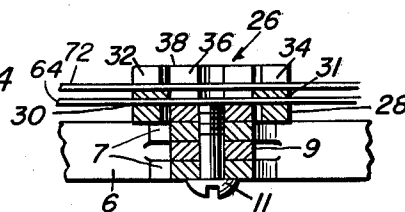


Fig. 4



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ORTHODONTIC PLIERS

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4 Claims. (Cl. 32-66)

This invention relates, generally speaking, to orthodontic procedures and techniques having to do with ligature ligations, more particularly, to improved ligature tying pliers and ligature wire storing, delivering and ligating or tying facilities added to said pliers.

More specifically, the invention pertains to ligature wire holding and twisting pliers expressly designed and adapted to enable the orthodontist to engage the ligated or looped portion of the ligature wire in the existing flanges of a bracket, a customary and known type, and then expeditiously tighten the ligature wire around the labial arch wire, readily, reliably and in one continuous mode of procedure.

Persons conversant with the art to which the invention relates are aware that it is customary and therefore common practice to apply ligature wire by hand. The prevailing procedure requires preparing short ligature wires which are then threaded by hand into the flanges of the brackets and are tightened by placing a pair of tying pliers on the cooperating portions of the looped wire and then twisting and winding the wire around the cleat lock of the pliers as a step preparatory to the final tightening procedure. It is an object in the instant matter to eliminate the use of individual or short ligature wires, the arduous steps pursued in connection therewith and to promote more uniform and reliable results. To this end the construction of the pliers makes it possible, by simply improving upon the pliers, to provide a source and supply (limited of course) of wire, the arrangement being such that the user saves time and avoids the perplexities and tedium otherwise involved in the handling of prevailing equipment. Then, too, and as will be hereinafter more fully appreciated, the improved pliers herein revealed will satisfactorily eliminate utilization of a ligature director inasmuch as the directing of the ligature wire may now be accomplished by properly utilizing the terminals of the jaws of the pliers and wherein the wire is fed out through a properly positioned tubular sheath or sleeve on one jaw terminal which is registrably cooperable with a V-shaped beak on the companion jaw.

In carrying out a preferred embodiment of the over-all concept the component parts of the pliers are so constructed that the ligature wire supply source and guiding means therefore is effectually incorporated to become a part of the pliers.

Whereas the preferred embodiment of the invention may be constructed and utilized otherwise than herein disclosed a preferred embodiment has to do with what may be described as attachment means for ligature tying pliers; that is, pliers which are provided with a semi-automatic concentric locking device through the medium of which ligatures are locked and unlocked expediently without winding or unclating. This is currently achieved when the aforementioned short length of ligature wire is placed in a center guide slot and fed away from a stud or lock nut. Slight pressure to the handles of the levers of the pliers accomplishes the wire-end locking result.

Briefly summarized the improved pliers are characterized by a pair of similarly constructed companion levers having handles at corresponding inner end portions and wire retaining ligature ligating jaws at outer end portions thereof and means hingedly joining cooperating intermediate portions of the respective levers. The hinge means comprises a hub which is fixed to one of the levers, said hub being circular in cross-section and having a top sur-

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face provided centrally with a kerf opening through said top surface. A complementary collar is provided and fixed on a median hinged portion of the other lever and it surrounds or encompasses the hub. This collar has the top surface thereof provided with diametrically opposite wire accommodating kerfs which are alignable with the first-named kerf and are adapted for reception of a free end portion of the ligature wire. This collar is unique in that it is provided with wire threading bores which are aligned with each other and are separated or isolated from and are out of communication with the last-named kerfs but are normally aligned and communicable with the first-named kerf in a manner to permit a portion of the ligature wire to be threaded through the rearward bore, through the first-named kerf and then through the forward bore.

These together with other objects and advantages which will become subsequently apparent resides in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a view in perspective of ligature ligating pliers with ligature wire storing and ligating or tying means constructed in accordance with the principles of the invention and illustrating a leading end of the ligature wire projecting beyond the improved jaw construction.

FIG. 2 is a plan view based on the showing depicted in FIG. 1 but showing how the looped wire has been formed with the wire-ends leading therefrom and about to be bent and retained against slippage to facilitate the ligating or twisting and tying steps.

FIG. 3 is an enlarged section, with parts in elevation, taken on the plane of the line 3-3 of FIG. 2 looking in the direction of the arrows.

FIG. 4 is an enlarged detail view fragmentarily shown and appearing in elevation and section and taken on the plane of the line 4-4 of FIG. 2, looking in the direction of the arrows.

The ligature ligating or tying pliers 4 constitute an instrument which is currently on the market and presently used by orthodontists in the handling of ligature ligations. This instrument, as the drawing shows, is characterized by a semi-automatic concentric locking device wherein ligatures are locked and unlocked promptly without winding or unclating. Persons conversant with this type of tying pliers are also aware that the ligature wire is properly placed in cooperating guide slots in the locking device and bent. In other words, locking takes place by a slight pressure to the arms of the pliers. More specifically, the instrument herein shown comprises a pair of pliers generally made of stainless steel and embodying a pair of duplicate coplanar levers 6 and 8 the left hand portions of which are suitably curved to provide handles 10 and 12. Intermediate portions of the levers are hingedly connected together by way of lugs or ears 7 and 9 and a cooperating pivot bolt 11, shown in FIG. 4, the levers being disposed side-by-side. The right hand end portion of the lever 8 has a tapering jaw 14 terminating in a laterally deflected beak 18 having a V-shaped seating notch 22 therein. The terminal 20 of the tapering jaw 24 is of special construction as will be later described. The aforementioned semi-automatic concentric locking device or means comprises a novel two-part hinge denoted generally by the numeral 26. This hinge embodies, among other features, a ring-like collar 28 rigidly mounted on the lever 8 and provided with horizontal bores or passages 30 and 31 extending diametrically through the same to accommodate portions of the wire which are slidably threaded there through as depicted in FIG. 4 in particular. The upper half of the collar is provided with kerfs or notches 32

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and 34 divided and separate from the bores 30 and 31 and normally registering with a complementary kerf 36 in the hub 38 which is encompassed by the collar 28 and fixed to the lever 6. These components 28 and 38 provides relatively rotatable coacting parts which when the kerfs 32, 34 and 36 are disaligned, the wire-end located therein is temporarily bent so as to anchor the wire against slippage and to permit proper formation of the ligation depicted at the right in FIG. 2 and to be later described. The hinge means is characterized by the fixed hub 38 and the encircling collar 28 with their wire-end seating notches or kerfs 32, 34 and 36 constitute features in the existing or marketed pliers. However, the bores or passages 30 and 31 through which the portion 64 of the wire is slidably threaded constitute an improvement introduced in this hinging hub and semi-automatic concentric locking device.

The source and supply of ligature wire is mounted on and made a part of the implement or pliers. More specifically, the ligature wire is coiled on a spool 40 removably mounted in the cup-like part 42 of a holder, said holder having a lid or cover 44 hinged in place at 46. The end of the wire emerges for use through a hole 48 provided therefor as shown in FIG. 1. Any suitable fastening means for the lid or cover may be provided. The numeral 50 here designates a wire bail or latch the bight portion 52 of which is hinged in a bearing as at 54 (See FIG. 3). The free latchable end of this catch is denoted at 56 and cooperates with a suitable keeper 58 fixed on the bottom of the cup or receptacle.

Attention is next directed to a first sheath or sleeve 60 which is fixed at 62 on the lever 6 as best shown in FIG. 2. This sleeve passes and guides a portion 64 of the wire. The portion of the wire just ahead of the sheath or sleeve 60 is threaded through the aligned bores or passages 30 and 31 in the collar 28 where it emerges as at 66 whereupon it is then threaded through a second or companion sleeve or guiding sheath or tube as at 68. The terminal end 70 of this tube registers and is flush with the notch 22 in the beak 18 as illustrated. The leading or free end portion 72 of the wire is ligated or fashioned into a ligation or loop 74 and the wire portions are crossed as at 76 for twisting and tying. The end portion 78 is passed rearwardly or from right to left in FIG. 2 through the notch or seat 22 where the terminal part of the wire is seated in the normally aligned kerfs 32, 34 and 36 as illustrated in FIG. 1 and 2.

It will be obvious that in using the device the wire spool 40 is inserted in the holder in the manner best illustrated in FIG. 3. The latch or fastening means 50 is closed and the wire, as already stated, is directed forwardly through the hole 48 provided therefor as illustrated in FIG. 1. The user continues to thread the wire through the sheath-like tubes or sleeves 60 and 68 and the portion of the wire therebetween is threaded through the passages 30 and 31 in the fixed collar 28. The pliers may now be said to be loaded as illustrated in FIG. 1 for use of the ligature wire, that is, wire which is ready for placement on the orthodontic appliance of the patient (not shown). In actual practice, the wire emerging from the end 70 of the sleeve 68 is directed with the tip under the flanges of the orthodontic buccal or labial brackets in the manner to engage the arch wire in the brackets. The wire is engaged in the beak 22 and then passed back through the aforementioned locking device. Pressure is applied now to the handles of the pliers which tightens the locking device and then the engaged ligature wire is twisted about four half-turns. This latter procedure having been accomplished, the operator cuts the wire at about 3-5 mm. from the bracket leaving the ligature wire ready for the next bracket service.

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In addition to the improved features 30 and 31 in the hub construction in FIG. 4 it is to be added that the guide sleeve 68 is a further improvement in that it may be made as an integral part of the jaw 24 and its end portion 20. In other words, in the ligature tying pliers on the market both of the jaws have beaks with V-shaped notches therein. In the improvement here the beak in the jaw 14 is retained but the beak on the jaw 24 is dispensed with and the end of the tube or sleeve 68 is substituted for the omitted beak.

The foregoing is considered as illustrated only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. Orthodontic pliers comprising a pair of similarly constructed companion levers having handles at corresponding inward end portions and wire positioning, retaining and ligature ligating jaws at outer end portions thereof, and means hingedly joining cooperating intermediate portions of the respective levers, said means embodying a hub fixed to one of said levers, said hub being circular in cross-section and having a top surface provided centrally with a kerf opening through said top surface, and a complementary collar fixed on a median hinged portion of the other lever and rotatably encompassing said hub, said collar having a top surface thereof provided with diametrically opposite wire-accommodating kerfs normally aligned with said first-named kerf for reception of a free end portion of said ligature wire, said collar being also provided with a pair of diametrically opposite wire-threading bores, said bores being separated from and out of communication with the last-named kerfs but being in alignable communication with said first-named kerf.

2. The structure according to claim 1 and, in combination, an elongated wire guiding sleeve fixed on an outer end portion of one of said levers and having an outer end portion terminating flush with the adjacent tip portion of the coacting jaw, the outer end of the last-named jaw being provided with a laterally deflected beak having a V-shaped wire seating notch therein, the inner end portion of said sleeve being positioned for cooperation with an adjacent one of said bores.

3. The structure defined in claim 2 and, in combination, a second elongated wire-threading and guiding sleeve cooperating with the first-named sleeve and fixedly mounted on said one lever and having a forward end thereof spaced rearwardly from said collar and the adjacent bore.

4. The structure defined in claim 3 and, in combination, a wire storing spool holder fixedly mounted on the handle of the last-named lever, said holder embodying a cup adapted to contain and confine a spool of ligature wire, said cup having a rim with a wire discharge hole spaced from but in wire feeding and guiding relation to an adjacent end portion of the second-named sleeve.

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