The present invention relates to improved crimping pliers particularly adaptable for use by orthodontists and for general use where a crimp is to be put into a wire, especially where such wire must remain in an assembly.

An object of this invention is to provide a novel and improved pliers for an orthodontist's use in a patient's mouth, to put a crimp for instance in a mounted arch-wire without distorting the position of said wire on the teeth and avoiding any lateral shift of such wire except in that small part thereof which is to constitute the crimp.

Another object hereof is to provide an orthodontist's pliers of novel and improved construction wherein the very first surface thereof entering the mouth, presents a formation to set on the arch-wire and hold it from bending except where the crimp is to be.

A further object hereof is to provide a novel and improved orthodontist's pliers of the character set forth, which effects a crimp in a wire to any desired depth within the limit of the pliers' capability, which may include means to adjust the depth of crimp effected, and which instrument may be used to deepen an existing crimp.

Another object of this invention is to provide a novel and improved crimping pliers of the type mentioned, affording various clearances in the crimp-forming parts thereof to allow wire movement to crimp form without any shearing effect, thus avoiding the breaking of the wire being worked on.

Another object of this invention is to provide a novel and improved orthodontist's pliers of the sort described, affording a bending punch part on one of its jaws and a complementary bending die and work holder on its other jaw, where when the pliers is of the type wherein the jaws are in pivotal relation with each other, so that the locus of travel of points on the movable jaw is arcual, the other jaw being at rest on the wire, the crimp made with these improved pliers will not slope from the teeth.

A further object hereof is to provide an orthodontist's pliers of the nature set forth, of novel and improved construction for crimping an arch-wire without removing it from the mouth and at no discomfort to the patient.

Another object of this invention is to provide a novel and improved crimp-forming pliers of the kind set forth, which is reasonably cheap to manufacture, easy to use, with no parts to go out of order and which is efficient in carrying out the function for which it is designed.

Other objects and advantages will become apparent as this disclosure proceeds.

In the accompanying drawings forming part of this specification, similar characters of reference indicate corresponding parts in all the views.

Fig. 1 shows a front view of the pliers embodying the teachings of this invention. Said instrument is shown positioned on the arch-wire in a patient's mouth and in condition ready to make a crimp in such wire.

Fig. 2 is an enlarged fragmentary perspective view of said pliers. The jaws are open.

Fig. 3 is a section taken at lines 3—3 in Fig. 2.

Fig. 4 is a section taken at lines 4—4 in Fig. 1, showing the jaws in closed condition, thereby effecting a crimp in the arch-wire.

Fig. 5 is a magnified view of one of the beaks shown in like manner as in Fig. 1.

Fig. 6 is a fragmentary end view of one of the plier jaws of slightly modified construction.

In the drawings, the preferred embodiment of this invention comprises a plier structure having the jaws 15 and 16 which are movable towards and away from each other. Each of these jaws may be at the end of a handle pivoted at 17; said handles being denoted by the numerals 18 and 19 respectively, and cross as is common in simple plier design. The jaw 15 has a lateral finger 20 extending therefrom towards the other jaw 16. When the pliers are closed partially, said finger 20 lies between two spaced beaks 21 and 22 which extend from the outer tip of the jaw 16, and of course, said finger continues between said beaks when the plier denoted generally as 14, is completely closed as in Fig. 4. Said finger 20 at its tip end facing jaw 16, is also formed as a beak indicated at 23. The mouth of beak 23 is in a plane substantially perpendicular to the plane of the mouths of the beaks 21, 22. The lips 21', 21", 22', 22" which are really like four teeth at the very tip of jaw 16, are so positioned that they all four at once are the first components of the pliers 14 to enter the mouth of the patient 24 when this tool is inserted as in Fig. 1, and of course the tool is easily set so that the arch-wire 25 lies in the mouths of both beaks 21, 22. It is evident that if the plier is closed so that the wire 25 shall become engaged in the beak 23, that the extent of further movement of the jaws towards each other, in fact only jaw 15 is the one that moves, will determine the depth of the crimp 25' formed in said wire 25. All three beaks 21, 22, 23 constitute a crimp-forming die means and of course there is clearance for wire thickness between beak 23 and each of the beaks 21 and 22, as indicated at 26 and 27 respectively.

As an aid to avoid shearing action on the wire 25, grooves 28 along the finger 29, an appropriate depth of the mouths of the beaks 21, 22, are provided. Also if desired, the said finger may have slight pivotal movement, in which instance, the jaw 15 is formed with a clevis 15' to hold said finger between its tines by means of the axis pin 29; the floor 15" of said clevis serving as a stop limiting the scope of movement of said finger 20. Such permitted movement of said finger avoids the crimp as 25" from extending away from the teeth 30, because it is the natural tendency of wire to bend without torsional movement which might result if the finger was fixedly secured on the jaw 15, whereupon movement of said finger 20 would be arcual. This "give" of said finger becomes useful especially when the crimp to be effected is a comparatively deep one. Of course, once a crimp is made, it is evident that it may be deepened with these pliers 14. Depth of crimp to be made, may be determined by providing the adjustment screw 31 through one handle, to contact the other at a certain closeness of the jaws.

It may also be noted that at the commencement of movement of the wire 25 by the finger 20, said wire has the tendency to move outwardly of the beaks 21, 22, before yielding to being bent. Hence the depth given the mouths of these beaks affords this movement without the wire disengaging from said beaks. An additional aid to avoid shearing action on the wire 25, may be accomplished by having the beaks 21, 22 in slightly divergent relation as noted in Fig. 6, instead of being parallel as shown in Figs. 2 and 4.

In the orthodontia structure illustrated, an arc wire 25 is mounted around a group of teeth, on each of which is a cleat element 32 whose manner of mounting is well
known, to serve to locate said arch wire whose ends are anchored on suitable terminal means 33.

Although crimping might be done by merely having the teeth 21' and 22' in cooperation with the finger 20, the action would be to bend the arch wire 25 as indicated at 34 at each side of the crimp effected. This of course is objectionable, and is avoided by the presence of the teeth 21'', 22'', which hold the arch wire 25 against such bending as at 34, and all bends in said wire are substantially square, but certainly not obtuse. Said teeth 21'', 22'' also serve to cause a frictional drag on the wire 25 as the crimp is being made therein, thereby accomplishing a gradual reaction of the forces being experienced at the anchor points as 33, instead of a sudden jerk thereon which would be very uncomfortable for the patient.

In implements of this type heretofore, the crimping plane was along the beaks while here the crimp is made in a plane across the beaks 21, 22. When the crimp 25' is made in a plane along the beaks where the finger 20 would travel in a direction akin to into the beaks, the wire portions out of the plier are free and are bent as at 34. In the present tool 14, the wire is held against such possible movement by the teeth 21'', 22'', and the resulting bends forming the crimp 25' are substantially square with respect to the length of the wire 25.

This invention is capable of numerous forms and various applications without departing from the essential features herein set forth. It is therefore intended and desired that the embodiment and uses set forth herein shall be deemed illustrative and not restrictive and that the patent shall cover all patentable novelty herein set forth; reference being had to the following claims rather than to the particular description herein, to indicate the scope of this invention.

I claim:
1. In an implement of the character described, opposed relatively movable jaws, one of said jaws having a finger extending laterally therefrom towards the second jaw; said finger being swingably mounted on the jaw carrying it and including means to limit the scope of movement of its swing on such jaw and four spaced teeth extending from the second jaw in a direction across the locus of movement of said finger; said teeth forming two spaced beaks on the second jaw; said beaks being adapted to simultaneously receive a wire therein; the locus of movement of said finger being between said two beaks, whereby when the jaws are brought together, said finger first passes between one tooth of each beak, then across the line of wire position and finally between the second teeth of each beak; said finger being away from between said second teeth when said jaws are apart a predetermined amount.
2. The implement defined in claim 1, wherein the mentioned finger at its free end is provided with a beak formation adapted to receive the wire therein during travel of said finger when the jaws are brought together and with a lengthwise groove along each face of said finger which is opposite a beak on the second jaw when the jaws are brought together, each of said grooves being communicative with the opening in the beak at the free end of said finger.

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