

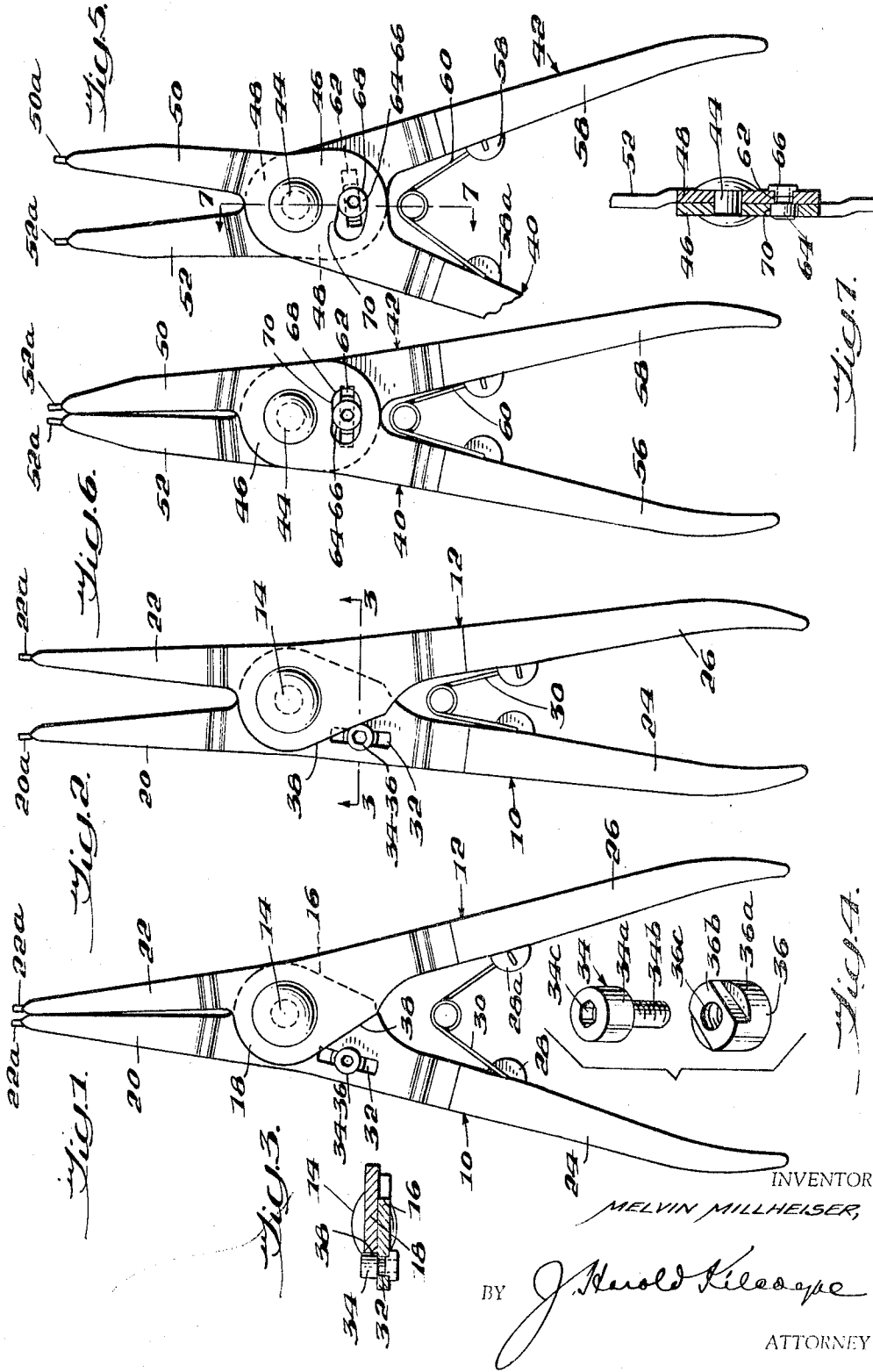
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M. MILLHEISER

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ADJUSTABLE STOP MEANS FOR PLIERS

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INVENTOR  
MELVIN MILLHEISER,

BY *J. Harold Kleepe*  
ATTORNEY

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**ADJUSTABLE STOP MEANS FOR PLIERS**

Melvin Millheiser, Rockaway, N.Y., assignor to Waldes Kohinoor, Inc., Long Island City, N.Y., a corporation of New York

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This invention relates to improvements in pliers for assembling and disassembling split spring retaining rings in and from grooves provided therefor in shafts, housing bores and the like, and more particularly to improved stop means which serve in so-called external ring pliers, i.e. pliers for use with external rings, to limit the spreading of the tips or points thereof and thereby overspreading of the rings with which the pliers are coupled during their assembly in and disassembly from their grooves, and in the case of internal pliers, i.e. pliers for use with internal rings and whose handles are normally spread apart by a spring extending therebetween, to pre-set the spacing of the pliers tips so that they will align automatically with the apertures conventionally provided in the free end portions of such spring retaining rings, thus to facilitate and speed ring pick-up preliminary to the ring assembly operation.

While plier-type tools equipped with handle-spreading spring means and with stop means functioning as aforesaid are well known, for which reference is had to United States Patents Nos. 2,439,785, 2,455,165 and 2,792,622 which with the present application are commonly owned, the prior stop means were open to the objection that they were not only of relatively costly design and were cumbersome as well, but, more importantly, that they incorporate laterally projecting parts which were likely to interfere with free movement of the pliers tips into assemblies incorporating components which limit access to the assembly parts to be retained.

Broadly stated, an object of the present invention is to provide, in pliers for use in installing and removing split spring retaining rings as aforesaid, stop means thereof of a design which overcomes the objections noted above in connection with the prior pliers stop means, and which is further characterized by simple design and inexpensive construction and which moreover is thoroughly practical and dependable in operation.

More particularly, the invention contemplates and provides pliers stop means which are incorporated into existing parts of the pliers and thus involve no laterally projecting parts as could impede movement of the plier tips into and from ring-seating position, for example, in assemblies wherein adjacent components limit access to the parts to be retained by the ring being installed or disassembled.

Still another object of the invention is the provision of adjustable-position stop means for use in assembling and disassembling split spring retaining rings which is characterized by such simple construction and design that the same may be incorporated into the hub portions of the plier arms and, when so incorporated, do not extend to increase the normal dimensions thereof.

The above and other objects and features of advantage of improved stop means for pliers-type split retaining ring assembling and disassembling tools according to the invention will appear from the following detailed description thereof, in which reference is had to the accompanying drawings, wherein—

FIG. 1 is a plan view of a pliers for assembling and disassembling external retaining rings and which is equipped with the improved and simplified stop means of the invention, the view showing the pliers in the handle-spread position;

FIG. 2 is a similar view but illustrating the handles compressed to their closed position, as the latter is determined by stop means as herein contemplated;

FIG. 3 is a section taken along line 3—3 of FIG. 2;

FIG. 4 is an exploded perspective view illustrating the details of the set screw and slide nut components of the stop means;

FIG. 5 is a partially broken-away view similar to FIG. 1 but illustrating a pliers for assembling and disassembling internal retaining rings similarly equipped with stop means according to the invention functioning, in this instance, to pre-set the initial spacing of the pliers tips to that of the initial spacing of the apertures in the ends of a ring to be assembled;

FIG. 6 is a view showing the pliers of FIG. 5 with its handles in their full-closed position, as determined by the jaws carrying the pliers tips having been brought together; and

FIG. 7 is a section taken along line 7—7 of FIG. 6.

Referring to the drawings in greater detail, and first considering FIGS. 1-4 thereof which illustrate a pliers-type tool for assembling and disassembling external retaining rings in and from grooves provided therefor in shafts, spindles or like carrier members, such illustratively comprises a pair of generally parallel lever arms 10, 12 connected to one another intermediate their ends by a rivet 14 serving as a pivot and which extends through hub-like formations 16, 18 formed in the intermediate length portions of said arms. The relatively forward or working-tip ends of said arms, which are offset to one another so that they lie in a common plane, provide tool jaws 20, 22 which terminates at their free ends in working tips or points 20a, 22a adapted for insertion in the apertures of the radially outwardly projecting lugs or ears conventionally provided at the free ends of split spring retaining rings of the external type.

The rearward or handle ends of said lever arms 10, 12 mount handles 24, 26 which illustratively have channel section and are disposed so that their channels face one another, the relatively forward ends of said channels receiving the rearward ends of said lever arms and being affixed thereto as by welding. Also, the rearward ends of said lever arms are formed with inwardly projecting tabs 28, 28a to which are anchored the ends of a spring 30 functioning normally to maintain the handles spread and the tool tips closed, which is the position of said pliers parts shown in FIG. 1.

With the construction so far described, it will be appreciated that compression of the handles 24, 26 will effect spreading of the working tips 20a, 22a and a corresponding spreading of an external spring retaining ring with which said working tips have been coupled, as by insertion of said tips into the apertures of the ring ears as aforesaid.

However, because uncontrolled handle-closing movement can and usually does result in over-spreading of and hence in the ring taking on a permanent set which impairs if not destroys its further usefulness, such pliers are usually provided with some form of stop means designed to limit handle-closing movement to that within the range which protects against objectionable ring over-spreading. According to the present invention, improved stop means are provided, such comprising a simple, adjustable-position set screw-slide nut combination contained within the dimensional confines of the aforesaid hub portions 16, 18 of the pliers arms. More particularly, the hub portion 16 of the lever arm 10 to the rear of the pivot 14 is formed with a longitudinally extending slot 32 of appreciable length, with the stop means proper comprising a set screw generally designated 34 secured in place along the slot by a nut 36. By reference to FIG. 4, said set screw has an enlarged head portion 34a of diameter greater

than the width of the slot 32, and a threaded shank portion 34b of substantially smaller diameter. Said set screw is adapted to be threaded into the slide nut 36 which has a head portion 36a of diameter somewhat greater than the width of the slot, from which depends a parallel-sided lug or key 36b of width corresponding to the width of said slot, said nut being further provided with a tapped through hole 36c adapted to threadedly receive the shank 34b of the set screw 34.

As will also be seen in FIGS. 1 and 4, the enlarged diameter head portion 34a of the set screw is provided with a hex-shaped recess 34c adapted to receive the end of a hex-shaped spanner wrench by which the set screw may be tightened and loosened. Thus, the arrangement is such that upon loosening of the set screw 34, the set screw-slide nut combination may be moved bodily to a selected position along the length of the slot 32 and thereupon secured in such position by tightening of the set screw, as results in said combination being located in a desired position of adjustment along said slot.

To make possible the use of the set screw 34 as a stop which serves to limit closing movement of the plier handles 24, 26, the companion hub portion of the plier or lever arm 12 is formed, along its edge which is disposed adjacent the set screw-slide nut combination, with a straightway-extending edge portion 38 which is inclined to the longitudinal axis of the slot 32 and so disposed with respect thereto that it intersects the relatively forward end of said slot when the handles are in their fully spread position and thence inclines away from the longitudinal line of said slot. By this arrangement, as the set screw-slide nut combination is moved downwardly along said slot, a progressively greater degree of handle-closing movement is permitted before such movement is stopped by engagement of said straightway edge 38 with the set screw. Conversely, as the set screw-slide nut combination is moved upwardly along the slot, the degree of closing movement of the handles and thereby the spreading of the working points is decreased.

Accordingly, it will be seen that the invention provides exceedingly simple adjustable-position stop means for varying the maximum degree of closing movement permitted the plier handles 24, 26 and thereby the maximum degree of spreading of the working points 20a, 22a of the pliers. It will further be seen that said stop means is completely encompassed within the dimensions of the hub structure of the pliers and thus in nowise impedes the ability of the pliers to move into assemblies which incorporate components which tend to limit entry of the working tips of pliers provided with laterally projecting stop means or stop-means parts.

Referring to FIGS. 5, 6 and 7, which illustrate the stop means as contemplated by the present invention applied to internal pliers, i.e. a pliers used with internal rings which must be contracted when being assembled in inwardly opening grooves of housing bores and the like, such an internal pliers is shown to comprise lever arms 40, 42 comparing to the arms 10, 12 of the aforesaid external pliers illustrated in FIGS. 1-4 but differing in that said arms are pivotally connected in crossing relation by a pivot 44 extending through their intermediate-length hub portions 46, 48. As with the prior described external pliers, the forward ends of said crossed arms constitute jaws 50, 52 which terminate in working tips or points 50a, 52a and to the rearward or handle ends of said crossed arms are secured handles 54, 56 carrying spring-mounting tabs 58, 58a to which the ends of a handle-spreading spring 60 are anchored.

From the above, it will be appreciated that contraction or closing of the handles against the bias of spring 60 results in the pliers tips 50a, 52a being moved towards one another, as they must be to contract an internal ring to which said pliers is coupled as by inserting said pliers tips into the apertures of the ears or lugs conventionally provided at the free ends of said ring. However, it will also be seen that unless means for limiting the degree of

handle opening is provided, the spacing of the working points is limited only by the amount that the spring can spread said handles. Such is a feature of objection to internal pliers provided with a handle spreading spring such as the spring 60, since in using a pliers to pick up a ring for assembly, it is necessary for the operator to contract the handles the precise amount as results in the pliers tips being spaced the exact distance that the ring apertures are spaced, since otherwise said tips will not align with said apertures.

The stop means for internal rings now to be described overcomes this objection in that it serves to pre-set the initial spacing of the pliers tips 50a, 52a to that of spacing the apertures in the ends of the rings to be assembled, and at the same time said stop means is incorporated and encompassed within the dimensions of the tool as a whole, as defined by and particularly within the dimensions of said lever-arm hub portions 46, 48.

More in detail, said stop means which is disposed wholly rearwardly of the pivot 44 comprises a longitudinal slot 62 in the hub portion 43 of the lever arm 42 and which compares to the slot 32 of the earlier described external pliers, a set screw-slide nut combination 64, 66 identical with the aforesaid set screw-slide nut combination 34, 36 and which is adapted to be secured in a desired fixed position along the length of said slot 62 by tightening of the set screw 64, and an abutment edge 68 adapted by its engagement with said set screw 64 to limit movement of the pliers handles in one direction and thus comparing with the aforesaid abutment edge 38 of the FIGS. 1-4 external pliers. For simplified and symmetrical design, however, said slot 62, rather than extending longitudinally of the lever arm in which it is formed, as does the aforesaid slot 32, extends crosswise of the arm hub portion 48 and the abutment edge 68 is the right-end edge of an oval-shaped window or opening 70 provided in the hub portion 46 of the lever arm 40 and which is disposed with its major axis also extending crosswise of said hub portion and having width in excess of the diameter of the head of said set screw 64 so that the latter may move freely along same.

The above described arrangement provides that the spacing of the working tips 50a, 52a may be pre-set to equal the spacing between the end apertures of a ring to be assembled then in its normal unstressed state simply by loosening the set screw, shifting the position of the set screw-slide nut assembly 64, 66 lengthwise along the slot 62 to a position in which it will function to pre-set the maximum permissible spacing of the pliers tips 50a, 52a to correspond with the normal spacing between the ring-end openings and thereupon tightening the set screw to lock said set screw-slide nut combination in place. Thereafter, the action of the spring 60 will be to spread the handles 54, 56 only the amount as results in the tips 50a, 52a being normally maintained in their pre-set position as insures said tips automatically aligning with the apertures provided therefor in the ends of the ring to be assembled, which greatly facilitates and speeds ring pick-up.

Without further analysis, it will be seen that the improved stop means for pliers-type tools of the external and internal forms above described for use in assembling and disassembling split spring retaining rings in and from grooves provided therefor in shafts, bores of housings and the like achieves the objectives of the invention as explained in the foregoing. However, as many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A pliers for assembling and disassembling split spring retaining rings comprising, in combination, a pair of lever arms having hub-like portions intermediate their ends and being pivotally connected for relative angular

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notion by a pivot passing through said hub portions, the ends of the arms extending to one side of said hub portions terminating in tips adapted to be inserted in the apertures conventionally provided in the free ends of said split retaining rings to be assembled and disassembled and the ends of the arms extending to the other side of said pivot mounting handles, spring means operatively associated with said handles for normally maintaining same in said spread-apart position, and stop means for limiting the maximum permissible spacing of said tips comprising a set screw-slide nut combination adjustable along a longitudinal slot provided in the hub portion of one lever arm and adapted to be secured in a desired position of adjustment therealong, and abutment-edge means on the hub portion of the other lever arm normally spaced from the set screw but adapted to abut said set screw and thereupon to prevent relative angular motion of said hubs and working tips in one direction, the construction and arrangement being such that said set screw-slide nut combination and said abutment edge means is encompassed within the dimensional confines of said hub portions.

2. A pliers according to claim 1, wherein said stop means is disposed to the handle side of said pivot.

3. A pliers for assembling and disassembling split external retaining rings comprising a pair of parallel lever arms having hub-like portions in their intermediate length portions and being pivotally connected for relative angular motion by a pivot passing through said hub portions, the ends of the arms to one side of said hub portions terminating in tips adapted for insertion into the apertures conventionally provided in the free ends of the external rings to be assembled or disassembled and the opposite ends of the arms mounting handles, spring means operatively associated with said handles for normally maintaining same in spread-apart position, and stop means for limiting closing motion of the handles and thereby spreading of the tips comprising a set screw-slide nut combination movable lengthwise along a slot provided in the hub portion of one said lever arm, and an abutment edge formed on the hub portion of the other arm along the edge thereof disposed adjacent said slot, said abutment edge being disposed to intersect said slot and thereby abut the set screw responsive to closing motion of said handles, the construction and arrangement being such that the positioning of the set screw-slide nut

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combination along said slot determines the amount that the handles can be closed.

4. A pliers according to claim 3, wherein said slot and abutment edge are disposed in their respective hub portions to the handle side of the pivot extending through said portions, and said slot extends longitudinally with respect to the arm on which its hub portion is provided and said abutment edge is the side edge of its hub portion which is disposed adjacent said slot.

5. A pliers for assembling and disassembling split internal retaining rings comprising, in combination, a pair of lever arms having hub-like portions intermediate their ends and being pivotally connected in crossed relation by a pivot passing through said hub portions, the ends of the arms extending to one side of said hub portions terminating in tips adapted to be inserted into the apertures conventionally provided in the free ends of the rings to be assembled and disassembled and the opposite ends of said arms mounting operating handles, spring means operatively associated with said handles for normally maintaining same in a spread position, and stop means for pre-setting the spacing of said tips to that of the normal spacing between said ring-end apertures comprising a set screw-side nut combination movable along the length of a slot provided in one hub portion, and abutment-edge means provided on the other hub portion and adapted upon engagement with said stop nut to establish the maximum spread position of said handles and thereby the maximum spacing of said tips under the bias of said spring means acting through said handles.

6. A pliers according to claim 5, wherein said slot extends generally cross-wise of the hub portion in which it is located and said abutment-edge means comprises one end-edge portion of an elongated opening provided in the hub portion of said other lever arm and which extends in generally overlying relation with respect to said slot.

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WILLIAM FELDMAN, Primary Examiner.

J. C. PETERS, Assistant Examiner.