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Cusato

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[54] PARALLEL JAW PLIERS

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[52] **U.S. Cl.** **81/352**

[51] **Int. Cl.** **B25b 7/12**

[58] **Field of Search** 81/352, 353, 354

[56] **References Cited**

UNITED STATES PATENTS

188,262	3/1877	Russell	81/353
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Assistant Examiner—Roscoe V. Parker
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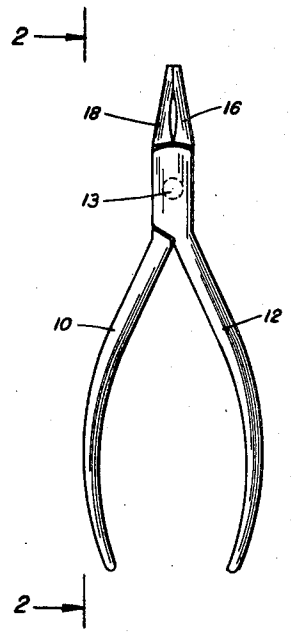
[57] **ABSTRACT**

The parallel jaw pliers of this invention are primarily for use in dentistry and particularly in orthodontics. The pliers provide a compact structure permitting the jaws to be moved in a parallel manner while occupying a minimum space such as in the mouth of a patient. The pliers consist of only four major members retained by a transverse pin which maintains the members in sliding alignment while acting as a pivot for only the handles. The jaws are carried between the handle members and on and by actuating pins extending from the handle members. As the pins are moved they maintain the jaws in a parallel arrangement as the handle members are moved.

11 Claims, 5 Drawing Figures



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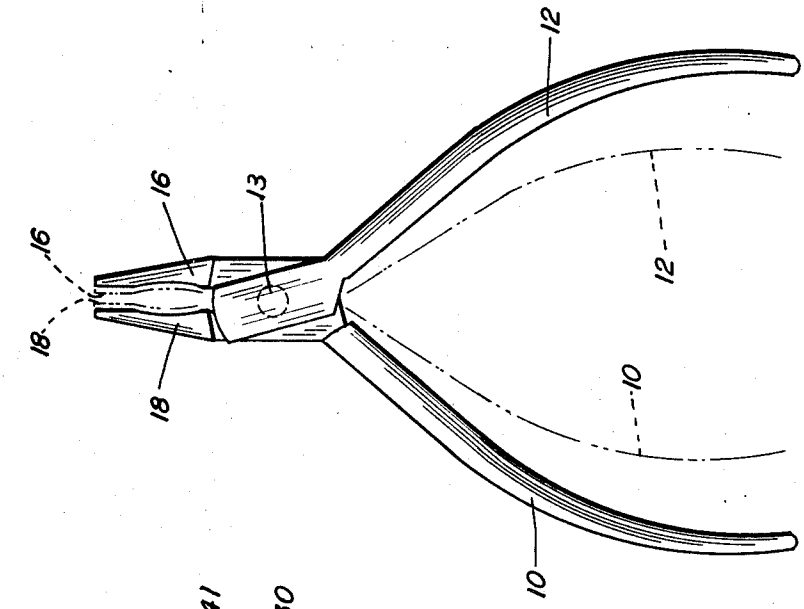

Fig - 3

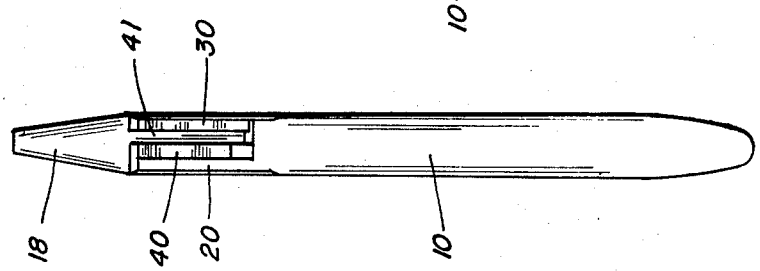

Fig - 2

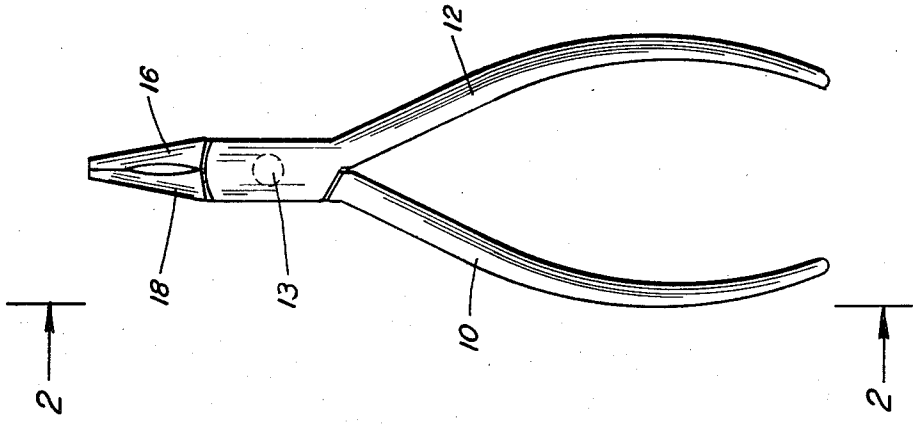

Fig - 1

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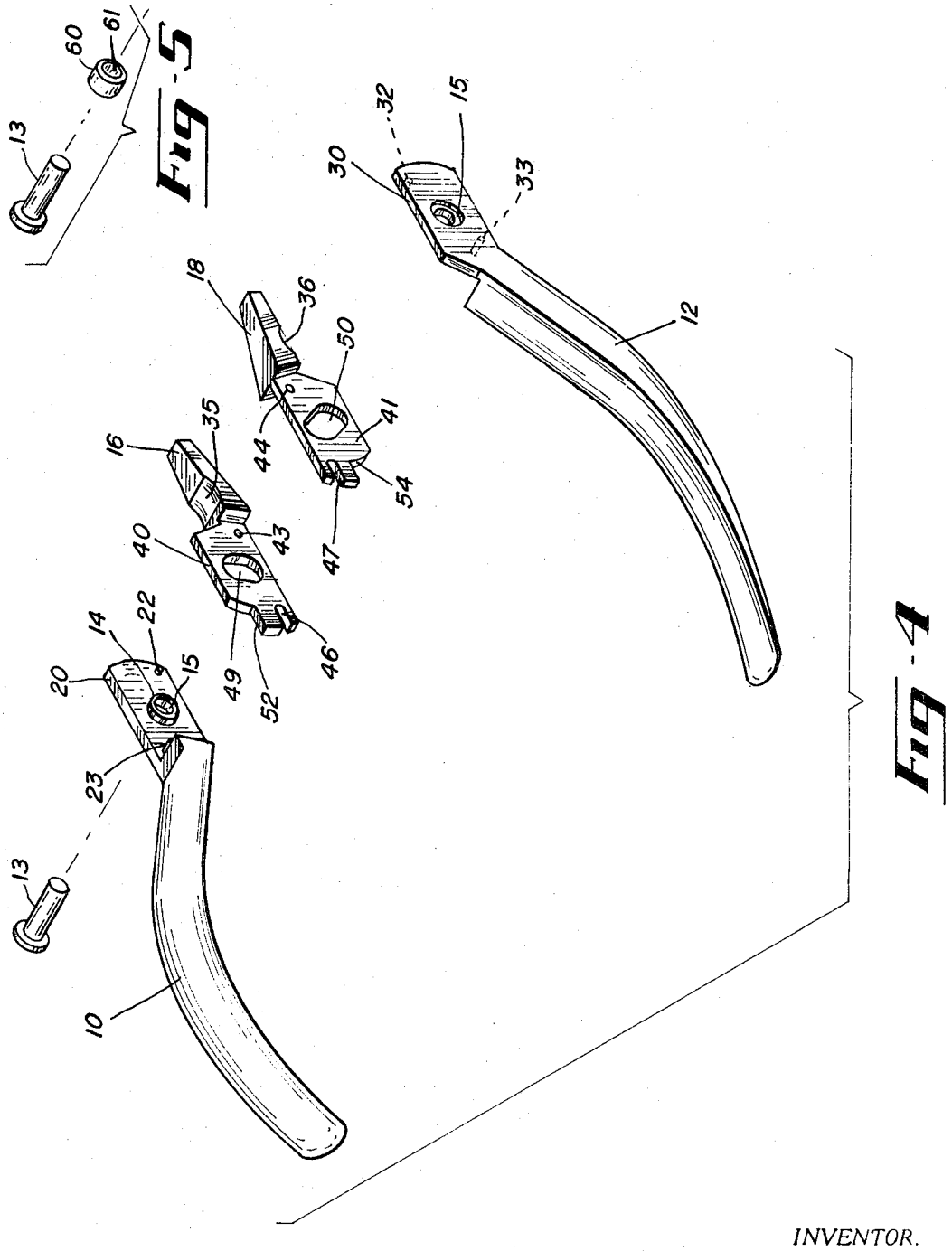

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PARALLEL JAW PLIERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

With reference to the classification of art as established in the United States Patent Office the present invention pertains to the general class of "-Metal Working" and more particularly to the subclass of "plier type" assembling and disassembling apparatus.

2. Description of the Prior Art

Pliers whose gripping jaws are adapted to remain parallel or substantially parallel during their opening and closing actuation are well known. Such pliers are represented in several U.S. patents among which is particularly noted U.S. Pat. No. 427,220 to BERNARD which issued May 6, 1890. Also noted are U.S. Pat. No. 168,924 to RUSSELL as issued Oct. 19, 1875; U.S. Pat. No. 188,262 also to RUSSELL as issued on Mar. 13, 1877; U.S. Pat. No. 188,408 to QUIRK as issued on Mar. 13, 1877; U.S. Pat. No. 491,231 to VONAHAUS et al., on Feb. 7, 1893 and U.S. Pat. No. 1,274,187 to NELSON as issued on July 30, 1918.

Pliers similar to those shown in the BERNHARD patent have been known for many years in the field of dentistry. However, those parallel jaw pliers that have been known and used in particular in the field of dentistry and orthodontics have been, because of their design, of a size which is larger than desirable. The number of pieces necessary to provide the parallelogram movement of the BERNHARD and like type pliers results in a pliers having a bulky jaw construction whereas in the restricted area of children's mouths the pliers should be as small as possible. In the present invention it is contemplated that a small parallel jaw pliers be provided for use in orthodontics in which they are only four moving members and in which the central retaining pin acts only as a means for pivotally retaining the handles while retaining the four members in a determined sliding relationship.

SUMMARY OF THE INVENTION

The present invention may be summarized at least in part with reference to its objects.

It is an object of this invention to provide, and it does provide, a parallel jaw pliers for use in orthodontics wherein a small and compact size is achieved by limiting the major components to four moving members and retaining these members by a transverse pin which is a pivot pin for only the handle members.

It is a further object of this invention to provide, and it does provide, a parallel jaw pliers for use in orthodontics wherein a small and compact size is achieved by making like handle and jaw members which are retained in a pivoted and sliding relationship by a transverse pin which does not provide a pivotal relationship with the jaw members. The parallel actuation of the parallel positioned jaws is provided by pins carried by the handle members so as to actuate only one end of each cooperative jaw member.

The parallel jaw pliers of this invention preferably comprises two like jaw members which are arranged at one hundred eighty degrees to each other. The forward or outer portion of each of the jaws is provided with a pivot pin hole while the rear portion has a slot disposed to receive a guide pin. A pair of like handle members is also arranged at one hundred eighty degrees to each other and on side plate portions carry pivot pins. The front pin is disposed to pivotally seat in the pin hole in the adjacent jaw while the rear pin passes by a cutout in the near jaw member to enter the slot in the other jaw member. A retaining pivot pin aligns and pivotally retains the handles in a determined rotary alignment as it, the pin, passes through a clearance hole or slot provided in each of the jaw members.

In addition to the above summary of the following disclosure is detailed to insure adequacy and aid in understanding of the invention. This disclosure, however, is not intended to prejudice that purpose of a patent which is to cover each new inventive concept therein no matter how it may later be disguised in form or additions of further improvements. For this reason there has been chosen a specific embodiment of the parallel jaw pliers as adopted for use in the field of orthodontics and showing a preferred means for manufacture and assembly. This specific embodiment and an alternate handle spacing means have been chosen for the purposes of illustration and description as shown in the accompanying drawings wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 represents a side or plan view of the parallel jaw pliers of this invention, the pliers shown being substantially full scale and with the jaws in a closed condition;

FIG. 2 represents an edge view of the pliers of FIG. 1, the view taken on the line 2—2 and looking in the direction of the arrows;

FIG. 3 represents the plan view of the pliers of FIG. 1 but with the jaws in about the fully opened condition, and in phantom outline showing the jaws and handles in an intermediately open condition;

FIG. 4 represents an isometric exploded view showing the relationship of the four main members of the pliers to each other and to the pin members carried by the handles, the pins adapted to provide the support and the planar actuation of the jaws, and

FIG. 5 represents an isometric view of a pivot pin and a bushing for use in an alternate pliers assembly.

The names, however, are intended to be generic in their application. Corresponding reference characters refer to like members throughout the several figures of the drawing.

The drawings accompanying and forming part of this specification disclose certain details of construction for the purpose of explanation of the broader aspects of the invention, but it should be understood that structural details may be modified in various respects without departure from the concept and principles of the invention and that the invention may be incorporated in other structural forms than shown.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in particular to the assembled pliers as seen in FIGS. 1, 2 and 3 and the disassembled plier components as seen in FIG. 4, the pliers include an upper handle portion 10 and a like lower handle portion 12. These handles are contemplated as being substantially identical with one turned one 180° from the other. Handle 10 is pivotally connected to handle 12 by

means of a pivot pin 13 extending through boss 14 and pivot aperture 15 formed in both handles 10 and 12. Upper and lower jaws 16 and 18 are also anticipated as being identical components turned 180° from each other.

Referring now particularly to the handle portion 10 as seen in FIG. 4 said handle is provided with an outer wall portion 20 in which there is fastened or molded so as to extend inwardly therefrom two pivot pins identified as 22 and 23. The front or forward pin 22 extends inwardly only a short distance while the rear pin 23 extends a further distance inwardly to be hereinafter more fully defined. Handle 12 also has an outer wall portion 30 like the portion 20 of handle 10. Extending inwardly from wall 30 and as seen in dashed outline are pins 32 and 33. The forward pin 32 extends inwardly a very short distance from the wall while the pin 33 extends inwardly a longer distance, which distances are comparable to those also provided by the pins 22 and 23 as they extend from the wall 20 of handle 10.

Referring now to the jaw members 16 and 18 it is to be noted that the jaw face portions 35 and 36 are disposed to be parallel to each other and to remain parallel when the jaw members are moved toward each other. Extending rearwardly from the heavier face portions of the jaws 16 and 18 are like wall or plate portions 40 and 41. Holes 43 and 44 are formed in these plate portions with each hole or aperture sized so as to be a snug rotary fit with the mating pin. Pin 22 is rotatably mounted in hole 43 in plate 40 while the pin 32 is rotatably mounted in hole 44 formed in plate 41. In the back or rear portions of the plate portions 40 and 41 are slots 46 and 47 disposed to slidably receive and engage respectively the pins 23 and 33. Pin 23 enters and engages slot 47 in jaw 18 while pin 33 enters and engages slot 46 in jaw 16. In both plate portions 40 and 41 and intermediate the front hole and the rear slot is formed an elongated hole with hole 49 being provided in plate 40 and hole 50 being provided in plate 41. In each plate the elongated hole is disposed to permit the free passage of pin 13 therethrough. Although shown as an elongated hole 49 in plate portion 40 and as an elongated hole 50 in plate portion 41 these clearance means may be larger drilled holes or slots just so that they provide a clearance for pin 13 after the assembly of the pliers and during the operation of the pliers.

In an assembled condition the short pin 22 extending from wall 20 enters hole 43 to act as a pivot support for the front portion of jaw 16 while pin 23 passes over the contoured rear portion 52 of jaw 16 to enter and engage slot 47 in jaw 18. Pin 32 carried by wall 30 enters hole 44 in jaw 18 and does not extend beyond the inner or left face of the plate portion 41. The rear and longer pin 33 passes by the contoured relief 54 in jaw 18 to enter and engage slot 46 in plate portion 40 but does not extend beyond the outer or left face of the plate portion 40. In an assembled condition the outer wall 20, plate 40, plate 41 and outer wall 30 are in a side-by-side arrangement as seen in FIG. 2. Pin 13 retains the two outer wall portions 20 and 30 so as to pivotally align these portions and the handles extending therefrom while slidably retaining the inner jaw portions 16 and 18. The bosses 14 provided on handles 10 and 12 are also of a length so that with pin 13 in swayed retaining condition the bosses engage each other in a face-to-face relationship to provide a determined spacing between the inner faces of walls 20 and 30.

ASSEMBLY AND OPERATION OF THE PARALLEL JAW PLIERS

In the assembled condition of FIGS. 1, 2 and 3 the parallel jaw pliers of this invention contemplate that the thickness of the outer wall portion 20; jaw plate or wall portion 40; jaw plate or wall portion 41 and outer wall portion 30 are substantially the same thickness. Pin 22 extends from the inner face of outer wall 20 an amount at least slightly less than the thickness of jaw plate portion 40. In like manner pin 32 extends inwardly from the inner face of outer wall 30 an amount at least slightly less than the thickness of jaw plate portion 41.

Pin 23 extends from the inner face of outer wall 20 an amount which is at least a slight amount less than the combined thickness of jaw plate portions 40 and 41. Pin 33 is like pin 23 in that said pin 33 extends from the inner face of outer wall 30 an amount which is at least a slight amount less than the combined thickness of jaw plate portions 41 and 40.

As assembled, pin 23 extends through the contoured rear relief portion 52 of jaw 16 to enter and extend nearly through slot 47 in jaw 18. In like manner pin 33 extends through contoured rear relief portion 54 of jaw 18 to enter and extend nearly through slot 46 in jaw 16. Pivot pin 13 is fixedly mounted in the aperture 15 in the outer wall portion 20 and passes through elongated holes 49 and 50 and into pivot aperture 15 in the outer wall portion 30 where the end of the pin is preferably riveted to provide a retaining head while the retained handle 12 is rotatable therearound. Pin 13 axially aligns handle 12 and the gripping length of the pin is made of a calculated length to provide a determined snugness of the sliding joint. Bosses 13 are of a determined length to provide a desired degree of play for the movement of plate portions 40 and 41.

As seen in FIG. 2 the jaws 16 and 18 are tapered from the wall section to the outer end whereat the jaws may be about five thirty-seconds of an inch in width and the combined thickness at the same tip end may also be about five thirty-seconds of an inch.

As the handles 10 and 12 are rotated around pin 13 the pin 22 carried by handle 10 supports and moves the forward portion of jaw 16 while pin 23 extends into slot 47 of jaw 18 to support and move the rear portion of jaw 18. Pin 32, carried by handle 12, supports and moves the forward portion of jaw 18 while pin 33 extends into slot 46 to support and move the rear portion of jaw 16. Pin 13 passes through bosses 14 in the handles, said bosses being freely movable in the elongated holes 49 and 50 so as to not engage or provide any support of jaws 16 and 18 or for the retaining of the jaws in a parallel condition. Pins 22 and 32 in addition to moving the jaws 16 and 18 also retain these jaws in a determined relationship to handles 10 and 12. The rear pins 23 and 33 in this invention are disposed to only swing the jaws and to support and maintain their parallel condition. The slots in which these pins ride are not extensive and the travel of the pin in the slot in the pliers as reduced to practice is less than one-eighth of an inch.

As reduced to practice, the pliers of this invention have handle **10** made as an investment casting of stainless steel with bosses **14**, apertures **15** and pins **22** and **23** cast integral therewith. Handle **12** is also a casting identical to handle **10** with boss **14** and aperture **15** provided in handle **12** as is provided in handle **10**. Jaw **16** is also a precision investment casting of stainless steel and when turned 180° becomes the exemplified jaw **18**. The normal finishing by polishing which is conventional in pliers which must be sterilized is of course contemplated in the present pliers. By making pins **22** and **23** on handle **10** and the like pins **32** and **33** on handle **12** of a cantilever design permits the pliers to be reduced in bulk and members and the few moving parts are easy to form and assemble.

It is of course to be noted that the forward pins **22** and **32** engage the adjacent jaw portions so that the load on them is essentially in shear while the longer rear pins are subjected to both bending and shear. If desired, the pins can be reversed as to the jaw members actuated. The pin apertures and slots as far as the jaw configuration can be reversed if desired, as only one pin hole and one slot are required in each jaw plate portion. It is also preferred that pins **22** and **23** as well as **32** and **33** be like distances from the axis of pin **13** and when the jaws are in a parallel condition the pins are a like distance above and below the plane of the jaw face.

Other pin arrangements are possible but to reduce assembly problems it is preferable to make handles **10** and **12** and the jaws **16** and **18** exactly like the other which requires that the pin combinations of **22** and **23** are mirror arrangements to that of pins **32** and **33**. It is also to be noted that the pins **22**, **23**, **32** and **33** may be mounted in the jaw plate portions while the pivot hole and slot would then be formed in the face of the end of the outer wall portions of the handle members.

ALTERNATE SPACER OF FIG. 5

Referring finally to FIG. **5** it is to be noted that handles **10** and **12** instead of having the bosses **14** formed thereon as in FIG. **5** may have these bosses omitted. In this condition it is assumed that the inner faces of the outer wall portions **20** and **30** will be of a planar configuration. A determined assembled spacing between these walls is then provided by a spacer **60** of a length which may be a couple of thousandths of an inch more than the combined thickness of the rear plate portions **40** and **41**. Bore **61** is preferably made as a sliding fit on the shank of pin **13**. The assembly of the handles, jaws with spacer **60** is substantially like that in FIGS. **1**, **2** and **3** above-described.

Terms such as "left," "right," "up," "down," "bottom," "top," "front," "back," "in," "out," "clockwise," "counterclockwise" and the like are applicable to the embodiment shown and described in conjunction with the drawings. These terms are merely for the purposes of description and do not necessarily apply to the position in which the parallel jaw pliers may be constructed or used.

While a particular embodiment of the parallel jaw pliers have been shown and described it is to be understood the invention is not limited thereto since modifications may be made within the scope of the accompanying claims and protection is sought to the broadest extent the prior art allows.

What is claimed is:

1. A pliers assembly in which the jaws are carried and are movable so that the gripping faces on the jaws are substantially parallel through their limits of movement, said pliers including: (a) a pair of handle members adapted for grasping by the user, each of said handle members having an outer wall portion; (b) a pivot pin adapted to retain the handle members in a pivotal relationship to each other and disposed to retain said outer wall portions with a determined distance therebetween; (c) a pair of jaw members each having a gripping face portion, said jaw members arranged so that the face portions are substantially parallel and disposed to be contiguous when brought together, each jaw member having a rear plate portion and with each plate portion having a clearance means therethrough, said clearance means disposed to accommodate the presence of the pivot pin when the plate portions of the jaw members are slidably retained between the outer wall portions of the handle member; (d) a fixed short pin carried on the outer wall portion of each handle and a mating pin-receiving aperture formed in a contiguous portion of the rear plate portion of each jaw member and disposed to receive and pivotally support said short pin, the pin and aperture being disposed a determined distance from the pivot pin; (e) a fixed longer pin carried on the outer wall portion of each handle and a mating pin receiving slot formed in a portion of the rear plate portion of each jaw member, the longer pins and slots being disposed a determined distance from the pivot pin on the side opposite the short pin, relief means formed in the rear plate portion of each jaw member whereby said longer pin of each handle may pass the rear plate portion of the jaw member contiguous therewith to respectively engage said slot in the rear plate portion of the other of said jaw members, and (f) means for mounting and retaining the short and longer pins in a cantilever manner as the pliers are assembled and used.

2. A pliers assembly as in claim **1** in which the short pin is carried forwardly of the pivot pin and the longer pin is carried rearwardly of the pivot pin.

3. A pliers assembly as in claim **2** in which the outer wall portions of the handle members and the plate portions of the jaw members are of substantially the same thickness with each of the short pins being at least slightly less in length than the thickness of a rear plate portion of a jaw member and with the longer pin of a length substantially longer than the thickness of a rear plate portion of a jaw member and of a length of at least slightly less than the combined thicknesses of the two adjacent rear plate portions of the two jaw members.

4. A pliers assembly as in claim **3** in which the axis of the short and long pin on one outer wall portion lays in a plane common with the axis of the pivot pin.

5. A pliers assembly as in claim **4** in which the short and long pins are disposed an equal distance from the pivot pin.

6. A pliers assembly as in claim **1** in which the handle members and the jaw members are made as stainless steel precision castings.

7. A pliers assembly as in claim **1** in which the combined thicknesses of the two outer wall portions of the handle members and the two plate portions of the jaw members are not more than three-eighths of an inch.

8. A pliers assembly as in claim **1** in which the handle members are like members and the jaw members are

like members with the handles and jaw members oriented at 180° to each other.

9. A pliers assembly as in claim 1 in which the clearance means for the pivot pin provided in the plate portion of the jaws are elongated holes formed in each jaw rear plate portion.

10. A pliers assembly as in claim 1 in which the outer wall portions of the handle members are precisely spaced from each other by means of bosses formed on the outer walls.

11. A pliers assembly as in claim 1 in which the outer wall portions of the handle members are precisely spaced from each other by means of a spacer carried on the pivot pin.

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