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B4B B80K B80X
U1S S1685 S1686

(56) Documents cited
GB 2058642 A **GB 1414740 A** **GB 0595489 A**
US 3602074 A

(58) Field of search
UK CL (Edition J) **B4B, E2F FCM FEA**
INT CL⁴ **B25B, B26B, F16C**

(54) **Pivot for hand tool**

(57) A hand tool, such as cutting nippers, cutting pliers or scissors, comprises a pair of arm members having respective tapered holes (8,9) provided in their intersecting regions, a tapered pin (10) fitted into the tapered holes, and a fixing member (12) inserted from the smaller-diameter end of the tapered holes and engaged with the tapered pin. The fixing member may be a screw or bolt engaging a female thread in the pins (10). A washer may lie under the bolt head. Alternatively the pin itself may have a projecting male screw engaging a nut received in the upper arm member.

FIG. 1

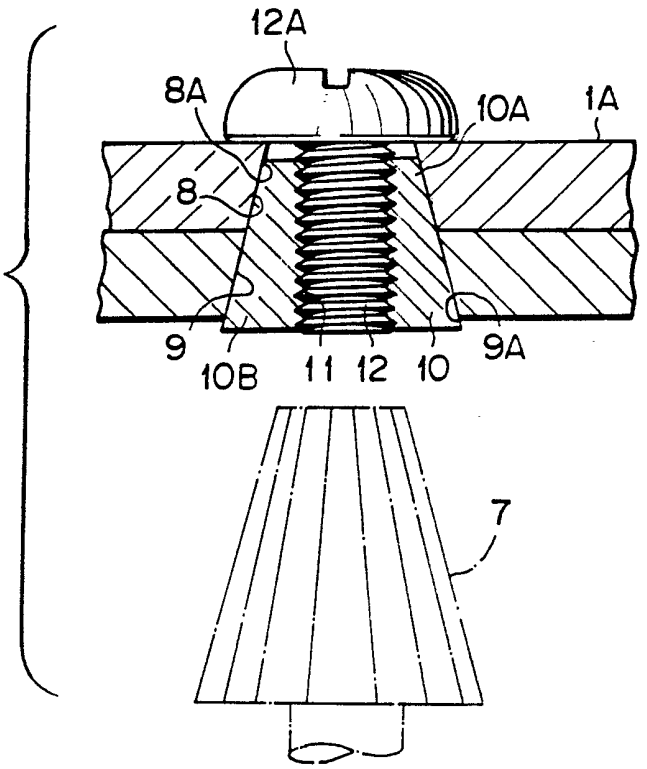

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FIG. 1

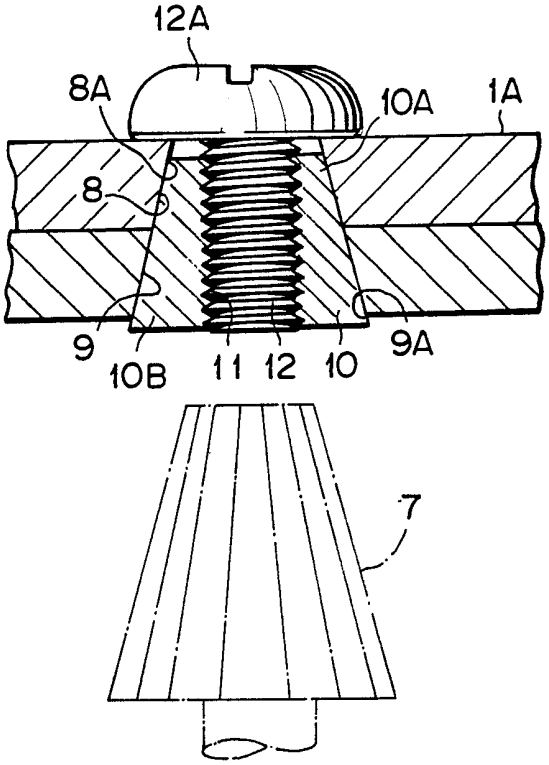


FIG. 2

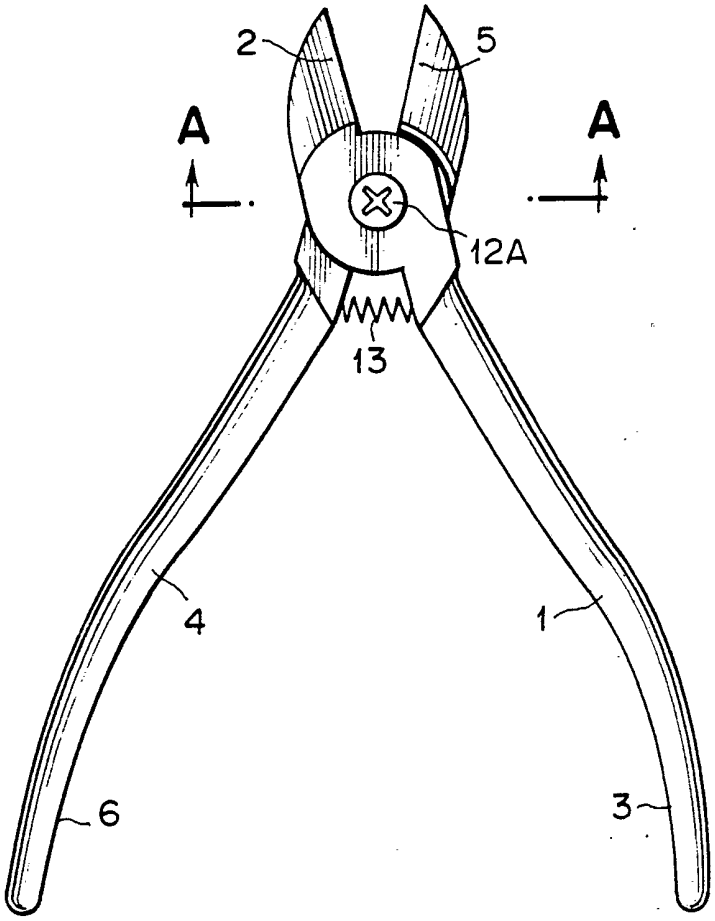


FIG. 3

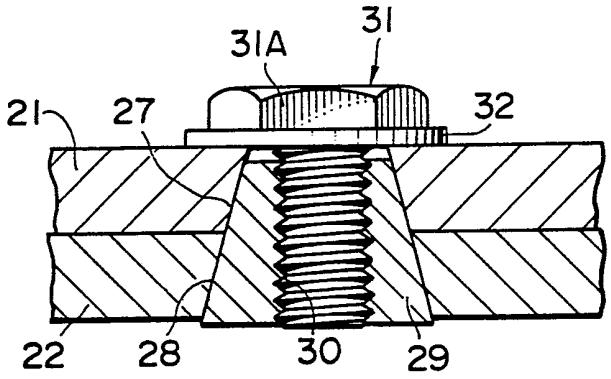


FIG. 4

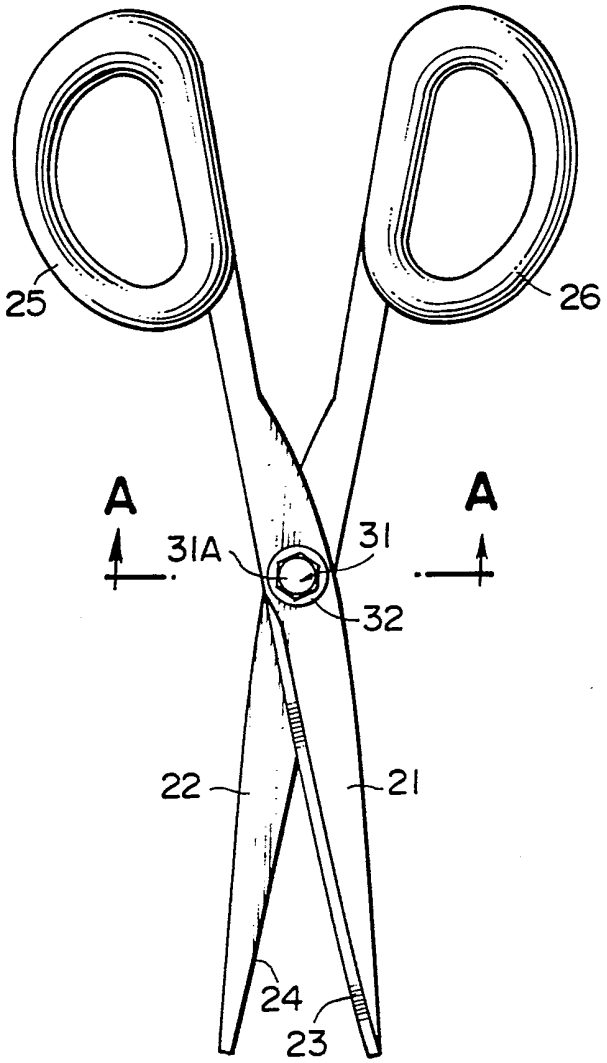


FIG. 5

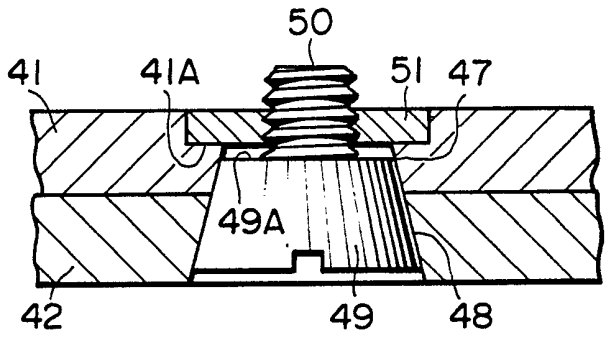
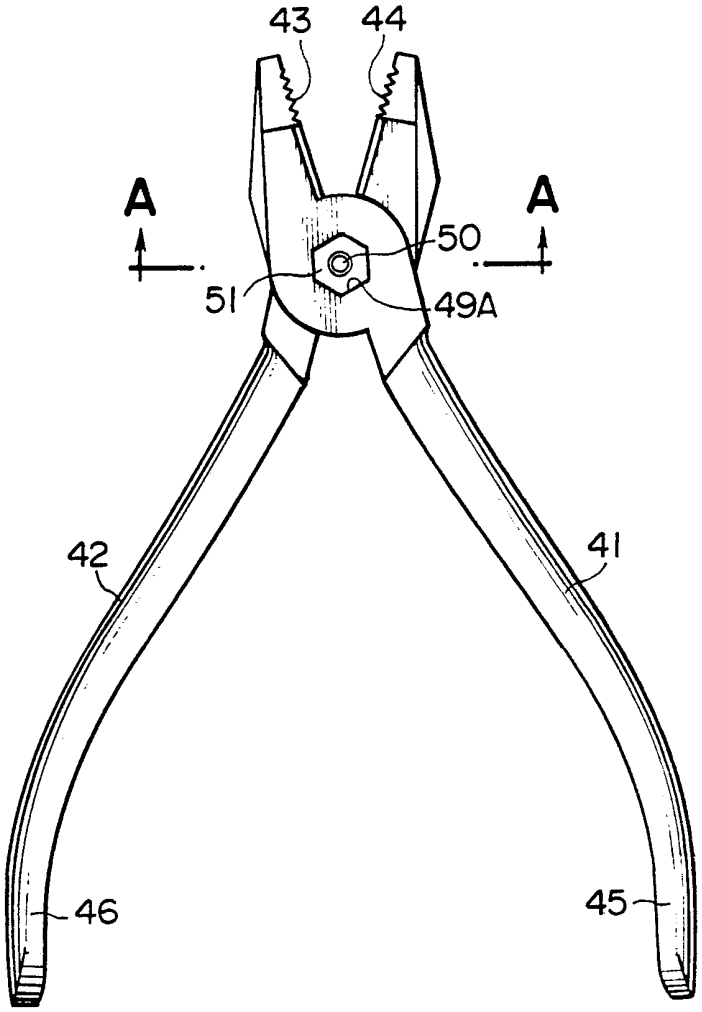


FIG. 6



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"HAND TOOL"

This invention relates to a hand tool of the type comprising a pair of mutually pivotable arm members, such as cutting nippers, cutting pliers, round nose chain pliers with side cutters, scissors, pliers and pincers.

Conventionally, a tool of this type is assembled by inserting a cylindrical pin into through holes provided at the intersecting regions of a pair of arm members, and tightening a screw in the other end of the cylindrical pin which protrudes from the other side of the two arm members. Such a form of pin-screw pivoting allows play to be generated, however, unless the holes are finished accurately enough to a predetermined precise size. This play makes it difficult for the tool blades to be brought to the correct positions for the intended purpose.

Japanese Utility Model Publication No. 30045/1983 discloses scissors in which any play of a nut at the connection between the arms is reduced by augmenting the friction between the nut and an associated washer by the use of a nut have a tapered peripheral surface and a washer having an end plate disposed at an angle of taper approximately the same as that of the peripheral surface of the nut.

According to this known art, the nut and the washer are arranged in a tapered hole which is formed in only one of the arm members, the nut receiving a screw. Even in this structure, however, a certain amount of play will be generated in the manner mentioned above, unless the finish between

the screw and the hole in the other arm member is accurate.

Japanese Patent Publication No. 1082/1984 discloses a hand tool in which a tapered pin is caulked in the pivoting portion in association with a tapered hole. However, play cannot be eliminated by this arrangement either, because the tapered surfaces of the members are discontinuous. In addition this hand tool is hard to repair, due to its caulked structure.

According to the present invention there is provided a hand tool comprising a pair of arm members pivotally interconnected at intersecting regions thereof and having respective handle portions; respective through holes formed in the intersecting regions of the arm members and having contiguous tapered surfaces; a tapered pin with a frusto-conical section received in the said through holes coaxially herewith, and a fixing member engaged with the tapered pin from the smaller-diameter end of the contiguous tapered through holes.

With such an arrangement, as the tapered pin is slidably engaged with the tapered holes, the pivotal interconnection between the two arm members does not involve any play.

Some embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:-

Fig. 1 is a sectional view showing a first embodiment of a hand tool according to the present invention, taken along a line A-A of Fig. 2;

Fig. 2 is a plan view of the hand tool shown in Fig. 1;

Fig. 3 is a sectional view showing a second embodiment of a hand tool according to the present invention, taken along a line A-A of Fig. 4;

Fig. 4 is a plan view of the hand tool shown in Fig. 3;

Fig. 5 is a sectional view showing a third embodiment of a hand tool according to the present invention, taken along a line A-A of Fig. 6; and

Fig. 6 is a plan view of the hand tool shown in Fig. 5.

Figs. 1 and 2 show a pair of cutting nippers which constitute a first embodiment of the present invention. The cutting nippers include a first arm member 1 having a blade 2 at the tip and a handle 3 at the rear portion and a second arm member 4 having a blade 5 opposed to the blade 2 and a handle 6 at the rear portion. First and second tapered holes 8 and 9 having the same taper and contiguous with each other are formed in the intersecting regions of the arm members 1 and 4 and are finished by means of a reamer 7.

A frusto-conically shaped tapered pin 10 is fitted into the first and second tapered holes 8 and 9. The tapered pin 10 has a female screw thread 11 formed along the central axis thereof. The smaller-diameter end 10A of this tapered pin 10 is larger in diameter than a smaller-diameter end 8A of the first tapered hole 8, while the larger-diameter end 10B of the tapered pin 10 is larger in diameter than the larger-diameter end 9A of the second tapered hole 9, the smaller-diameter end 10A of the tapered pin 10 thereby locating in a position somewhat inwardly of the outer surface 1A of the first arm member 1.

A male screw 12 which constitutes a fixing member is engaged with the tapered pin 10 from the smaller-diameter end 8A of the first tapered hole 8. The head of the screw 12 has a diameter larger than that of the smaller-diameter end 8A, and is locked against the first arm member 1.

Further, a spring 13 (Fig. 2) is provided between the handle portions of the first and second arm members 1 and 4.

After the first and second arm members 1 and 4 have been engaged with each other and the tapered pin 10 inserted into the first and second tapered holes 8 and 9, the male screw 12 is inserted into the tapered pin from the smaller-diameter end 8A of the hole 8, and is engaged with the female screw thread 11, thereby pivotally interconnecting the first and second arm members 1 and 4. By thus inter-connecting the pair of arm members 1 and 4 through the tapered pin 10, a uniform sliding engagement can be effected between the tapered pin 10 and the first and second tapered holes 8,9, which inhibits any generation of play. Any looseness generated between the first and second arm members 1 and 4 through long use can be removed by re-tightening the screw 12, which draws the second arm member 4 towards the first arm member 1, i.e. the former is pressed against the latter. This eliminates any looseness between the arm members. By thus forming the first and second tapered holes 8 and 9 to be contiguous with each other in the intersecting regions of the first and second arm members 1 and 4, fitting the tapered pin 10 into these tapered holes 8 and 9, and engaging the screw 12 with the tapered pin 10, the tapered pin 10 normally slides inside the tapered holes 8 and 9, which eliminates any play between the arm members. Further, since the tapered pin 10 can be fitted into the first and second tapered holes 8 and 9, any small errors in size between the tapered holes 8 and 9 can be absorbed.

As the smaller-diameter end 10A of the tapered pin 10 has a diameter larger than that of the smaller-diameter end 8A of the first tapered hole 8, a

clearance is provided between the tapered pin 10 and the head portion 12A of the screw 12. This makes it possible to re-tighten the screw 12 so as to eliminate any looseness between the first and second arm members which may be generated when the tapered holes become worn after long use.

Figs. 3 and 4 show a pair of scissors which constitute a second embodiment of this invention. The scissors include first and second arm members 21, 22 having blades 23 and 24 and handles 25 and 26 respectively. First and second tapered holes 27 and 28 are formed contiguously with each other in the intersecting regions of the first and second arm members 21 and 22. A tapered pin 29 is fitted into the first and second tapered holes 27 and 28, and has a female screw thread 30 formed along the axis thereof. A bolt 31 which constitutes a fixing member is engaged with the female screw thread 30, the head 31A of the bolt being locked against the first arm member 21. A washer 32 is provided between the bolt 31 and the first arm member 21, for preventing any looseness between them.

A pivotal connection is thus provided without any play occuring, because the tapered pin 29 slides within the first and second tapered holes 27 and 28.

Figs. 5 and 6 show a pair of cutting pliers which constitute a third embodiment of this invention. The cutting pliers include first and second arm members 41 and 42 having clipping portions 43 and 44 and handles 45 and 46, respectively. First and second tapered holes 47 and 48 are formed in the intersecting regions of these arm members 41 and 42. A tapered pin 49 is fitted into the first and second tapered holes 47 and 48. An upstanding male screw 50 is formed at the centre of the smaller-diameter end 49A of the tapered pin 49. A nut

51 is engaged with the male screw 50 and is locked in a recess 41A formed in the outer surface of the first arm member 41. The first and second arm members 41 and 42 are accordingly pivotally interconnected by fitting the tapered pin 49 into the first and second tapered holes 47 and 48 and engaging a nut 51 with the male screw 50.

The present invention is not to be construed as being restricted to the above-described embodiments. It can be applied to any tool which consists of a pair of arms or other members that are pivotally interconnected such as round nose chain pliers with side cutters, pliers, and pincers.

As described above, the present embodiments make it possible to pivotally interconnect a pair of arm members without any play by forming tapered holes in the arm members, fitting a tapered pin into these tapered holes, and providing a fixing member adapted to be engaged with the tapered pin from the smaller-diameter end of the tapered holes. It will thus be seen that the present invention, at least in its preferred forms provides a hand tool which is substantially free from the above-mentioned problems of play and which is easy to repair if a certain amount of play is generated after long use.

It is to be clearly understood that there are no particular features of the foregoing specification, or of any claims appended hereto, which are at present regarded as being essential to the performance of the present invention, and that any one or more of such features or combinations thereof may therefore be included in, added to, omitted from or deleted from any of such claims if and when amended during the prosecution of this application or in the filing or prosecution of any divisional application based thereon. Furthermore the manner in which any of such features of the specification or claims are described or defined may be amended, broadened or otherwise modified in any manner which falls within the knowledge of a person skilled in the relevant art, for example so as to encompass, either implicitly or explicitly, equivalents or generalisations thereof.

CLAIMS:-

1. A hand tool comprising:

a pair of arm members pivotally interconnected at intersecting regions thereof and having respective handle portions ;

respective through holes formed in the intersecting regions of the arm members and having contiguous tapered surfaces;

a tapered pin with a frusto-conical section received in the said through holes coaxially therewith; and

a fixing member engaged with the tapered pin from the smaller-diameter end of the contiguous tapered through holes.

2 A hand tool as claimed in claim 1, wherein the said tapered pin is engaged with the fixing member by means of a female screw thread formed in the tapered pin and a male screw thread on the fixing member, the fixing member having a head portion of a diameter larger than that of the smaller-diameter end of the tapered holes.

3. A hand tool as claimed in claim 1, wherein the said tapered pin is engaged with the fixing member by means of a female screw thread formed in the tapered pin and a male screw thread on the fixing member, the fixing member being engaged with the female screw thread from the smaller-diameter end of the tapered holes, through a washer.

4. A hand tool as claimed in claim 1, wherein the said tapered pin is engaged with the fixing member by means of a male screw on the smaller-diameter end of the tapered pin and engaging in a nut which constitutes the fixing member, the fixing member being locked against rotation.

5. Hand tools substantially as hereinbefore described with reference to the accompanying drawings.

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