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EUROPEAN PATENT APPLICATION

②① Application number: **82303782.5**

⑤① Int.Cl.³: **B 25 G 1/06, B 25 B 23/16**

②② Date of filing: **19.07.82**

③① Priority: **22.07.81 GB 8122504**
24.08.81 GB 8125737
07.12.81 GB 8136873
02.02.82 GB 8203442

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④③ Date of publication of application: **26.01.83**
Bulletin 83/4

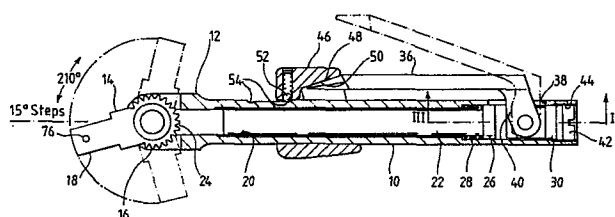
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⑧④ Designated Contracting States: **AT BE CH DE FR IT LI NL SE**

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⑤④ **An improved hand tool.**

⑤⑦ A multi-purpose hand tool consisting of a handle member, a holding member pivotally connected thereto which is adapted to have one of a multiplicity of fastener engaging members releasably secured thereon and locking means for locking the holding member in pivotally adjusted position relatively to the handle member.



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"An improved hand tool"

This invention relates to hand tools and more particularly, to a multi-purpose hand tool for engaging fasteners to effect securing or release thereof.

According to this invention, a multi-purpose hand
5 tool comprises a handle member, a holding member
pivotally connected to the handle member at or adjacent
to one end thereof for pivotal movement relatively
thereto in a plane containing the handle member, one or
more fastener engaging members adapted to be quickly
10 releasably secured to the holding member, and locking
means for locking the holding member in pivotally
adjusted position relatively to the handle member;
wherein the locking means includes an operating arm
which extends along a major portion of the length of
15 the handle member/^{which is gripped by an operative}so that in use a gripping force exerted
by an operative on the handle member and operating arm
positively urges the locking means into the locked position.

Preferably, one end of the operating arm is pivotally
connected to the handle member and the free end of the
20 operating arm is spaced-apart from the handle member when
the locking means is in the unlocked position. Preferably,
also, said one end of the operating arm is pivotally
connected to the handle member at a point remote from
the holding member and the operating arm extends towards
25 ~~the~~the holding member.

Preferably, releasable retaining means is provided
on the handle member, said retaining means being adapted
to engage the free end of the operating arm and positively
retain the arm in a position whereby the locking means
30 locks the holding member in adjusted position. Preferably,
also, the releasable retaining means includes a cam
surface adapted to engage in frictional wedging contact
with the free end of the operating arm to retain the arm

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in the position whereby the locking means locks the holding member in adjusted position.

Preferably, the locking means comprises a locking member which is slidably mounted within the
5 handle member to engage and secure the holding member in adjusted position, the operating arm being provided with cam means for not only engaging the locking member and urging said member into the engaged position but also preventing rotational movement of the locking
10 member relatively to the handle member about the longitudinal axis thereof. Preferably, also, the position of the cam means is adjustable along the length of the handle member to adjust the force exerted by the locking member on the holding member when the
15 locking member is in the engaged position.

Preferably, the holding member and each fastener engaging member are provided with interconnecting means adapted to enable the angle of connection between the holding member and the fastener engaging member to be
20 selectively varied. Preferably, also, the holding member and each fastener engaging member are respectively provided with male or female interconnecting means whereby the female interconnecting means consists of a recess having a plurality of sides which are an exact
25 multiple of the number of sides of the male interconnecting means to enable the angle of the fastener engaging member to be selectively varied relatively to the holding member. The male interconnecting means is, preferably, square in cross-section and the female interconnecting means is a
30 sixteen sided polygon in cross-section to enable the angle of the fastener engaging member to be varied in forty five degrees increments relatively to the holding member.

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A preferred embodiment of this invention will now be described, by way of example only, with reference to the accompanying drawings of which:-

Figure 1 is a sectional side elevation of a multi-
5 purpose hand tool;

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

Figure 3 is a section on the line III-III in Fig.
1;

10 Figure 4 is a perspective view of the hand tool shown in Fig. 1 in a dismantled condition;

Figure 5 is a plan view of a fastener engaging member in the form of an open ended spanner for use with the tool;

15 Figure 6 is a side elevation of the open ended spanner shown in Fig. 5 of the drawings;

Figure 7 is an end elevation to an enlarged scale of part of the open ended spanner shown in Figs. 5 and 6 of the drawings;

20 Figure 8 is a section on the line VIII-VIII in Fig. 7 of the drawings;

Figure 9 is a partly sectioned side elevation of a knuckle adapter;

Figure 10 is an end elevation of part of the
25 knuckle adapter shown in Fig. 9 of the drawings looking in the direction of the arrow A;

Figure 11 is an end elevation of part of the knuckle adapter shown in Fig. 9 of the drawings looking in the direction of the arrow B;

30 Figure 12 is a partly sectioned side elevation of a locking insert;

Figure 13 is a front elevation of the locking insert containing a section on the line XIII-XIII in Fig. 12; and

Figure 14 is an end elevation of the locking insert.

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Referring now to the drawings a multi-purpose hand tool which is particularly, but not exclusively, suitable for use as a multi-purpose spanner comprises a handle member 10 having a bifurcated end portion 12. A holding member 14 is pivotally mounted between the arms of the bifurcated end portion 12 for pivotal movement in a plane containing the longitudinal axis of the handle member 10.

The holding member 14 comprises a central substantially cylindrical portion having a series of teeth¹⁶ formed on the periphery thereof and male inter-connecting means¹⁸ of square shape in cross-section extending radially from the pivotal axis of the holding member 14.

The handle member 10 is provided with a longitudinally extending central bore 20 in which a locking member 22 is slidably mounted. The end of the locking member 22 adjacent to the holding member 14 has teeth 24 formed thereon which are adapted to engage in mesh with the teeth 16 on the central portion of the holding member 14 so as to retain the holding member in pivotally adjusted position. The spacing of the teeth 16 and 24 are arranged so that pivotal adjustment of the holding member can be effected in a series of, for example, fifteen degree increments.

The end of the locking member 22 remote from the holding member 14 has an enlarged diameter end portion 26 formed thereon and a compression spring 28 is confined endwise between the enlarged diameter end portion of the locking member 22 and the end face of an enlarged diameter portion of the bore 20 so that the locking member 22 is urged by the spring 28 to a position in which the teeth 24 thereon are disengaged from the teeth 16 on the holding member which is thus free to be moved pivotally.

A cam carrier 30 is slidably mounted in the end of the bore 20 remote from the holding member 14 and a

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longitudinally extending slot 32 is formed therein which is adapted to receive a rectangular projection 34 extending from the end portion 26 of the locking member 22.

5 An operating arm 36 is mounted in the slot 32 and extends through a further slot 38 formed in the handle member 10 and extends therefrom towards the end of the handle member 10 having the holding member 14 mounted therein. The operating arm 36 is arranged to be a
10 close fit in the slot 38 and the rectangular projection 34 is also arranged to be a close fit in the slot 32 of the cam carrier 30 thus restricting rotational movement of the locking member 22 relatively to the handle member about the longitudinal axis of the handle member.

15 The operating arm 36 is also provided with a cam surface 40 which is adapted to engage in contact with the end face of the projection 34 so that pivotal movement of the operating arm from the position shown in broken lines to the position shown in full lines in
20 Figure 1 of the drawings urges the locking member 22 against the action of the spring 28 into a position in which the teeth 24 engage in mesh with the teeth 16 of the holding member 14 to retain the holding member 14 in pivotally adjusted position. An externally screw-
25 threaded end cap 42 is mounted in an internal screw-threaded end portion 44 of the bore 20 of the handle member 10 and the end cap 42 is arranged to engage in contact with the cam carrier 30 so as to adjust the position thereof along the longitudinal axis of the bore
30 20. This adjustment of the pivotal position of the operating arm 36 enables adjustment to be made to the force exerted by the teeth 24 when they engage in mesh with the teeth 16 on the holding member 14 in order to inter alia compensate for any wear which may take place.

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A locking member 46 is slidably mounted on the external surface of the handle member 10 and is provided with a cam surface 48 which is adapted to engage in frictional wedging contact with the cam surface 50 formed on the free end of the operating arm 36 to retain the operating arm in the engaged position shown in full lines in Figure 1 of the drawings. The operating arm 36 is released by slidably moving the locking member 46 on the external surface of the handle member 10 towards the holding member 14 so as to disengage the interengaging cam surfaces 48 and 50 and allow the operating arm to move under the action of the spring 28 to the disengaged position shown in broken lines in Figure 1 of the drawings. The locking member is provided with a conventional spring loaded ball arrangement 52 which is adapted to engage in complementary recesses 54 in the external surface of the handle member 10 when the locking member is in either its engaged or disengaged position. A groove 56 extends between the recesses 54 and the spring loaded ball 52 is arranged to engage therein during movement of the locking member 46 between the disengaged and engaged positions so as to restrain the locking member 46 against rotational movement relatively to the handle member 10 about the longitudinal axis thereof.

Referring now Figs. 5, 6, 7 and 8 of the drawings a fastener engaging member 60 is provided with a conventional open ended spanner 62 at one end thereof and a recess 64 at the opposite end thereof which forms a female interconnecting means which is capable of interconnection with the male interconnecting means 18 on the holding member 14. The recess 64 is arranged to be a multi-sided polygon whose sides are an exact multiple of the sides of the male interconnecting means

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18 and in this particular case, the recess 64 is arranged to be a substantially sixteen sided polygon so that the square male interconnecting means 18 can be inserted therein in a plurality of positions which
5 enable the angular position of the open ended spanner 62 to be adjusted relatively to the holding member 14 and the handle member 10 in increments of forty five degrees to improve the versatility of the tool.

Referring now particularly to Figures 12, 13 and
10 14 of the drawings, a locking insert indicated generally at 80 is formed of a compressible plastics material and comprises a flange 82 having four equi- angularly spaced-apart ribs 82 extending therefrom. The ends of the ribs 84 remote from the flange 82 are
15 connected together by an end plate 86 having a central aperture 88 formed therein which increases the flexibility of the locking insert 80.

The locking insert 80 is adapted to be inserted into the recess 64 of the fastener engaging member 60
20 and when the square male interconnecting means 18 is inserted into the locking insert 80 disposed in the recess 64, the ribs 84 are compressed. This compression produces a retaining action in the form of a frictional force restricting movement between the fastener engaging
25 member 60 and the interconnecting means 18 of the holding member 14.

The locking insert 80 is capable of being inserted into the recess 64 in a plurality of positions so as to enable the position of the fastener engaging member 60
30 to be adjusted relatively to the holding member 14 as previously described.

It will also be appreciated that the fastener engaging member 60 can take the form of not only various sizes of open ended spanner but also additional fastener
35 engaging members can be provided having other types of

fastener engaging means thereon such as ring spanners, socket heads, Allen keys, screw driver heads or indeed any other suitable form of arrangement without departing from the scope of this invention.

5 Referring now specifically to Figures 9 to 11 of the drawings, a knuckle adapter 70 consists of a male interconnecting means 72 disposed at one end thereof and a female interconnecting means 72 disposed at the opposite end thereof. The male interconnecting means
10 72 is disposed at an angle to the female interconnecting means 74 and a whole series of knuckle adapters may be used in which the male and female interconnecting means thereon are disposed at different angles. The male interconnecting means 72 conforms to the interconnecting
15 means 18 on the holding member 14 and the female interconnecting means 74 conform to the recess 64 on the fastener engaging member 60. The knuckle adapter 70 is arranged to be mounted on the male interconnecting means 18 of the holding member 14 and the fastener
20 engaging member 60 is mounted on the male interconnecting means 72 so that the knuckle adapter is disposed between the holding member 14 and the fastener engaging member 60. It will be appreciated that the utilisation of such knuckle adapters increases the versatility of the tool
25 as it enables the fastener engaging members to be disposed at an increased number of angles to the handle member 10 of the tool. It will be appreciated that the locking insert 80 is also used in conjunction with the knuckle adapter 70 as previously described.

30 A conventional spring-loaded ball mechanism 76 is also provided on the male interconnecting means 18 of the holding member 14 to enable fastener engaging members which are provided with a female interconnecting means in the form of a recess having a conventional square
35 shape in cross-section to be releasably retained on the holding member 14, of the type used, for example, in conventional socket equipment.

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In operation, when the operating arm 36 is in the position shown in broken lines in Figure 1 of the drawings, the angle of the fastener engaging members 60 to the handle member 10 of the tool is adjusted to a convenient position and the operating arm 36 is then moved to the position shown in full lines in Figure 1 of the drawings by an operative gripping the handle member 10 and the operating arm 36 in one hand. The tool is dimensioned so that it is possible for the thumb of an operative to then slide the locking member 46 into the engaged position so that the holding member 14 is retained in adjusted position relatively to the handle member 10. It will also be appreciated that during use of the tool, the greater the force exerted by an operative on the tool, the greater the force exerted upon the operating arm 36 by the grip of the operative and the greater the engaging force exerted between the teeth 24 and the teeth 16. This arrangement ensures that the holding member 14 is firmly and positively retained in adjusted position relatively to the handle 10 when a large force is exerted upon the tool by an operative.

Claims.

1. A multi-purpose hand tool comprising a handle member, a holding member pivotally connected to the handle member at or adjacent to one end thereof for
5 pivotal movement relatively thereto in a plane containing the handle member, one or more fastener engaging members adapted to be quickly releasably secured to the holding member, and locking means for locking the holding member in pivotally adjusted
10 position relatively to the handle member; wherein the locking means includes an operating arm which extends along a major portion of the length of the handle member/^{which is gripped by an operative}so that in use a gripping force exerted by an operative on the handle member and operating arm
15 positively urges the locking means into the locked position.

2. A multi-purpose hand tool according to Claim 1, wherein one end of the operating arm is pivotally connected to the handle member and the free end of the
20 operating arm is spaced-apart from the handle member when the locking means is in the unlocked position.

3. A multi-purpose hand tool according to Claim 2, wherein said one end of the operating arm is pivotally connected to the handle member at a point remote from
25 the holding member and the operating arm extends towards the holding member.

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4. A multi-purpose hand tool according to any one of Claims 1 to 3, wherein releasable retaining means is provided on the handle member, said retaining means being adapted to engage the free end of the operating
5 arm and positively retain the arm in a position whereby the locking means locks the holding member in adjusted position.

5. A multi-purpose hand tool according to Claim 4,
10 wherein the releasable retaining means includes a cam surface adapted to engage in frictional wedging contact with the free end of the operating arm to retain the arm in the position whereby the locking means locks the holding member in adjusted position.

6. A multi-purpose hand tool according to any one of
15 the preceding claims, wherein the locking means comprises a locking member which is slidably mounted within the handle member to engage and secure the holding member in adjusted position, the operating arm being provided with cam means for not only engaging the locking member
20 and urging said member into the engaged position but also preventing rotational movement of the locking member relatively to the handle member about the longitudinal axis thereof.

7. A multi-purpose hand tool according to Claim 6,
25 wherein the position of the cam means is adjustable along the length of the handle member to adjust the force exerted by the locking member on the holding member when the locking member is in the engaged position.

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8. A multi-purpose hand tool according to any one of the preceding claims, wherein the holding member and each fastener engaging member are provided with interconnecting means adapted to enable the angle of
5 connection between the holding member and the fastener engaging member to be selectively varied.

9. A multi-purpose hand tool according to Claim 8, wherein the holding member and each fastener engaging member are respectively provided with male or female
10 interconnecting means whereby the female interconnecting means consists of a recess having a plurality of sides which are an exact multiple of the number of sides of the male interconnecting means to enable the angle of the fastener engaging member to be selectively varied
15 relatively to the holding member.

10. A multi-purpose hand tool according to Claim 9, wherein the male interconnecting means is square in cross-section and the female interconnecting means is a sixteen sided polygon in cross-section to enable the
20 angle of the fastener engaging member to be varied in forty five degree increments relatively to the holding member.

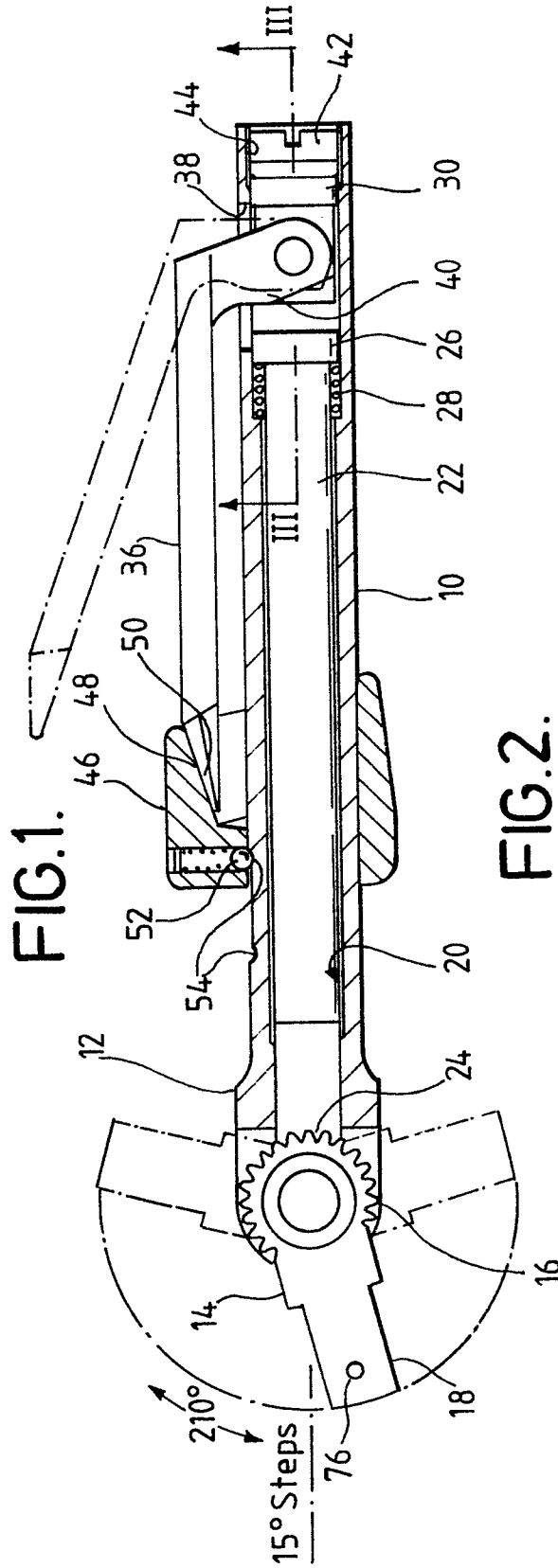


FIG.2.

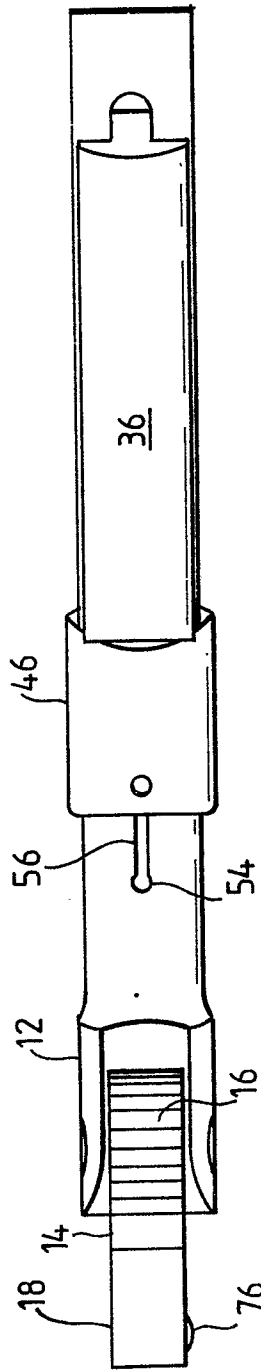


FIG.3.

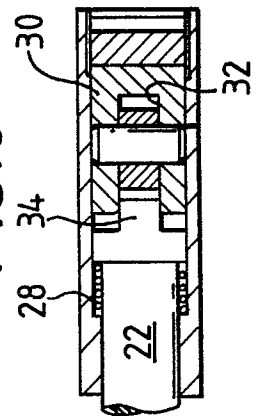


FIG.4.

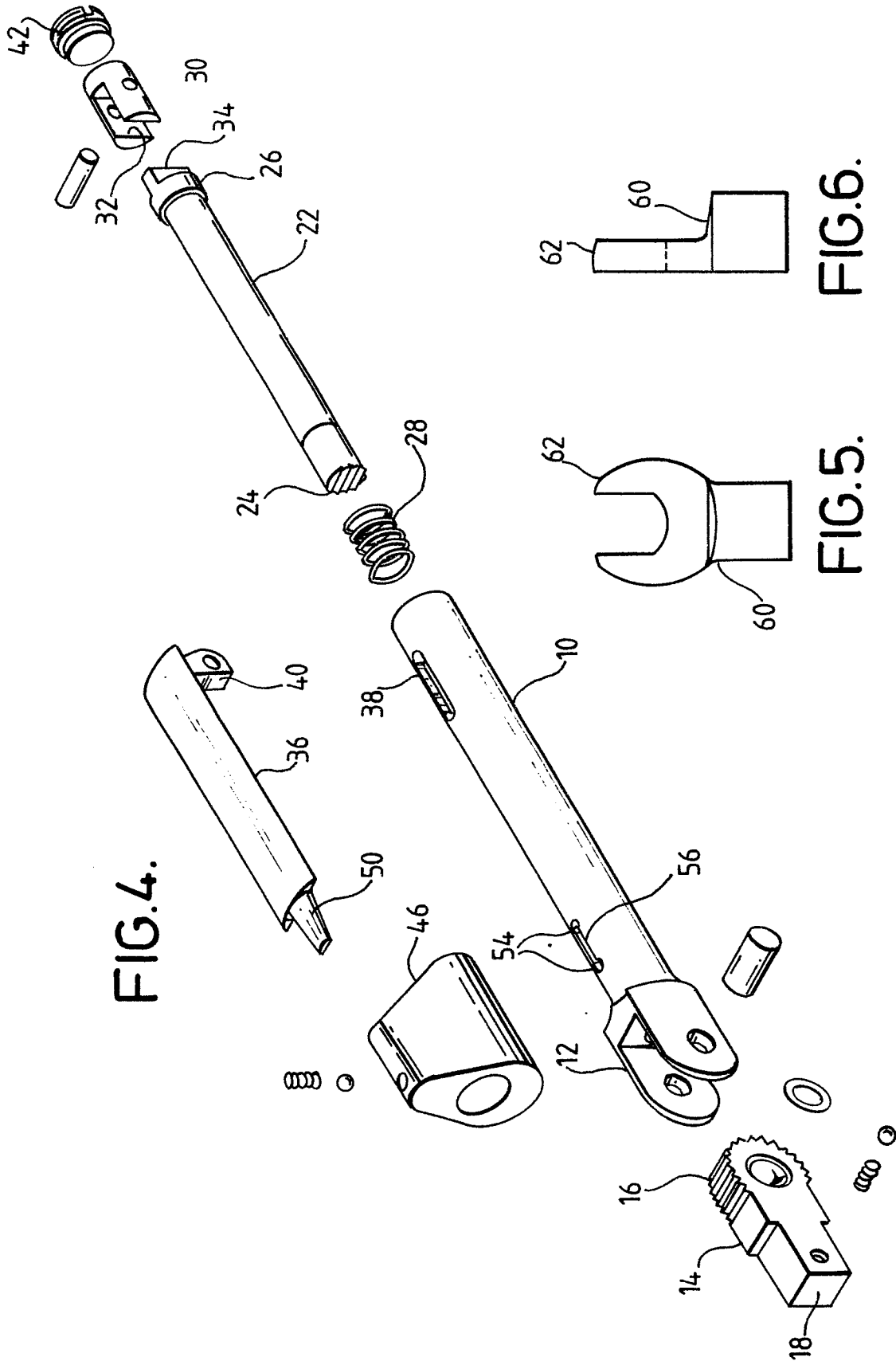


FIG.5.

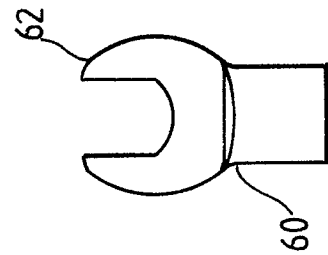
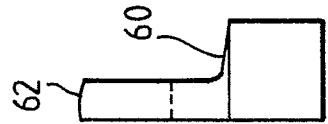


FIG.6.



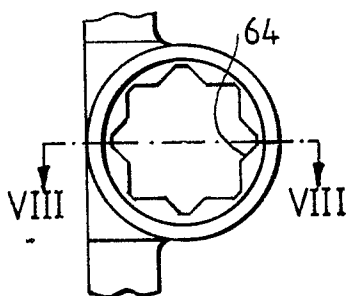


FIG. 7.

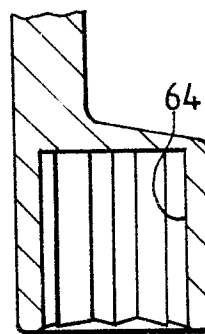


FIG. 8.

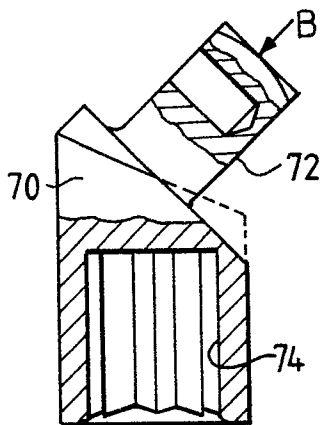


FIG. 9.

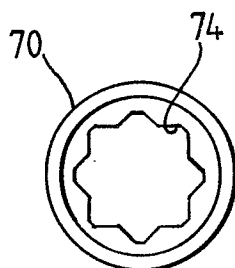


FIG. 10.

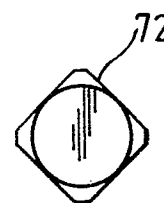


FIG. 11.

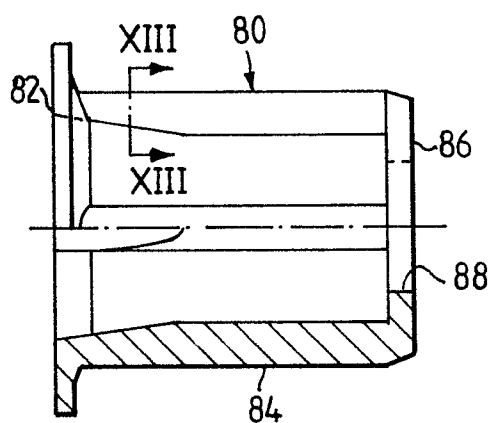


FIG. 12.

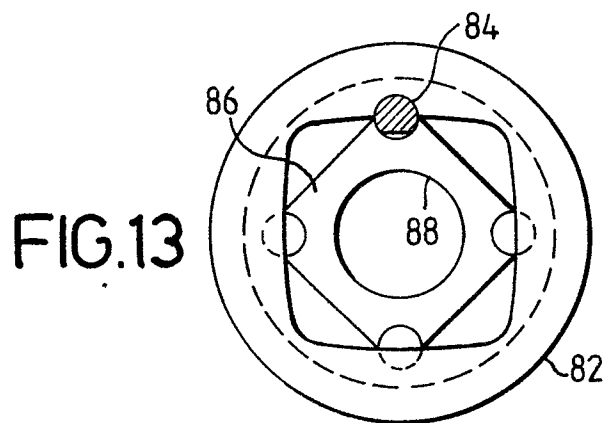


FIG. 13.

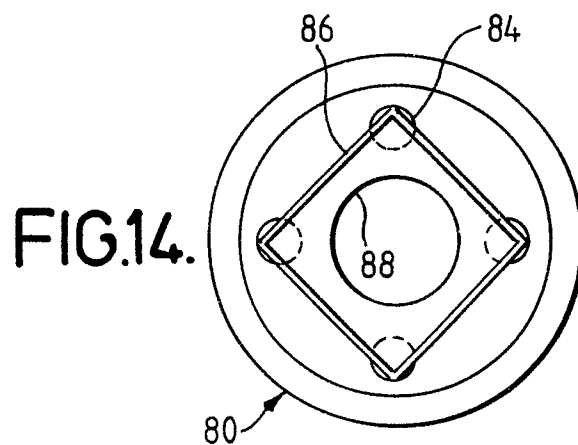


FIG. 14.