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(71) Applicant: **DAE SAM CO., LTD.**
614-26, Guro-1 Dong
Guro-ku, Seoul(KR)

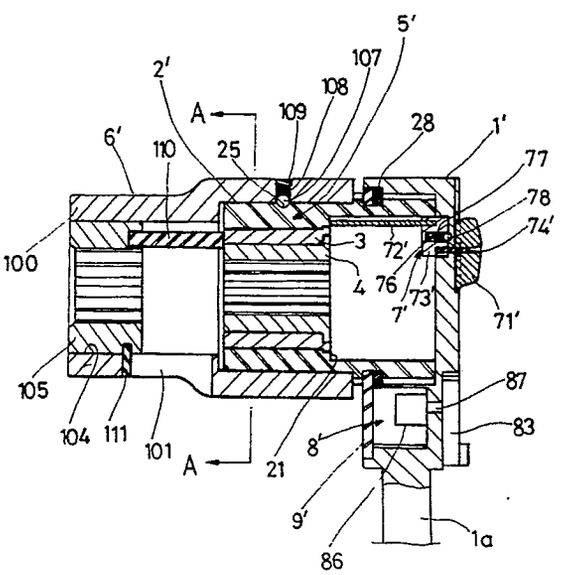
(72) Inventor: **Kwang-Moo Kim**
387-13, Ahcheon-Dong
Koori, Kyunggi-Do(KR)

(74) Representative: **Sajda, Wolf E., Dipl.-Phys. et al**
MEISSNER, BOLTE & PARTNER
Widenmayerstrasse 48 Postfach 86 06 24
W-8000 München 86(DE)

(54) Socket wrench.

(57) A socket wrench capable of handling a great diversity of bolts and nuts is disclosed. The socket wrench includes an upper socket member (5') and a lower socket member (6') in a detachable form. The upper socket member (5') includes an outer socket (2') and a plurality of socket units (3, 4) while the lower socket member (6') also includes an outer socket (100) and a plurality of socket units (105). The socket units are installed in an axially slidable manner by providing an axially adjusting member (7), and therefore, a proper one can be selected from the plurality of socket units in order to loosen or tighten the bolt or nut. Further, an ordinary ratchet mechanism (8) is installed in order to set the rotational direction of the upper and lower socket members (5', 6').

FIG.7



EP 0 457 956 A2

FIELD OF THE INVENTION

The present invention relates to a socket wrench, and particularly to a socket wrench in which, when tightening or loosening various bolts and nuts, a proper socket unit fitting to the bolt or nut can be easily selected and used by coupling or detaching upper and lower socket members.

BACKGROUND OF THE PRESENT INVENTION

Korean Utility Model Publication No. 84-2675 and 83-1343 are the prior art for the present invention, and, of them, the former has the following features. That is, a plurality of socket members are provided in such a manner that they can be used for bolts and nuts of various sizes without changing the socket members. However, in this device, a proper socket member has to be selected and is let to be projecting forwardly in order to use it for a bolt or nut. Therefore, the projecting portion receives intensive stresses during the use, and therefore, when designing the tool, the projecting portion has to be given a sufficient thickness so as to have a sufficient strength, with the result that the total bulk of the tool is increased.

In the case of the latter (83-1343), socket members of different sizes are provided, and, in accordance with the need, a proper socket member has to be attached in the form of replacement. Thus a plurality of socket members have to be carried separately, and therefore, various inconveniences are accompanied, as well as there is the apprehension that the socket members might be lost.

There is also Korean Utility Model Application No. 89-13012 which is also prior art for the present invention, and which is filed by the present inventor. This device gives solutions to the various problems inherent in the preceding devices, but has a disadvantage as described below. That is, when the main body is restored to the original position after turning the socket frame during the use, the main body moves in a state with the knob secured to the socket frame, with the result that there are generated frictions between the knob and the main body so that the life expectancy of the knob is adversely affected. Further, between a socket frame and an outer socket frame, there is required a separate slidably securing mechanism which consists of a combination of a ball, a spring and a headless bolt, and therefore, there can occur disorders in its operation.

SUMMARY OF THE INVENTION

The present invention is intended to overcome the above described disadvantages of the conventional devices.

Therefore it is a first object of the present invention to provide a socket wrench which is convenient to use, simple in its structure, and long in its life expectancy because the axially adjusting member is not interfered even if the main body and the socket units are separately actuated.

It is a second object of the present invention to provide a socket wrench which can be used for a wide range of sizes of bolts and nuts.

In achieving the first object, the socket wrench according to the present invention comprises: a main body; a plurality of socket units having different diameters and installed within the main body, the socket units being installed in an axially slidable manner; an axially adjusting member for the socket units; and a ratchet mechanism for setting the rotational direction of the socket units.

In achieving the second object, the socket wrench according to the present invention comprises: a main body; an upper socket member for being coupled with the main body, and consisting of a plurality of socket units of different diameters, the socket units being installed in an axially slidable manner; a lower socket member consisting of socket units having diameters different from the diameters of the socket units of the upper socket member; an axially adjusting member for the socket units; and a ratchet mechanism for setting the rotational direction of the socket units.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects and other advantages of the present invention will become more apparent by describing in detail the preferred embodiment of the present invention with reference to the attached drawings in which:

- Figure 1 is an exploded perspective view of the device according to the present invention;
- Figure 2 is a longitudinal sectional view of the assembled state of the device according to the present invention;
- Figure 3 is a plan view of the device of the present invention with the upper cover removed;
- Figure 4 is a longitudinal sectional view showing another embodiment of the present invention, and showing the method of fastening the lower cover;
- Figure 5 illustrates a state with the lower cover separated;
- Figure 6 is an exploded perspective view of still another embodiment of the present invention;
- Figure 7 is a longitudinal sectional view of

the assembled state of the embodiment of Figure 6;

Figure 8 is a sectional view taken along the line A - A of Figure 7;

Figure 9 is a plan view of the embodiment of Figure 6, with the lower socket member eliminated, and with the lower cover separated;

Figure 10 is a longitudinal sectional view showing still another embodiment of the present invention, which is different from that of Figure 6;

Figure 11 illustrates the embodiment of Figure 10, with the illustration of the lower socket member omitted, and with the lower cover separated; and

Figure 12 is a sectional view taken along the line B - B of Figure 10.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in Figures 1 to 3, the socket wrench according to the present invention includes in a combined form: a main body 1 having a handle portion 1a at one side thereof; an outer socket 2 and socket units 3,4 concentrically overlappingly installed in an axially slidable manner; an upper cover 6 having a guide member 5 at the bottom thereof; an axially adjusting member 7 for axially adjusting the socket units 3,4; and an ordinary ratchet mechanism 8 for setting the rotational direction of the outer socket 2.

The main body 1 is provided with an opening 10 for receiving the outer socket 2 at one side thereof, and is also provided with an open slot 11 at the other side thereof in order to receive the ratchet mechanism 8. The opening 10 and the open slot 11 communicate with each other, and the opening 10 is provided with an annular step 12 at the lower portion thereof, while the open slot 11 is provided with fastening slots 13, 14 and ratchet installing slots 15, 16.

The outer socket 2 and the socket units 3, 4 are installed into the opening 10 in an axially slidable manner, and the socket units 3, 4 are respectively provided with flange portions 31, 41, the flange portion 31 having an inclined inner circumferential portion 30. Further, the socket units 3, 4 are respectively provided with inner and outer teeth portions 32, 33, 42, 43, and the outer socket 2 is provided with an inner teeth portion 20, an annular step 21 for mounting the socket unit 3, and another annular step 22 for installing the guide member 5 which is to be described below.

The outer socket 2 is further provided with an outer teeth portion 23 at the upper portion thereof. The socket unit 4 is inserted into the socket unit 3, and the socket unit 3 is inserted into the outer socket 2, while the outer socket 2 is inserted into the opening 10 of the main body 1 until the bottom portion of the outer teeth portion 23 of the outer socket 2 is matched with the annular step 12 of the main body.

The guide member 5 is installed under the upper cover 6, and the guide member 5 is provided with a rectangular projection 50 at the centre thereof so that the rectangular projection 50 can be coupled with a rectangular slot 61 of the upper cover 6. The guide member 5 is further provided with an installation hole 51 besides the rectangular projection 50, and is also provided with an installation slot 53 between the rectangular projection 50 and the installation hole 51 in order to install an omega shaped leaf spring 52.

The guide member 5 constituted as described above is installed to the annular step 22 of the outer socket 2. The upper cover 6 is provided with: an installation hole 60 for installing the axially adjusting member 7; a rectangular slot 61 for being coupled with the rectangular projection 50 of the guide member 5; fastening holes 62, 63 formed at the opposite sides thereof; an installation hole 64 for installing the ratchet mechanism 8; and stopping protuberances 65, 66 formed at the opposite sides thereof, the upper cover being fastened to the main body 1 by means of fastening screws 67, 68.

The axially adjusting member 7 consists of a combination of an actuation bar 70 and an adjusting knob 71, and the actuation bar 70 includes an adjusting bar 72 having a semi-elliptical cross section, a cylindrical portion 73 having a plurality of retaining slots 73a, and a concentrical shaft 74, all the above parts being integrally formed.

Meanwhile, the adjusting knob 71 is provided with a projection 75 on the top thereof. Therefore, the axially adjusting member 7 can be installed in such a manner that:the cylindrical portion 73 is rotatably inserted into the installation hole 51 of the guide member 5; the concentrical shaft 74 is rotatably inserted into the installation hole 60 of the upper cover 6; and the upper end portion of the concentrical shaft 74 is fixedly inserted into the adjusting knob 71, so that, in accordance with the turning of the adjusting knob 71, the actuation bar 70 should also be turned.

Under this condition, when the adjusting knob 71 is turned, the user knows the current position, i.e., the position of contact between the bottom of the adjusting bar 72 and the annular step 21 of the outer socket 2, and between the bottom of the adjusting bar 72 and the upper faces of the socket units 3, 4 as shown in Figure 3, because the omega shaped leaf spring 52 which is secured by

being inserted into the installation slot 53 of the guide member 5 is also coupled with the retaining slots 73a by inserting the middle projection 52a of the spring 52 into the slots 73a.

The ratchet mechanism 8 includes: ratchets 80, 81 for being rotatably inserted into the ratchet installing slots 11 of the main body 1; a pressing cam 82 disposed between the ratchets 80, 81, and rotatably installed to the installation hole 64 of the upper cover 6; and an adjusting knob 83 installed to the top of the pressing cam 82 from the outside of the upper cover 6.

The ratchets 80, 81 are elastically installed by installation springs 84, 85 between the outer sides of the ratchets 80, 81 and the inner walls of the open slots 11. The pressing cam 82 includes a lower pressing end 86 and an upper revolution shaft 87 in an integral form, and thus, in accordance with the direction of the revolution of the pressing end 86, the pressing cam 82 presses one of the ratchets 80, 81, so that the tip of one of the ratchets 80, 81 should be meshed with the teeth portion 3 of the outer socket 2, thereby deciding the rotational direction of the outer socket 2. Meanwhile, the adjusting knob 83 is provided with a shaft hole 88 for receiving the revolution shaft 87 of the pressing cam 82.

Figures 4 and 5 illustrate another embodiment of the present invention, and this modified embodiment is constituted such that: the bottom of the main body 1' is made to be open; an outer socket 2, socket units 3, 4, an axially adjusting member 7 and a ratchet mechanism 8 are installed in the same form as that of the first embodiment; and a lower cover 9 is installed to the bottom of the main body 1'.

Therefore, descriptions for the outer socket 2, the axially adjusting member 7, the socket units 3, 4 and the ratchet mechanism 8 will be skipped, and descriptions will be focused mainly on the main body 1' and the lower cover 9.

The main body 1' includes: a handle portion 1a fixedly installed at one side thereof; an open slot 11' for receiving the outer socket 2 and the ratchet mechanism 8; an annular groove 17 for receiving the upper end portion of the outer socket 2; an installation slot 18 having a shaft hole 18a at the centre thereof and for installing the axially adjusting member 7; a shaft hole 19 for rotatably installing the revolution shaft 87 of the ratchet mechanism 8; ratchet installation slots 15', 16' also for installing the ratchet mechanism 8; fastening holes 13', 14' formed at the opposite sides of the bottom thereof; a step portion 10'(elliptical step) for installing the lower cover 9; and a recess 12' formed at one side of the outer upper portion thereof in order to install the adjusting knob 83 of the ratchet mechanism 8 in a left and rightwardly movable manner.

The lower cover 9 takes an elliptical form so as to be fit to the step portion 10' of the main body 1'. The lower cover 9 further includes: fastening holes 90, 91 for fastening the lower cover 9 to the main body 1' by means of fastening screws 92, 93; and a circular recess 94 formed at one side thereof and for receiving the outer socket 2 in a rotatable manner. The outer socket 2, the socket units 3, 4, the axially adjusting member 7, and the ratchet mechanism 8 are installed into the main body 1' in the cited order, and then, the lower cover 9 is fitted and fastened by means of the fastening screws 92, 93.

Figures 6 to 9 illustrate still another embodiment of the present invention, and in this embodiment, the main body 1', the socket units 3, 4, and the axially adjusting member 7 are provided in the same technical constitutions as those of the embodiment of Figures 4 and 5.

However, an upper socket member 5' includes an outer socket 2' which is slightly different from the outer socket 2, and an axially adjusting member 7' for axially adjusting the socket units 3, 4. Further, a lower socket member 6' is provided in order to couple it with the periphery of the lower end of the upper socket member 5', the above elements constituting the characteristic feature of this embodiment.

Now descriptions will be made focusing mainly on the upper and lower socket members 5', 6' and the axially adjusting member 7' which have features different from the preceding embodiments.

The upper socket member 5' accommodates therein an outer socket 2' and a plurality of socket units 3, 4, the latter being inserted into the outer socket 2' in a slidable manner, and the outer socket 2' being also axially slidable. The outer socket 2' is provided with an inner teeth portion 20, and an annular step 21 for halting the socket unit 3. On the outside of the outer socket 2', there are provided upper and lower teeth portions 26, 27 and an annular groove 24 formed between the upper and lower teeth portions 26, 27, in addition to a coupling slot 25.

The socket units 3, 4 are inserted into the outer socket 2' to the hilt, while a lower cover 9' having a snap ring 28 and teeth shaped opening 9a is fitted to the annular groove 24.

The axially adjusting member 7' includes: an actuation bar 72' for being fitted to one side of the lower portion of the cylindrical portion 73'; a connecting shaft 74' for being secured to one side of the upper portion of the cylindrical portion 73'; and an adjusting knob 71' for being secured to the connecting shaft 74'. At the centre of the top of the cylindrical portion 73', there is formed a slot 76 into which a spring 77 and a securing ball 78 are inserted. The axially adjusting member 7 is in-

stalled in such a manner that, in a state with the actuation bar 72', the connecting shaft 74', the spring 77 and the securing ball 78 coupled together, the connecting shaft 74' is inserted into the installation hole 18', and the adjusting knob 71' is securely fitted into the lower coupling hole 71'a from above. Thus, as the adjusting knob 71' is turned, the cylindrical portion 74' and the actuation bar 72' are moved in an interlocked state each other.

Under this condition, the adjusting knob 71' has only to be turned around the connecting shaft 74' in accordance with the position of contact between the actuation bar 72' and the annular step of the outer socket 2' or between the actuation bar 72' and the upper faces of the socket units 3, 4. That is, as shown in Figure 9, the securing ball 78 and the actuation bar 72' are turned around the connecting shaft 74' so that the ball 78 is coupled with either one of the ball securing slots 76 of the main body 1', and so that the actuation bar 72' is positioned either on the annular step 21 of the outer socket 2' or on the upper faces of the socket units 3, 4, thereby deciding the lifting of the socket units 3, 4.

The lower socket member 6' includes an outer socket 100 which is constituted such that an elongate slot 101 is formed in the lengthwise direction; an upper teeth portion 102 is formed on the inside thereof; an intermediate portion 103 is provided for being fitted with the lower portion of the outer socket 100; and a lower teeth portion 104 is also provided.

The lower teeth portion 104 is coupled with a socket unit 105 having a diameter different from the diameters of the inner and outer teeth portions 32, 33, 42, 43 of the socket units 3, 4.

The intermediate portion 103 is provided with a threaded hole 106 into which a securing ball 107, a supporting spring 108 and a headless bolt 109 are inserted and fitted.

Thus when the upper and lower socket members 5', 6' are coupled together, the upper teeth portion 102 is properly fitted to and coupled with the lower teeth portion 27 of the outer socket 2', and the ball 107 which is elastically secured by means of the spring 108 is inserted into the coupling slot 25, thereby coupling the upper and lower socket members 5', 6'.

The socket unit 105 is provided with an axially adjusting pin 110 at one side of the upper portion thereof, and is also provided with securing pin 111 for being fitted into the elongate slot 101, so that the socket unit 105 can be lifted only when the socket unit 3 of the upper socket member 5' is lifted, and that the securing pin 111 should be movable in the axial direction only within the elongate slot 101 of the outer socket 100.

Figures 10 to 12 illustrate still another embodiment of the present invention. In comparison with the embodiment of Figures 6 to 9, the main body 1', the socket units 3, 4 and the socket unit 105 are same in their technical constitutions, while the axially adjusting member 7 has a technical constitution same as that of Figures 4 and 5. However, the ratchet mechanism 8', the outer socket 2' of the upper socket member 5' and the outer socket 100 of the lower socket member 6' are uniquely different.

Therefore, descriptions will be made below focusing mainly on the ratchet mechanism 8' and on the outer sockets 2', 100.

The ratchet mechanism 8' includes: ratchets 112, 113 for being respectively fitted into coupling slots 15', 16' of the main body 1'; and a pressing cam 82 for being inserted into an installation hole 64 in a rotatable manner, and for being fixedly coupled with the adjusting knob 83.

The ratchets 112, 113 respectively include a 3-step engaging portion 114 for being meshed with the upper teeth portion 26 of the outer socket 2'; a spring installation slot 115; a spring hooking hole 116; and an integral pivot shaft 117. The spring installing slots 115 secure the opposite ends of a compression spring 118, and the spring hooking holes 116 secure the opposite ends of a tension spring 119, in such a manner that the ratchets 112, 113 should be elastically retained. The pressing cam 82 consists of an upper revolution shaft 87 and a cam shaped pressing end 86 in an integral form, and the adjusting knob 83 is provided with a shaft hole 88, so that, when coupling, the revolution shaft 87 can be rotatably inserted into the shaft hole of the adjusting knob 83. Thus the pressing cam 82 is interlocked with the turning of the adjusting knob 83, and if the pressing end 86 pushes one of the ratchets 112, 113, then the 3-step engaging portion 114 of the ratchet which is not pushed is meshed with the upper teeth portion 26 of the outer socket 2', thereby deciding the rotational direction of the outer socket 2'.

The outer socket 2' of the upper socket member 5' includes an inner teeth portion 20, an inner annular step 21, an outer teeth portion 23, a longitudinal elongate projection 120, and a threaded hole 121, the threaded hole 121 being for receiving a securing ball 122, a supporting spring 123 and a headless bolt 124.

The outer socket 100' of the lower socket member 6' includes: an inner longitudinal groove 125 for being coupled with the longitudinal elongate projection 120; and a securing slot 126 formed at one end of the inner longitudinal groove 125 for receiving the ball 122 when coupling.

The socket wrench of the present invention constituted as above will now be described as to its

function and effect.

The method of the use of the device according to the present invention is same both for the embodiment of Figures 1 to 3 and the embodiment of Figures 4 and 5. The method of the use is also same both for the embodiment of Figures 6 to 9 and the embodiment of Figures 10 to 12, if the lower socket member 6' is not used. Therefore, the use of the socket wrench of the present invention will be described for two cases i.e., the case where only the main body 1,1' is used (without the lower socket member 6'), and the case where the socket wrench is used with the lower socket member 6' a coupled.

For the former case, the use is carried out in such a manner that a relevant one is selected from among the outer socket 2 and the socket units 3,4 by turning the adjusting knob 71 of the axially adjusting member 7.

In this case, the adjustment is carried out in such a manner that, in the case of smallest bolts or nuts, none of the socket units 3,4 is lifted; in the case of intermediate size bolts or nuts, only the socket unit 4 is lifted, with the socket unit 3 being left intact; and in the case of largest bolts or nuts, the socket units 3,4 are all lifted up. The above described situations are effected in accordance with the contact position between the bottom of the longitudinal projection 72 having an elongate elliptical cross section and the upper faces of the socket units 3,4, and between the bottom of the projection 72 and the annular step 21 of the outer socket 2 as shown in Figure 3. In this way, a proper socket fitting to the bolt or nut is selected, and the user can visually confirm the above mentioned contact position, because the middle projection 52a of the leaf spring 52 is inserted into the retaining slot 73a of the axially adjusting member 7 in accordance with the shifting contact position upon turning the adjusting knob 71, the positions being indicated on the upper cover 6 or on the main body 1'.

In this way, after the selection of the outer socket or one of the socket units 3,4, the adjusting knob 83 of the ratchet mechanism 8,8' is turned to left or right in accordance with the loosening or tightening of the bolt or nut, with the result that the pressing cam 82 is turned to press one of the ratchets 80,81, and that the teeth portion 23 of the outer socket 2 and one of the ratchets 80,81 are meshed together, thereby deciding the rotational direction of the outer socket 2.

In this connection, for the case of the embodiments of Figures 10 to 12, the ratchets 112, 113 can maintain strong elasticities because they are provided with a compression spring 118 and a tension spring 119, while they form a firm fixing with the upper teeth portion 26 because they are provided with the 3-step engaging portions 114.

Second, in the latter case in which the socket wrench is used with the lower socket member 6' coupled, bolts or nuts which can not be handled by means of the outer socket 2, 2' and the socket units 3,4 of the upper socket member 5' are loosened or tightened.

For example, if the bolt or nut has an intermediate diameter between the socket unit 3 and the socket unit 4, then the socket unit 105 can be used, while, if the bolt or nut has a diameter larger than that of the outer socket 2, 2', then the outer socket 100 can be used.

In the case where the socket unit 105 is to be used, the adjusting bar 72 of the actuation bar 70 is let to be positioned on the socket units 3, 4 by turning the adjusting knob 71, so that the socket unit 3 can not be lifted. Then the socket unit 105 also can not be lifted owing to the function of the pin 110, and therefore, the lower socket member 6' of the socket wrench can be used in a state with the socket unit 105 fixed.

In the case where the outer socket 100 is to be used, the adjusting bar 72 of the actuation bar 70 is let to be positioned on the annular step 21 of the outer socket 2' by turning the adjusting knob 71, so that the socket unit 3 should be rendered liftable. In this state, if the socket unit 105 is lifted, then the pin 110 is also lifted upwardly, and the securing pin 111 is also elevated along the elongate slot 101, thereby making it possible to use the outer socket 100.

Thus, a socket unit which is fit to the bolt or nut to be loosened or tightened is selected in a manner described above, and depending on the selected socket unit, the upper socket member 5' or the lower socket member 6' is attached or detached. Then, the socket wrench of the present invention can be used like the conventional hand tools, and therefore, further descriptions on the use will be skipped.

According to the present invention as described above, an outer socket 2 and a plurality of socket units 3,4 are axially slidably installed, and an axially adjusting member 7 and a ratchet mechanism 8 are separately provided, so that the selection of the outer socket 2 and the socket units 3,4 can be easily and arbitrarily carried out, and that the rotational direction of them can also easily and arbitrarily be carried out. During the use, the axially adjusting member 7 is not interfering with the socket units 3,4, and therefore, the life expectancy of the socket wrench is extended. Further, the upper and lower socket members 5', 6' can be attached or detached by simple manipulations, so that one of the outer sockets 2', 100 and the socket units 3,4,105 can be conveniently selected according to the need. Particularly, owing to the provi-

sions of the compression and tension springs 118, 119 and the 3-step engaging portions 114 to the ratchets 112, 113 of the ratchet mechanism 8', the actuations become exact and smooth. Further, the overall structure of the socket wrench according to the present invention is relatively simple, and therefore, the manufacturing is rendered easy.

Claims

1. A socket wrench comprising: a main body (1) having a handle (1a) in a unitized form; an outer socket (2) and a plurality of socket units (3, 4) installed in an axially slidable manner; an axially adjusting member (7) for adjusting the axial actuations of the socket units (3, 4); and an ordinary ratchet mechanism (8) for setting the rotational direction of the socket units (3, 4) and the outer socket (2),
the main body (1) comprising: an opening (10) for receiving the outer socket (2); an open slot (11) for installing the ratchet mechanism (8) and open to the opening (10); an annular projection (12) formed at a lower position of the opening (10); and fastening holes (13, 14) and ratchet installation slots (15, 16) formed on the bottom of the open slot (11),
the socket umits (3, 4) comprising: flange portions (31, 41) formed on one respective end of them; and inner (32, 42) and outer teeth portions (33, 43) for meshing with each other and with the outer socket (2);
the outer socket (2) comprising: an inner teeth portion (20) for meshing with the socket unit (3); an inner annular step (21) for mounting the socket unit (3); another inner annular step (22) and an outer teeth portion (23), and
the axially adjusting member (7) comprising: an actuation bar (70) and an adjusting knob (71), the actuation bar (72) including: a longitudinal elongate projection (72) having a semi-elliptical cross section, a cylindrical portion (73) having a plurality of retaining slots (73a), and a concentrical shaft (74) all in an integral form; and the adjusting knob (71) including a projection (75).

2. The socket wrench according to claim 1, wherein an upper cover (6) is installed on the top of the main body (1);
a guide member (5) is installed on the bottom of the main body (1);
the guide member (5) is provided with a rectangular projection (50) at the centre thereof, an installation hole (51) for installing the axially adjusting member (7), and a leaf spring installing slot (53) between the rectangular projection (50) and the installation hole (51);
the rectangular projection (50) is inserted into a rectangular slot (61) of the upper cover (6);
the leaf spring installing slot (53) receives an omega shaped leaf spring (52);
and the upper cover (6) is provided with an installation hole (60) for installing the axially adjusting member (7), a rectangular slot (61) for coupling with the guide member (5), fastening holes (62, 63) formed at the opposite edges thereof, an installation hole (64) for installing the ratchet mechanism (8), and stopping protuberances (65, 66) formed at the oppsoite edges thereof, so that the upper cover (6) can be fastened to the main body (1) by means of fastening screws (67, 68).

3. The socket wrench according to claim 1 or 2, wherein the main body (1') comprises: a handle (1a) in an integral form; an open slot (11') for installing the outer socket (2) and the ratchet mechanism (8); a circular guide groove (17) for rotatably receiving the tip of the outer socket (2); an installation slot (18) for installing the axially adjusting member (7) and having a shaft hole (18a) at the centre thereof; a shaft hole (19) for rotatably installing the revolution shaft (87) of the ratchet mechanism (8); ratchet installation slots (15', 16') formed at the opposite edges thereof; fastening holes (13', 14') formed at the opposite sides of the front portion thereof; an elliptical step (10') for installing a lower cover (9); and a recess (12') formed at a side of the top thereof, and for receiving the adjusting knob (83) of the ratchet meachanism (8) in a left and rightwardly movable manner, and wherein
the lower cover (9) having an elliptical form so as to be fitted to the elliptical step (10') of the main body (1'), comprises: fastening holes (90, 91) for fastening the lower cover (9) to the main body (1') by means of securing screws (82, 93); and an installation hole (94) formed at the centre thereof, and for mounting the outer socket (2) on it in a rotatable manner.

4. A socket wrench comprising: a main body (1') having a handle (1a) in an integral form; an upper socket member (5') consisting of an outer socket (2') and socket units (3, 4), the socket units (3, 4) being axially slidable; an axially adjusting member (7') for adjusting the axial actuations of the socket units (3, 4); a lower socket member (6') for being coupled with the upper socket member (5') and a ratchet mechanism (8') for setting the rotational directions of the outer sockets of the upper and lower socket members (5', 6'); the outer socket (2') of the upper socket member (5')

comprising:
upper and lower teeth portions (26, 27); an annular groove (24) disposed between the upper and lower teeth portions (26, 27); and a coupling slot (25), the annular groove (24) being for installing a lower cover (9') having a snap ring (28) and a teeth shaped opening (9a),
the axially adjusting member (7) comprising: an actuation bar (72') for being secured to one side of the lower portion of a cylindrical portion (73'); a connecting shaft (74') for being secured to one side of the upper portion of said cylindrical portion (73'); an adjusting knob (71') for being secured to the connecting shaft (74') and a spring (77) and a securing ball (78) being inserted into a slot (76) which is formed at the center of the top of the cylindrical portion (73'), the lower socket member (6') comprising: an outer socket (100) and a socket unit (105),
the outer socket (100) comprising: an elongate slot (101) formed on one side thereof in the lengthwise direction; an upper teeth portion (102) formed on the inside thereof; a lower teeth portion (104); and an intermediate portion (103) for being coupled with the outer socket (2') of the upper socket member (5');
the socket unit (105) of the lower socket member (6') being to be coupled with the lower teeth portion (104) of the outer socket (100) and having a diameter different from the socket units (3, 4) and the outer socket (2') of the upper socket member (5'), an axially adjusting pin (110) being installed on the top of the socket unit (105) of the lower socket member (6'), and a securing pin (111) being installed on one side of the socket unit (105) of the lower socket member (6'), the securing pin (111) being to be coupled with the elongate slot (101) of the outer socket (100), and
the intermediate portion (103) being provided with a threaded hole (106) for accommodiating a ball (107), a supporting spring (108) and a headless bolt (109), so that the ball (107) can be inserted into a coupling slot (25) when the upper and lower socket members (5', 6') are coupled.

5. The socket wrench as claimed in claim 4, wherein the outer socket (2') of the upper socket member (5') further comprises: an outer teeth portion (23); a longitudinal elongate projection (120); and a threaded hole (121) for accommodating a securing ball (122), a supporting spring (123) and a headless bolt (124),
the ratchet mechanism (8') comprises: two 3-step engaging portions (114) for meshing with the upper teeth portion (26) of the outer socket (2') of the upper socket member (5'); spring installation slots (115) for receiving the opposite ends of a compression spring (118); and spring hooking holes (116) for for receiving the opposite ends of a tension spring (119); and the outer socket (100') of the lower socket member (6') comprises: an inner longitudinal groove (125) for being coupled with the longitudinal elongate projection (120); and a securing slot (126) formed at a corner of the longitudinal groove (125) so that the ball (122) can be inserted when coupling the upper and lower socket members (5', 6').

FIG. 1

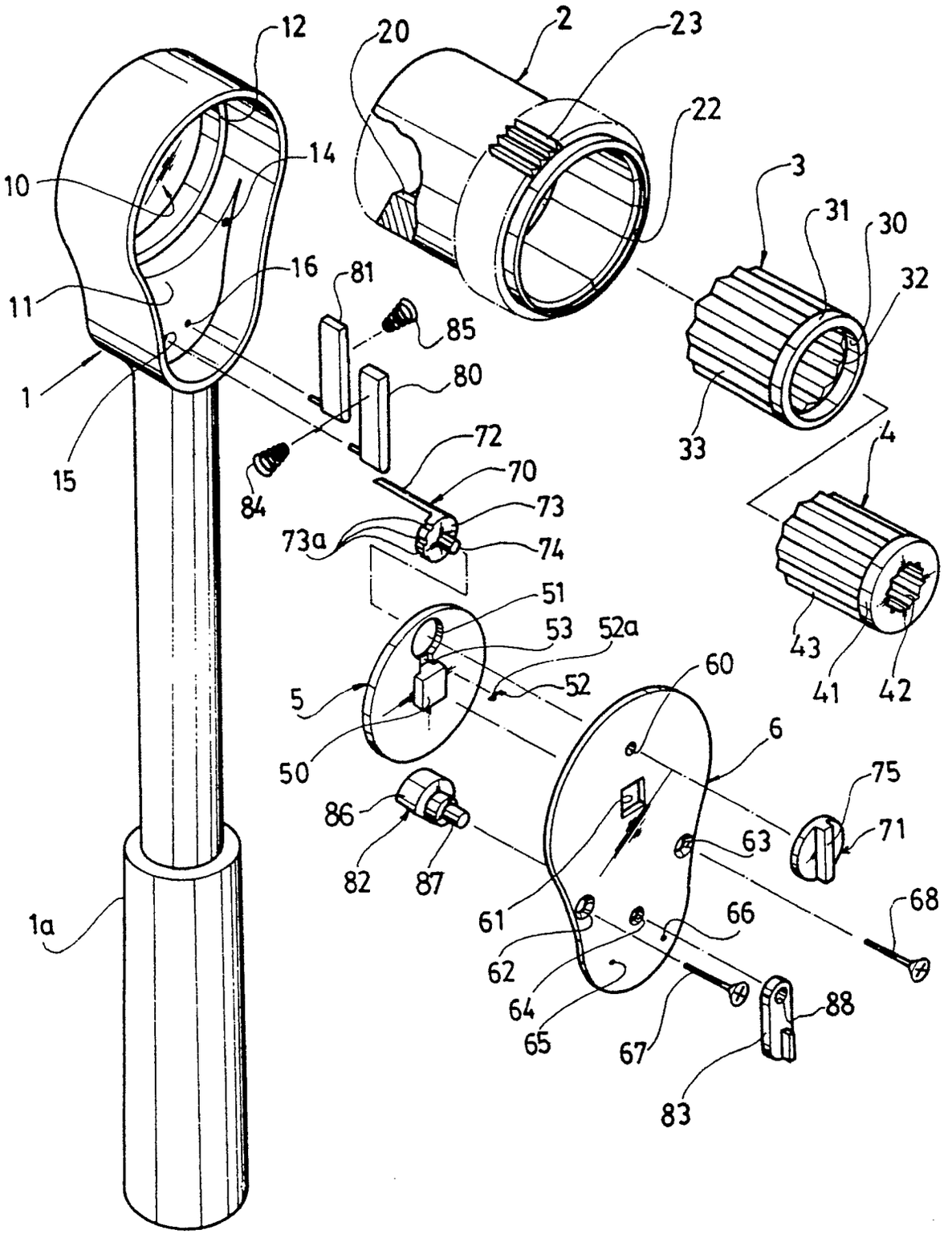

12
20
2
23
22
14
10
3
31
30
16
81
32
11
85
80
1
33
72
4
15
84
70
73
73a
74
51
53
52a
52
60
5
41
42
43
50
6
86
75
71
63
82
87
61
66
68
62
64
65
67
88
83
1a

FIG.2

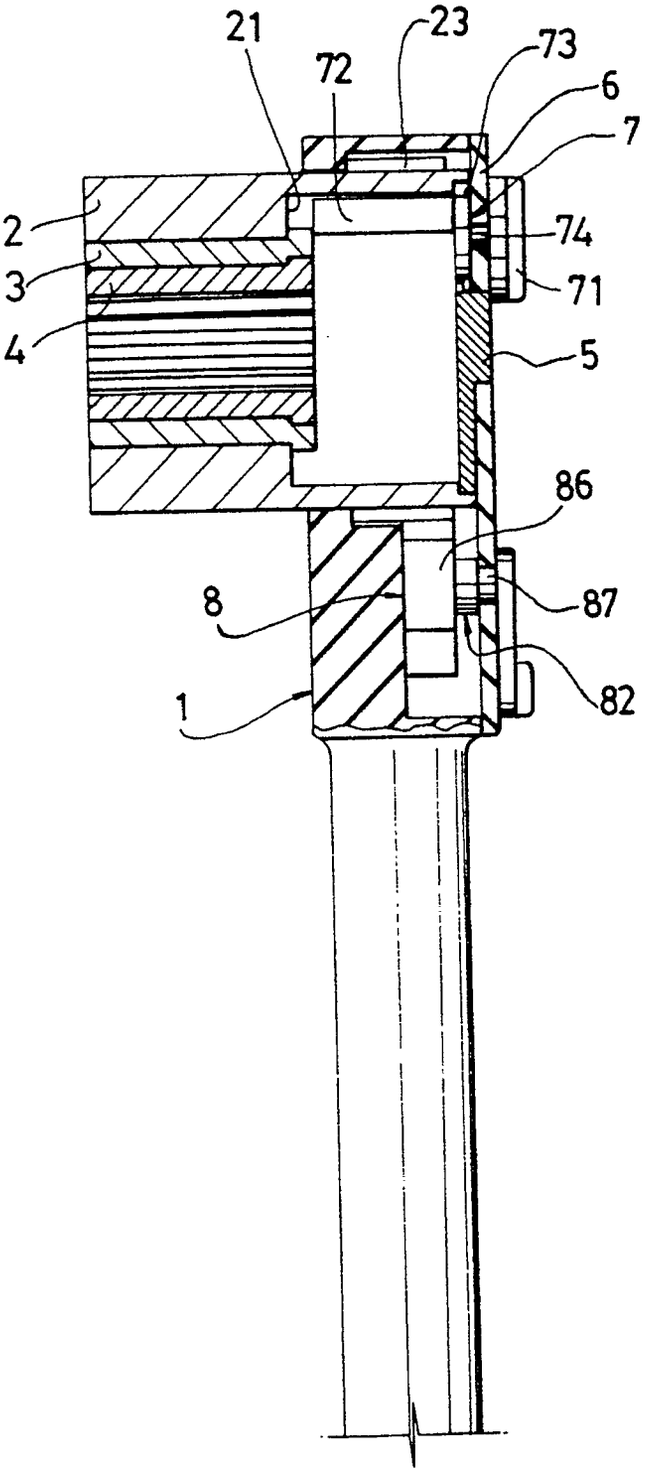


FIG.3

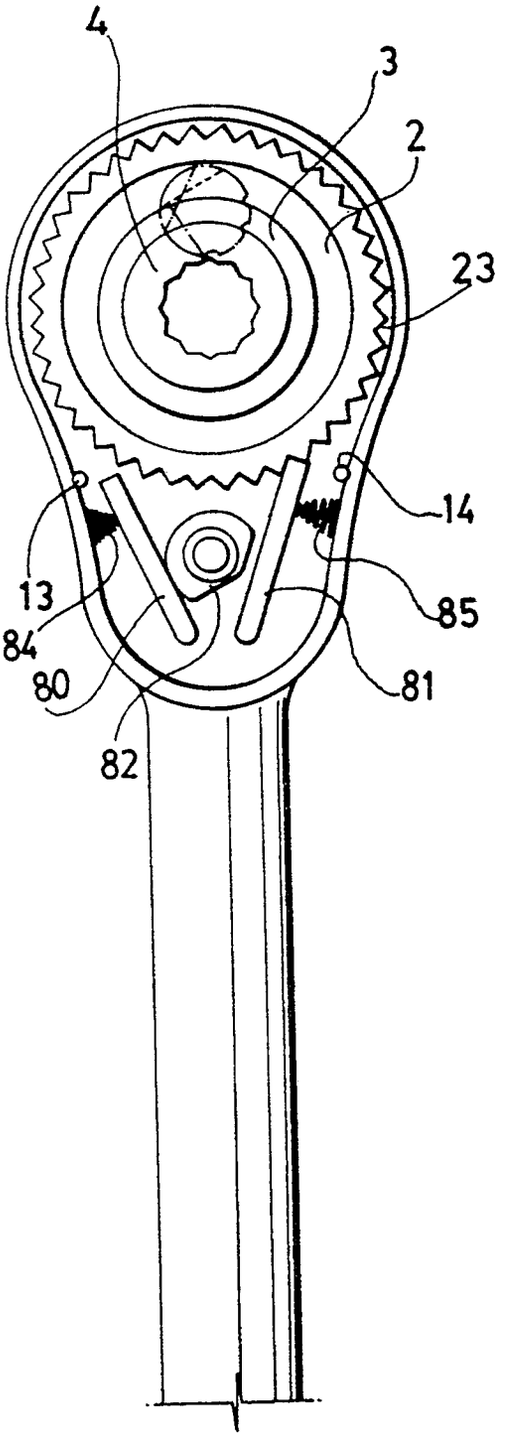


FIG.4

FIG.5

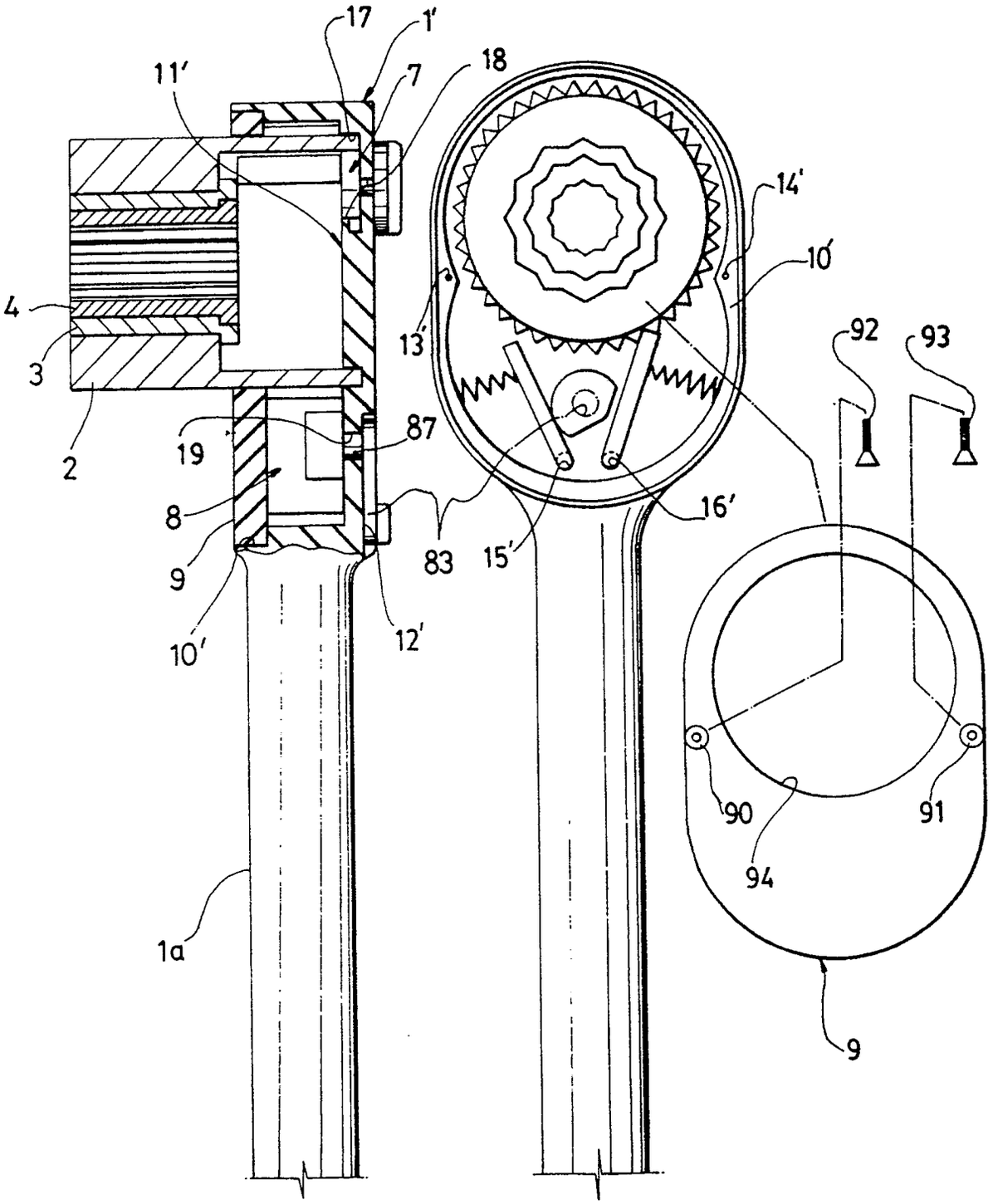


FIG. 6

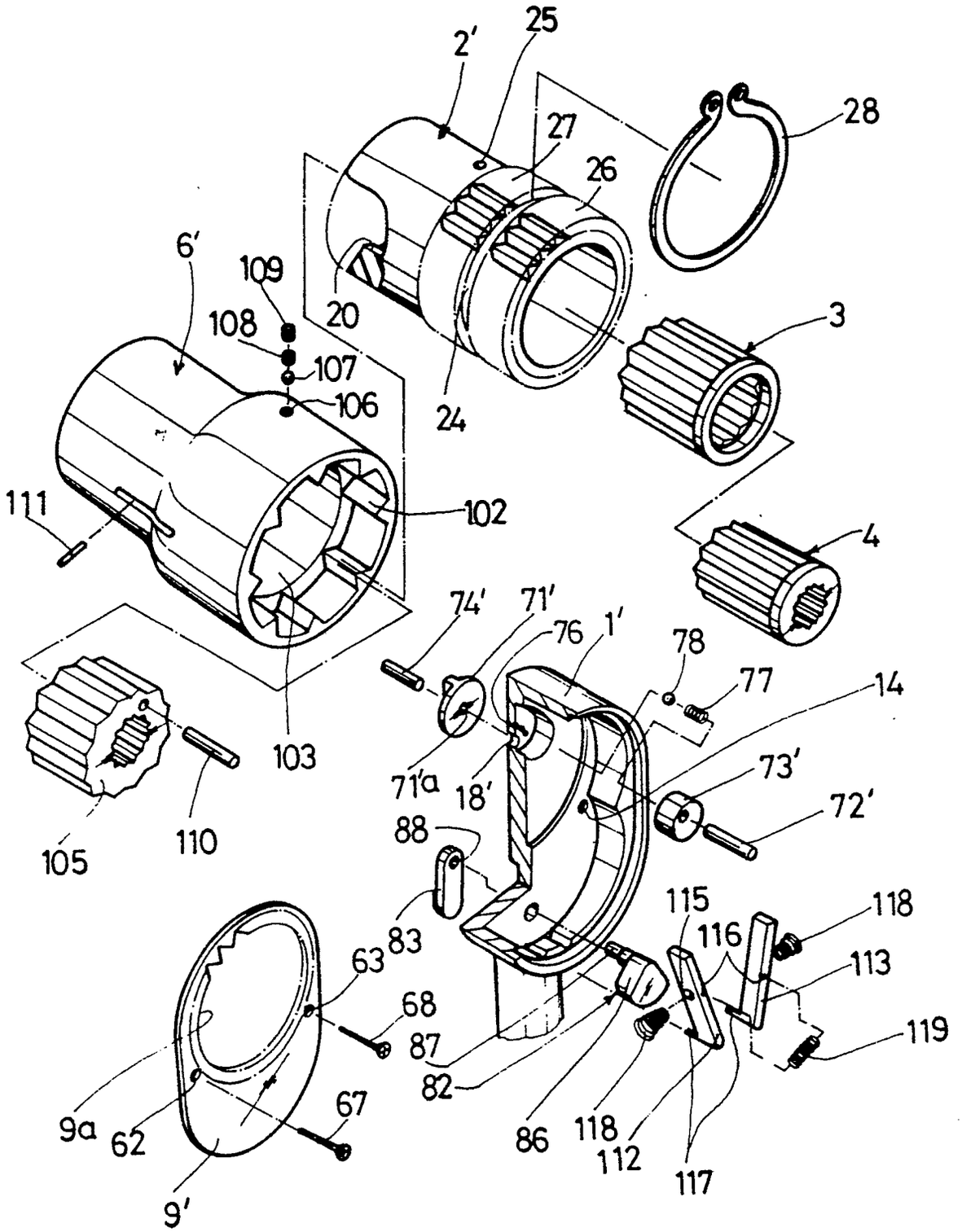

2'
25
28
27
26
6'
109
108
107
106
20
24
3
111
102
4
74'
71'
76
1'
78
77
14
103
71'a
18'
73'
72'
105
110
88
83
115
116
118
113
63
68
87
82
119
9a
62
67
86
118
112
117
9'

FIG. 7

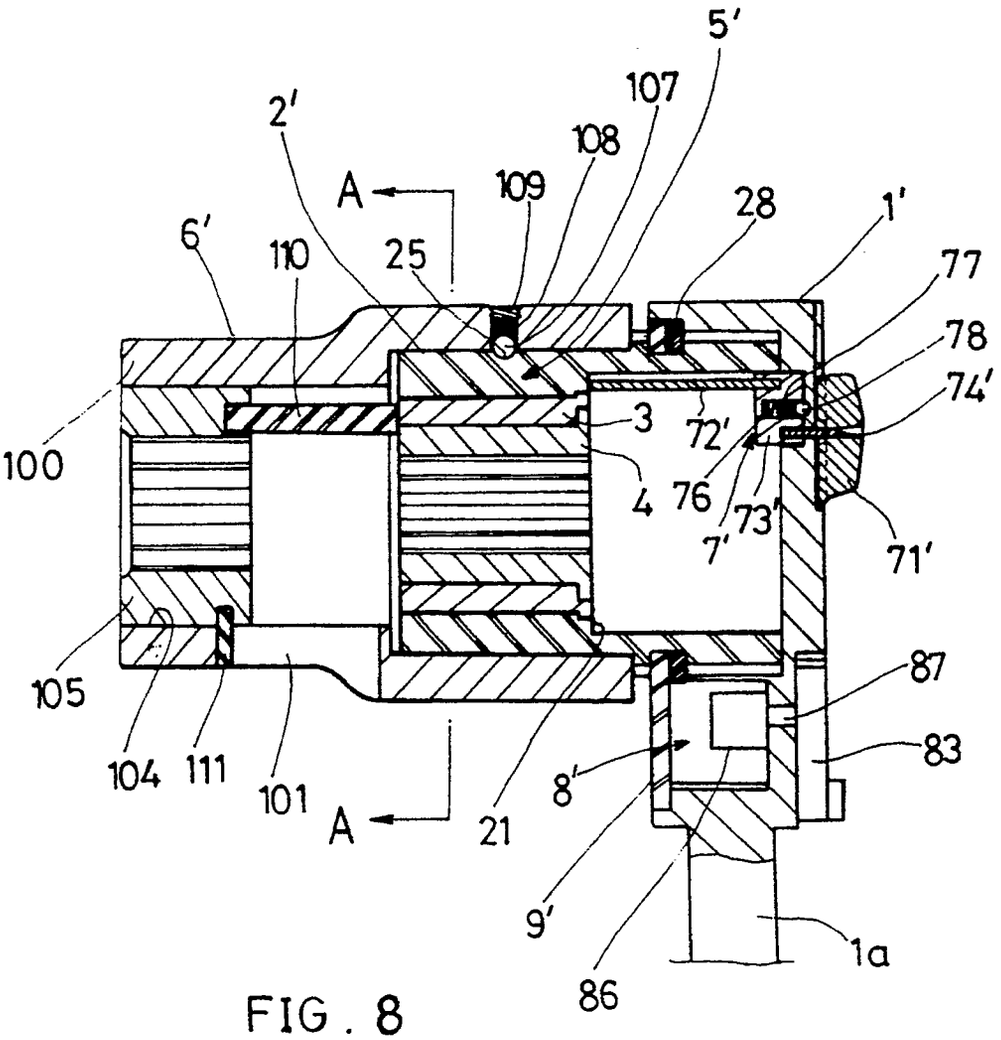

5'
107
2'
108
A
109
28
1'
6'
110
25
77
78
74'
100
3
72'
4
76
73'
7'
71'
105
87
83
104
111
101
A
21
8'
9'
1a
86

FIG. 8

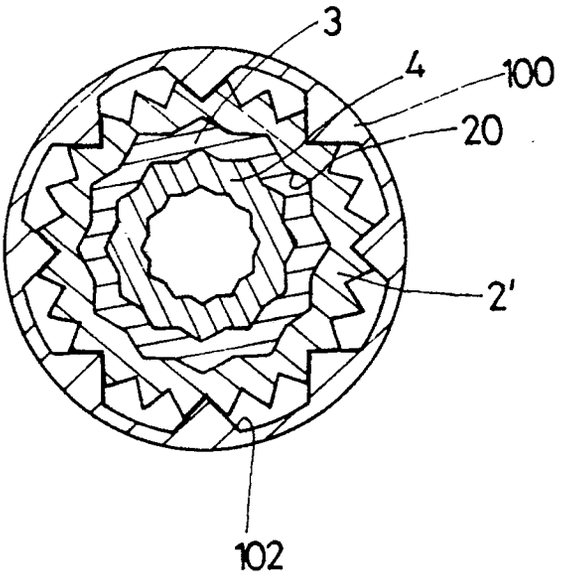

3
4
100
20
2'
102

FIG.9

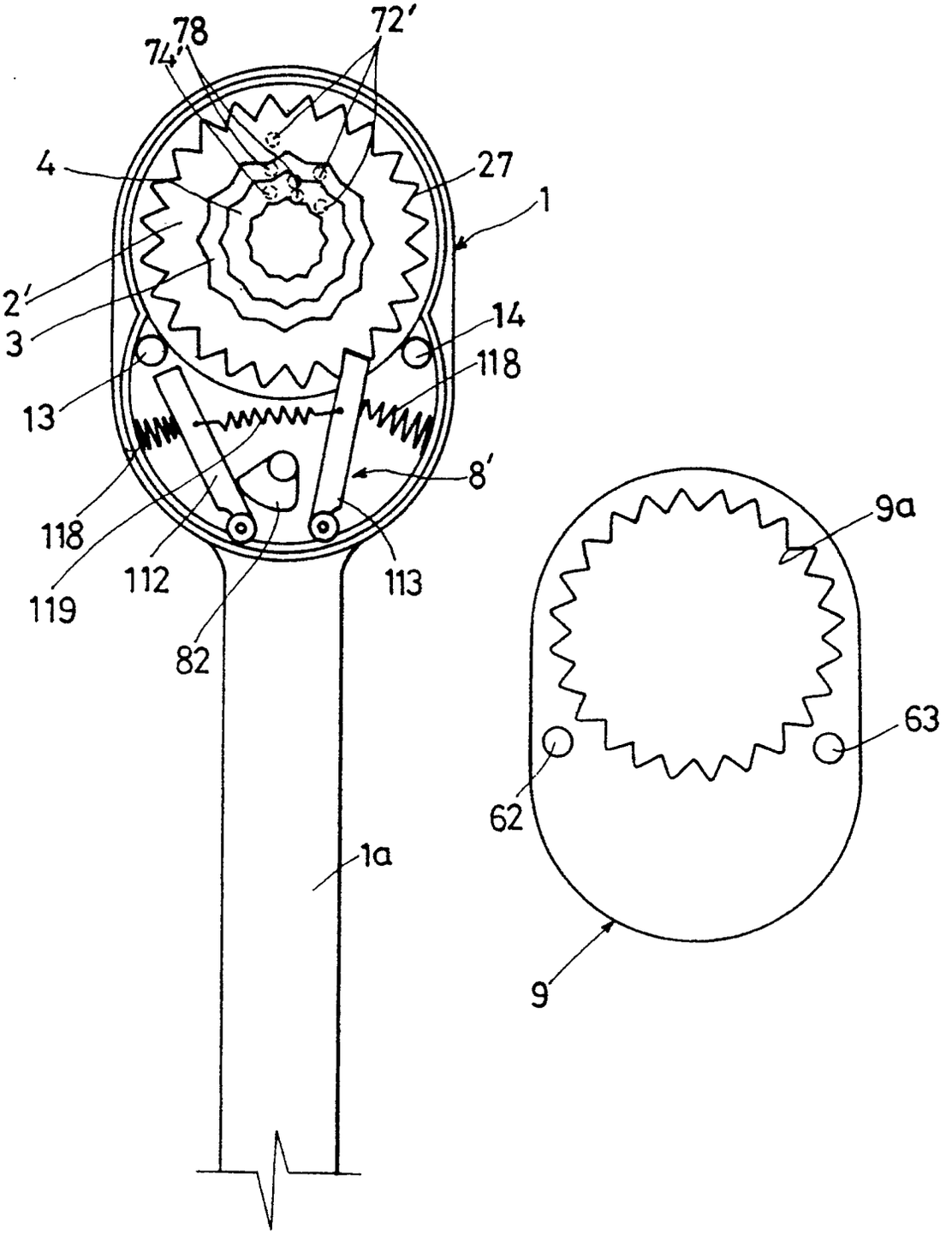


FIG.10

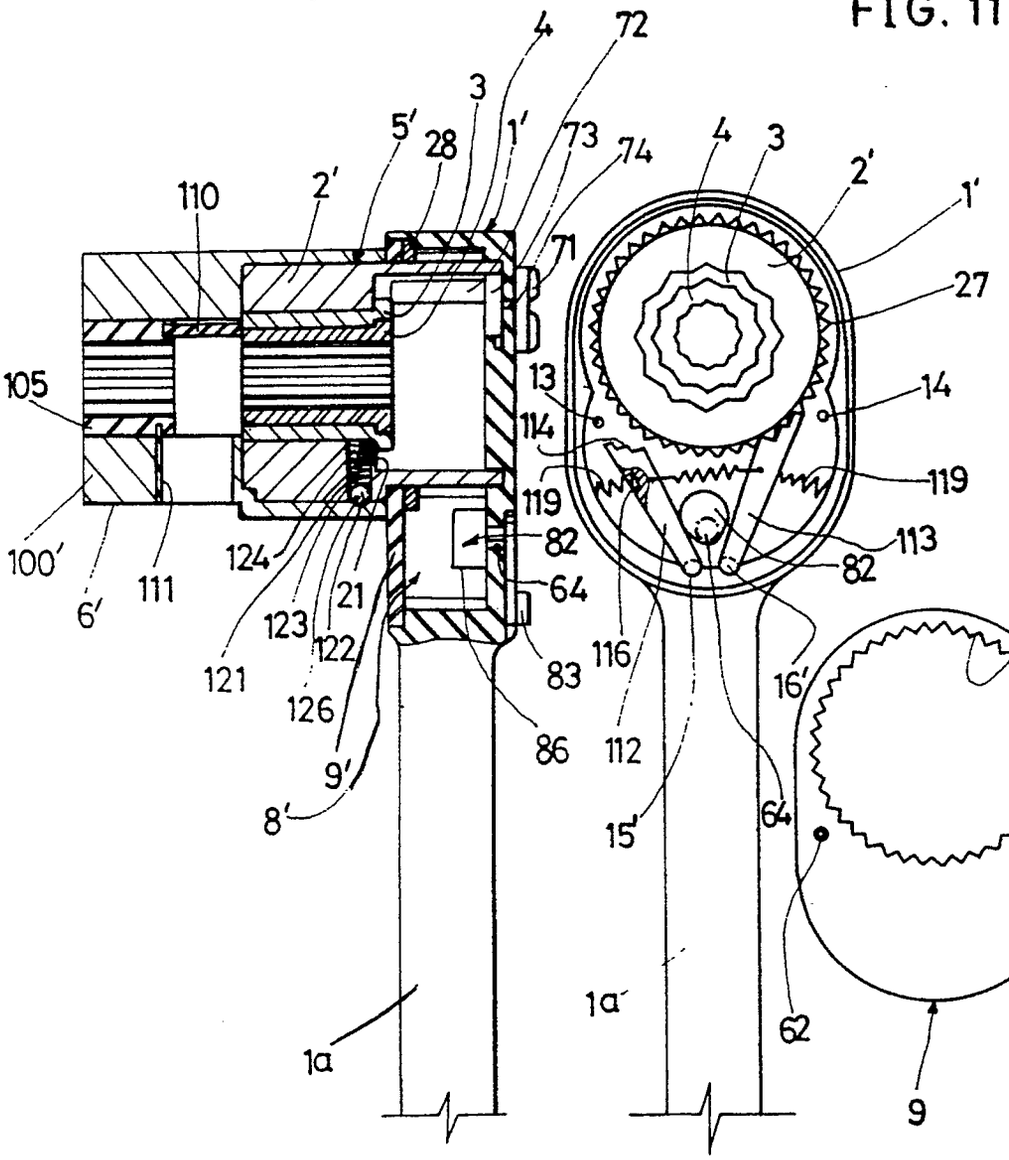

4
72
3
5'
28
1'
73
74
110
2'
71
105
100'
6'
111
124
123
122
21
121
126
9'
8'
13
114
119
82
64
83
86
1a
4
3
2'
1'
27
14
119
113
82
116
112
15'
16'
64
9a
63
62
1a'
9

FIG. 11

FIG.12