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Device for a torque wrench

This invention relates to a device for a torque wrench for coupling a torque handle to a socket.

The conventional torque wrench is generally provided with no torque indicating means and is prone to distorting or breaking a nut of an article when the torsion applied thereto is too great. Conversely, the nut loosens and becomes insecure when the torque applied is insufficient. For example, spark plugs and various nuts and bolts used in automobiles and motorcycles, and fittings for home electrical appliances require tightening to a specific torque value.

One known type of torque wrench has an indicating disc on a handle thereof and an indicator on a rectangular plug thereof. However, it is considerably bulky and is inconvenient to use. In addition, it requires close attention to be paid to the indicating disc and the indicator thereof while being used to ensure that the desired torque is not exceeded. In this case, only a skilled operator can make good use of the torque wrench.

United States Patent Specification No. 3,889,490 describes a simple form of torque wrench which is locked by means of a screw. United States Patent Specification No. 3,001,430 describes a torque limiting screwdriver with a ball detent mechanism arranged to transmit the torque force.

An object of the present invention is to provide an improved socket joint for a torque wrench.

The present invention provides a torque limiting device for a socket wrench comprising a torque limiting clutch for transmitting torque from the socket wrench to a socket, the clutch comprising two frictionally engaged clutch members; resilient means applying force to one of the clutch members to maintain said clutch members in engagement with one another, said force being adjustable; control means movable between a first position wherein said force is fixed and a second position enabling adjustment of said force; a substantially tubular housing telescopically engaged in a substantially tubular portion of a body and containing said torque limiting clutch for transmitting torque from the socket wrench to a socket, one of the clutch members being adapted for engagement in the socket and the other being coupled to said body by way of said resilient means, whereby rotation of said housing relative to said body adjusts said force applied by said means characterised in that said body is connectible at its end remote from said housing to said socket wrench and said control means comprises a controlling ring coaxially surrounding said body and rotatable relative thereto between said first and second positions, at least one torque transmitting ball element movably disposed in a through-hole in the wall

of said body tubular portion and having a dimension greater than the thickness of said wall so as to project from said throughhole; and wherein the housing has a plurality of recesses formed in its radially outer surface for partially receiving said torque transmitting ball element when said controlling ring is in said first position to prevent relative rotation of said housing and said body and said controlling ring has at least one recess formed in its radially inner surface for partially receiving said torque transmitting ball element when said controlling ring is in said second position to enable relative rotation of said housing and said body; and wherein said body tubular portion has an axial screw threaded member along which said housing is screwable by relative rotation of said body and said housing and said resilient means is a compression coil spring coupling said other clutch member to said screw threaded member.

The present invention is further described hereinafter, by way of example, with reference to the accompanying drawings; in which:

Figure 1 is an exploded perspective view showing a preferred embodiment of the present invention;

Figure 2 is a longitudinal section through the preferred embodiment of Fig. 1;

Figure 3 is a longitudinal section through a second embodiment according to the present invention;

Figure 4 is a perspective view showing a torque wrench embodying the device of this invention;

Figure 5 is a perspective view showing a further torque wrench embodying the device of this invention; and

Figure 6 is an exploded perspective view showing a second form of clutch for a joint according to this invention.

Figure 1 shows a preferred device according to this invention comprising a body 10, a bolt 20, a rectangular plug 60, a clutch housing in the form of a casing 50, a clutch 70, a spring 80, a compressing ring 40, a controlling ring 30 in the form of a sleeve-like member and a positioning nut 90.

The body 10 is in the form of a cylinder having a cylindrical portion or chamber 11 situated at its lower end as seen in Fig. 1 so as to receive the clutch casing 50. Situated adjacent the opposite, upper end of the chamber 11 is a screw-threaded axial blind bore 12 which engages with one end of the bolt 20. A plurality of small screw-threaded radial bores 13 is provided in the body 10 opening into the bore 12 for receiving screws 25 which secure the bolt 20 in position. A plurality of through holes 16 are provided in the wall 15 of the chamber 11 so as to receive a plurality torque transmitting elements in the form of balls 17 each having a diameter greater than the

thickness of the wall 15 of the chamber 11. The upper end of the body 10 is provided with an axial socket 18 of rectangular cross-section so as to receive a rectangular plug of a torque wrench (not shown). The outer periphery of the body 10 is engraved with a plurality of lines 19 (Figs. 4 and 5) corresponding in number to recesses in the form of guiding flutes 53 of the clutch casing 50 and indicating lines and symbols 55 engraved on the outer wall of the casing 50.

One end of the bolt 20 engages in the bore 12 as described above; the other end thereof engages in a screw threaded axial bore 93 in the positioning nut 90.

The controlling ring 30 is a sleeve-like fit around the outer wall of the chamber 11 and at each end has a respective annular recess 31, 32 in the form of increased internal diameter portions so as to protect wholly the compressing ring 40 and the outer wall of the body 10 in part. A protruding pin 33 is provided on the controlling ring 30 and engages in an arcuate groove 42 in an upper surface 41 of the compressing ring 40 so that rotation of the controlling ring 30 relative to the ring 40 is limited. The outer wall of the controlling ring 30 is provided with an indicating means 34 (Figs. 4 and 5) showing the states of "ON" and "OFF" each of which can be brought into alignment with an arrow on the body 10 to indicate whether torsion is "ON" or "OFF". The inner wall 35 of the ring 30 is provided with a plurality of longitudinal grooves 36 to receive the balls 17. A slanting rim of each groove 36 facilitates insertion and removal of said balls 17.

The inner diameter of the compressing ring 40 is equal to the outer diameter of the wall 15 so that said compressing ring 40 is a tight fit over the body 10. The outer diameter of the ring 40 is somewhat smaller than inner diameter of the recess 32 of the ring 30 so as to enable the controlling ring 30 to rotate freely.

The clutch casing 50 is a hollow cylindrical tube provided with a radially inwardly directed annular flange 51 at a lower end of its inner wall to receive the rectangular plug 60 and clutch 70. The positioning nut 90 is secured to the clutch casing 50 by inserting one or more pins 95 through holes 52 and 92 in the casing 50 and positioning nut 90 respectively. The spring 80 is positioned between the bolt 20 and clutch 70. A plurality of guiding flutes 53 are provided on the outer wall of the casing 50 so as to partially receive the balls 17. A plurality of indicating lines and symbols 55 are engraved on the outer wall thereof to indicate the strength of the torque applied thereto.

The plug 60 rests against the protruding ring 51 with its rectangular portion projecting at one end and is designed to connect with a socket of an article. The other end of the plug 60 is formed as one clutch member 701 with teeth to

engage with teeth 71 on a second clutch member 702.

The clutch members 701, 702 as shown in Figure 1 have symmetrical teeth.

Figure 6 shows a further preferred embodiment of the clutch; one contacting face thereof is provided with a plurality of protrusions 711 while another face thereof is provided with several cavities 712 corresponding to the protrusions 711. A locating means 72 is situated to position said spring 80 on the clutch.

The positioning nut 90 has a cylindrical outer wall 91 provided with two said circular holes 92 to enable it to be secured to the clutch casing 50 as described hereinbefore. The inner wall of the nut 90 is provided with the bore 93 as previously mentioned permitting movement of the clutch casing 50 with respect to the body 10 so as to adjust the tension of the spring 80 and to adjust the torque applied by the socket joint.

Figures 2, 3 and 4 show how the socket joint of this invention is fitted to a torque wrench. A plug of a torque wrench 100 is inserted in the rectangular socket 18. The rectangular plug 60 then engages with a socket of an article requiring torque. When the controlling ring 30 is rotated to the indicating means 34 to bring the "OFF" indicating means 34 adjacent the arrow on the body 10 the balls 17 which are held in engagement in the flutes 53 by the inner wall of the ring 30 will engage in the grooves 36 of the controlling ring 30. This allows the balls to rise out of the flutes 53 (Fig. 2) and allows rotation of the body 10 relative to the casing 50.

Rotating the body 10 relative to the casing 50 screws the bolt 20 into or out of the positioning nut 90 thus drawing the casing 50 into or out of the body 10 and adjusting the force of the spring 80 acting on the clutch member 702. Torque is indicated by the lines and symbols 55 and 19 engraved on the clutch casing 50 and body 10. When the body 10 is rotated to the required torque position the controlling ring 30 is then rotated to bring the "ON" indicating means 34 adjacent the arrow on the body 10 to force the balls 17 into the guiding flutes 53 and hold them in position to prevent relative rotation of the body 10 and casing 50 (as shown in Figure 2). The force of the spring 80 is such that while the set torque is not exceeded the clutch members will be held in engagement. Once the torque is exceeded the teeth on the members 701, 702 will ride over one another.

It is to be noted that the pre-decided amount of the torque may be changed if need be.

The socket joint of this invention is also applicable to a non-ratchet type torque wrench handle 200 as shown in Figure 5.

While the described embodiments represent the preferred form of the present invention, it is to be understood that modifications will occur to those skilled in this art without departing from the scope of the invention as defined in the appended claims.

Claims

1. A torque limiting device for a socket wrench (100) comprising a torque limiting clutch (70) for transmitting torque from the socket wrench to a socket, the clutch comprising two frictionally engaged clutch members (701, 702); resilient means (80) applying force to one of the clutch members (71) to maintain said clutch members in engagement with one another said force being adjustable; control means (30) movable between a first position wherein said force is fixed and a second position enabling adjustment of said force; a substantially tubular housing (50) telescopically engaged in a substantially tubular portion (15) of a body (10) and containing said torque limiting clutch (70) for transmitting torque from the socket wrench to a socket, one of the clutch members (701) being adapted (60) for engagement in the socket and the other (702) being coupled to said body (10) by way of said resilient means (80), whereby rotation of said housing (50) relative to said body (10) adjusts said force applied by said means (80) characterised in that said body (10) is connectible at its end remote from said housing to said socket wrench and said control means (30) comprises a controlling ring coaxially surrounding said body (10) and rotatable relative thereto between said first and second positions, at least one torque transmitting ball element (17) movably disposed in a through hole (16) in the wall of said body tubular portion (15) and having a dimension greater than the thickness of said wall so as to project from said through hole; and wherein the housing (50) has a plurality of recesses (53) formed in its radially outer surface for partially receiving said torque transmitting ball element when said controlling ring is in said first position to prevent relative rotation of said housing and said body and said controlling ring (30) has at least one recess (36) formed in its radially inner surface for partially receiving said torque transmitting ball element when said controlling ring is in said second position to enable relative rotation of said housing and said body; and wherein said body tubular portion has an axial screw-threaded member (20) along which said housing is screwable by relative rotation of said body and said housing and said resilient means is a compression coil spring coupling said other clutch member to said screw-threaded member.

2. A device as claimed in claim 1 wherein said recesses (53, 36) are axially extending.

3. A device as claimed in claim 1 or 2 wherein the rim of the said recess (36) in said controlling ring (30) is ramp like.

4. A device as claimed in any of claims 1 to 3 wherein said housing (50) is engraved on its outer surface with a length of indicating symbols shorter than the length of each said recess (53) formed in the said surface.

5. A device as claimed in claim 4 wherein

said body (10) is provided on its outer periphery with a plurality of indicating symbols (19) cooperating with said indicating symbols engraved on the outer surface of said housing (50).

6. A device as claimed in any of claims 1 to 5 wherein the controlling ring (30) is provided with indicating means (34) on its outer surface.

7. A device as claimed in any of claims 1 to 6 wherein the face of one of said clutch members (701) is provided with a plurality of protrusions (711) and the face of the other of said clutch members (702) is provided with a plurality of corresponding recesses (712).

8. A device as claimed in any of claims 1 to 7 wherein the opposing faces of the two clutch members (701, 702) are formed with inter-engaging teeth (71).

9. A device as claimed in any of claims 1 to 8 wherein one clutch member (701) of said clutch (70) is integral with a rectangular plug (60) for engagement with the socket.

10. A device as claimed in any of claims 1 to 9 wherein a ring (40) is secured to the body tubular portion (15) and engages in an annular recess (32) in the controlling ring (30); and a pin (33) in one of said annular recess (32) and said ring (40) engages in an arcuate groove (42) in the other of said annular recess (32) and ring (40) to limit rotation of the controlling ring (30) relative to the body (10).

11. A device as claimed in claim 10 wherein said pin (33) is mounted in said annular recess (32) and engages in the arcuate groove (42) in the ring (40).

Revendications

1. Dispositif limiteur de couple pour une clé à douille (100), comprenant un embrayage (70) limiteur de couple adapté pour transmettre ce couple de la clé à la douille et comportant deux organes d'embrayage (701—702) engagés entre eux par frottement; des moyens élastiques (80) appliquant une force à l'un (701) des organes d'embrayage afin de maintenir ces derniers en contact l'un avec l'autre, cette force étant réglable; des moyens de contrôle (30) mobiles entre une première position où ladite force est fixe et une seconde position permettant le réglage de cette force; un manchon (50) sensiblement tubulaire engagé de manière télescopique dans une partie (15) sensiblement tubulaire du corps (10) de la clé et adapté pour loger l'embrayage (70) limiteur de couple conçu pour transmettre ce couple de la clé à la douille, l'un des organes (701) d'embrayage étant adapté pour être engagé par son nez (60) dans la douille, et l'autre (702) étant accouplé audit corps (10) de clé par l'intermédiaire des moyens élastiques (80), dispositif caractérisé par le fait que le corps (10) de clé est raccordé par son extrémité arrière à la douille par l'intermédiaire dudit manchon et que lesdits moyens de contrôle (30) comprennent une bague

réglable coaxialement autour du corps (10) et pouvant tourner par rapport à celui-ci entre une première et une seconde position, au moins une bille (17) de transmission de couple étant disposée de manière mobile, dans un trou (16) traversant la paroi de la partie tubulaire (15) du corps (10), et ayant un diamètre plus fort que l'épaisseur de cette paroi de manière à saillir du trou (16); le manchon (50) étant pourvu de plusieurs évidements (53) situés radialement dans sa surface extérieure et adaptés pour recevoir partiellement la bille de transmission de couple lorsque la bague de contrôle est dans sa première position afin d'empêcher la rotation du manchon par rapport au corps, cette bague de contrôle (30) ayant au moins un évidement (36) formé radialement dans sa surface intérieure pour recevoir la bille de transmission de couple lorsqu'elle se trouve dans ladite seconde position et afin de permettre la rotation dudit manchon par rapport au corps (10), la partie tubulaire de ce dernier comportant un goujon axial (20) fileté sur lequel est vissé ledit manchon par suite de la rotation du corps (10) par rapport à lui, lesdits moyens élastiques étant constitués par un ressort de compression à boudin situé entre le goujon fileté et l'organe d'embrayage (702) lui faisant face.

2. Dispositif selon la revendication 1, caractérisé par le fait que les évidements (53, 36) sont allongés axialement.

3. Dispositif selon l'une ou l'autre des revendications 1 ou 2, caractérisé par le fait que le bord de l'évidement (36) situé dans la bague de contrôle (30) est en forme de rampe.

4. Dispositif selon l'une quelconque des revendications 1 à 3, caractérisé par le fait que le manchon (50) porte, gravée sur sa surface extérieure, une ligne de signes indicateurs, cette ligne étant plus courte que la longueur de chacun des évidements (53) situés sur cette surface extérieure.

5. Dispositif selon la revendication 4, caractérisé par le fait que le corps (10) de clé comporte sur sa surface extérieure plusieurs signes indicateurs (19) disposés pour coopérer avec les signes indicateurs gravés sur la surface extérieure du manchon (50).

6. Dispositif selon l'une quelconque des revendications 1 à 5, caractérisé par le fait que la bague de contrôle (30) est pourvue de moyens indicateurs (34) sur sa surface extérieure.

7. Dispositif selon l'une quelconque des revendications 1 à 6, caractérisé par le fait que la face de l'un des organes d'embrayage (701) est pourvue de plusieurs saillies (711) et la face correspondante de l'autre organe d'embrayage (702), située en regard de la face précédente, est pourvue d'évidements correspondant auxdites saillies.

8. Dispositif selon l'une quelconque des revendications 1 à 7, caractérisé par le fait que les faces opposées et coopérantes des deux

organes d'embrayage (701, 702) sont pourvues de dents adaptées pour être en prise entre elles.

9. Dispositif selon l'une quelconque des revendications 1 à 8, caractérisé par le fait que l'un des organes d'embrayage (701) de l'embrayage (70) comporte solidairement un nez carré (60) adapté pour s'engager dans la douille de la clé.

10. Dispositif selon l'une quelconque des revendications 1 à 9, caractérisé par le fait qu'une bague (40) est fixée à la partie tubulaire (15) du corps de la clé et est engagée dans un évidement annulaire (32) de la bague de contrôle (30), cet évidement (32) ainsi que la bague (40) comportant chacun un ergot adapté pour s'engager dans une rainure arquée (42) correspondante de cet évidement (32) et de la bague (40) afin de limiter la rotation de la bague de contrôle (30) par rapport au corps (10) de la clé.

11. Dispositif selon la revendication 10, caractérisé par le fait que chaque ergot (33) est monté dans l'évidement annulaire (32) et est engagé dans la rainure arquée (42) correspondante de la bague (40).

Patentansprüche

1. Vorrichtung zur Begrenzung des Drehmoments für einen Ringschlüssel (100) mit einer das Drehmoment begrenzenden Kupplung (70) zum Übertragen der Drehkraft von dem Ringschlüssel auf einen Rohrstutzen, wobei die Kupplung zwei durch Reibung gekuppelte Kupplungsglieder (701, 702) besitzt, daß Federglieder (80) vorgesehen sind, die die Kraft auf eines der Kupplungsglieder (71) übertragen, um diese Kupplungsglieder weiterhin in Eingriff miteinander zu halten, wobei diese Kraft regelbar ist, daß Kontrollvorrichtungen (30) vorgesehen sind, die zwischen einer ersten Stellung, in der diese Kraft festgelegt ist und einer zweiten Stellung, die das Verstellen dieser Kraft gestattet, beweglich sind, daß ein im wesentlichen rohrförmiges Gehäuse (50) vorgesehen ist, das teleskopartig in einen rohrförmigen Teil (15) eines Körpers (10) eingreift und das die das Drehmoment begrenzende Kupplung (70) zum Übertragen der Drehkraft von einem Ringschlüssel zu einem Rohrstutzen aufweist, wobei eines der Kupplungsglieder (701) so ausgebildet ist (60), daß es in den Rohrstutzen eingreift und das andere (702) an dem Körper (10) mit Hilfe von Federgliedern (80) angekuppelt ist, wobei die Drehung des Gehäuses (50) in Bezug auf den Körper (10) die Kraft, die von den Federgliedern (80) aufgebracht wird, einstellt, dadurch gekennzeichnet, daß der Körper (10) an seinem von dem Gehäuse entfernten Ende mit dem Ringschlüssel verbindbar ist und die Kontrollvorrichtungen (30) einen Kontrollring aufweisen, der den Körper (10) coaxial umgibt und der dazu drehbar zwischen der ersten und der zweiten Stellung ist, daß zumindest ein die Drehkraft übertragendes Kugelelement (17)

vorgesehen ist, das beweglich in einem Durchgangsloch (16) in der Wand des rohrförmigen Körperteils (15) angebracht ist und das eine Abmessung besitzt, die größer ist als die Dicke der Wand, so daß es aus diesem durchgehenden Loch hervorsteht, und daß das Gehäuse (50) eine Vielzahl von Ausnehmungen (53) aufweist, die in seiner radialen äußeren Oberfläche gebildet sind zum teilweisen Aufnehmen dieses die Drehkraft übertragenden Kugelements, wenn der Kontrollring in seiner ersten Stellung ist, um die relative Drehbewegung des Gehäuses und des Körpers zu verhindern und daß der Kontrollring (30) zumindest eine Nut (36) besitzt, die in seiner inneren Oberfläche gebildet ist zum teilweisen Aufnehmen des die Drehkraft übertragenden Kugelements, wenn der Kontrollring in seiner zweiten Stellung ist, um eine relative Drehbewegung des Gehäuses und des Körpers zu ermöglichen, und daß dieser rohrförmige Körperteil ein axiales mit einem Schraubgewinde versehenes Teil (20) besitzt, mit dem das Gehäuse durch die relative Drehbewegung des Körpers und des Gehäuses verschraubbar ist und daß die Federglieder eine zusammen-drückbare Schraubenfeder sind, die das Kupplungsteil mit dem Schraubgewindeteil verbindet.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Ausnehmungen (53, 36) sich axial erstrecken.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Rand der Nut (36) in dem Kontrollring (30) rampenförmig ist.

4. Vorrichtung nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß in die äußere Oberfläche des Gehäuses (50) ein Abschnitt mit Hinweissymbolen eingraviert ist, der kleiner ist, als die Länge einer jeden Ausnehmung (53) die diese Oberfläche aufweist.

5. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß der Körper (10) an seinem

äußeren Umfang mit einer Vielzahl von Hinweissymbolen (19) versehen ist, die mit den Hinweissymbolen, die auf der äußeren Oberfläche des Gehäuses (50) eingraviert sind, zusammenwirken.

6. Vorrichtung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß der Kontrollring (30) mit Hinweiseinrichtungen (34) auf seiner äußeren Oberfläche versehen ist.

7. Vorrichtung nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß die Außenseite eines der Kupplungsteile (701) mit einer Vielzahl von Erhebungen (711) versehen ist und die Außenseite des anderen Kupplungsteiles (702) eine Vielzahl von entsprechenden Vertiefungen (712) aufweist.

8. Vorrichtung nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß die beiden einander gegenüberliegenden Seiten der Kupplungsteile (701, 702) mit ineinandergreifenden Zähnen (71) versehen sind.

9. Vorrichtung nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß ein Kupplungsteil (701) der Kupplung (70) einstückig mit einem Vierkant-Bolzen (60) für den Eingriff mit dem Ringschlüssel ausgebildet ist.

10. Vorrichtung nach einem der Ansprüche 1 bis 9, dadurch gekennzeichnet, daß ein Ring (40) an dem rohrförmigen Teil (15) des Körpers gesichert ist und in eine ringförmige Ausnehmung (32) in dem Kontrollring (30) eingreift und daß ein Stift (33) in einer der ringförmigen Ausnehmungen (32) und der Ring (40) zusammenwirkt mit einer bogenförmigen Rille (42) in der anderen ringförmigen Ausnehmung (32) und dem Ring (40), um die Drehbewegung des Kontrollrings (30) in Bezug auf den Körper (10) zu begrenzen.

11. Vorrichtung nach Anspruch 10, dadurch gekennzeichnet, daß der Stift (33) in der ringförmigen Ausnehmung (32) befestigt ist und in die bogenförmige Rille (42) in dem Ring (40) eingreift.

45

50

55

60

65

6

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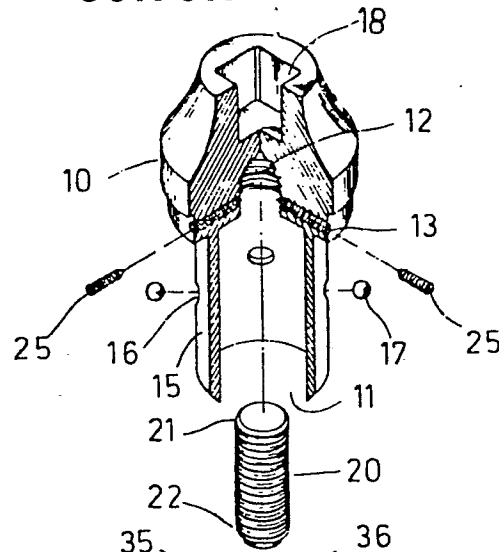


FIG. 6

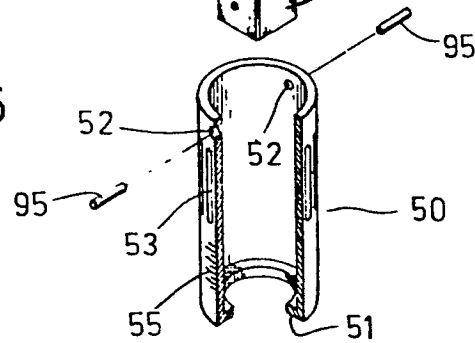


FIG. 1

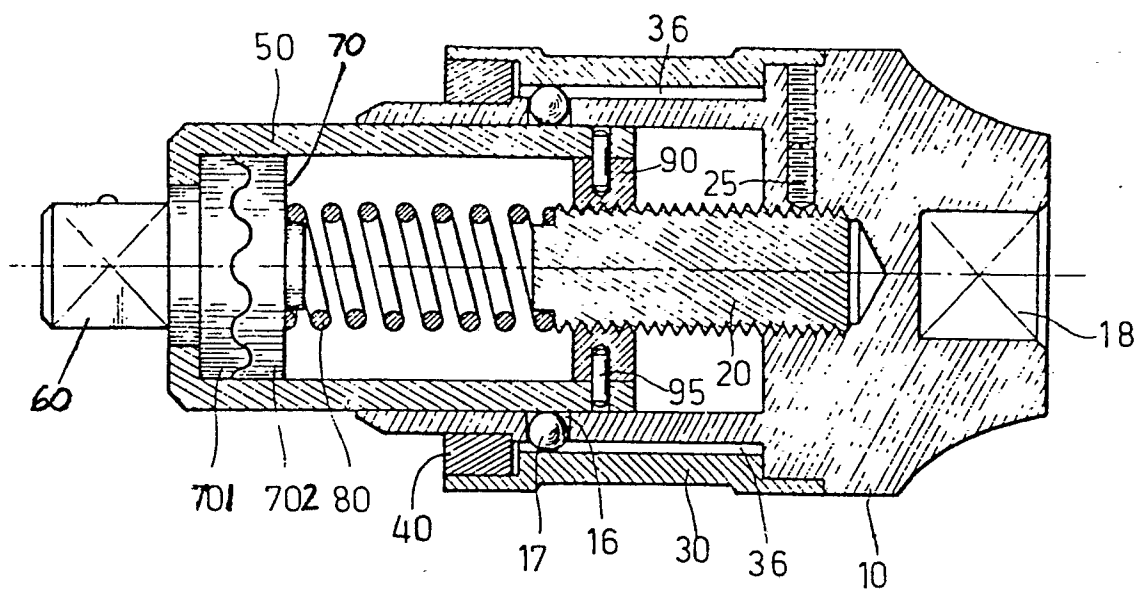


FIG. 3

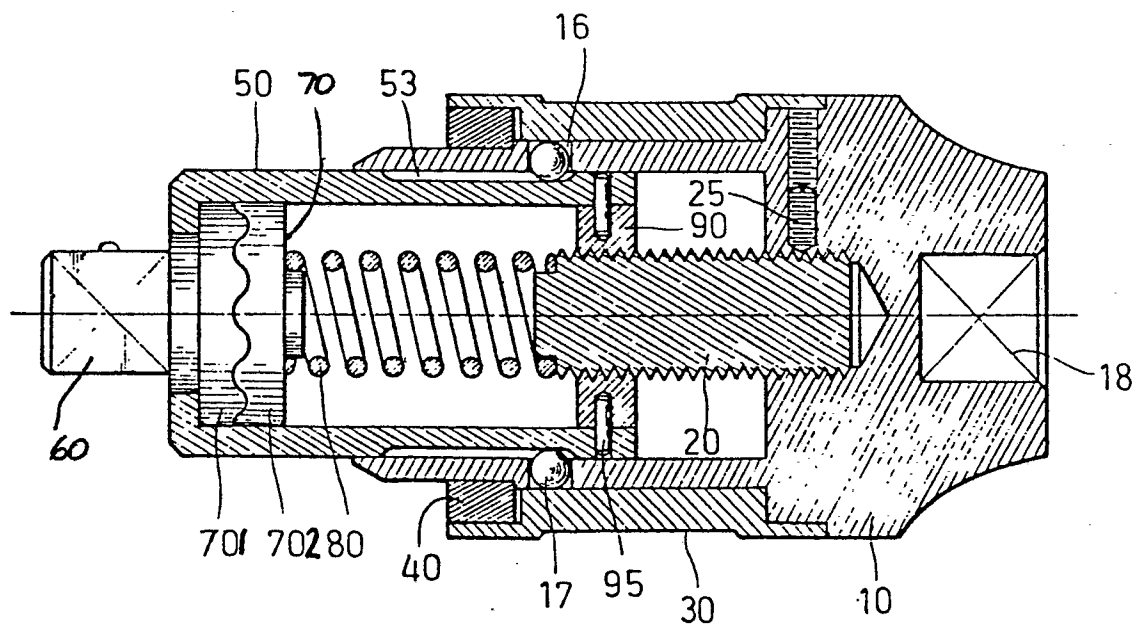


FIG. 2

