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- (73) Patenthaver: **Rote Mate Industry Co., Ltd., No. 1-8, Sicun Road , Daya District, Taichung City 428, Taiwan**
- (72) Opfinder: **LAI, YING TSUNG, No. 1-8, Sicun Road, Daya District, 428 Taichung City, Taiwan**
- (74) Fuldmægtig i Danmark: **Budde Schou A/S, Dronningens Tværgade 30, 1302 København K, Danmark**
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US-A1- 2004 093 997
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US-A1- 2010 224 038

DESCRIPTION

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a screw depth adjuster, especially to a screw depth adjuster in which screws are positioned after being driven to the required depth from surfaces of workpiece/material for preventing damages on the surface of the workpiece/material and damages on the screw caused by being driven too much.

Description of Related Art

[0002] Screw depth adjusters are well known to people skilled in the art, as revealed in US Pat. Pub. No. 20080289459, US Pat. No. 5,235,327, US Pat. No. 4,736,658, etc. Refer to US Pat. Pub. No. 20080289459, a screw/depth control driver device used for preventing the screw from driving beyond the depth required by users is revealed. The device has a free-spinning sleeve 17. In order to achieve the above purpose, a device is provided to set and hold the amount of return by the sleeve before the torque driving the screw is released preventing the screw from being over-driven. The device further includes a screw driving device 12, a depth control stop/setting nut 14 and a lock-retaining ring 16. The screw driving device 12 has a thread pattern to allow the depth control stop 14 to be moved forward or backward and held along the screw driving device 12 to control the depth of the screw being driven. The sleeve 17 can rotate freely on the screw driving device 12. The lock retaining ring 16 is unable to rotate when engaged over the depth control stop 14. While in use, the depth control stop is rotated on the screw driving device to be fixed at a selected longitudinal position of the device. Then the lock retaining ring 16 is slid back over the depth control stop 14. When the screw driving device is driven forward, the depth control stop comes to butt against the screw control sleeve so that the screw driving device cannot be driven forward any further and hence the screw cannot be driven forward any further. To use the device, the depth control stop 14, the lock retaining ring 16 and the sleeve 17 are moved in turn.

[0003] In order to set a desired depth of the screw, the depth control stop 14 is first rotated clockwise/anti-clockwise. Then the lock retaining ring 16 is slid back over the depth control stop 14. The sleeve 17 is then slid completely forward until a flared end is beyond. However, the position of the sleeve 17 during the driving is unable to learn in a real-time manner. Thus the depth control stop 14 has to be moved multiple times for adjustment. During each time of adjustment of the driving depth, the sleeve 17 needs to be moved first and then the lock retaining ring 16 is slid forward to disengage the depth control stop 14, hence the depth control stop 14 can rotate and move for adjustment. Users can't learn whether the position of the

sleeve 17 is correct for the desired depth of the screw while adjusting the depth control stop. Therefore the device is inconvenient to use.

[0004] Moreover, the screw/depth control driver device further includes two longitudinally-oriented grooves 30 and the lock retaining ring 16 has two protrusions 27 on opposite sides that fit into the longitudinally-oriented grooves 30 correspondingly. The above design has significant shortcomings. The power tools available on the market now provide greater rotary torsion. The most common range of rotary torsion is 150-240 Newton-meter (Nm) and the revolutions per minute (RPM) is ranging from 3200 to 3600. When the sleeve 17 is in contact with the workpiece, the IPM (impacts per minute) is 3500~4000. The impact force acted on the sleeve 17 is returned to the depth control stop 14 so that the protrusions 27 and the longitudinally-oriented grooves 30 hit each other and cause deformation. The protrusions 27 of the depth control stop 14 are unable to move smoothly in the longitudinally-oriented grooves 30 once being deformed, and even easily locked in the grooves 30. Thereby the depth control stop 14 can't be moved for adjustment.

[0005] Furthermore, the depth control stop 14 contains detent balls 28 each of which fit over a spring 15. Thus the dent balls 28 can be elastically protruding from or popped in the depth control stop 14. The lock retaining ring 16 has a groove on the inside designed 25 to allow the dent balls 28 set into the depth control drop 14 to be engaged into the lock retaining ring 16 to hold the lock retaining ring 16 into place over the depth control stop 14. During adjustment, the depth control drop 14 needs to be rotated a circle until the dent balls 28 being mounted into the grove 25 correspondingly. There is a limit on the rotation of the depth control drop 14 -at least half a circle as one scale. Thereby the screw/depth control driver device 10 doesn't have fine-adjustment function.

[0006] US 2004/093997 A1 discloses a screw depth adjuster used for driving screws to a certain depth during driving process comprising: a rod having a first portion which is a is a polygonal rod used for connection with power tools; and a second portion which is a threaded rod formed by extension of the first portion and having an assembly portion extended from the rear end of the threaded rod and further comprising a control member and a driving member.

[0007] Thus there is room for improvement and there is need to provide a novel screw depth adjuster that solves the problems mentioned above.

SUMMARY OF THE INVENTION

[0008] Therefore it is a primary object of the present invention to provide a screw depth adjuster which not only allows users to learn the depth of the control member/sleeve going to be adjusted in a real-time manner but also avoids damages caused by vibrations generated during the adjustment.

[0009] It is another object of the present invention to provide a screw depth adjuster which

provides fine adjustment of the depth of screws so that the screw can be driven to the position required properly.

[0010] In order to achieve the above objects, the invention provides a method according to claim 1 and a device according to claims 2 and 3.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The structure and the technical means adopted by the present invention to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanying drawings, wherein:

Fig. 1 is an explosive view of an embodiment according to the present invention;

Fig. 2 is another explosive view of an embodiment viewed from another angle according to the present invention;

Fig. 3 is an assembly view of an embodiment according to the present invention;

Fig. 4 is a side sectional view of an embodiment according to the present invention;

Fig. 5 is a perspective view of an embodiment while in use according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] Refer to Fig. 1, Fig. 2 and Fig. 3, a screw depth adjuster according to the present invention includes a rod 1, a control member 3, a driving member 5, a first washer 6, a flared sleeve 10, a second washer 8 and a fixing member 9, which are fitted on the rod 1 in turn. The rod 1 consists of a first portion 1a and a second portion 1b formed by extension of the first portion 1a. The first portion 1a is a polygonal rod 11 used for connection with power tools. The second portion 1b is a threaded rod 13 with an assembly portion 15 extended from the rear end of the threaded rod 13. The assembly portion 15 is provided with a slot 151 and a first C-shaped ring 16 is mounted in the slot 151. A first plane 14a and a second plane 14b are disposed on two sides of the threaded rod 13 longitudinally and arranged parallel to each other. A hole 12 is formed on both the first plane 14a and the second plane 14b at the position close to the first portion 1a while a stopping pin 2 is mounted in the hole 12.

[0013] The control member 3 is composed of a push portion 31, a polygonal stopper 32 extended from the push portion 31, a first passage 33 extended from the push portion 31 to the polygonal stopper 32, a third plane 34a and a fourth plane 34b. The cross section of the polygonal stopper 32 is a polygon. The third plane 34a and the fourth plane 34b are arranged

in parallel and formed in the first passage 33 at the positions corresponding to the first plane 14a and the second plane 14b of the threaded rod 13. Thereby the control member 3 is able to be pushed and moved slidably axially on the threaded rod 13. The driving member 5 consists of an adjustment portion 51 and a sleeve portion 52 extended from the adjustment portion 51. A polygonal second passage 511 is disposed on the adjustment portion 51 and a circular limiting groove 512 is arranged at the second passage 511 while a second C-shaped ring 4 is mounted in the circular limiting groove 512. A third passage 521 is formed by extension of the second passage 511 from the intersection between the second passage 511 and the sleeve portion 52 to the sleeve portion 52. The third passage 521 is composed of a threaded segment and a smooth segment extended from the threaded segment. A circular groove 522 is formed on the sleeve portion 52. The shape of the polygonal second passage 511 of the adjustment portion 51 matches the shape of the polygonal stopper 32 of the control member 3. The cross section of the polygonal second passage 511 is also polygonal, the same as that of the polygonal stopper 32.

[0014] A fourth passage 101 is arranged at the flared sleeve 10 and a socket 7 is mounted in the fourth passage 101. The fourth passage 101 includes a first surface 102 and a second surface 103. The first washer 6 is abutting against the first surface 102 while the second washer 8 is abutting against the second surface 103. The flared sleeve 10 is a shade with windows and a contact surface 104 is formed on the bottom of the shade.

[0015] While being assembled, the sleeve portion 52 of the driving member 5 is first inserted through the first washer 6 and the socket 7. Then the socket 7 is inserted through the fourth passage 101 of the flared sleeve 10 and mounted into the second washer 8 correspondingly. The first portion 1a of the rod 1 is inserted into the third passage 521 and the second portion 1b reaches the threaded segment. The second portion 1b of the rod 1 is threaded through the threaded segment and continuingly until the assembly portion 15 is driven into the smooth segment of the third passage 521 of the driving member 5 and a part of the assembly portion 15 is exposed outside the sleeve portion 52 of the driving member 5. Next the fixing member 9 is mounted into the circular groove 522 of the sleeve portion 52. Then the control member 3 is pushed forward after the third plane 34a and the fourth plane 34b in the first passage 33 of the control member 3 being aligned with the first plane 14a and the second plane 14b of the threaded rod 13. Lastly the stopping pin 2 is inserted into the hole 12. The assembly process has been completed.

[0016] As shown in Fig. 3 and Fig. 4, the driving member 5 is mounted into the socket 7 after the socket 7 being mounted into the fourth passage 101 of the flared sleeve 10. The flared sleeve 10 is able to be rotated on the assembly portion 15. The flared sleeve 10 can be rotated more smoothly due to the first washer 6 and the second washer 8.

[0017] Moreover, the flared sleeve 10 can be pushed by the driving member 5 to be moved on the threaded rod 13. The polygonal stopper 32 of the control member 3 is used to be mounted into the polygonal second passage 511 of the adjustment portion 51 correspondingly and the second C-shaped ring 4 is used to temporarily hold and position the control member 3 for

preventing the control member 3 from being released. At the moment, the driving member 5 is locked by the control member 3 and unable to be rotated and moved on the threaded rod 13. As to the driving member 5, it is used to push the flared sleeve 10 so that the flared sleeve 10 is able to be moved and positioned at any position of the threaded rod 13 for adjustment of the depth of the screw. Thereby the flared sleeve 10 can be moved forward or backward on the threaded rod 13 under control of the longitudinal movement of the driving member 5 which is determined according to the depth of the screw required by users. Thereby the screw will not be driven beyond the depth required in the workpiece and dents formed on the surface of the workpiece can be minimized.

[0018] During the driving operation, a method for driving a screw to a depth required steadily according to the present invention includes the following steps. First rotate the driving member 5 on the threaded rod 13 to move to the position required. Now the flared sleeve 10 is pushed by the driving member 5 to move forward or backward on the threaded rod 13 synchronously. Then the control member 3 is pushed and inserted into the second passage 511 of the driving member 5 until the polygonal stopper 32 is mounted into the polygonal second passage 511. Thereby the driving member 5 is locked by the control member 3, unable to be moved and rotated.

[0019] As shown in Fig. 4, while in use, first a head of a screwdriver bit
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17 is placed into assembly portion 15 of the driving member 5 to be mounted and positioned therein. At the moment, the working end of the screwdriver bit 17 is exposed outside the contact surface 104 of the flared sleeve 10. When the user rotates the driving member 5, the flared sleeve 10 is synchronously driven to move longitudinally. The user can directly see the length of the working end of the screwdriver bit 17 protruding from the contact surface 104 of the flared sleeve 10. After finding the length between the working end of the screwdriver bit 17 and the contact surface 104, the control member 3 is pushed and inserted into the second passage 511 of the driving member 5 until the polygonal stopper 32 is mounted into the second passage 511 so that the driving member 5 is locked and unable to be rotated and moved. Now the first portion 1a of the rod 1 is connected to a power tool while a screw 18 is fitted on the working end of the screwdriver bit 17. Once the present invention is driven by the power tool to rotate until the contact surface 104 of the flared sleeve 10 is abutting against the surface of the workpiece/material 19, the flared sleeve 10 is idling and unable to drive the screw 18, as shown in Fig. 5.

[0020] In summary, the present invention has the following advantages:

1. 1. The user can see the length of the working end of the screwdriver bit 17 protruding from the contact surface 104 of the flared sleeve 1 in a real time manner while operating the driving member 5 so that the screw depth can be adjusted all at once.
2. 2. The present device provides fine adjustment of the screw depth due to that the shape

of the polygonal second passage 511 of the adjustment portion 51 matches the shape of the polygonal stopper 32 of the control member 3. When the driving member is rotated to a required position which is corresponding to one side of the polygonal cross section of the polygonal stopper 32. Each side of the polygonal cross section represents a scale of fine adjustment. There are at least four sides of the polygonal cross section. The polygon can be a hexagon, an octagon, a dodecagon, a star polygon or a circle with a zig zag border. Take the octagon as an example. Compared with the device available now, the present invention provides fine adjustment of the screw depth. In the device available now, the device needs to be rotated at least half a circle as one scale for adjustment of the depth. It is assumed that the depth being adjusted is 1mm when the device available now is rotated a circle. Thus one scale (being rotated half a circle) is $1\text{mm}/2$. That's 0.5mm. Owing to the octagon of the present invention, one scale is $1\text{mm}/8$. In the present invention, the minimum depth able to be adjusted is $1\text{mm}/8$. That's 0.125mm. Thus the polygonal shape of the present invention provides the fine adjustment function.

3. 3. The first passage 33 of the control member 3 are provided with the third plane 34a and the fourth plane 34b which are arranged parallel to each other and aligned with the first plane 14a and the second plane 14b of the threaded rod 13 respectively. Thereby the control member 3 is able to be moved slidably on the threaded rod 13. Owing to the parallel design of the planes 34a, 34b, the impact force acted on the first passage 33 of the control member 3 can be dispersed and the control member 3 will not be deformed.

[0021] Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, and representative devices shown and described herein. Accordingly, various modifications may be made without departing from the invention as defined by the appended claims .

REFERENCES CITED IN THE DESCRIPTION

Cited references

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US20080289459A [0002] [0002]
- US5235327A [0002]
- US4736658A [0002]
- US2004093997A1 [0006]

PATENTKRAV

1. Fremgangsmåde til at drive en skrue til en bestemt dybde under anvendelse af en skruedybdejusteringsindretning, omfattende følgende trin:

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(a) drejning af et drivelement (5) på en gevindstang (13), til at bevæge sig til den position fremad/bagud, som kræves, for at bevæge en udvidet bøsning (10) synkront fremad/bagud på gevindstangen (13);

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(b) forskydning af et styreelement (3) ind i en anden passage (511) i drivelementet (5) for positionering af drivelementet (5) og montering af et polygonalt stopelement (32) i styreelementet (3) i den polygonale anden passage (511) eftersom tværsnittet af den polygonale anden passage (511) og formen af den polygonale anden passage (511) i justeringsdelen (51) stemmer overens med formen af det polygonale stopelement (32) i styreelementet (3); hvorved drivelementet (5) låses af styreelementet (3), ude af stand til at blive bevæget og drejet, og ligeledes den udvidede bøsning (10); hvorved skruen drives til den bestemte dybde og er ude af stand til at blive bevæget yderligere.

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2. Skruedybdejusteringselement, som anvendes til at drive skruer til en bestemt dybde under drivprocessen, omfattende:

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en stang (1) med

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en første del (1a), som er en polygonal stang (11), som anvendes til forbindelse med drivværktøjer; og

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en anden del (1b), som er en gevindstang (13), dannet som en forlængelse af den første del (1a) og med et montageafsnit (15), som strækker sig fra den bageste ende af gevindstangen (13), et første plan (14a) og et andet plan (14b) placeret på to sider af gevindstangen (13), langsgående og anbragt indbyrdes parallelt, et hul (12) placeret tæt på den første del (1a) og monteret med en stopstift (2) og en første C-formet ring (16), som er monteret i en slids (151) i montagedelen (15); og

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et styreelement (3), et drivelement (5), en første skive (6), en udvidet bøsning (10), en anden skive (8) og et fikseringselement (9), som er anbragt på stangen (1) i rækkefølge;

hvor styrelementet (3) omfatter et trykafsnit (31), en polygonal stopindretning (32),
 som strækker sig fra trykafsnittet (31), en første passage (33), som strækker sig
 fra trykafsnittet (31) til det polygonale stopelement (32), et tredje plan (34a) og et
 fjerde plan (34b); hvor det tredje plan (34a) og det fjerde plan (34b) er anbragt
 5 parallelt og udformet i den første passage (33) ved positionerne svarende til det
 første plan (14a) og det andet plan (14b) på gevindstangen (13), således at
 styreelementet (3) er i stand til at blive skubbet og bevæget glidende aksialt på
 gevindstangen (13);
 hvor drivelementet (5) består af en justeringsdel (51) med en polygonal anden
 10 passage (511) og en bøsning (52), som strækker sig fra justeringsdelen (51);
 hvor en cirkulær begrænsende not (512) er anbragt ved den anden passage (511)
 medens en anden C-formet ring (4) er monteret i den cirkulære begrænsningsnot
 (512); en tredje passage (521) er udformet ved forlængelse af den anden passage
 (511) fra skæringen imellem den anden passage (511) og bøsning (52) til
 15 bøsning (52); den tredje passage (521) har et gevindsegment og et glat
 segment; en cirkulær not (522) er udformet på bøsning (52); formen af den
 polygonale anden passage (511) i justeringsdelen (51) stemmer overens med
 formen af den polygonale stopdel (32) i styreelementet (3);
 hvor en fjerde passage (101) er anbragt ved den udvidede bøsning (10) og har en
 20 første flade (102) og en anden flade (103), medens en sokkel (7) er monteret i
 den fjerde passage (101); den første skive (6) ligger an imod den første flade
 (102) medens den anden skive (8) ligger an imod den anden flade (103);
 hvor bøsning (52) i drivelementet (5) først indsættes via den første skive (6)
 og soklen (7); derefter indsættes soklen (7) via den fjerde passage (101) i den
 25 udvidede bøsning (10) og monteres tilsvarende i den anden skive (8); stangen (1)
 indsættes i den tredje passage (521) i drivelementet (5), skrues igennem gevind-
 segmentet og skrues videre indtil montagedelen (15) drives ind i det glatte
 segment i den tredje passage (521) i drivelementet (5) og en del af montagedelen
 (15) fritlægges udvendigt for bøsning (52) i drivelementet (5); derefter mon-
 30 teres fastgørelseselementet (9) i den cirkulære not (522) i bøsning (52);
 styreelementet (3) skubbes fremad, efter at det tredje plan (34a) og det fjerde plan
 (34b) i den første passage (33) i styreelementet (3) er oprettet med det første plan
 (14a) og det andet plan (14b) i gevindstangen (13); til sidst indsættes stopstiften
 (2) i hullet (12) i den første del (1a) for at færdiggøre montagen.

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3. Skruedybdejusteringsindretning, som anvendes til at drive skruer til en bestemt dybde under drivprocessen, omfattende:

- 5 en stang (1) med
- en første del (1a), som anvendes til forbindelse med drivværktøjer; og
- en anden del (1b), som er en gevindstang (13) dannet som en forlængelse af den første del (1a) og med en montagedel (15), som strækker sig fra bagenden af gevindstangen (13), et første plan (14a) og et andet plan (14b) placeret på to
- 10 sider af gevindstangen (13) langsgående og indbyrdes parallelt;
- et styreelement (3) omfattende
- en trykdel (31),
- 15 et polygonalt stopelement (32), som strækker sig fra trykdelen (31),
- en første passage (33), som strækker sig fra trykdelen (31) til det polygonale stopelement (32), og
- et tredje plan (34a) og et fjerde plan (34b) anbragt parallelt og dannet i den første passage (33) ved positionerne svarende til det første plan (14a) og det
- 20 andet plan (14b) på gevindstangen (13);
- et drivelement (5), som omfatter
- en justeringsdel (51) forsynet med en polygonal anden passage (511), hvis
- 25 form svarer til formen af det polygonale stopelement (32) i styreelementet (3),
- og
- en bøsning (52) dannet ved forlængelse af justeringsdelen (51) og med en tredje passage (521) dannet ved forlængelse af den anden passage (511) fra skæringen imellem den anden passage (511) og bøsningens del;
- 30 og en cirkulær not (522); hvor den tredje passage (521) omfatter et gevind-afsnit og et glat afsnit;
- en udvidet bøsning (10) forsynet med en fjerde passage (101), som omfatter en første flade (102) og en anden flade (103); og
- 35 en sokkel (7) monteret i den fjerde passage (101);
- en første skive (6), som ligger an imod den første flade (102); og

en anden skive (8), som ligger an imod den anden flade (103);
og et fastgørelseselement (9);

5 hvor styreelementet (3) er i stand til at blive skubbet og bevæget glidende aksialt på gevindstangen (13), ved at det tredje plan (34a) og det fjerde plan (34b) i den første passage (33) i styreelementet (3) er oprettet med og anbragt på det første plan (14a) og det andet plan (14b) på gevindstangen (13);

hvor stangen (1) indsættes i og skrues igennem den tredje passage (521) fortsættende indtil en del af montagedelen (15) er fritlagt udenfor bøsningssdelen (52) på drivelementet (5);

10 hvor, efter at soklen (7) er monteret i den fjerde passage (101) i den udvidede bøsning (10), bøsningssdelen (52) på drivelementet (5) først indsættes igennem den første skive (6) og soklen (7) for at blive monteret tilsvarende i den anden skive (8); til sidst monteres fikseringselementet (9) i den cirkulære not (522) i bøsningssdelen (52).

15

DRAWINGS

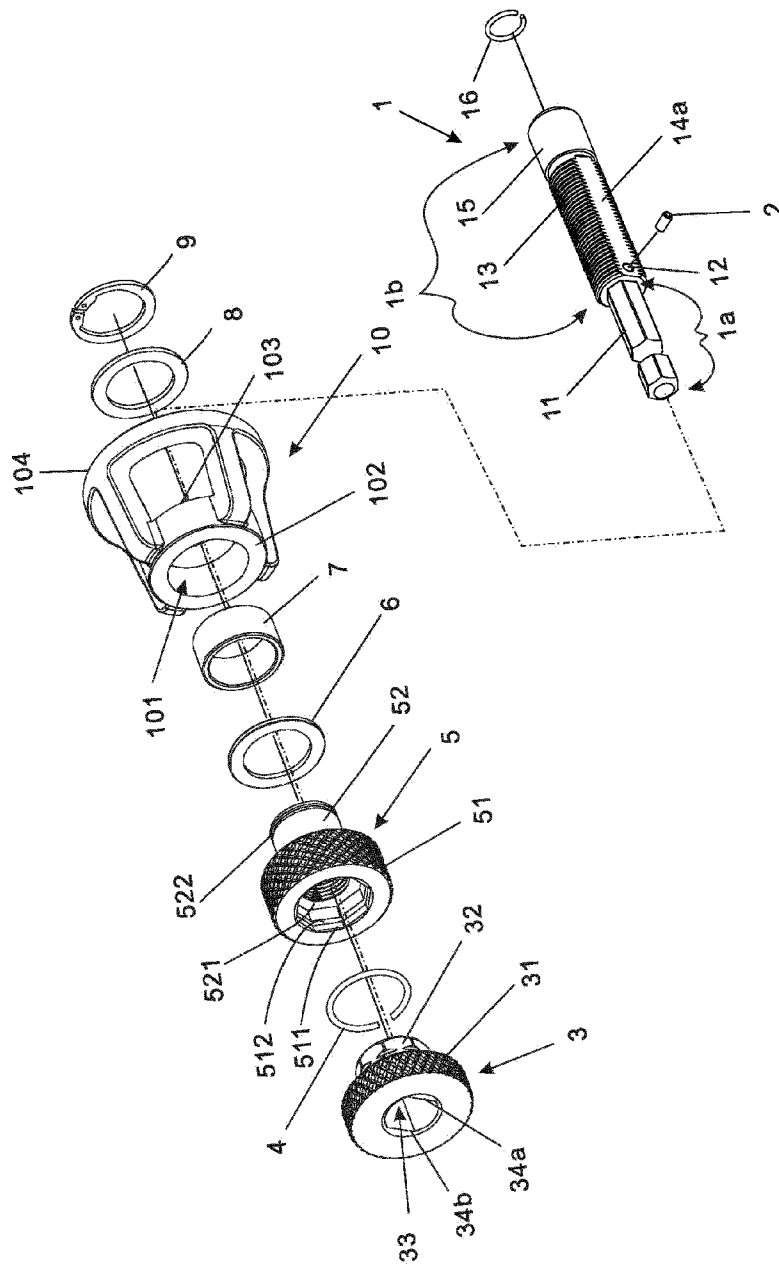


FIG. 1

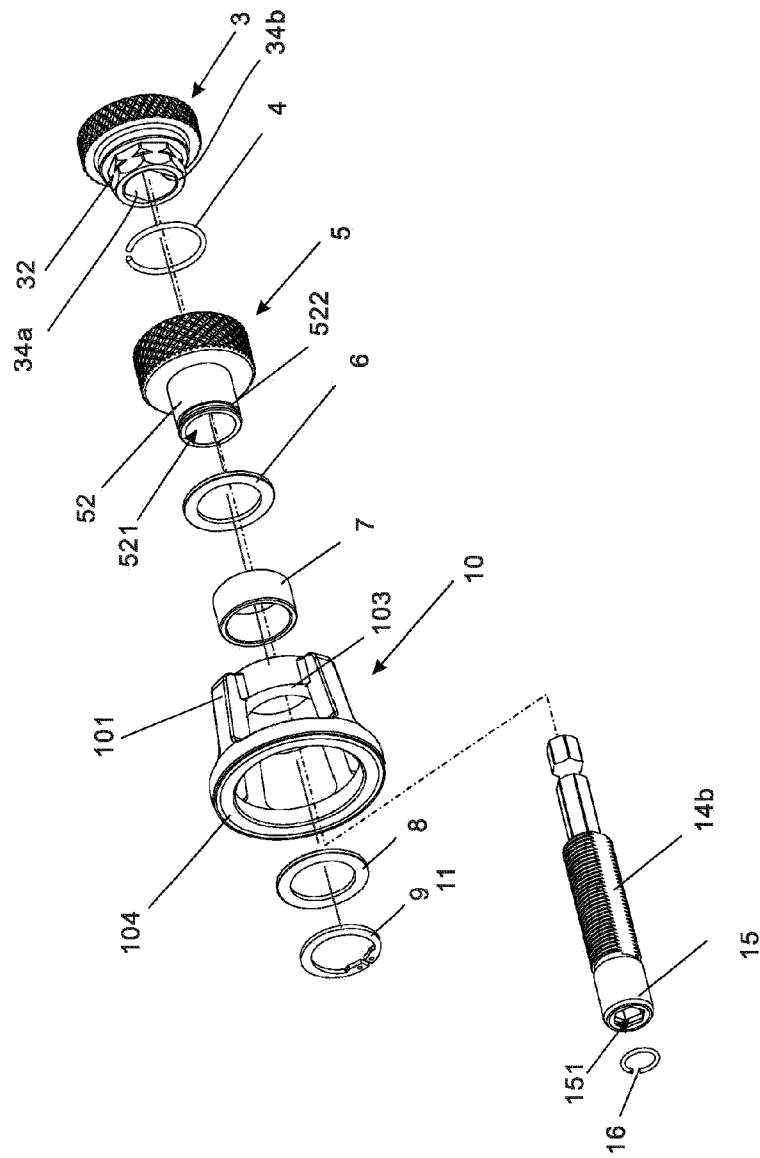


FIG. 2

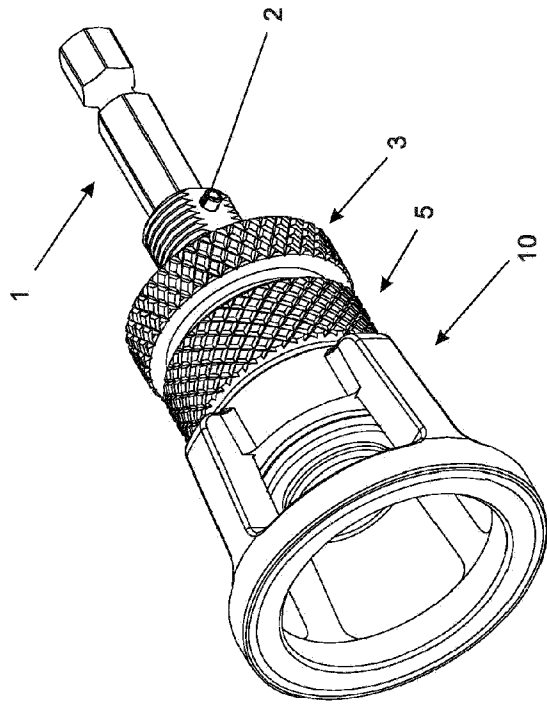


FIG. 3

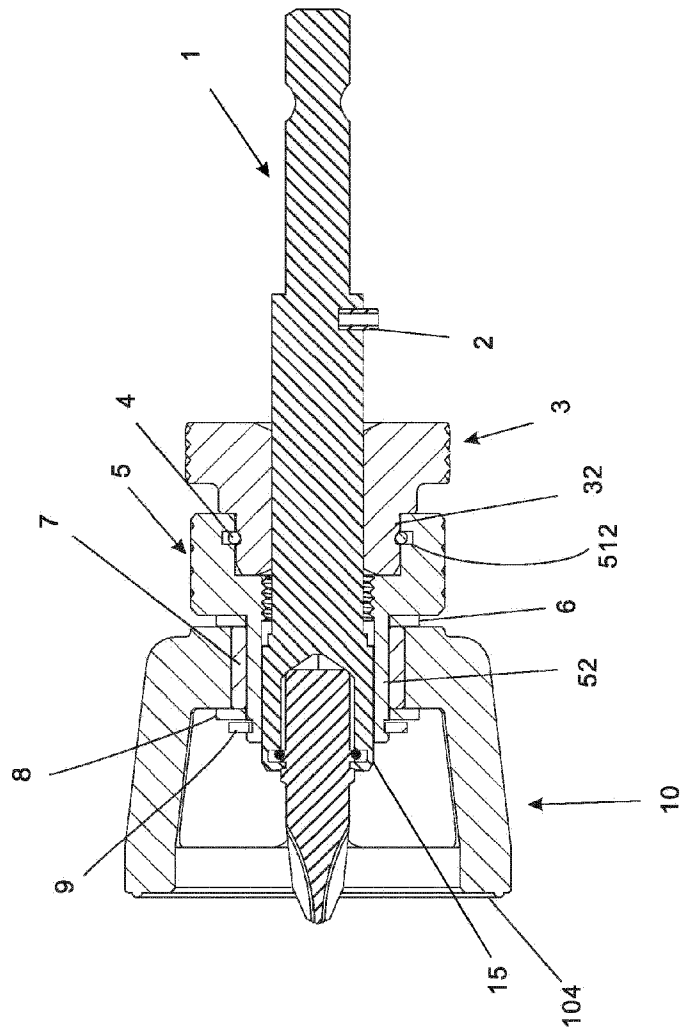


FIG. 4

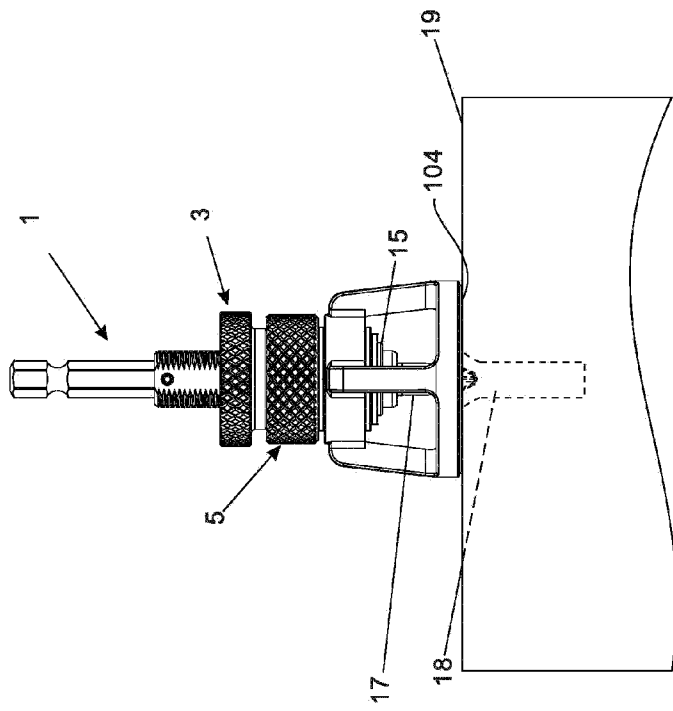


FIG. 5