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(54) **RATCHET WRENCH CAPABLE OF QUICKLY MOUNTING AND DISMOUNTING A BIT**

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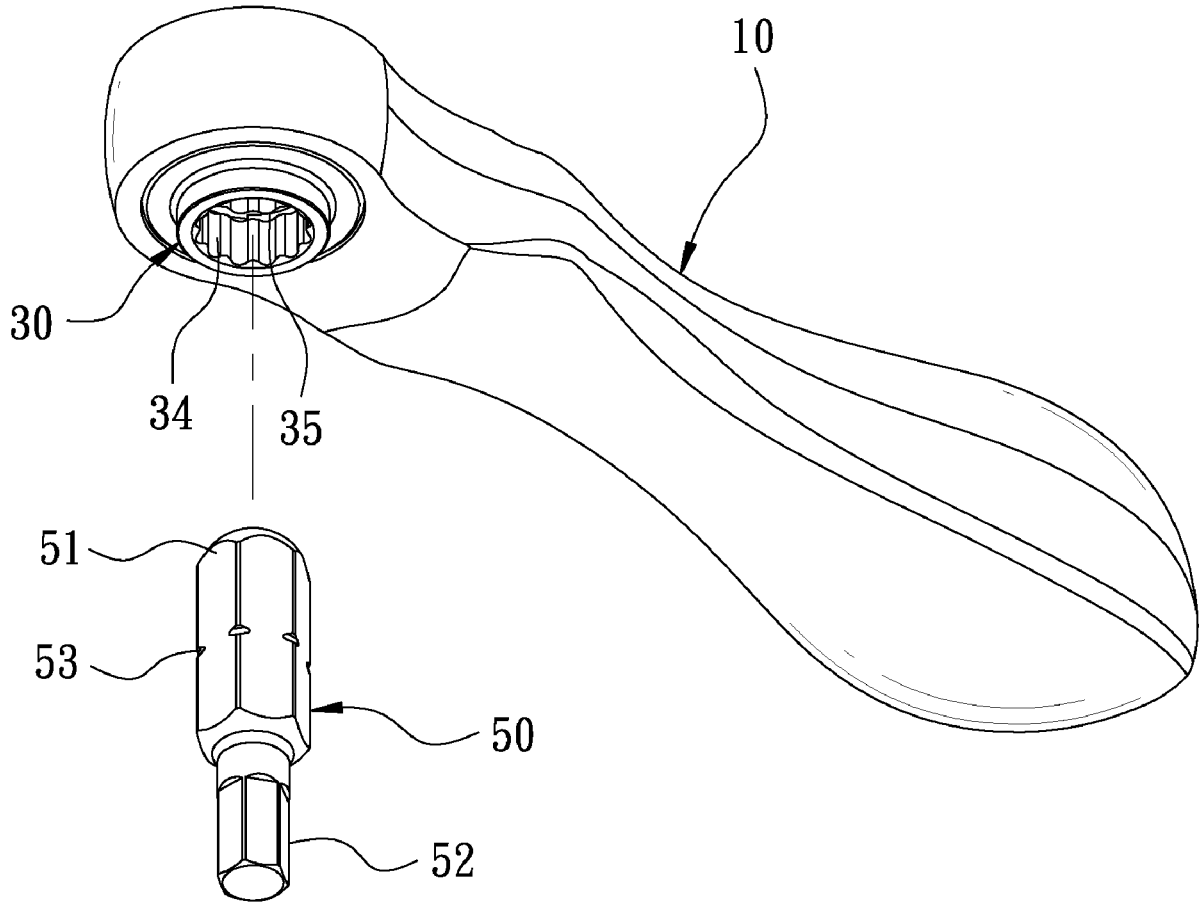
(57) **ABSTRACT**

A ratchet wrench capable of quickly mounting and dismounting a bit includes a wrench body and a ratchet wheel rotatably disposed in the wrench body. One side of the ratchet wheel is formed with a slide trough. An end cap is slidably disposed in the slide trough. Another side of the ratchet wheel is formed with a polygonal hole communicating with the slide trough. When a bit is inserted in the polygonal hole, the bit can be quickly positioned by block of the end cap. When the bit is about to be taken out, the bit can be pushed out of the polygonal hole via pressing the end cap, so that the bit can be taken out quickly.



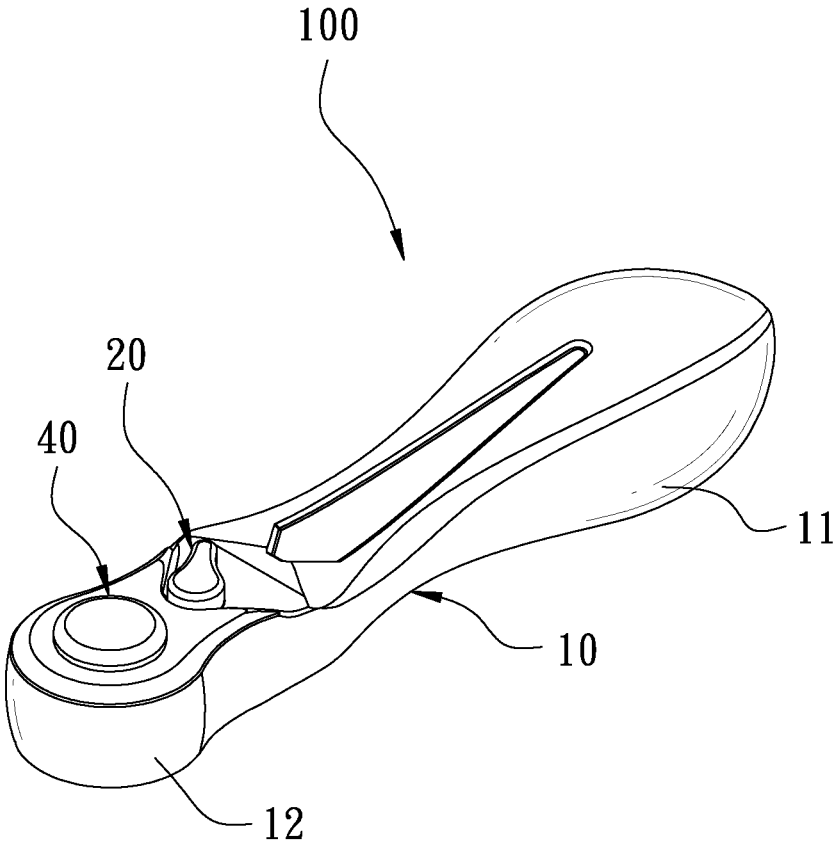


FIG. 1

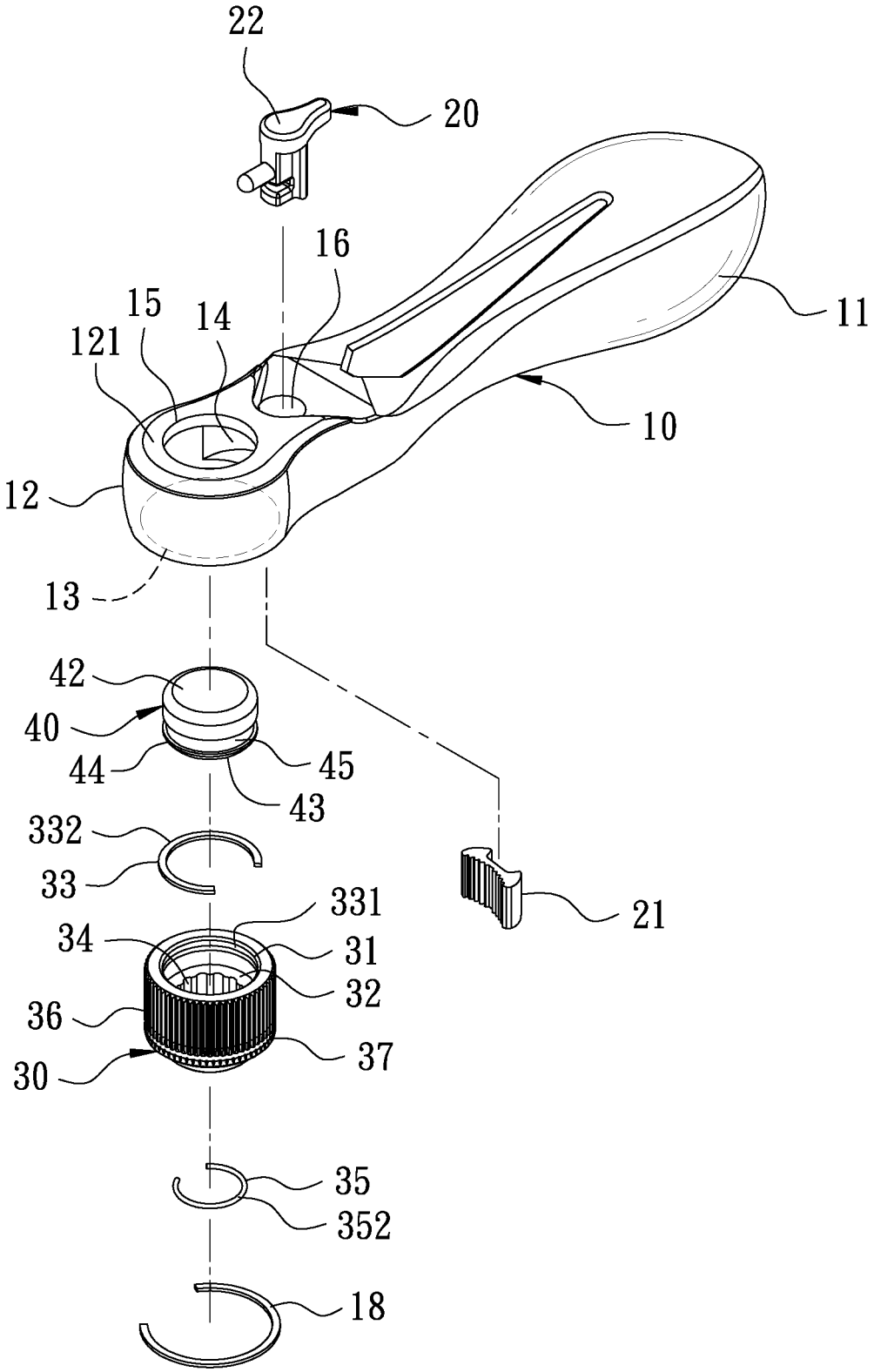

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FIG. 2

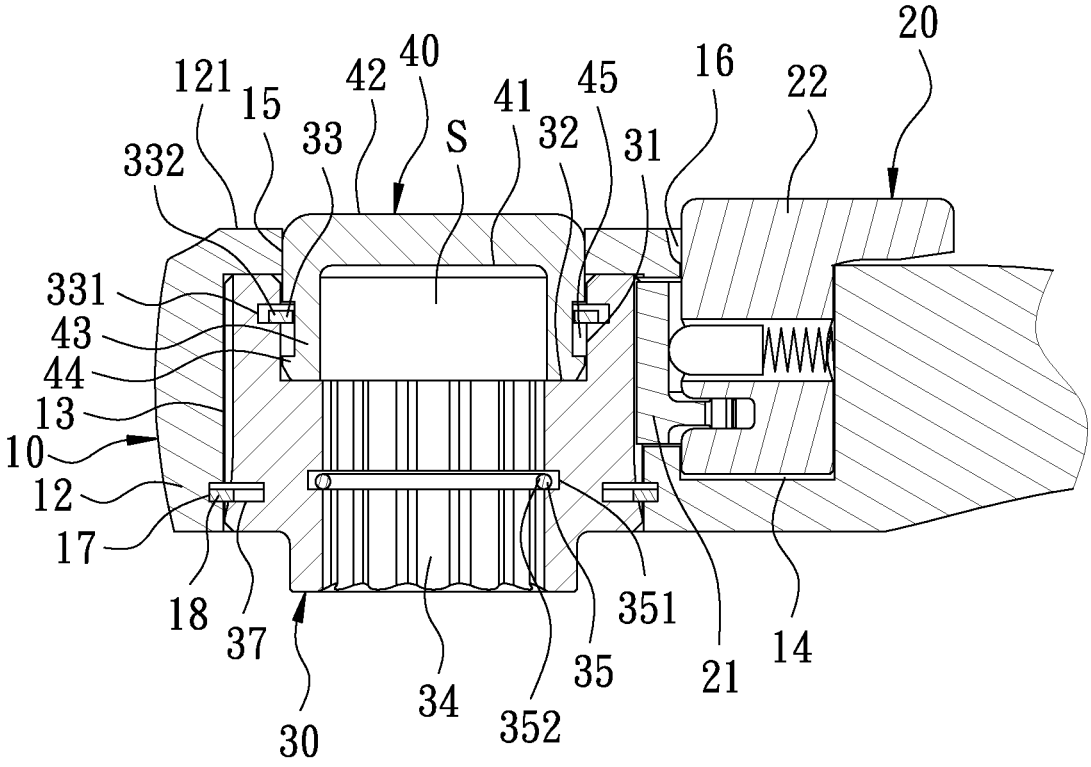
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FIG. 3

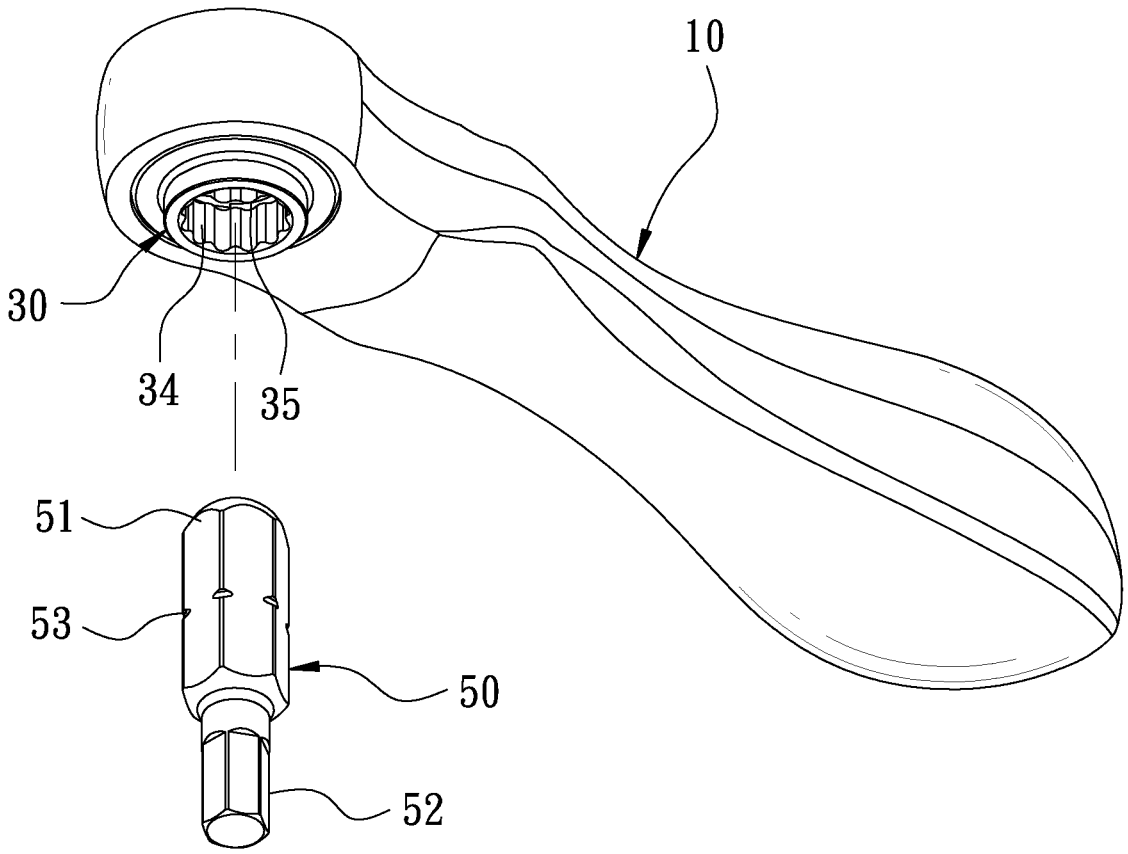

FIG. 4

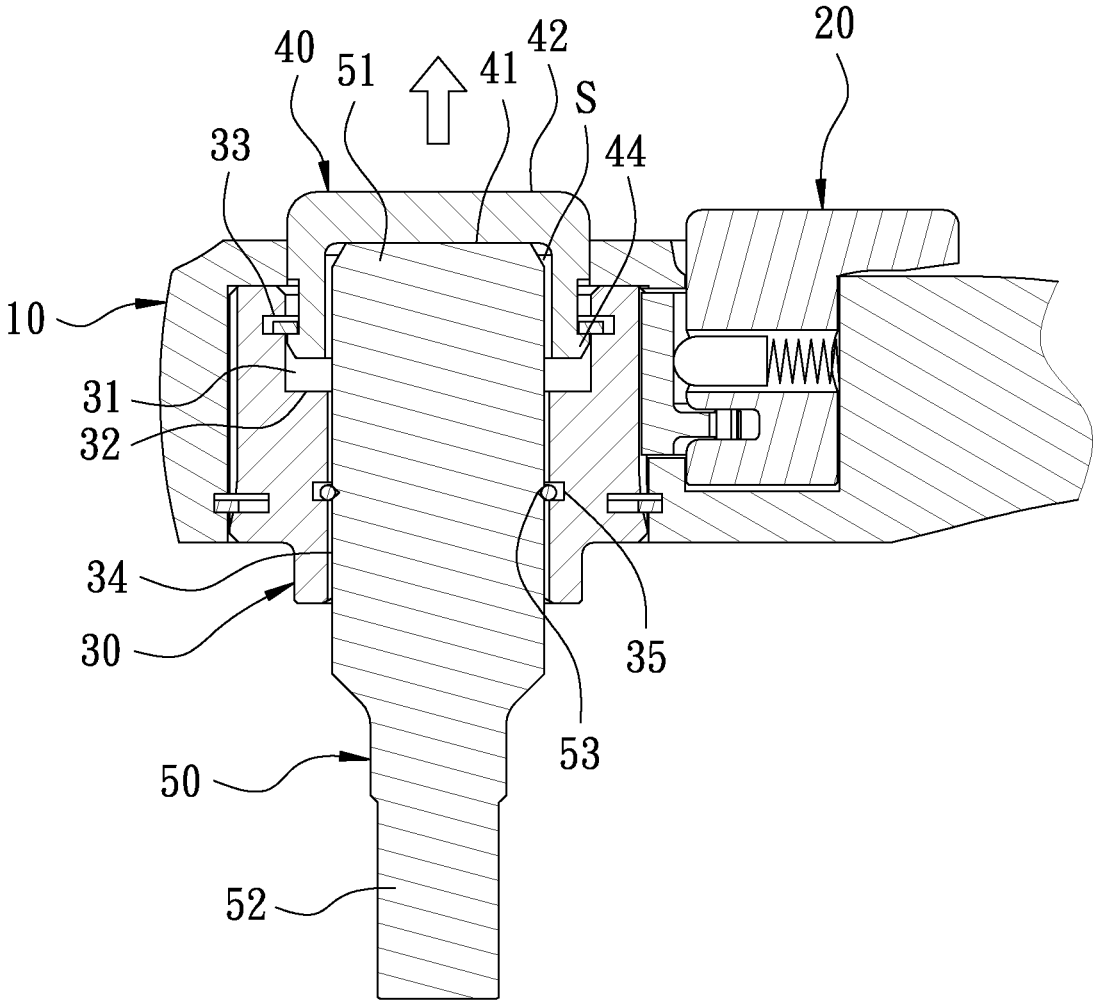

FIG. 5

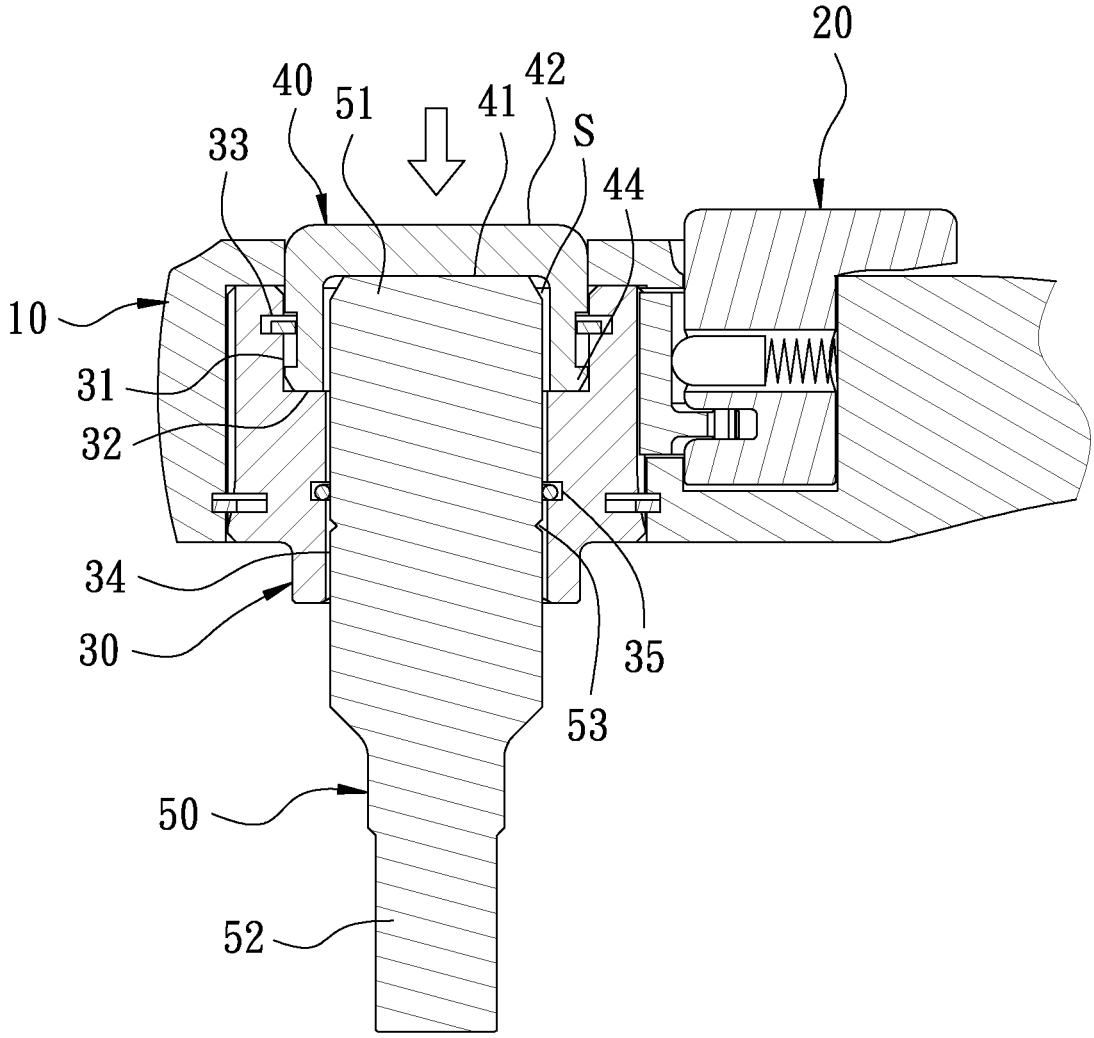

FIG. 6

RATCHET WRENCH CAPABLE OF QUICKLY MOUNTING AND DISMOUNTING A BIT

FIELD OF THE INVENTION

[0001] The present invention relates to a ratchet wrench capable of quickly mounting and dismounting a bit.

BACKGROUND OF THE INVENTION

[0002] A conventional ratchet wrench has a main body. One end of the main body is formed with a head. The head has a receiving trough therein. A rotatable ratchet wheel is provided in the receiving trough. One side of the ratchet wheel is provided with an operating unit for controlling and switching the rotational direction of the ratchet wheel. The ratchet wheel is formed with a through hole that is configured for the user to insert and position a bit therein, so as to tighten or loosen a workpiece by the bit.

[0003] However, the conventional ratchet wrench adopted the through-hole design. It is difficult for the user to push the bit to a predetermined position when installing the bit and is inconvenient for the user to take out or replace the bit. In view of this, a magnetic member is provided in the through hole in order to locate the bit by magnetic attraction. However, the insufficient magnetic force of the magnetic member results in bad positioning effect, besides, the bit having an outer coating or made of a non-magnetic material is not able to cooperate with the magnetic member. On the other hand, the magnetic member is generally a circular or rectangular magnet, which increases the difficulty in attaching or lodging the magnetic member into the through hole. Furthermore, the reliability is poor in combining the bit and the magnetic member. Once the conventional ratchet wrench is impacted by an external force, the magnetic member is likely to depart from the through hole. Accordingly, the inventor of the present invention has devoted himself based on his many years of practical experiences to solve these problems.

SUMMARY OF THE INVENTION

[0004] The primary object of the present invention is to provide a ratchet wrench capable of quickly mounting and dismounting a bit, which allows a user to quickly, conveniently position the bit to the ratchet wrench and quickly remove the bit from the ratchet wrench.

[0005] In order to achieve the aforesaid object, a ratchet wrench capable of quickly mounting and dismounting a bit. The ratchet wrench is in cooperation with a bit when in use. The ratchet wrench comprises a wrench body, an operating unit, a ratchet wheel, and an end cap. One end of the bit is formed with a pushing end, and another end of the bit is formed with a driving end. A circumference of the bit is formed with at least one notch. The wrench body has a handle and a head at one end of the handle. One side of the head is formed with a first accommodating trough. An inner wall of the first accommodating trough is formed with a second accommodating trough. Another side of the head has a first through hole communicating with the first accommodating trough and a second through hole communicating with the second accommodating trough. The operating unit includes at least one pawl accommodated in the second accommodating trough and a knob inserted in the second through hole. The ratchet wheel is rotatably disposed in the first accommodating trough. One side of the ratchet wheel, corresponding to the first through hole, is formed with a slide trough. A bottom of the slide trough is formed with a limiting surface. An inner wall of the slide trough is provided with a limiting portion. A spacing is spaced apart between the limiting portion and the limiting surface. Another side of the ratchet wheel is formed with a polygonal hole communicating with the slide trough. An inner wall of the polygonal hole is provided with a retaining portion. A circumference of the ratchet wheel is formed with a toothed portion corresponding to the pawl. The end cap is slidably disposed in the slide trough. One side of the end cap, corresponding to the polygonal hole, is formed with a pushed portion, and another side of the end cap is formed with a press portion. A circumference of the end cap extends downward to form an annular wall. The annular wall is provided with an abutting portion. The abutting portion is confined between the limiting surface and the limiting portion. A limiting space is defined between an inner side of the annular wall and the pushed portion. The end cap is slidable along an axial direction of the first through hole and movable between a first position and a second position. When the end cap is in the first position, the abutting portion abuts against the limiting surface. When the end cap is in the second position, the abutting portion abuts against the limiting portion.

[0006] As to the ratchet wrench capable of quickly mounting and dismounting the bit provided by the present invention, when the bit is inserted in the polygonal hole of the ratchet wheel, the pushing end of the bit is confined in the limiting space of the end cap, and the end cap is pushed to the second position. At this time, the movement stroke of the end cap is limited by the abutting portion to abut against the limiting portion so as to provide a blocking effect, so that the bit cannot be moved any further. Additionally, the retaining portion of the ratchet wheel is engaged with the notch of the bit to position the bit, so the bit can be quickly positioned. When the user intends to remove the bit from the ratchet wrench, by reasons that the end cap is in the second position and the pressing portion of the end cap extends out of the first through hole, the user enables to press the pressing portion to push the bit out of the polygonal hole, and meantime the retaining portion is disengaged from the notch, thereby achieving the effect of quick removing the bit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. **1** is a perspective view in accordance with a preferred embodiment of the present invention;

[0008] FIG. **2** is an exploded view in accordance with the preferred embodiment of the present invention;

[0009] FIG. **3** is a partially sectional view in accordance with the preferred embodiment of the present invention;

[0010] FIG. **4** is a schematic view in accordance with the preferred embodiment of the present invention when in use;

[0011] FIG. **5** is a first schematic view showing the operation of the preferred embodiment of the present invention; and

[0012] FIG. **6** is a second schematic view showing the operation of the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings.

[0014] FIG. **1** is a perspective view in accordance with a preferred embodiment of the present invention. FIG. **2** is an exploded view in accordance with the preferred embodiment of the present invention. FIG. **3** is a partially sectional view in accordance with the preferred embodiment of the present invention. The present invention discloses a ratchet wrench **100** capable of quickly mounting and dismounting bits. The ratchet wrench **100** comprises a wrench body **10**, an operating unit **20**, a ratchet wheel **30**, and an end cap **40**.

[0015] The wrench body **10** has a handle **11** and a head **12** formed at one end of the handle **11**. One side of the head **12** is formed with a first accommodating trough **13**. An inner wall of the first accommodating trough **13** is formed with a second accommodating trough **14**. The other side of the head **12** has a first through hole **15** communicating with the first accommodating trough **13** and a second through hole **16** communicating with the second accommodating trough **14**.

[0016] The operating unit **20** includes at least one pawl **21** accommodated in the second accommodating trough **14** and a knob **22** inserted in the second through hole **16**. The knob **22** is configured to drive the pawl **21** to deflect in the second accommodating trough **14**.

[0017] The ratchet wheel **30** is rotatably disposed in the first accommodating trough **13**. One side of the ratchet wheel **30**, corresponding to the first through hole **15**, is formed with a slide trough **31**. A diameter of the slide trough **31** is approximately equal to a diameter of the first through hole **15**. The bottom of the slide trough **31** is formed with a limiting surface **32**. An inner wall of the slide trough **31** is provided with a limiting portion **33**. A spacing is spaced apart between the limiting portion **33** and the limiting surface **32**. In this embodiment, the limiting portion **33** is composed of an annular limiting groove **331** disposed on the inner wall of the slide trough **31** and a limiting ring **332** disposed in the annular limiting groove **331**. The other side of the ratchet wheel **30** is formed with a polygonal hole **34** communicating with the slide trough **31**. An inner wall of the polygonal hole **34** is provided with a retaining portion **35**. In this embodiment, the retaining portion **35** is composed of an annular retaining groove **351** disposed on the inner wall of the polygonal hole **34** and a retaining ring **352** disposed in the annular retaining groove **351**. A circumference of the ratchet wheel **30** is formed with a toothed portion **36** corresponding to the pawl **21** to be engaged with the pawl **21** for unidirectional ratcheting action. The inner wall of the first accommodating trough **13** is formed with a first positioning groove **17**. The circumference of the ratchet wheel **30** is further formed with a second positioning groove **37** corresponding to the first positioning groove **17** and is provided with a positioning ring **18**. The positioning ring **18** is disposed between the first positioning groove **17** and the second positioning groove **37**, so that the ratchet wheel **30** is constrained in the first accommodating trough **13**.

[0018] The end cap **40** is slidably disposed in the slide trough **31**. One side of the end cap **40**, corresponding to the polygonal hole **34**, is formed with a pushed portion **41**. The other side of the end cap **40** is formed with a press portion **42**. A pressing surface of the press portion **42** is not lower than a top surface **121** of the head **12**. A circumference of the end cap **40** extends downward to form an annular wall **43**. A bottom edge of the annular wall **43** is provided with an abutting portion **44**. The abutting portion **44** is confined between the limiting surface **32** and the limiting portion **33**. The end cap **40** is slidable along the axial direction of the first through hole **15** and movable between a first position and a second position. When the end cap **40** is in the first position, as shown in FIG. **5**, the abutting portion **44** abuts against the limiting surface **32**. When the end cap **40** is in the second position, as shown in FIG. **6**, the abutting portion **44** abuts against the limiting portion **33** to make the press portion **42** extend out of the first through hole **15**. At this time, a surface of the pushed portion **41** of the end cap **40** is approximately flush with the top surface **121** of the head **12**. Because an outer diameter of the annular wall **43** of the end cap **40** is slightly less than the diameter of the first through hole **15** and the slide trough **31**, the end cap **40** enables to smoothly slide axially between the first position and the second position. In this embodiment, an outer surface of the annular wall **43** of the end cap **40** is formed with a receiving groove **45**. The limiting ring **332** is accommodated in the receiving groove **45** and the annular limiting groove **331**.

[0019] FIG. **4** is a schematic view in accordance with the preferred embodiment of the present invention when in use. FIG. **5** is a first schematic view showing the operation of the preferred embodiment of the present invention. When in use, the ratchet wrench **100** is in cooperation with at least one bit **50**. One end of the bit **50** is formed with a pushing end **51**, and the other end of the bit **50** is formed with a driving end **52**. A circumference of the bit **50** is formed with a plurality of notches **53**. It should be noted that a distance between the pushing end **51** and one of the notches **53** is approximately equal to a distance between the pushed portion **41** and the retaining portion **35** when the end cap **40** is in the second position. As shown in FIG. **5**, when the pushing end **51** of the bit **50** is inserted into the polygonal hole **34**, the pushing end **51** abuts against the pushed portion **41** of the end cap **40** and is confined in a limiting space S formed by the annular wall **43** and the pushed portion **41** of the end cap **40**, thereafter the end cap **40** is pushed by the bit **50** to move outward relative to the first through hole **15** until the abutting portion **44** abuts against the limiting portion **33**. Meantime, the retaining portion **35** is engaged in the notches **53**, so that the bit **50** is positioned to the ratchet wrench **100**, thereby achieving the effect of quick positioning the bit **50**. Owing to the reason that the limiting space S formed by the pushed portion **41** and the annular wall **43** of the end cap **40** can effectively cover and position the bit **50**, when the bit **50** is inserted in the polygonal hole **34**, the end cap **40** can effectively prevent the bit **50** from extending out of the head **12** if the user applies an excessive force to the bit **50**.

[0020] FIG. **6** is a second schematic view showing the operation of the preferred embodiment of the present invention. When the user intends to remove the bit **50** from the ratchet wrench **100**, by reasons that the end cap **40** is in the second position and the pressing portion **42** of the end cap **40** extends out of the first through hole **15** the user enables to press the pressing portion **42** to push the bit **50** out of the polygonal hole **34**, and meantime the retaining portion **35** is disengaged from the notches **53**, thereby achieving the effect of quick removing the bit **50**.

[0021] It is worth mentioning that, in this embodiment, the end cap **40** is slidably disposed in the slide trough **31** of the

ratchet wheel **30**, and the limiting space S is defined between the annular wall **43** and the pushed portion **41**. Mentioned design enables to reduce the thickness of the head **12** and make the ratchet wrench **100** suitable for use in a confined space and allowing the end cap **40** to extend outward slightly from the first through hole **15**. When the ratchet wrench **100** is impacted by an external force to fall on the ground, the possibility for directly impacting the end cap **40** can be substantially decreased, thereby preventing damages to the end cap **40**. It is worth mentioning that, since the ratchet wrench **100** provides the retaining portion **35** to engage with the notches **53** of the bit **50** for positioning, the design in this invention enables the bit **50** to be applicable to various kinds of materials or coatings compared to prior art.

[0022] Although particular embodiments of the present invention have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the present invention. Accordingly, the present invention is not to be limited except as by the appended claims.

What is claimed is:

1. A ratchet wrench, in cooperation with a bit when in use, comprising:

a wrench body, having a handle and a head formed at one end of the handle, one side of the head being formed with a first accommodating trough, an inner wall of the first accommodating trough being formed with a second accommodating trough, another side of the head having a first through hole communicating with the first accommodating trough and a second through hole communicating with the second accommodating trough;

an operating unit, including at least one pawl accommodated in the second accommodating trough and a knob inserted in the second through hole;

a ratchet wheel, rotatably disposed in the first accommodating trough, one side of the ratchet wheel, corresponding to the first through hole, being formed with a slide trough, a bottom of the slide trough being formed with a limiting surface, an inner wall of the slide trough being provided with a limiting portion, a spacing being spaced apart between the limiting portion and the limiting surface, another side of the ratchet wheel being formed with a polygonal hole communicating with the slide trough, an inner wall of the polygonal hole being provided with a retaining portion, a circumference of the ratchet wheel being formed with a toothed portion corresponding to the pawl;

an end cap, slidably disposed in the slide trough, one side of the end cap, corresponding to the polygonal hole, being formed with a pushed portion, another side of the end cap being formed with a press portion, a circumference of the end cap extending to form an annular wall, the annular wall being provided with an abutting portion, the abutting portion being confined between the limiting surface and the limiting portion, a limiting space being defined between an inner side of the annular wall and the pushed portion, wherein the end cap is slidable along an axial direction of the first through hole and movable between a first position and a second position, when the end cap is in the first position, the abutting portion abuts against the limiting surface, when the end cap is in the second position, the abutting portion abuts against the limiting portion.

2. The ratchet wrench as claimed in claim **1**, wherein one end of the bit is formed with a pushing end, another end of the bit is formed with a driving end, a circumference of the bit is formed with at least one notch, when the bit is inserted in the polygonal hole of the ratchet wheel to push the end cap to the second position, the retaining portion is engaged in the notch, and the pushing end of the bit abuts against the pushed portion of the end cap and is confined in the limiting space.

3. The ratchet wrench as claimed in claim **2**, wherein a distance between the pushing end of the bit and the notch is approximately equal to a distance between the pushed portion of the end cap and the retaining portion when the end cap is in the second position.

4. The ratchet wrench as claimed in claim **1**, wherein an outer surface of the annular wall of the end cap is formed with a receiving groove, the limiting portion includes an annular limiting groove disposed on the inner wall of the slide trough and a limiting ring, and the limiting ring is accommodated in the receiving groove and the annular limiting groove.

5. The ratchet wrench as claimed in claim **1**, wherein when the end cap is in the second position, the press portion of the end cap extends out of the first through hole of the wrench body, and a surface of the pushed portion of the end cap is approximately flush with a top surface of the head.

6. The ratchet wrench as claimed in claim **1**, wherein the retaining portion includes an annular retaining groove disposed on the inner wall of the polygonal hole and a retaining ring disposed in the annular retaining groove.

7. The ratchet wrench as claimed in claim **1**, wherein the inner wall of the first accommodating trough is formed with a first positioning groove, the circumference of the ratchet wheel is formed with a second positioning groove corresponding to the first positioning groove and provided with a positioning ring, and the positioning ring is disposed between the first positioning groove and the second positioning groove to restrain the ratchet wheel in the first accommodating trough.

8. The ratchet wrench as claimed in claim **1**, wherein the first through hole has a diameter approximately equal to that of the slide trough, and the annular wall of the end cap has an outer diameter slightly less than the diameter of the first through hole.

9. The ratchet wrench as claimed in claim **1**, wherein the abutting portion is formed at a bottom edge of the annular wall.

* * * * *