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SCREWDRIVER WITH RELEASABLE BLADE

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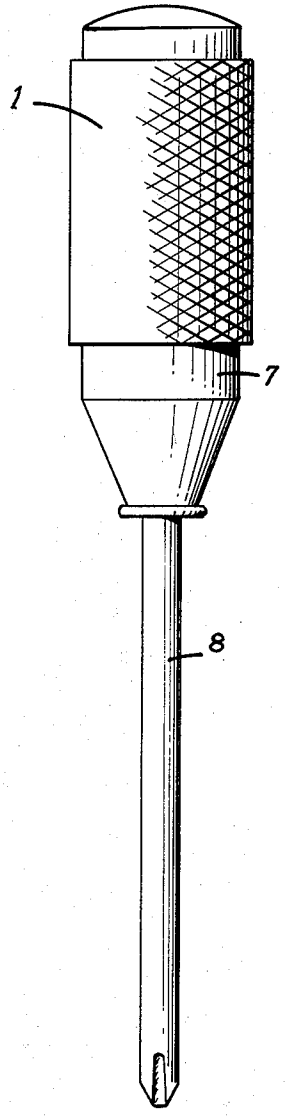


Fig. 1

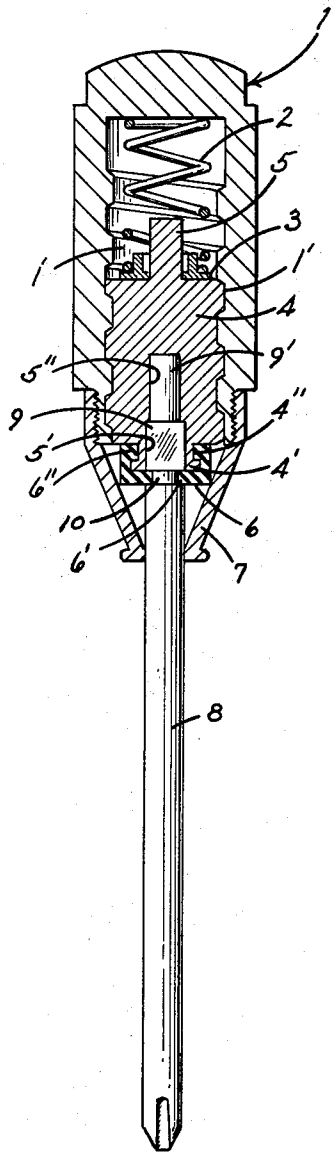


Fig. 2

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SCREWDRIVER WITH RELEASABLE BLADE

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This invention relates to screwdrivers, and more particularly to automatic return screwdrivers with interchangeable blades.

The type of screwdriver with the improvement of which this invention is concerned permits screws to be tightened or loosened by axial forces which, when exerted upon the screwdriver handle, actuate rotation of the screwdriver blade. When the handle is withdrawn from the screw head, the blade is returned to its initial position by a return spring and is ready to rotate a screw upon another application of axial forces.

It is the main object of this invention to provide a screwdriver in which a blade is held securely against accidental release during operation of the screwdriver, yet is readily removable to be exchanged for another blade of different size or shape as desired.

A more specific object is the provision of such a screwdriver by means of which screws or bolts may be tightened or loosened by a hammer blow or other sudden impact applied to the screwdriver handle without releasing the blade from the handle.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the accompanying drawing in which:

FIG. 1 is an elevational view of a preferred embodiment of the invention; and

FIG. 2 shows the device of FIG. 1 in axial section.

The screwdriver illustrated in FIGS. 1 and 2 has a hollow, substantially cylindrical handle **1**. The handle cavity has an open and a closed end. A portion of the handle in the cavity near the open end of the latter carries flat, steep-pitched threads **1'**.

A substantially cylindrical plug **4** is arranged in the handle cavity and has external threads which engage the threads **1'**. The plug **4** carries an axially projecting abutment rod **5** which limits movement of the plug **4** toward the closed cavity end. A helical compression spring **2** is interposed between the closed end of the handle cavity and the plug **4** and urges the plug to move outwardly of the open end. The pressure of the coil spring **2** is transmitted to the plug **4** by a washer **3**.

The plug **4** has an axial bore with an orifice facing the open end of the handle cavity. The outermost portion of the bore passes through a coaxial tubular extension **4'** of the plug **4** which is provided with an annular groove **4''** in its outer, cylindrical surface. The outer portion **5'** of the bore in the plug **4** is of square cross section. The inner axial bore portion **5''** is of circular cross section. The diameter of its cross section is smaller than the smallest cross sectional dimension of the outer bore portion **5'**.

A cover **7** of hollow frustoconical shape is coaxially mounted on the open end of the handle **1**. The shank of a screwdriver blade **8** engages the cylindrical bore of the plug **4** and passes outwardly of the handle **1** through a central hole in the apex of the frustoconical cover **7**. The terminal shank portion **9'** of the blade **8** is cylindrical and conforms matingly to the inner bore portion **5''** of the plug **4** in which it is received. Another shank portion **9** contiguously adjacent the cylindrical terminal portion **9'** is of square cross section to mate with the outer bore portion **5'** in which it is secured against rotation by the non-circular configuration of the cross section of bore and shank. Obviously the cross

section of shank portion **9** and bore portion **5'** may be different from a square cross section without loss of its function as long as it is non-circular. It is also apparent that the diameter of the cylindrical shank portion **9'** must not be greater than the smallest cross-sectional dimension of the coaxial bore portion **5'** if the screwdriver blade **8** is to be released at will from the plug **4**. An annular groove **10** circles the shank of the blade **8** outwardly adjacent the orifice of the axial bore in the plug **4**.

The screwdriver blade **8** is axially secured in the plug **4** by a retaining ring **6** of resilient, preferably elastomeric, material. Rubber or plastics of suitable resilience are the preferred materials for the ring **6**. Nylon has been found to be well suited in many instances, and oil resistant synthetic rubber will perform well.

The ring **6** is of generally cylindrical tubular form. Two annular projections **6'** and **6''** project into the axial passage of the ring **6**. The projections are axially spaced from each other and of different radial height so that one may engage the groove **10** in the shank of the screwdriver blade outside the bore of the plug **4** while the other one engages the annular groove **4''** in the tubular extension **4'** of the plug **4**.

To assemble the screwdriver from its loose component parts, one first inserts the spring **2** with its washer **3** into the handle cavity. The resilient retaining ring **6** is slipped over the tubular extension **4'** of the plug **4** until its internal projection **6''** is seated in the groove **4''**. The plug **4** is then threaded on the threads **1'** in the handle cavity with its rod **5** coaxial with the spring **2**. The cover **7** is then fitted over the plug **4** which will partly project outwardly of the handle cavity because of the pressure of the spring **2**. The cover is threadedly attached to the handle **1** while the spring **2** is compressed by abutment of the cover **7** against the ring **6**.

This assembly operation is only performed during manufacture of the screwdriver and for maintenance purposes. It is evident that the screwdriver may be disassembled in reversing the above steps. No tools are needed for assembly or disassembly.

Insertion or removal of a blade is even simpler. The blade shown in the drawing has a tip of the well-known Phillips type but the particular configuration of the tip is not relevant to this invention. Blades having any desired tip and provided with a cylindrical terminal shank portion remote from the tip, and a square shaped shank section adjacent the terminal portion may be mounted in the handle by simply passing them axially through the ring **6** in suitable axial alignment with the bore portion **5'** until the shank is properly seated in the plug **4**. The ring **6** will then automatically engage the groove **10** in the screwdriver shank.

Removal of the blade **8** for replacement by another blade is accomplished simply by axially pulling the blade outwardly of the handle until the resilient resistance of the ring **6** is overcome. This resistance is sufficient to prevent accidental release of the blade **8** from the handle **1** even if the ring **6** is made of a very soft grade of rubber. The retaining force of the ring may be selected or varied by the use of different ring materials.

The screwdriver of the invention is suitable for loosening rusted-in screws or bolts by the application of a sudden sharp impact to the closed end of the handle **1**, and for other screw turning operations in which the handle is merely moved toward and away from a screw head which is engaged during inward handle movement and released during outward movement while the spring **2** returns the blade to its starting position, as is conventional.

The screwdriver of the invention may be made to have a right-handed or left-handed turning effect depending on the direction of the threads **1'** and the mating threads on

the plug 4. It may also be modified for alternate right-hand or left-hand operation in a manner known in itself.

It will be understood, of course, that the foregoing disclosure relates only to a preferred embodiment of the invention. It is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of the disclosure which do not constitute departures from the spirit and scope of the invention set forth in the appended claims.

What is claimed is:

1. A screwdriver with replaceable blade comprising, in combination,

(*a*) a hollow handle formed with internal threads having an axis, said handle having an axial end wall formed with an axial opening therethrough;

(*b*) a plug member in said handle threadedly engaging said threads thereof, said member having an axial recess of non-circular cross section and being formed with an annular groove about said axis;

(*c*) a blade member having an elongated shank, a first longitudinal portion of said shank matingly conforming to said recess and being received therein, a second longitudinal portion of said shank adjacently outside said recess being formed with an annular groove, and a third longitudinal portion of said shank passing through said opening in rotatable guiding engagement with said end wall; and

(*d*) a retaining ring of resilient material having two annular projections respectively releasably engaging said grooves for retaining said blade member in said plug member.

2. A screwdriver a set forth in claim 1, wherein said grooves are open in a radially outward direction, and said annular projections extend radially inward from the remainder of said retaining ring.

3. A screwdriver as set forth in claim 1, further comprising resilient means permanently urging said plug member to move on said threads in a predetermined axial direction, and stop means for limiting movement of said plug member in said direction.

4. A screwdriver as set forth in claim 3, wherein said resilient means include a helical compression spring interposed between said handle and said plug member, said screwdriver further comprising abutment means axially projecting from said plug member in a direction toward said spring for limiting axial movement of said plug member in a direction opposite to said predetermined direction against the restraint of said spring.

5. A screwdriver as set forth in claim 3, wherein said stop means includes a member threadedly secured to said handle.

6. A screwdriver as set forth in claim 1, wherein said annular grooves are axially spaced from each other.

7. A screwdriver with replaceable blade, comprising in combination,

(*a*) a handle defining an elongated cavity therein, said cavity having an axis and one axially open end;

(*b*) threads on said handle in said cavity about said axis;

(*c*) a plug member in said cavity threadedly engaging said threads for simultaneous axial movement and rotation of said plug member on said handle, said plug member having an axial recess, an outer portion of said recess being of non-circular cross section, and an inner portion of said recess being of circular cross section having a diameter not greater than any dimension of said non-circular cross section, said plug member being formed with an external annular groove about said axis;

(*d*) a cover member on said open end, said cover member being formed with a bore of circular cross section;

(*e*) a blade member having a shank projecting from said open end in conforming rotatable engagement with said bore of said cover member, a portion of said shank matingly conforming to said recess and being received therein, another portion of said shank adjacently outside said recess being formed with an external annular groove about said axis; and

(*f*) a retaining ring of resilient material having two axially spaced internal annular projections respectively releasably engaging said grooves for axially retaining said blade member in said plug member.

8. A screwdriver as set forth in claim 7, wherein the other end of said cavity is closed, a compression spring being interposed betwen said closed end and said plug member for permanently urging the same to move toward said open end.

9. A screwdriver as set forth in claim 8, further comprising abutment means projecting from said plug member toward said closed end for limiting movement of said plug member against the urging of said compression spring.

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