

March 17, 1953

J. F. SPIELMAN

2,631,484

REVERSIBLE IMPACT DRIVING SCREW DRIVER DESIGN

Filed June 5, 1952

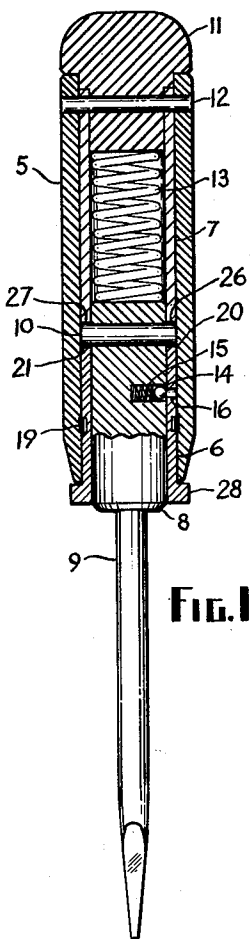


FIG. 1

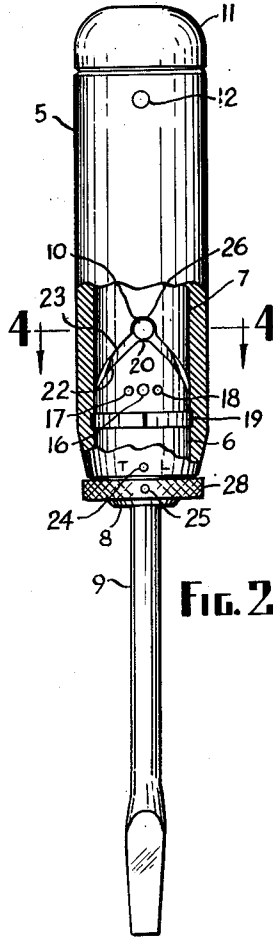


FIG. 2

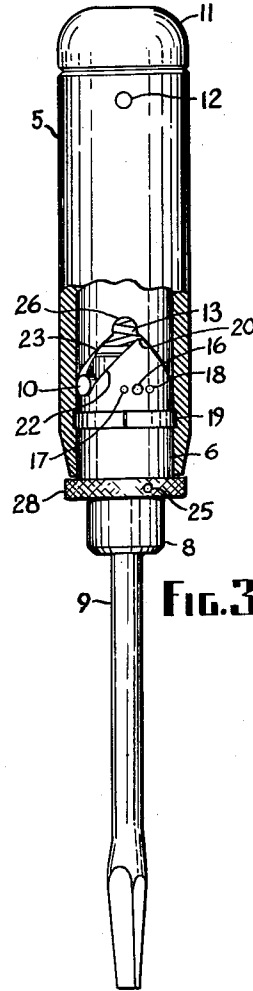


FIG. 3

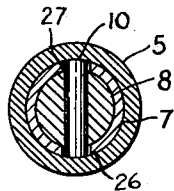


FIG. 4

INVENTOR:

James F. Spielman

UNITED STATES PATENT OFFICE

2,631,484

REVERSIBLE IMPACT DRIVING SCREW
DRIVER DESIGN

James F. Spielman, Torrington, Conn.

Application June 5, 1952, Serial No. 291,846

6 Claims. (Cl. 81—52.3)

1

The invention relates to an unusual screwdriver which transmits an impact upon the handle member to a rotative impulse of the working blade member, and which is adjustable to operate in either direction of rotation. A reversible impact driving screwdriver is now defined.

The invention is additionally adjustable for use as an ordinary screwdriver.

In using fastening screws, the major problems usually arise during the initial loosening and final tightening of screws. The invention proposes a new basic design for a screwdriver with which a user may tighten screws securely and loosen tight screws easily.

An ordinary screwdriver consists of a handle, or body, and a working blade. Numerous types of fastening screw heads and screwdriver working blades exist. Therefore, a "screw" will herein be interpreted to mean any screwing fastener having any type head for engagement by a screwdriver working blade; and a "working blade" will herein be interpreted to mean any member projecting from a screwdriver body for engaging a screwing fastener.

One object of the invention is to provide a new screwdriver which will transmit an impact upon the handle member thereof to a rotative impulse of the working blade member thereof, which is adjustable for operation in either direction of rotation, and which is further adjustable for use as an ordinary screwdriver.

Another object of the invention is to provide a practical, easily assembled construction of the invention.

The foregoing objects are fulfilled in the following description of the accompanying drawing, in which Fig. 1 is a vertical cross-sectional view of the invention; Fig. 2 is a vertical cut-away view of the invention orthographically projected from Fig. 1; Fig. 3 is an operational view comparable with Fig. 2; and Fig. 4 is a cross-sectional view taken along line 4—4 of Fig. 2.

A handle, or body 5 has a hollow interior and rotatably carries a guide sleeve 6 which is round in cross-section. The guide sleeve 6 is mounted in the body 5 by a retaining ring 19 which expands from a peripheral slot around the guide sleeve 6 into a circular recess in the interior of the body 5 when the guide sleeve 6 is inserted into the body 5. The guide sleeve 6 diminishes symmetrically from two diametrically opposite points thereon to its inward-facing end, thereby providing two diametrically opposite normal points 20 and 21 (Figs. 1 and 2) and four helical guide surfaces, 22 being an example. The illus-

2

trated construction of the invention provides the guide sleeve 6 with three ball-receiving position holes 16, 17 and 18 necessarily involving the interior of the wall of the guide sleeve 6. A flange 28 is preferred on the outward extending end of the guide sleeve 6 for adjustment by the fingers.

A drive plunger 8 is slidably and rotatably carried in the guide sleeve 6, and contains a ball 14 urged radially therefrom by a spring 15 to normally engage the position hole 16 in the wall of the guide sleeve 6. A type of screwdriver working blade 9 is fixed in and projects outwardly from the drive plunger 8. Any fastening means outside of the invention may be used for fixing a screwdriver working blade of any type in the drive plunger 8.

A compression spring 13 tends to urge the drive plunger 8 outwardly from the body 5.

A drive sleeve 7 is fixed in the body 5 in alignment with and inwardly from the guide sleeve 6 by a peened retaining pin 12. The drive sleeve 7 slidably and rotatably receives a portion of the drive plunger 8. The drive sleeve 7 diminishes symmetrically from two diametrically opposite points thereon to the outward-facing end thereof, providing four helical drive surfaces, 23 being an example, which correspond with the helical guide surfaces, 22 being an example, on the guide sleeve 6, and a pair of diametrically disposed drive pin receiving spaces or normal notches 26 and 27.

A drive pin 10, preferred as a lateral driving element, is diametrically carried through the drive plunger 8 and, in an intermediate or normal adjustment of the invention, is positioned in alignment with and beyond the normal points 20 and 21 on the guide sleeve 6. The ends of the drive pin 10 are normally engaged in the normal notches 26 and 27 on the drive sleeve 7 beyond the farthest inward-facing end of the guide sleeve 6.

An impact head 11, considered as a part of the body 5, is retained by the retaining pin 12.

With the exceptions of the ball 14, the spring 15 and the position holes 16, 17 and 18, the invention is seen to be symmetrical about a vertical center line, especially in Figs. 1 and 2; and, with these exceptions, appears alike from the near and far sides.

When the illustrated form of the invention is adjusted to an intermediate or normal position (Figs. 1 and 2), a gap exists between the guide surfaces, 22 being an example, and the drive surfaces, 23 being an example, to permit

3

limited rotative adjustment of the guide sleeve 6 in either direction. In Figs. 1 and 2, the ball 14 engages the position hole 16, denying voluntary rotation of the guide sleeve 6 relative to the body 5 and the drive plunger 8. Rotation of the working blade 9 in respect to the body 5 is prevented by the drive pin 10 engaging the sides of the normal notches 26 and 27. The normal points 20 and 21 at the farthest inward-facing end of the guide sleeve 6 retain the drive pin 10 in the normal notches 26 and 27 at the nearest outward-facing end of the drive sleeve 7. A mark 25 on the flange 28 is aligned with a mark 24 on the body 5 (Fig. 2). The point of the working blade 9 may be engaged by the head of a type of fastening screw (not shown), and the body 5 may be rotated by hand to turn the screw. The invention as seen in Figs. 1 and 2 is then adapted for use as an ordinary screw-driver.

When a user of the invention encounters a screw which will not easily loosen, he may rotate the flange 28 to move the mark 25 toward the letter "L" on the body 5 (Fig. 2). This movement removes the ball 14 from the position hole 16, increasing the distance between the guide surface 22 and the drive surface 23. The un-referenced cooperating diametric counterparts of the guide surface 22 and the drive surface 23 part correspondingly. A pair of cooperating helical paths for the ends of the drive pin 10 are provided, and the compression spring 13 urges the drive plunger 8 outwardly. The drive pin 10 follows the guide surface 22 (and the cooperating diametric counterpart) until the position seen in Fig. 3 results. The user may now engage the point of the working blade 9 with the screw, may grip the body 5 tightly and may strike a blow upon the impact head 11 with the palm of his hand or with an object. The impact of the blow engages the drive pin 10 with the incline of the drive surface 23 (and the cooperating diametric counterpart), urging a rotative movement of the working blade 9 in a loosening direction (when the screw has a right-hand thread). At the same time, the point of the working blade 9 becomes forcefully engaged with the screw.

After the blow, the compression spring 13 reacts, returning the tool to the position seen in Fig. 3, permitting repeated blows to be struck when the screw does not loosen easily.

To return the tool to the normal position, the drive plunger 8 must be compressed into the body 5 to the extent that the guide sleeve 6 may be rotated to align the marks 24 and 25.

It now becomes evident that a reverse adjustment of the guide sleeve 6, moving the mark 25 toward the letter "T" on the body 5 (Fig. 2), will prepare the tool to transmit a blow upon the impact head 11 to a counter-rotative or tightening impulse of the working blade 9. This reverse operation is readily seen when the drawing is held before a mirror.

During impact operation, the ball 14 travels freely along the interior of the wall of the guide sleeve 6. The position holes 17 and 18 are smaller than the position hole 16, and are illustrated as a means to prevent free rotation of the guide sleeve 6 in the event that the drive pin 10 travels into the normal notches 26 and 27 during impact operation. In that circumstance the ball 14 is received either by the position hole 17 or the position hole 18. However, the position holes 17 and 18 do not receive enough of the ball 14 to defeat the tension of the compression spring 13.

4

When the drawing is examined it is seen that some of the parts may be substituted or duplicated by construction design. Means for fixing the drive sleeve 7 in the body 5 and means for rotatably mounting the guide sleeve 6 in the body 5 may vary. A spring-ball positioning means for the guide sleeve 6 is a practical construction. Relative diameters may vary.

However, a spirit of invention is seen in the relationship between a slidable and rotatable drive plunger element carrying a lateral driving element and fixed counter-inclining drive surfaces substantially corresponding with adjustable counter-inclining guide surfaces, whereby contrary or reverse helical paths for travel of the driving element may be selected.

With particular regard for the fundamental elements of the invention, I set forth the following claims.

1. I claim:

1. In a screwdriver which is adjustable to transmit an impact upon a handle member thereof to a rotative impulse of a working blade member thereof in either direction of rotation: a hollow handle element having a closed end and an open end, a system of counter-inclining drive surfaces fixed within said hollow in said handle element toward the said closed end thereof and facing the said open end thereof, a guide sleeve element carried within the said open end of said handle element, said guide sleeve element embodying a system of counter-inclining guide surfaces facing the said closed end of said handle element and substantially corresponding with said system of counter-inclining drive surfaces, means for rotatively adjusting said guide sleeve element by hand to a limited degree in either direction from a normal or intermediate point, a drive plunger element slidably and rotatably carried longitudinally within said guide sleeve element, said drive plunger element being arranged to contain a screwdriver working blade element facing outwardly from the said open end of said handle element, and a driving element laterally carried by said drive plunger element and normally engaging a space beyond the farthest end of said guide sleeve element facing the said closed end of said handle element, whereby rotative adjustment of said guide sleeve element in one direction provides a helical path for travel of said driving element and whereby a reverse rotative adjustment of said guide sleeve element provides a reverse helical path for travel of said driving element.

2. A screwdriver as defined in claim 1, where said driving element is a dowel-like drive pin diametrically carried through said drive plunger element.

3. In a reversible impact driving screwdriver, a hollow handle element having a closed end and an open end, a drive sleeve fixed within said handle element toward the closed end thereof, said drive sleeve embodying counter-inclining drive surfaces having cooperating diametric counterparts, said drive surfaces facing the open end of said handle element, a guide sleeve having means rotatably carrying the same within the open end of said handle element, means for rotatably adjusting said guide sleeve by hand to a limited degree in either direction from a normal or intermediate adjustment, said guide sleeve embodying counter-inclining guide surfaces having cooperating diametric counterparts, said guide surfaces facing the closed end of said handle element and

5

substantially corresponding with said drive surfaces embodied on said drive sleeve, a drive plunger slidably and rotatably carried within and concentrically aligned with said guide sleeve and said drive sleeve, said drive plunger being arranged to contain a screwdriver working blade element facing outwardly from the open end of said handle element, a drive pin carried diametrically through said drive plunger and normally engaging a space between the farthest inward-facing end of said guide sleeve and the nearest outward-facing end of said drive sleeve, and a spring mechanically compressed between the inward-facing end of said drive plunger and the closed end of said handle element whereby to urge said drive plunger outwardly from the open end of said handle element.

4. The invention as defined in claim 3, where said means for adjusting said guide sleeve to the named normal or intermediate adjustment comprises an element urged radially from within said drive plunger by a spring to engage a position hole in the interior wall of said guide sleeve.

5. The invention as defined in claim 3, where said means rotatably carrying said guide sleeve within the open end of said handle element comprises a retaining ring which expands from a

6

peripheral slot around said guide sleeve into a circular recess in the interior wall of the said handle element.

6. The invention as defined in claim 3, where said space between the farthest inward-facing end of said guide sleeve and the nearest outward-facing end of said drive sleeve is afforded by a pair of diametrically arranged drive pin receiving normal notches in said drive sleeve.

JAMES F. SPIELMAN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,743,505	Turgeon	Jan. 14, 1930
2,010,616	Walsh	Aug. 6, 1935
2,543,441	Crummey	Feb. 27, 1951

FOREIGN PATENTS

Number	Country	Date
343,400	Italy	Sept. 28, 1936
429,810	Italy	Feb. 3, 1948
810,739	Germany	Aug. 13, 1951