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(54) Off-axis bit or the like.

(57) The bit (25) or the like is adapted for use in a driver (10) having a polygonal cavity, enabling the driver (10) to be tilted during use in tightening or loosening the bit (25). The bit (25) is elongated and has two sets of six driving surfaces (31, 36) equiangularly oriented about its longitudinal axis. The driving surfaces (31, 36) of one set are inclined at +10° to the longitudinal axis, and the driving surfaces of the other set are inclined at -10° to the longitudinal axis.

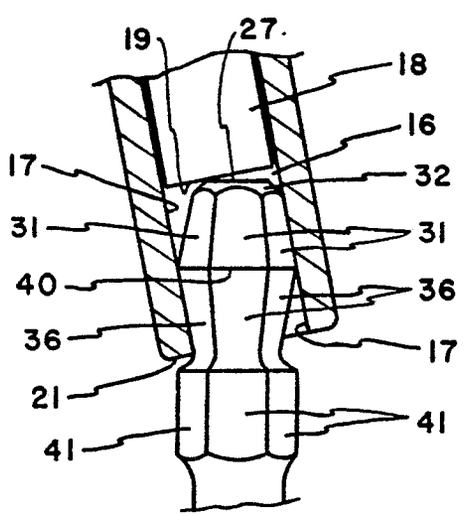

FIG. 4

EP 0 308 968 A1

This invention relates to a fastener engaging mechanism for use with a driver such as a screwdriver having a hex cavity at one end.

It is common practice to provide drivers with removable bits or sockets in order to accommodate different size fasteners. Often, the fastener is not easily accessible because it is blocked by other parts. If a standard driving tool is tilted to gain access to the fastener, adequate engagement is not possible. Various mechanisms have been proposed to accommodate such situations. However, the prior art devices suffer from various disadvantages, including tool slippage from the fastener during driving operation.

Accordingly, it is an object of the present invention to provide a fastener engaging mechanism for use with a driving tool in which improved driving connection between the tool, the fastener engaging mechanism and the fastener is provided when the tool is tilted.

The present invention provides a fastener engaging device for use with a driving tool, said fastener engaging device being elongated and having a longitudinal axis, said device being characterized by a plurality of first substantially flat driving surfaces equiangularly oriented about the longitudinal axis, a corresponding plurality of second substantially flat driving surfaces equiangularly oriented about the longitudinal axis, said first driving surfaces being inclined at a predetermined angle to the longitudinal axis in a positive direction, said second driving surfaces being inclined at the same predetermined angle to the longitudinal axis in a negative direction, and a fastener engag ing formation.

The present invention also provides a bit for use with a driving tool having a shank, said bit being elongated and having a longitudinal axis, said bit being characterized by a shank engaging end surface generally perpendicular to the longitudinal axis, a plurality of first substantially flat driving surfaces equiangularly oriented about the longitudinal axis, a corresponding plurality of second substantially flat driving surfaces equiangularly oriented about the longitudinal axis, said first driving surfaces being inclined at a predetermined angle to the longitudinal axis in a positive direction, said second driving surfaces being inclined at the predetermined angle to the longitudinal axis in a negative direction, and a fastener engaging formation at the end opposite said shank engaging surface.

In the drawings:

Figure 1 is an elevational view of a driver carrying a bit constructed in accordance with the features of the present invention;

Figure 2 is a view like Figure 1 except that the driver is inclined with respect to the longitudinal axis of the bit;

Figure 3 is an enlarged fragmentary, elevational view of the bit; and

Figure 4 is an enlarged view partly in section of the circled area in Figure 2 showing the relationship between the driver and the bit.

Referring now to the drawings, there is depicted a driver 10 having a handle 11. In the embodiment shown, the rear of the handle is hollow and is closed by a removable cap 12. The hollow interior is used to store bits. Extending from the handle 11 is a hollow shank 15. Mounted in the shank 15 is an elongated magnet 18 having a flat end surface 19. A cavity 16 is defined between the surface 19 and the free end 21 of the shank 15. The cavity is defined by six flat bearing surfaces 17. The angle between each adjacent pair of surfaces is 120°.

Located in the cavity 16 is a bit 25 incorporating the features of the present invention. The bit includes a body 26 having a flat end surface 27 which in use, as seen in Figure 4, engages the flat end surface 19 of the magnet 18 and is retained thereby. The bit 25 includes a first set 30 of six flat driving surfaces 31 which each terminate at one end of the bit 25 in a chamfered area 32 connecting the driving surfaces 31 with end surface 27. A second set 35 of six flat driving surfaces 36 are respectively aligned with corresponding ones of the driving surfaces 31. The driving surfaces 31 and the driving surfaces 36 intersect at a hexagonal outline 40. The driving surfaces 31 are inclined at an angle of plus X° with respect to the longitudinal axis of the body 26. In a preferred embodiment, the angle X is 10°. Six driving surfaces 41 respectively extend from the driving surfaces 36 and are parallel to the longitudinal axis of the body 26. The surfaces 41 protrude from the shank 15 when the bit 25 is fully seated in the cavity 16. The bit 25 has a fastener engaging formation 45 which in the illustrated embodiment has a construction to drive a screw.

When the fastener to be tightened or loosened is difficult to reach the tool 10 may be tilted so that the longitudinal axis of the handle 11 and shank 15 is inclined at an angle of approximately X° with respect to the longitudinal axis of the bit 25. The two sets of driving surfaces 31 and 36 cooperate with the complementary shaped bearing surfaces 17 which form the cavity 16 in the shank 15. As can be seen in Figure 4, when the longitudinal axis of the shank 15 is tilted with respect to the longitudinal axis of the bit 25 at the angle X°, a pair of opposed driving surfaces 31 and 36 are in contact with opposed bearing surfaces 17 of the cavity 16.

By this construction, when the tool 10. is used to drive a fastener, two of the bearing surfaces 17 respectively contact one of the driving surfaces 30 and the opposing one of the driving surfaces 35. This construction provides for driving a fastener in an off-axis position without slippage.

The size of the bit 25 with respect to the cavity 16 is such that the hexagonal outline 40 is slightly smaller than the hexagonal outline defined by the bearing surfaces 17. Thus the bit 25 can be inserted into the cavity 16 and thereafter shifted plus and minus X° to the longitudinal axis of the shank 15. Mechanisms other than magnetism may be used to retain the bit 25 within the cavity 16. The effective length of each of the driving surfaces 31 and 36 is about one half the longitudinal extent of the bearing surfaces 17.

By using a tool with a deeper cavity 16, the drive surfaces 41 can be engaged by the bearing surfaces 17, so that the tool can be used in the usual way, in a non-tilting mode. The tool can be used in a non-tilting manner by having the bearing surfaces 17 engage the hexagonal outline 40.

While there has been described what at present is considered to be the preferred embodiment of the present invention, it will be apparent to those skilled in the art that various modifications and alterations may be made herein.

Claims

1. A fastener engaging device for use with a driving tool, said fastener engaging device being elongated and having a longitudinal axis, said device being characterized by a plurality of first substantially flat driving surfaces (31) equiangularly oriented about the longitudinal axis, a corresponding plurality of second substantially flat driving surfaces (36) equiangularly oriented about the longitudinal axis, said first driving surfaces (31) being inclined at a predetermined angle to the longitudinal axis in a positive direction, said second driving surfaces (36) being inclined at the same predetermined angle to the longitudinal axis in a negative direction, and a fastener engaging formation (45).

2. The fastener engaging d4vice of claim 1, characterized in that the plurality is 6.

3. The fastener engaging device of claim 1 or 2, characterized in that the predetermined angle is about 10°.

4. The fastener engaging device of claim 1, 2 or 3, characterized in that each of the driving surfaces (31, 36) has the same longitudinal extent.

5. The fastener engaging device of any of claims 1 to 4, characterized by a corresponding plurality of third driving surfaces (41) parallel to the longitudinal axis.

6. The fastener engaging device of any of claims 1 to 5, characterized in that it is composed of magnetic material.

7. A bit for use with a driving tool having a shank, said bit being elongated and having a longitudinal axis, said bit being characterized by a shank engaging end surface (27) generally perpendicular to the longitudinal axis, a plurality of first substantially flat driving surfaces (31) equiangularly oriented about the longitudinal axis, a corresponding plurality of second substantially flat driving surfaces (36) equiangularly oriented about the longitudinal axis, said first driving surfaces being inclined at a predetermined angle to the longitudinal axis in a positive direction, said second driving surfaces being inclined at the predetermined angle to the longitudinal axis in a negative direction, and a fastener engaging formation (45) at the end opposite said shank engaging surface (27).

8. The bit of claim 7, characterized in that the plurality is 6.

9. The bit of claim 7 or 8, characterized in that the predetermined angle is about 10°.

10. The bit of claim 7, 8 or 9, characterized by a corresponding plurality of third driving surfaces (41) between said second driving surfaces (36) of said fastener engaging formation (45).

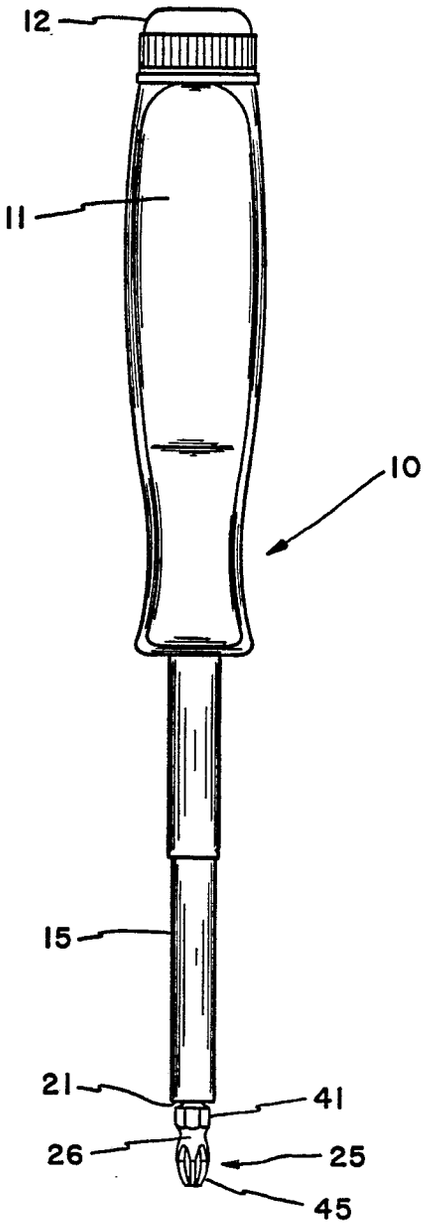

FIG. 1

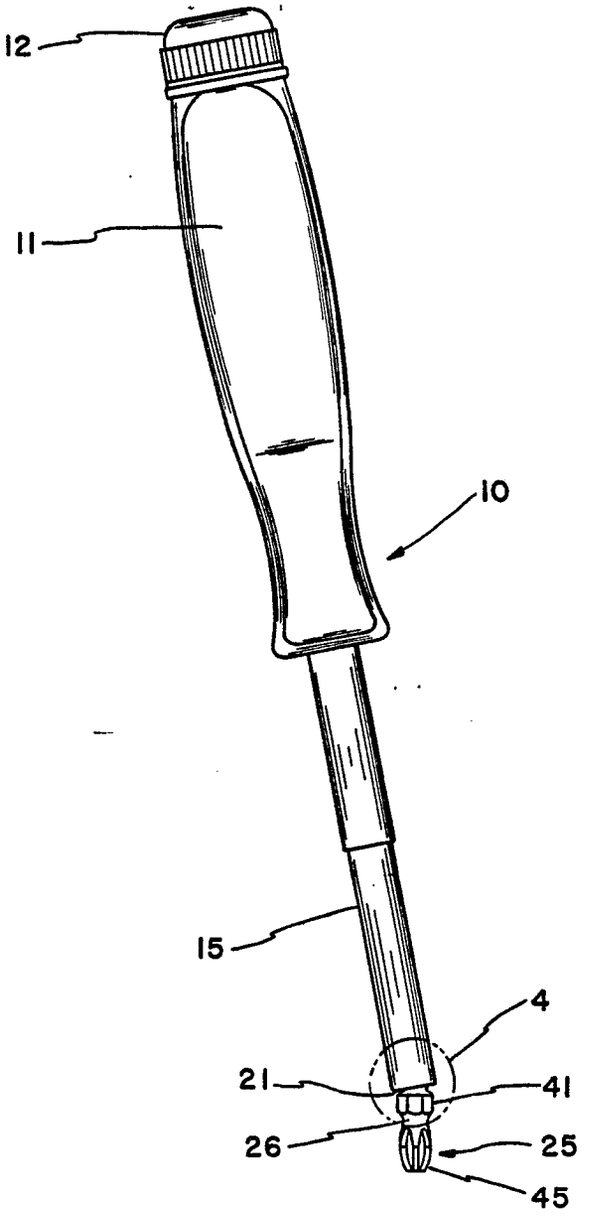

FIG. 2

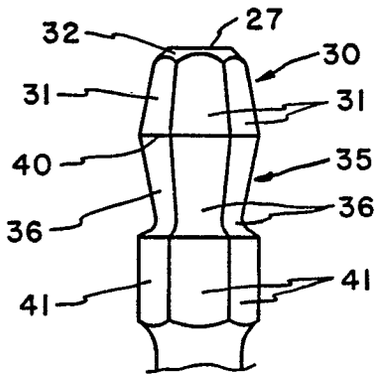

FIG. 3

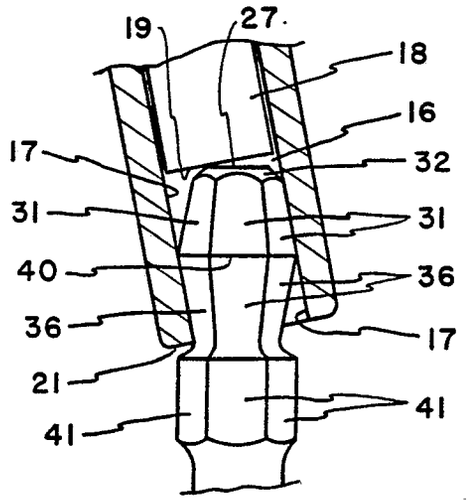

FIG. 4

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EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 88115713.5

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US - A - 3 897 703 (PHIPPS) * Abstract; fig. 2-4 * --	1,2,4, 7,8	B 25 B 15/00
A	DE - C - 827 780 (FORST) * Fig. 3 * --	1,2	
A	US - A - 3 213 719 (KLOACK) * Fig. 4 * --	1,6	
A	US - A - 3 253 626 (STILLWAGON) * Totality * ----	6	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 25 B 13/00
B 25 B 15/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	12-12-1988	BENCZE

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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