United States Patent

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[54] **CAVITY HEAD SCREW AND DRIVING TOOL THEREFOR**

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[21] Appl. No.: **51,152**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 827,627, May 26, 1969.

[52] **U.S. Cl.** **145/50**, 85/45

[51] **Int. Cl.** **B25b 15/02**, F16b 23/00

[58] **Field of Search** ..... 145/50 A, 50 D, 50 E, 50 R, 145/51, 52; 85/45; 81/90 C; 287/DIG. 7; 279/96, 102

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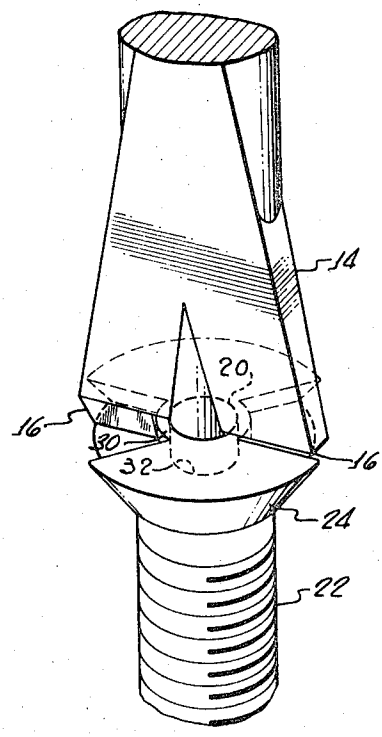
[57] **ABSTRACT**

The upper surface of the head of a screw has wedge-shaped cavities arranged on either side of, or around, a central hub or land. The cavities have undercut sidewalls, and the land has a central hole, preferably circular. A driving tool such as a screwdriver, or the like, is provided with multiple blades which are spaced apart on either side of or around a central aperture. A central pin depends from the shank of the screwdriver and is adapted to engage the hole in the central land of the screw. The bottoms of the screwdriver blades are of expanded thickness so that when these blades are inserted in and engage the screwhead cavities, the expanded bottom portions of the blades will lock under the undercut sidewalls of the cavities. Mating of the screwdriver blades and the screw head cavities is guided, aligned and axially stabilized by engagement of the screwdriver central pin in the hole in the central land of the screwhead surface. Expandable pin sections maintained under tension may be employed to temporarily lock a screw onto the screwdriver blades and held in positive axial alignment with said screwdriver for insertion and withdrawal.

6 Claims, 11 Drawing Figures



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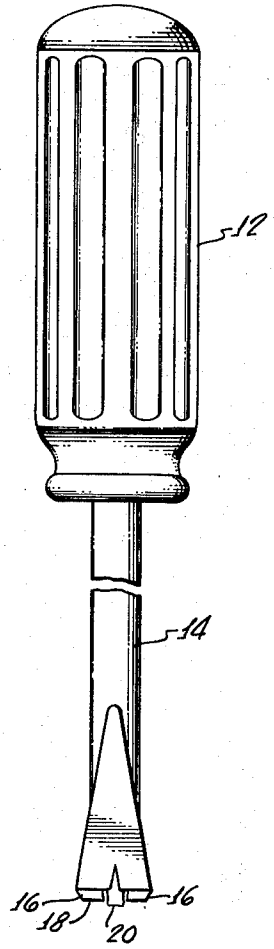
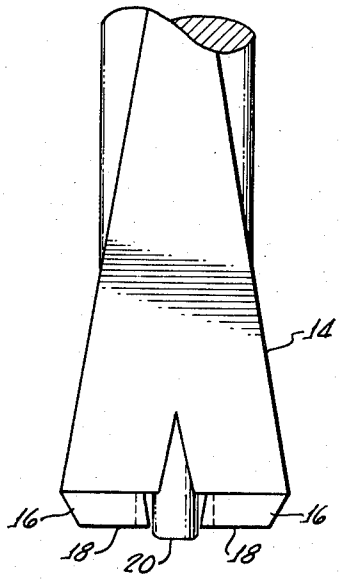


FIG. 1.



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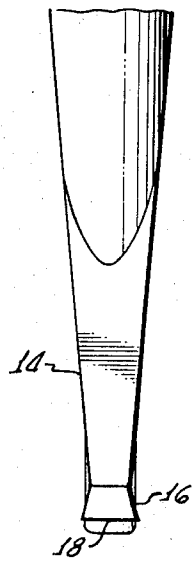

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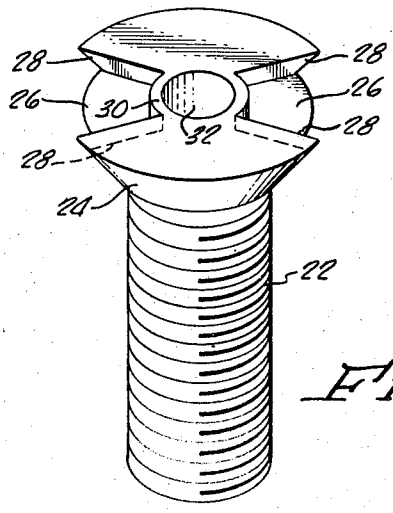

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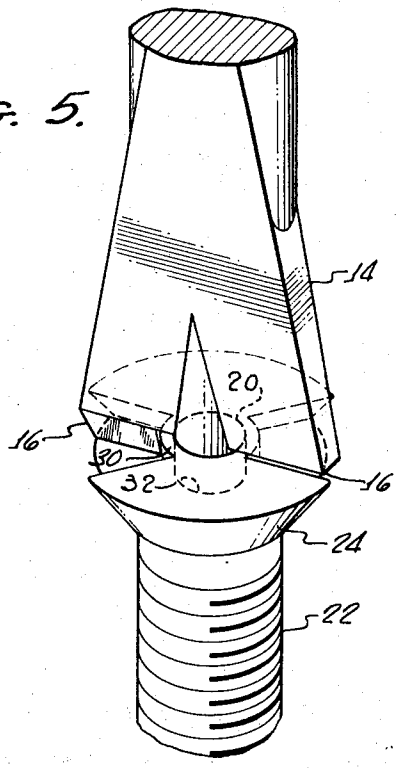

FIG. 5.

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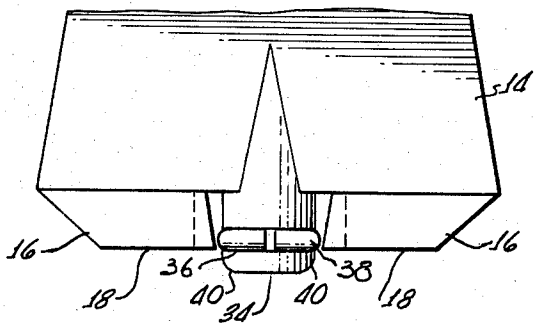

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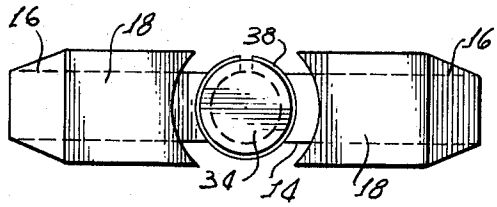

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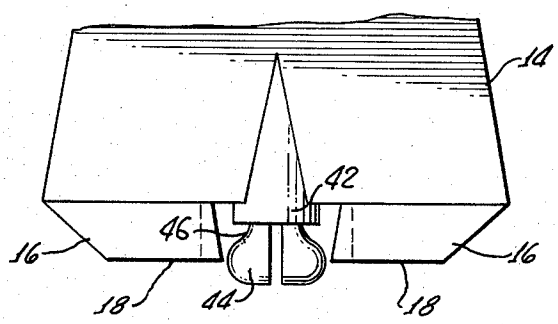

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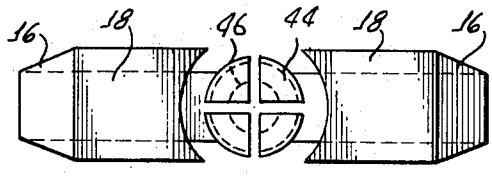

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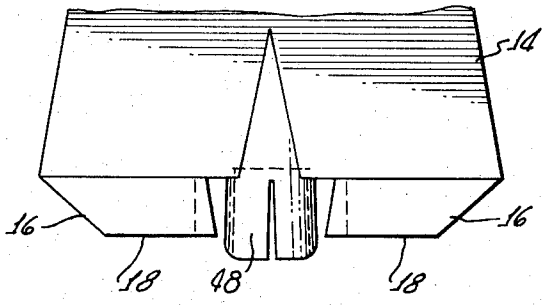

FIG. 10.

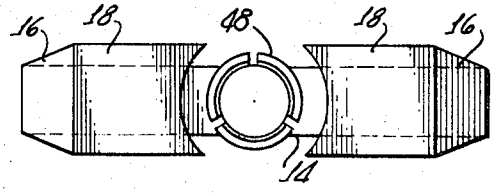

FIG. 11.

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CAVITY HEAD SCREW AND DRIVING TOOL THEREFOR

This application is a continuation-in-part of my application Ser. No. 827,627, filed May 26, 1969.

This invention relates to a screw or fastener, and to a driving tool to drive or withdraw such screw.

My aforesaid application Ser. No. 827,627 describes and claims a screw or rotatable fastener, and a screwdriver for such fastener in which the screwdriver blades are locked in screwhead cavities so that the screwdriver blades cannot slip endwise to mar the work, nor can the blade slip upwardly out of the cavities. No pressure whatsoever is required to maintain the screwdriver blades and the screwhead in proper working engagement. This is accomplished by providing a screw or rotatable fastener having a plurality of radial, cuneiform cavities in its head upper surface. The generally radial side walls of the cavities are undercut and the cavities are arranged on either side of, or around, a central land in the screwhead surface. A screwdriver having a plurality of spaced apart blades is employed to engage the cavities in the screwhead and to drive the screw. Each screwdriver blade has its bottom portion of expanded thickness so that these expanded portions can lock in under the undercut side walls of the screwhead cavities. The screwdriver blades are laterally spaced apart from each other on either side of, or around a central aperture into which fits or mates the central land in the head of the screw. Thus when the screwdriver blades are in working engagement with the screw their expanded bottom portions are locked under the undercut cavity side walls and the central land in the screwhead surface mates with the aperture between the screwdriver blades to maintain positive central alignment. The screwdriver cannot slip endwise, or up out of a slot, and no pressure is required to maintain the screwdriver blades in working engagement with the screw.

The screw and driving tool of this invention comprise an improvement over those described above in that the screw can be accurately guided or piloted into proper position to receive the blades in the cavities in the screwhead and is axially aligned and stabilized with respect to the driving tool. This is accomplished by providing a central pin depending from the shank of the screwdriver between the spaced apart blades, and a hole in the central land of the screwhead surface with which the screwdriver pin can mate. If desired, the screw can be temporarily fastened or held in such position so that easy and positive entry of the screw shank into its threaded mating piece is readily made. Split pins or other resilient means can be employed to provide tension against the walls of the hole in the screwhead land to hold a screw temporarily in place with screwhead cavities engaging the screwdriver blades.

Details of the construction and operation of this invention will be more readily apparent from the following detailed description thereof, and from the annexed drawings in which:

FIG. 1 shows a side view of a driving tool such as a screwdriver embodying features of this invention.

FIG. 2 shows the blade portion of the screwdriver of FIG. 1, considerably enlarged.

FIG. 3 shows an end view of the blade portion of the screwdriver of FIG. 1, considerably enlarged.

FIG. 4 shows a perspective view of a screw embodying features of this invention.

FIG. 5 shows a perspective view of a screwdriver and screw according to this invention in working engagement.

FIG. 6 shows a side view, enlarged, of the blade portion of the screwdriver of FIG. 1 having a modified central pin.

FIG. 7 shows a bottom view of the screwdriver blade portion of FIG. 6.

FIG. 8 shows a side view, enlarged, of the blade portion of the screwdriver of FIG. 1 having another type of modified central pin.

FIG. 9 shows a bottom view of the screwdriver blade portion of FIG. 8.

FIG. 10 shows a side view, enlarged of the blade portion of the screwdriver of FIG. 1 having yet another modification of the central pin.

FIG. 11 shows a bottom view of the screwdriver blade portion of FIG. 10.

Referring to FIGS. 1, 2 and 3 the driving tool, is shown, for example, having a conventional screwdriver handle 12 to which is attached a shank 14 to which are attached a plurality, two in the example shown, of radial, laterally spaced apart blades 16. These blades 16 are are characterized by a bottom 18 of expanded thickness as will be most clearly seen in FIG. 3. Between blades 16 and depending from the shank 14 is a central pin 20 which is preferably longer, as shown, than the height of blades 16.

Referring now particularly to FIG. 4 the screw comprises a shank 22 and a head 24 which is characterized by having in its head surface a plurality, two in the example shown, of radial cuneiform cavities 26 having undercut sidewalls 28. Cavities 26 are separated by a central land 30 in which is a hole 32 adapted to mate with pin 20 depending from the driving tool shank as shown in FIGS. 1 and 2.

In FIG. 5 the screwdriver of FIG. 1 and the screw of FIG. 4 are shown in working engagement. Screwdriver blades 16 are in cavities 26 in the screwhead 24 with their side faces engaging the undercut side walls, and pin 20 depending from screwdriver shank 14 is mated with hole 32 in the central land 30 of the screwhead 24.

In FIGS. 6 and 7 is shown, enlarged, the blade portion of a driving tool with a modified central pin 34 having resilient means including an encircling or girdling groove 36 in which is placed split spring expansion ring 38 whose purpose is to temporarily grip the sidewalls of hole 32 in the screw. Preferably ring 38 is laterally curvate to provide easy entry and withdrawal from hole 32, and the bottom edge of pin 34 is also radiused as at 40 to provide easy entry.

In FIGS. 8 and 9 is shown, enlarged, the blade portion of a driving tool with another type of modified central pin comprising an upper shoulder portion 42 adapted to mate with hole 32 in the head of the screw, and a lower bulbous portion 44 attached to shoulder 42 by neck 46. This assembly is vertically split into a plurality of spaced apart sections to provide spring tension or resilience against the walls of hole 32 when inserted therein.

In FIGS. 10 and 11 is shown, enlarged, the blade portion of a driving tool with yet another type of modified central pin comprising a tube 48 vertically split into a plurality of spaced apart sections to provide spring ten-

sion or resilience against the wall of hole **32** when inserted therein.

The term "screw" as employed herein in the specification and claims is intended to embrace all types of headed fasteners and other elements which are set, tightened, or adjusted by rotation. This will include wood screws, sheet metal screws, machine screws, and cap screws, as well as applications wherein a screwhead is adapted for rotation of control rods and shafts for a wide variety of purposes.

The term "radial" as applied to the cuneiform cavities in the head surfaces of the screw of this invention is intended to convey a description within the limits of available language. The side walls of these cavities may not be, accurately speaking, true radii since they may not, or may not if extended, meet at the center of the screwhead surface. They are shown with opposite sides of the facing cavities parallel so that the opposite sides of the driving tool can be parallel and perfect alignment and contact obtained. Their appearance in the example illustrated is, however, similar to radiating surfaces and for clarity they are thus described. Cavities sides as true radii may of course be used, with driver blades corresponding.

Operation of this invention may be described with reference to FIGS. **1** to **5**. The driving tool or screwdriver blades **16** are engaged with a screwhead **24** initially with the blades **16** centrally in cavities **26**, and with pin **20** between the screwdriver blades **16** mating with hole **32** in the land **30** between the screwhead cavities **26**. Then the screwdriver may be rotated clockwise in FIG. **5** to drive the screw, and, while driving, the expanded bottom portions **18** of blades **16** will lock under the undercut side walls **28** of screwhead cavities **26** and prevent any slipping or displacement of the blades **16** with respect to the screw. To remove the screwdriver, the blades **16** are backed counterclockwise sufficiently so that they are centered in cavities **26** from which the blades **16** may now be readily withdrawn. For withdrawal of the screw, the screwdriver blades **16** are inserted into the cavities **26** as before and the screwdriver rotated counterclockwise as will be obvious. During the withdrawal the same advantageous locking action between the screwdriver blades **16** and the screwhead cavities **26** is obtained.

The embodiments of the driving tool or screwdriver illustrated in FIGS. **6** to **11** are particularly advantageous for temporarily locking the screwdriver to a screw. When the central pin is inserted in hole **32** in the screwhead, the split ring **38** in FIGS. **6** and **7**, the split bulb **44** in FIGS. **8** and **9**, or the split tube **48** in FIGS. **10** and **11** expand to grip the inner wall of hole **32** to temporarily lock the screw and screwdriver together.

The driving tool and fastener of this invention are useful for many applications in which positive control of the screw by the driving tool is important. The pin between the driving tool blades makes for ready alignment of the driver blades when engaged in the corresponding hole in the screwhead surface. Additionally resilient or tension means incorporated into the driving tool pin provides temporary locking together of the screw and screwdriver. While the inner edges of the driving tool blades will contact the outer edges of the screw central land and to a degree pilot these elements into proper relationship, the pin and hole combination of this invention provides positive, strong piloting and guiding effect. Additionally, when the driving tool pin is longer than the height of the driver blades it will enter its mating hole in the screw before the blades enter the screwhead cavities, thus providing proper alignment before blade and screw contact. This may be more important when the driving tool is power driven or automatically operated and when it might be disadvantageous for rotating force to be applied before the screw and driving blades are properly aligned.

The driver central pin, when inserted in its mating hole in a fastener, also serves to provide longitudinal or axial stability between the driver and the screw. This is particularly useful when the driving tool is power or automatically operated and also when the driving tool is provided with a right angle handle for exerting powerful torque. Under these conditions, it is advantageous to provide the pin and hole for central alignment and accurate bearing so that the pin acts as a type of central shaft for guidance and control while the blades can exert full unrestricted rotative power. The embodiment in which the pin is of greater length than the driver blade height provides additional bearing area for even greater central alignment and axial stabilization.

Provision of resilient means in the driver pin construction is valuable for use with any embodiment wherein a temporary locking of the screw onto the driver blades may be required, such as fastening assemblies under weightless conditions or the like. Various resilient mechanisms may be employed including springs, resilient expanding assemblies or resilient materials such as rubber or neoprene in suitable configurations, as will be apparent. This feature is important since the driving tool can be used for one-handed operation and the screw accurately guided into its threaded mating piece. Thus the fastener can be accurately guided into proper position even in remote or difficult-of-access locations and at the same time is held in positive, accurate alignment with the driving tool. When torque is applied the driver pin holds the fastener in proper axial position for most effective application of rotative driving force. After driving, the driving tool blades and the central pin can readily be withdrawn from the screw.

I claim:

1. The combination of a driving tool and a screw to be driven thereby, said driving tool having a shank, a plurality of laterally spaced apart flat blades attached to said shank, the lower portions of said blades being of expanded thickness, and said screw having a plurality of radial cuneiform cavities in its head upper surface, said cavities having undercut sidewalls and a central land separating said cavities, said central land in said screwhead surface adapted to mate with the space between said screwdriver blades, and the expanded portions of said screwdriver blades engaging said undercut sidewalls of said cavities in the surface of said screw when said screwdriver and said screw are in working engagement, in which the improvements comprise:

a said driving tool having a central pin depending from said shank between said laterally spaced apart blades; and,

b said screw having a hole in the central land separating the cuneiform cavities in the head thereof adapted to mate with the said pin depending between the blades of said driving tool.

2. The combination of claim 1 in which the depending pin of said driving tool has resilient means to temporarily grip the walls of said hole in said central land of the head surface of said screw when said driving tool and said screw are in working engagement.

3. The combination of claim 1 in which the depending pin of said driving tool has an encircling groove around its outer surface and expandable spring means in said groove adapted to temporarily grip the walls of said hole in said central land of the head surface of said screw when said driving tool and said screw are in working engagement.

4. The combination of claim 1 in which the depending pin of said driving tool has an upper shoulder portion adapted to mate with said hole in the central land of the head surface of said screw, and a lower bulbous portion split vertically into a plurality of spaced apart sections and adapted to temporarily grip the walls of said hole in the central land of the head surface of said screw when said driving tool and said screw are in working engagement.

5. The combination of claim 1 in which the depending pin of said driving tool is of tubular form and split vertically into a plurality of spaced apart sections and adapted to temporarily grip the walls of said hole in the central land of the head surface of said screw when said driving tool and said screw are in working engagement.

6. The combination of claim 1 in which the cross section of the depending pin of said driving tool and the cross section of the hole of the central land of the head surface of said screw are circular.

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