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(54)

Multi-functional fastener driver device

(57) A multi-functional fastener driver device 10 that is capable of providing rotational force to fasteners having different configurations (hexagonal, flathead, wing-nut or hook screw, for example) to urge a preselected fastener into a workpiece. The device 10 includes a first portion 12 that is secured, via a shank portion 16, to a tool providing rotary force, and a second portion 14 that transfers the rotary force to a preselected fastener via a plurality of arm members 30. The arm members 30 are configured from multiple apertures 24 and 38, and slots 32 and 34. The arm members 30 engage the fas-

tener and force the fastener to rotate thereby "screwing" the fastener into the workpiece. When fasteners are too large to rotate without deforming the arm members 30, a sleeve 42 is utilized to snugly receive the device 10 therein to maintain the arm members 30 configuration while rotating the fastener. Further, the sleeve 42 includes opposing recesses 52 in an end wall 50. The recesses 52 are adapted to align with a slot 32 or 34 in a fastener receiving end 25 of the device 10 to allow the drive ends of large fasteners to be engaged by both the device 10 and the sleeve 42.

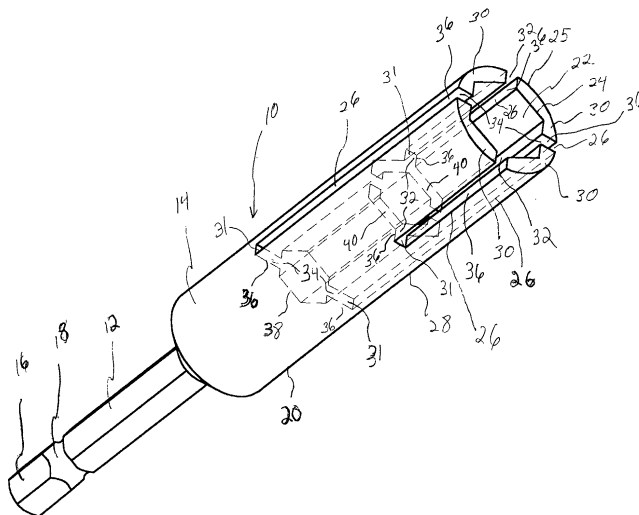


FIG. 1

Description

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0001] The present invention relates generally to fastener drivers and, more particularly, to fastener drivers that are capable of providing rotational force to fasteners having different sizes and configurations.

2. BACKGROUND OF THE PRIOR ART

[0002] Fastener drivers that provide rotational motion to urge fasteners into a workpiece, come in a variety of sizes and configurations. These drivers are designed to cooperate with the size and configuration of a preselected fastener. Some fastener configurations are non-symmetrical or "odd" shaped and present problems in providing a driver that is capable of receiving and rotating the fastener. Examples of these odd shaped fasteners include flathead, wingnut and hook screw.

[0003] Prior art drivers that are capable of rotating these odd shaped fasteners, are relegated to engaging only one shape of fastener. Further, prior art drivers have only limited tolerance for fastener dimensional variations corresponding to the preselected shape. Examples of prior art fastener drivers are disclosed in U.S. Patents 5,697,268; 4,724,731; 4,706,380; 3,812,894; 3,742,533; and Des. 379,420. None of these prior art devices provide a tool that will deliver rotary motion to two or more odd shaped fasteners including but not limited to flathead, wingnut or hook screw. When confronted with two or more different fasteners, two or more different fastener drivers are required. A need exists for a multi-functional fastener driver device that will deliver rotational force to a variety of fastener configurations within predetermined dimensional ranges for the respective fastener.

SUMMARY OF THE INVENTION

[0004] It is an object of the present invention to provide a multi-functional fastener driver device that overcomes many of the disadvantages of the prior art.

[0005] A principle object of the present invention is to provide a device that allows an individual to use one tool to drive one of several types and sizes of fastener into a workpiece. A feature of the device is that it has multiple slots and apertures to receive a preselected fastener. An advantage of the device is that it replaces several drive tools with one when driving different sized or configured fasteners.

[0006] Another object of the present invention is to provide multiple hexagonally configured apertures. A feature of the device is "nested" hexagonal apertures. An advantage of the device is that it allows several sizes of hex head fasteners to be driven into a workpiece with

only one fastener driver.

[0007] Still another object of the present invention is to provide a method of preventing deformation of the device when driving large fasteners. A feature of the device is a cylindrical configuration that allows the device to be forcibly inserted into a sleeve. An advantage of the device is that it is capable of driving large fasteners without damage to arm members that engage and rotate the head of the fastener.

[0008] Yet another object of the present invention is to provide a method of rotating large hook screw or flat-head fasteners. A feature of the device is a preselected slot in a fastener receiving end of the device that aligns with a pair of opposing recesses in an end wall of the sleeve. An advantage of the device is that it is capable of driving the large fasteners without damage to the arm members or the fastener.

[0009] A further object of the invention is to provide a device that transfers rotary motion to a wingnut fastener. A feature of the device is a substantially "V" configured outer recess having converging side walls and a base wall. An advantage of the device is that it guides the "wings" of the wingnut into snug engagement with cooperating portions of the base and side walls for efficient transfer of rotary motion to the wingnut.

[0010] Another object of the invention is to provide a device that transfers rotary motion to a variety of fastener configurations including wingnut, hook screw or flat-head. A feature of the device is an inner rectangular configured recess radially displaced from the outer substantially "V" configured recess. An advantage of the device is that it is capable of providing rotary motion to a variety of fastener configurations having a relatively wide range of dimensions.

[0011] Another object of the invention is to increase the area of engagement between the fastener and the device. A feature of the device is a plurality of hub engagement sectors having concave surfaces corresponding to a convex surface of a hub portion of the wingnut. An advantage of the device is that it stabilizes the wingnut as the wingnut is forcibly rotated by the device.

[0012] Still another object of the invention is to provide a device that is capable of forcibly driving a stud bolt, which removably receives a wingnut, into a workpiece. A feature of the device is a straight threaded second orifice "nested" in a first orifice. An advantage of the device is that one tool anchors the stud bolt and forcibly tightening the wingnut upon the stud bolt.

[0013] Yet another object of the invention is to increase the area of engagement between the "wings" of the wingnut and the device. A feature of the device is a sectioned base wall in the outer recess of the device. An inner planar section of the base wall engages a planar portion of the wings of the wingnut. A planar angled or alternatively arcuate outer section of the base wall engages an arcuate portion of the wings of the wingnut. An advantage of the device is that it will not deform the

wings of wingnut when forcibly rotating the wingnut into a "tightened" or "loosened" position.

[0014] Yet another object of the present invention is to increase the "gripping" capability of the outer recess when rotationally engaging the wings of the wingnut. A feature of the device is knurled surfaces on side and base walls of the outer recess. An advantage of the device is that it increases the rotational force received by the wingnut from the device.

[0015] Another object of the present invention is to provide a relatively large stud bolt receiving first orifice in the device. A feature of the device is a relatively lengthly longitudinal dimension for the first orifice. An advantage of the device is that it internally receives a stud bolt having a relatively long portion extending through and beyond a wingnut tightened upon the stud bolt. Internally receiving the stud bolt, allows the device to snugly engage the wingnut to forcibly rotate the wingnut in a "tightening" or "loosening" direction.

[0016] Briefly, the invention provides a multi-functional fastener comprising a first portion having means for receiving rotary motion; a second portion integrally joined to said first portion, said second portion having means for transferring rotary motion to a fastener; said rotary motion receiving means including a shank having a hexagonal configuration, said rotary motion transferring means further comprising a hexagonal configured aperture extending longitudinally from a fastener receiving end of said second portion; a first slot for receiving a flathead fastener having a first dimensions, said first slot extending longitudinally from said fastener receiving end of said second portion; and a second slot for receiving a flathead fastener having second dimensions, said second slot extending longitudinally from said fastener receiving end of said second portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The foregoing invention and its advantages may be readily appreciated from the following detailed description of the preferred embodiment, when read in conjunction with the accompanying drawings in which:

Figure 1 is a phantom, front perspective view of a multi-functional fastener driver device in accordance with the present invention.

Figure 2 is a front elevation view of the device of figure 1.

Figure 3 is a side elevation view of the device of figure 1,

Figure 4 is a phantom, front perspective view of a sleeve that receives a multi-functional fastener driver device therein in accordance with the present invention.

Figure 5 is a side elevation view of the device of figure 1 inserted in the sleeve of figure 4.

Figure 5A is a combination of figures 1 and 4 orientating the sleeve of figure 4 for receiving the device

of figure 1.

Figure 6 is a perspective view of a multi-functional wingnut fastener driver device in accordance with the present invention.

Figure 7 is a front elevation view of the device of figure 6.

Figure 8 is a side elevation view of the device of figure 6.

Figure 9 is a top elevation view of the device of figure 6.

Figure 10 is a sectional view taken along line 10-10 of figure 9.

Figure 11 is a sectional view taken along line 11-11 of figure 9.

Figure 12 is the sectional view of the device of figure 11 with a stud bolt screwed into a second orifice.

Figure 13 is the sectional view of the device of figure 10 with a wingnut inserted in an outer recess such that the "wings" of the wingnut engage a base wall of the outer recess.

Figure 14 is a perspective view of an alternative embodiment of the multi-functional wingnut fastener driver device of Figure 6 in accordance with the present invention.

Figure 15 is a front elevation view of the device of Figure 14.

Figure 16 is a top elevation view of the device of figure 14.

Figure 17 is a sectional view taken along line 17-17 of Figure 16.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0018] Referring now to the figures and in particular to figures 1-3, perspective, front and side elevation views of a multi-functional fastener driver in accordance with the present invention is denoted by numeral 10. The multi-functional fastener driver device 10 is a single piece tool fabricated from steel or similar strength material pursuant to manufacturing techniques well known to those of ordinary skill in the art. The driver 10 receives rotary motion from a manual or power driver source (not shown), and transfers the rotary motion to a fastener (not shown). The fastener may range in size and configuration from a relatively small hook screw to a relatively large flathead fastener.

[0019] The multi-functional fastener driver device 10 includes a first portion 12 integrally joined to second portion 14. The first portion 12 has a hexagonal configuration (when taking a side view of the device 10) and a longitudinal dimension substantially longer than a corresponding lateral dimension, thus providing a shank portion 16 that includes a detent 18 for ultimate insertion into the chuck of a power tool, or the socket of a manual driver that provides rotary motion.

[0020] The second portion 14 includes a cylindrical outer wall 20, a hexagonally configured (when taking a side view of the second portion 14) inner wall 22 that

forms a hexagonal fastener receiving aperture 24 extending coaxially with the cylindrical outer wall 20 from a fastener receiving end 25, a longitudinal distance substantially near a mid-section 28 of the second portion 14, and four recesses 26 extending parallel to the longitudinal axis of the second portion 14 to form four spaced apart arm members 30 having four fastener head engagement walls 31 there between.

[0021] The hexagonal fastener receiving aperture 24 has a predetermined cross-sectional area that snugly receives a correspondingly configured fastener head. Although the preferred aperture 24 configuration is hexagonal, alternative aperture 24 configurations including square and triangular may be utilized. The four recesses are equally spaced apart such that adjacent recesses are radially separated or offset ninety degrees thereby oppositely positioning two of the four recesses to form radial slots 32 and 34 (although the slots 32 and 34 may be radially aligned or radially offset other than ninety degrees should the fastener design require a different offset parameter) that cooperate with the receiving aperture 24 to allow a flathead fastener to be inserted in one of the slots 32 or 34. Obviously, the second portion 14 is capable of receiving only one preselected fastener in either the receiving aperture 24 or a radial slot 32 or 34. Thus, the second portion 14 is multi-functional because it is capable of receiving a wide variety of fasteners.

[0022] However, the second portion 14 has a tendency to flex and deform when transferring a rotational force to a fastener due to the spacing between the arm members 30. Also, the distance separating inner and outer walls 22 and 20, which determines the lateral thickness and corresponding rigidity of the arm members 30, is an important parameter effecting the degree of deformation of the second portion 14. More specifically, arm members 30 having shorter longitudinal dimensions and greater lateral thickness, will have less flexure and deformation when transferring rotational forces to a fastener inserted therein. Thus, more rotational force is transferred to the fastener.

[0023] The multi-functional capabilities of the present device 10 is enhanced by varying the dimensions or the axial alignment of the two slots 32 and 34. The slots 32 and 34 can vary in both longitudinal and lateral dimensions thereby allowing different sizes of flathead fasteners to be received by the second portion 14. Further, the slots 32 and 34 can be axially aligned with different lateral dimensions thus forming a "nested" slot configuration. An extra benefit provided by minimizing the longitudinal dimension of slot 32, is that the corresponding portions of the arm members 30 adjacent to slot 32, will be more resistant to deformation when transferring rotational force to the inserted fastener. Besides varying the longitudinal and lateral dimensions of the slots to decrease deformation of the second member 14 and the arm members 30, deformation is further reduced by providing a taper to the inner longitudinal walls 36 forming the slots 32 and 34. The tapered walls 36 converge as

a fastener head inserts into the slots 32 and 34 until the fastener head ultimately engages both longitudinal walls 36; compared to parallel inner longitudinal walls 36 that allow the fastener head to contact engagement walls 31.

The tapered walls 36 provide a method of continuously transferring rotary motion from the second portion 14 to a flathead fastener due to the continuous engagement between the tapered walls 36 and the fastener head; compared to parallel inner longitudinal walls 36 that allow gaps to occur between the fastener head and the parallel walls 36 resulting in unstable rotary force transfer.

[0024] The multi-functional driver device's 10 capabilities are further enhanced by including a "nested" hexagonal aperture 38 coaxial with the receiving aperture 24. The nested aperture 38 has substantially the same hexagonal configuration as the receiving aperture 24, but the nested aperture 38 has relatively smaller corresponding dimensions. This nested arrangement results in a rim wall 40 formed at the bottom of the receiving aperture 24. The rim wall 40 not only acts as a stop for the hexagonal head of a fastener inserted in the receiving aperture 24, but also provides added lateral thickness to corresponding portions of arm members 30 adjacent thereto. The added lateral thickness decreases arm member 30 flexure when transferring rotary force to fasteners.

[0025] Referring now to figures 4, 5 and 5a, the installation of some of the large fasteners requires a great amount of rotational force to drive the fastener into a workpiece. In these situations, the second portion 14 will deform to unacceptable configurations irrespective of the design of the device 10. To prevent this degree of deformation, a cylindrical outer sleeve 42 having an inner wall 44 substantially equal in diameter to and coaxially with the outer wall 20 of the second portion 14, forcibly receives the second portion 14 such that the fastener receiving end 25 of the second portion 14 is planar or "flush" with a corresponding receiving end 46 of the sleeve 42. The sleeve 42 includes a cylindrical outer wall 48 having a diameter relatively larger than the diameter of the inner wall 44 thereby preventing deformation of the second member 14 and providing sufficient surface area to form an end wall 50 that allows a pair of opposing recess 52 to be positioned adjacent to one of the slots 32 or 34 in the receiving end 25 in the second member 14.

[0026] The recesses 52 extend parallel to the longitudinal axis of the sleeve 42, a distance relatively short compared to the longitudinal extension of the slots 32 and 34. The recesses 52 have a lateral dimension equal to the lateral dimension of one of the slots 32 or 34. The recesses 52 are positioned adjacent to one of the slots 32 or 34 thereby expanding the radial dimension of the chosen slot 32 or 34 to substantially equal the diameter of the outer wall 48 of the sleeve 42 thus allowing a much larger fastener head to be engaged and rotated by the combined second portion 14 and sleeve 42.

[0027] In operation, a first portion 12 of a multi-function fastener driver device 10 is secured to a manual or powered rotary driver tool via a shank portion 16. A fastener having a predetermined configuration is inserted in correspondingly configured hexagonal apertures 24 or 38, or slots 32 or 34 in the second portion 14 which is integrally joined to the first portion 12. Rotary motion is transferred from the rotary driver tool to the fastener via arm members 30 thereby providing sufficient rotational force to urge the fastener into a workpiece.

[0028] A sleeve 42 is provided to snugly receive the device 10 therein to prevent the arm members 30 from deforming should the selected fastener be relatively large and require excessive rotational force to drive the fastener into the workpiece. The sleeve 42 includes a rim or end wall 50 that is planar with the fastener receiving end 25 of the second portion 14. The end wall 50 of the sleeve 42 includes opposing recesses 52 that are positioned adjacent to either slot 32 or 34 to lengthen the chosen slot thereby providing more engagement area between the large fastener and the combined device 10 and sleeve 42, thus transferring the rotational force across a larger portion of the fastener head and reducing wear on the device 10 and sleeve 42.

[0029] Referring now to figures 6-9, perspective, front, side and top elevation views depict a multi-functional wingnut fastener driver device 60 in accordance with the present invention. The wingnut fastener driver device 60 is an alternative embodiment of the multi-functional fastener driver device 10 detailed above. The wingnut device 60 includes a first or shank portion 62, a second or cylindrical portion 64, and a frustoconically configured middle portion 66 that integrally joins the shank portion 62 to the cylindrical portion 64 whereby the rotational force imposed upon the shank portion 62 is transferred to a fastener end or drive end 68 of the cylindrical portion 64.

[0030] The shank portion 62 is hexagonally configured and includes a detent 70 and cooperating end portion 72 that ultimately insert into a rotary tool. The shank portion 62 is laterally and longitudinally dimensioned to insert in a standard rotary tool such that the middle and cylindrical portions 64 and 66 are positioned adjacent to the rotary tool, yet avoid communication with the rotary tool, thus providing safety and maximum rotary force.

[0031] The middle portion 66 is coaxial with and integrally joined to the shank portion 62, and includes a cylindrical section 74 coaxial with integrally joined to the cylindrical portion 64 of the device 60. The diameter of the cylindrical section 74 is relatively larger than the lateral dimension of the shank portion 62, and relatively smaller than the diameter of the cylindrical portion 64 thereby allowing the device 60 to drive a wingnut having dimensions relatively larger than the drive end of the rotary tool.

[0032] The cylindrical portion 64 includes a cylindrical outer wall 76 extending longitudinally from the middle portion 66 to the drive end 68, a cylindrical inner wall 78

coaxial to the outer wall 76 and extending a relatively short axial distance from the drive end 68, a first orifice 79 coaxial to the inner wall 78 extending an axial distance that positions a bottom wall 81 of the first orifice 79 proximate to the longitudinal mid-portion of the cylindrical portion 64, a second non-tapered or straight threaded orifice 83 coaxial to the first orifice 79 and extending from the bottom wall 81 of the first orifice 79 to a longitudinal position substantially adjacent to the middle portion 66 of the device 60, an outer tapered recess 80 extending transversely across the drive end 68 of the cylindrical portion 64 and to a "depth" dimension relatively longer than the axial length of the inner wall 78, and an inner rectangular configured recess 82 extending diametrically across the drive end 68 and radially displaced from the outer recess 80.

[0033] The outer tapered recess 80 is substantially "V" shaped (when taking a front view of the device 60 -See Fig. 7) with relatively "steep" converging side walls 84 that extend from the drive end 68 to a base wall 86. The side walls 84 receive the "wings" 102 of the wingnut 104 to guide the wingnut 104 into snug engagement with the base wall 86 and converging side walls 84 (see figure 13). The base wall 86 has a relatively small lateral dimension in relation to its longitudinal dimension. The base wall 86 includes two sections separated by the first orifice 79, each section including inner and outer angularly joined planar portions 88 and 90 that engage corresponding portions of the wingnut. The inner portions 88 are opposing, planar, radially extending walls that are perpendicular to the axis of the cylindrical portion 64, and extend from the perimeter of the first orifice 79 to the outer portions 90 of the base wall 86. The outer portions 90 integrally join to corresponding inner portions 88 and the outer wall 76 of the cylindrical portion 64 such that a relatively large acute angle is formed between the cylindrical inner wall 78 and the outer portions 90 of the base wall 86. The inner portions 88 engage corresponding planar portions of the wings 102 of the wingnut 104 while the outer portions 90 engage corresponding arcuate portions of the wings 102 thereby providing multiple contact points between the device 60 and the wingnut 104 to transfer rotary motion from the device 60 to the wingnut 104 without deforming the wings 102. Although the outer portions 90 have been detailed above as being "planar," the outer portion configuration may be arcuate to enhance engagement with the arcuate portions of the wings 102 of the wingnut 104. The transfer of rotary motion is further increased by adding "gripping" capability in the form of knurled surfaces upon the side and base walls 84 and 86 of the outer recess 80.

[0034] Referring to figures 6, 9, 10, 11, 12 and 13, the rectangular inner recess 82 is radially displaced substantially about ninety degrees from the outer tapered recess 80, thus allowing the device 60 to not only receive and rotate wingnut fasteners, but also to rotary drive the flathead and hook screw fasteners detailed above. The inner recess 82 extends diametrically

across the drive end 68 to integrally join with the cylindrical inner wall 78 and the first and second orifices 79 and 83. The inner recess 82 cooperates with the outer recess 80 and the first orifice 79 to configure four hub engagement sectors 92 that are countersunk from the drive end 68 of the cylindrical portion 64. Each hub engagement sector has a concave hub engagement surface 94 that congruently engages a corresponding hub portion 106 of the wingnut 104 to stabilize the wingnut 104 as the device 60 transfers rotary motion to the wingnut 104 via the outer recess 80 engaging and rotating the wings 102 of the wingnut 104. The first orifice 79 has a diameter relatively larger than that of a preselected stud bolt 96 that is to be anchored into a first workpiece (not shown) to ultimately receive and secure a second workpiece (not shown) thereto. The stud bolt 96 has a first end 98 that passes through the first orifice 79 and threads into the straight threaded second orifice 83, which is longitudinal "nested" inside the first orifice 79, to rigidly secure the bolt 96 to the device 60. The second orifice 83 is dimensioned to rotationally receive the correspondingly threaded first end 98 of the stud bolt 96. The secured stud bolt 96 has a second end 100 that protrudes beyond the drive end 68 of the device 60, a dimension that allows the second end 100 to be inserted into the first workpiece a depth that rigidly secures the bolt 96 to the first workpiece. The second orifice 83 allows the device 60 to rotatably drive the threaded second end 100 of the stud bolt 96 into the first workpiece until the stud bolt 96 is secured and anchored thereto. Once the stud bolt 96 is secured, reversing the rotation of the device 60 easily detaches the device 60 from the bolt 96 due to the non-binding characteristics of the straight thread of the second orifice 83.

[0035] The stud bolt 96 ultimately inserts through an orifice in the second workpiece whereupon a wingnut is hand tightened on the bolt 96. The device 60 is positioned upon the stud 96 such that the outer recess 80 of the device 60 receives the wings 102 of the wingnut 104 and the first orifice 79 receives the first end 98 of the bolt 96. The device 60 rotationally tightens the wingnut 104 until the second workpiece is rigidly secured to the first workpiece. Obviously, the longitudinal dimension of the first orifice 79 must be capable of receiving the longitudinal portion of the stud bolt 96 extending past the wings 102 of the tightened wingnut 104 thereby preventing obstructions to the longitudinal extension of the stud bolt 96 through the wingnut. Further, the longitudinal dimension of the second orifice 83 must be smaller than the axial dimension of the wingnut 104 to prevent the bolt 96 from re-inserting into the second orifice 83 upon tightening the wingnut 104 to secure the second workpiece to the first workpiece.

[0036] In operation, a multi-functional wingnut fastener device 60 is utilized to remove or tighten a wingnut 104 upon a stud bolt 96. Also, the device 60 is capable of forcibly driving the bolt 96 into a workpiece. To anchor the stud bolt in the workpiece, the bolt 96 is screwed into

a straight threaded second orifice 83 via the drive end 68 of the device 60 such that a portion of the stud 96 protrudes beyond the drive end 68. The device 60 is removably secured to a rotary motion tool and the protruding bolt 96 is driven into the workpiece. Once the bolt 96 is secured, the device 60 is removed from the bolt 96 by reversing the rotational direction of the rotary tool. A wingnut 104 requiring loosening or tightening is engaged by the drive end 68 of the cylindrical portion 64 of the device 60. The stud bolt 96 loosely inserts into the first orifice 79 to a position proximate to the second orifice 83. The wingnut 104 snugly fits in the drive end 68 of the device 60 such that the wings 102 of the wingnut 104 engage both the converging side walls 84 and the base walls 86 of an outer recess 80 in the drive end 68; and the convex hub portion 106 of the wingnut 104 engages corresponding concave hub engagement surfaces 94 of hub engagement sectors 92 configured via the outer and inner recess 80 and 82 in the drive end 68 cooperating with the first orifice 79. The wingnut 104 is then either loosened or tightened to the required position without the bolt 96 inserting into the second orifice 83. Once the wingnut 104 is rotated to the required position, the device 60 is easily removed from the wingnut 104 and stud bolt 96.

[0037] Referring now to figures 14-17, an alternative or modified embodiment of the multi-functional wingnut fastener driver device 60, is illustrated and denoted as numeral 150. The modified wingnut fastener driver device 150 is substantially identical to the original device 60 except that the tapered recess 80 of the original device 60 has been replaced by a rectangular recess 152 (see fig. 15) having parallel longitudinal side walls 154 substantially longer than and perpendicular to a bottom wall 156. The rectangular recess 152 is dimensioned to snugly receive the wings 102 of the wingnut 104 (see fig. 13), and to provide an increased area of engagement between the wings 102 and the side walls 154 thereby preventing the wings 102 from deforming when increasing the quantity of rotary motion urged upon the wingnut 104 to rigidly secure relatively large objects together. To further promote the transfer of rotary motion from the device 150 to the wingnut 104, and to reduce lateral movement of the device 150 relative to the wingnut 104, the bottom wall 156 of the device 150 may be configured to congruently engage a corresponding portion of the wings 102 thus stabilizing the proximate position of the device 150 relative to the wingnut 104 as the wingnut 104 is tightened upon or removed from a threaded stud bolt 96 (see fig. 13).

[0038] The foregoing description is for purposes of illustration only and is not intended to limit the scope of protection accorded this invention. The scope of protection is to be measured by the following claims, which should be interpreted as broadly as the inventive contribution permits.

Claims

1. A multi-functional fastener driver device comprising:

a first portion (12) having means (16,18) for receiving rotary motion; and
a second portion (14) integrally joined to the first portion (12) and having means for transferring rotary motion of the device to a fastener;

CHARACTERISED IN THAT the rotary motion transferring means includes a first slot (32) extending longitudinally from a fastener receiving end (25) of the second portion (12) for receiving a first fastener having a predetermined configuration and a second slot (34) extending longitudinally from the fastener receiving end (25) of the second portion (12) for receiving a second fastener having a predetermined configuration.

2. A device according to claim 1, wherein the first and second slots (32,34) are radially aligned.

3. A device according to claim 1, wherein the first and second slots (32,34) are longitudinally parallel and radially offset.

4. A device according to any preceding claim, wherein the first and second slots (32,34) are axially aligned.

5. A device according to any preceding claim, wherein the first slot (32) has a greater longitudinal extent than the second slot (34).

6. A device according to any preceding claim, wherein at least one of the first and second slots (32,34) is tapered.

7. A device according to any preceding claim, wherein the rotary motion transferring means further includes an aperture (24) in the second portion (12) for receiving a third fastener having a predetermined configuration.

8. A device according to claim 7, wherein the longitudinal axis of the aperture (24) is co-axial with the longitudinal axis of the second portion (12).

9. A device according to claim 7 or claim 8, wherein the aperture (24) has a hexagonal configuration.

10. A device according to any of claims 7 to 9, wherein the aperture (24) extends a first longitudinal distance from the fastener receiving end (25) of the second portion (12) and the rotary motion transferring means further includes a second aperture (38) extending a second longitudinal distance from the

fastener receiving end (25) of the second portion (12), the second aperture (38) being nested inside the said aperture (24).

11. A device according to any preceding claim, further comprising an outer sleeve (42) surrounding the second portion (12).

12. A device according to claim 11, wherein the outer sleeve (42) includes a slot (52) that is radially aligned with the first or second slot (32,34) in the second portion (12).

13. A device according to any preceding claim, wherein the rotary motion receiving means includes a shank (16) having a hexagonal cross-section.

14. A multi-functional wingnut fastener and winghead bolt driver device comprising:

a first portion (62) having means for receiving rotary motion; and
a second portion (64) integrally joined to the first portion (62) and having means for transferring rotary motion of the device to a wingnut fastener (104) or winghead bolt;

CHARACTERISED IN THAT the rotary motion transferring means includes a recess (80,152) in a fastener receiving end (68) of the second portion (64) and means for engaging a hub portion of the wingnut fastener (104) or winghead bolt, the hub engagement means cooperating with the recess (80) to removably receive and rotate the wingnut fastener (104) or winghead bolt.

15. A device according to claim 14, wherein the recess (80) is tapered and the fastener receiving end (68) of the second portion (64) further includes a rectangular recess (82) radially offset from the tapered recess (80).

16. A device according to claim 15, wherein the second portion (64) further includes a cylindrical outer wall (76) extending a first longitudinal distance from the fastener receiving end (68) of the second portion (64) and a cylindrical inner wall (78) co-axial with the outer wall (76) and extending a second longitudinal distance from the fastener receiving end (68) of the second portion (64), and wherein the first longitudinal distance is greater than the second longitudinal distance.

17. A device according to claim 16, wherein the hub engagement means includes a plurality of hub engagement sectors (92) integral with the inner wall (78), the hub engagement sectors (92) having a configuration corresponding to the tapered recess

(80) and the rectangular recess (82).

18. A device according to claim 17, wherein the hub engagement sectors (92) have a concave configuration and converge to form a first orifice (79) co-axial with the inner wall (78), the first orifice extending a longitudinal distance from the fastener receiving end (68) of the second portion (64) that is greater than the second longitudinal distance and less than the first longitudinal distance.

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19. A device according to claim 17 or claim 18, wherein the tapered recess (80) has converging side walls (84) extending from the fastener receiving end (68) of the second portion (64) to form a planar base wall (86) that is longitudinally displaced from the fastener receiving end (68) by a distance greater than the distance between the fastener receiving end (68) and the hub engagement sectors (92).

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20. A device according to claim 19, wherein the base wall (86) has a longitudinal dimension substantially equal to the diameter of the outer wall (76) and a lateral dimension that converges the side walls of the tapered recess (80) to receive a predetermined wingnut fastener (104) or winghead bolt that engages the base wall (86).

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21. A device according to claim 19 or claim 20, wherein the base wall (86) has an angled or arcuate profile (88,90) in the radial direction to engage predetermined portions (102) of the wingnut fastener (104) or winghead bolt.

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22. A device according to any of claims 18 to 21, wherein the second portion (84) further includes a threaded second orifice (83) co-axial with the first orifice (79) and extending longitudinally from a bottom wall (81) of the first orifice (79) for receiving a threaded bolt (96) for securing the wingnut fastener (104) to a workpiece.

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23. A device according to any of claims 16 to 22, wherein the tapered recess (80) extends substantially diametrically across the fastener receiving end (68) of the second portion (64) to join with the outer wall (76) of the second portion (64).

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24. A device according to any of claims 16 to 23, wherein the rectangular recess (82) extends substantially diametrically across the fastener receiving end (68) of the second portion (64) to join with the inner wall (78) of the second portion (64).

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25. A device according to any of claims 15 to 24, wherein the tapered recess (80) includes means for gripping portions of the wingnut fastener (104) or winghead bolt.

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26. A device according to claim 25, wherein the gripping means includes knurled side and base walls of the tapered recess (80).

5

27. A device according to any of claims 14 to 26, wherein the rotary motion receiving means includes a shank (72) having a hexagonal cross-section.

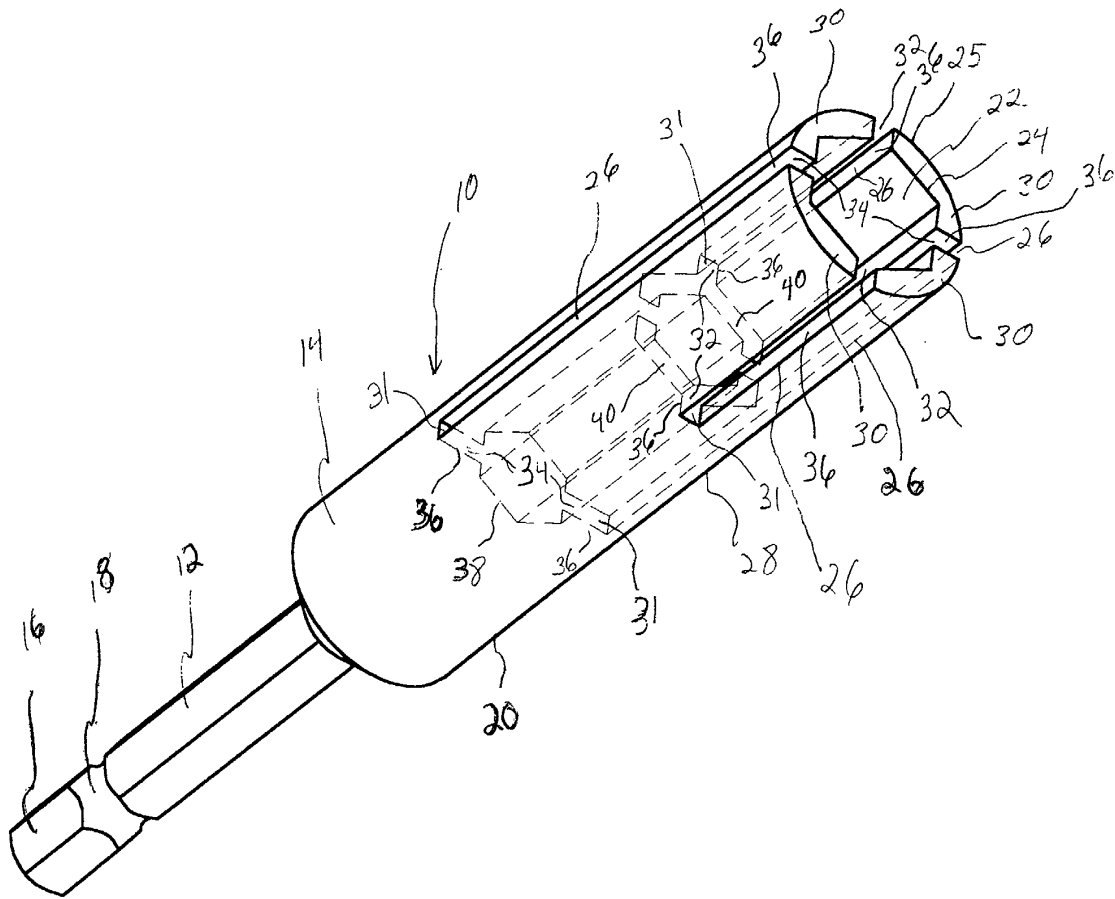


FIG. 1

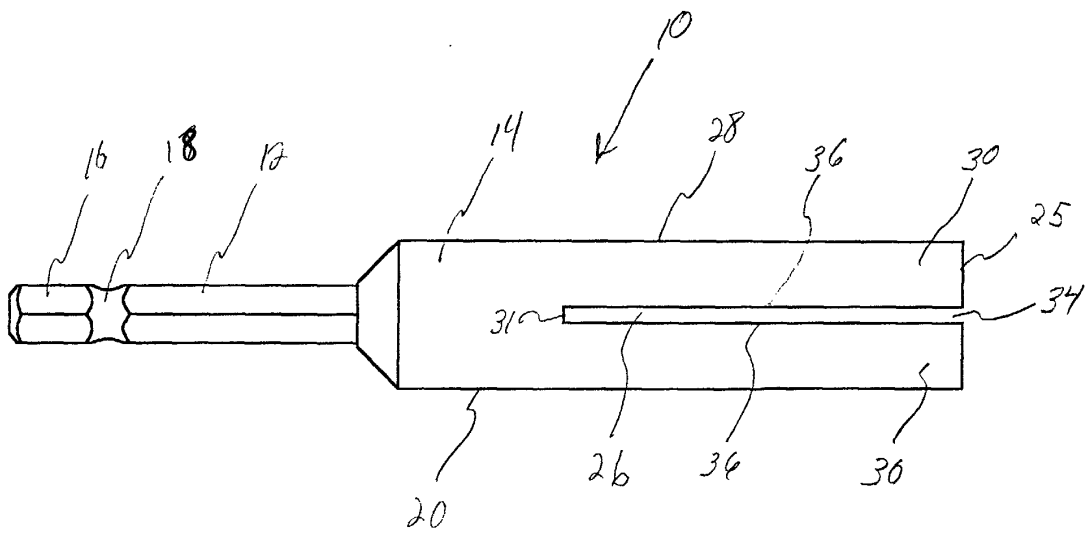


FIG. 2

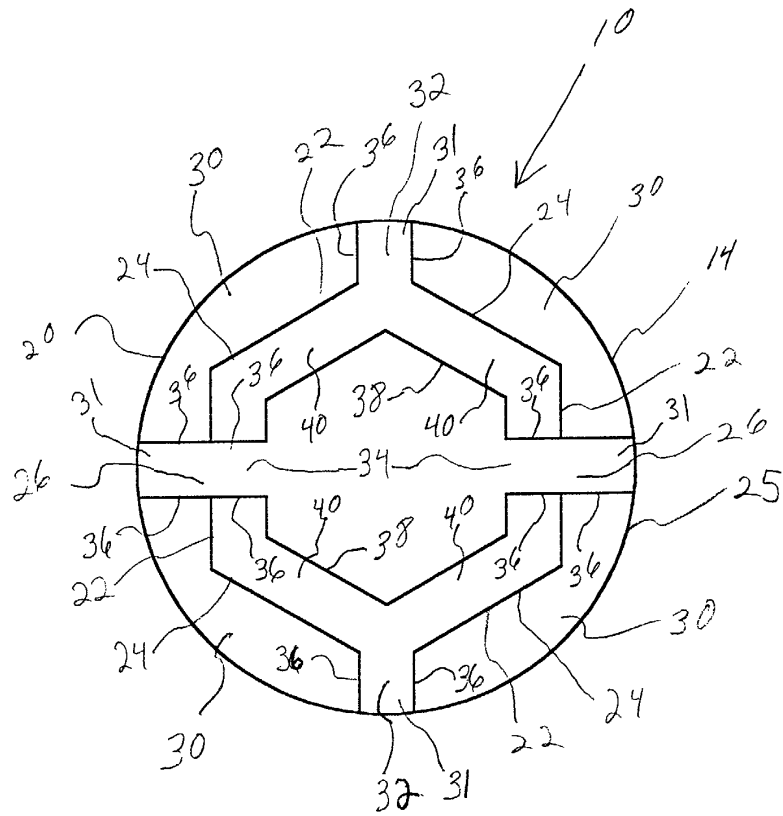


FIG. 3

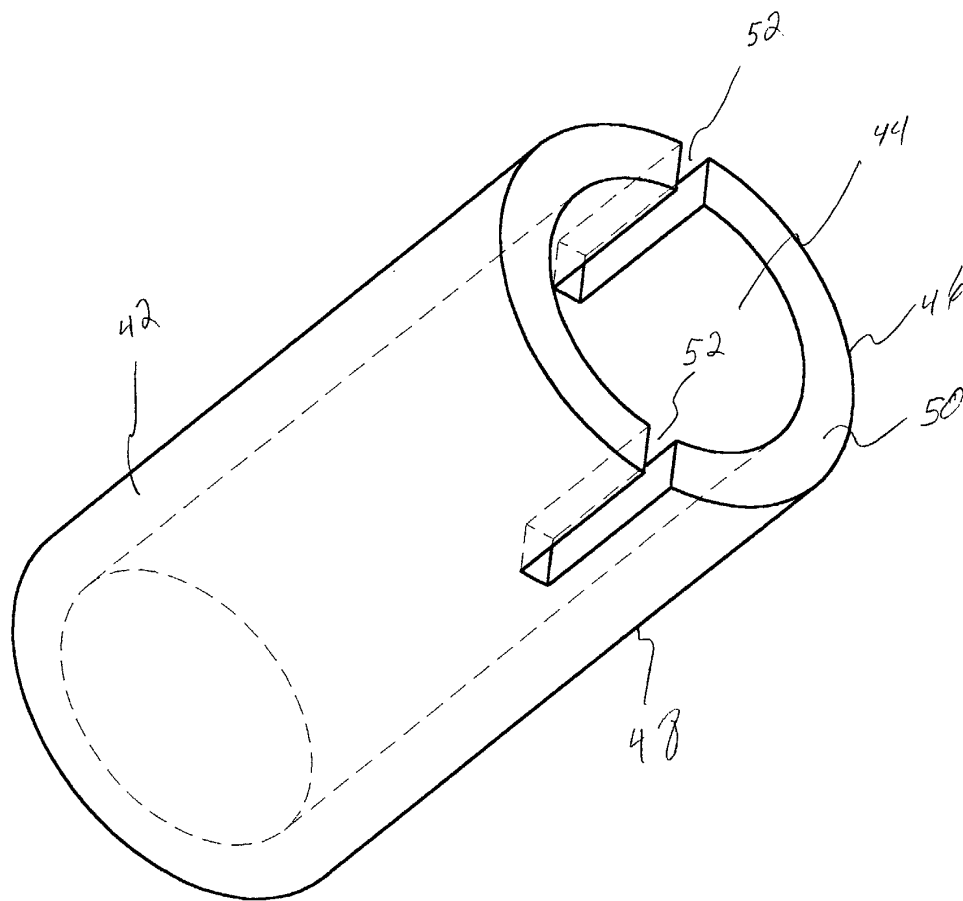


FIG. 4

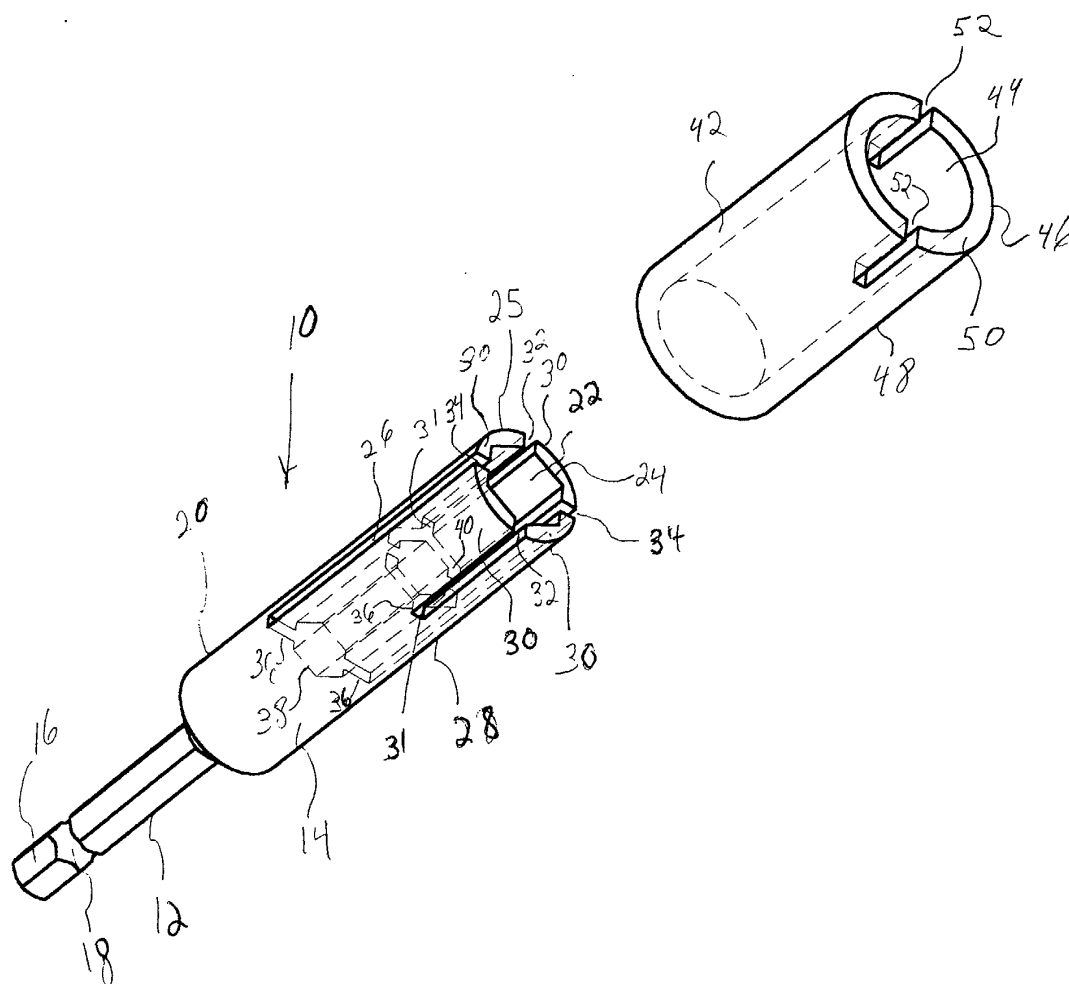


FIG.

5A

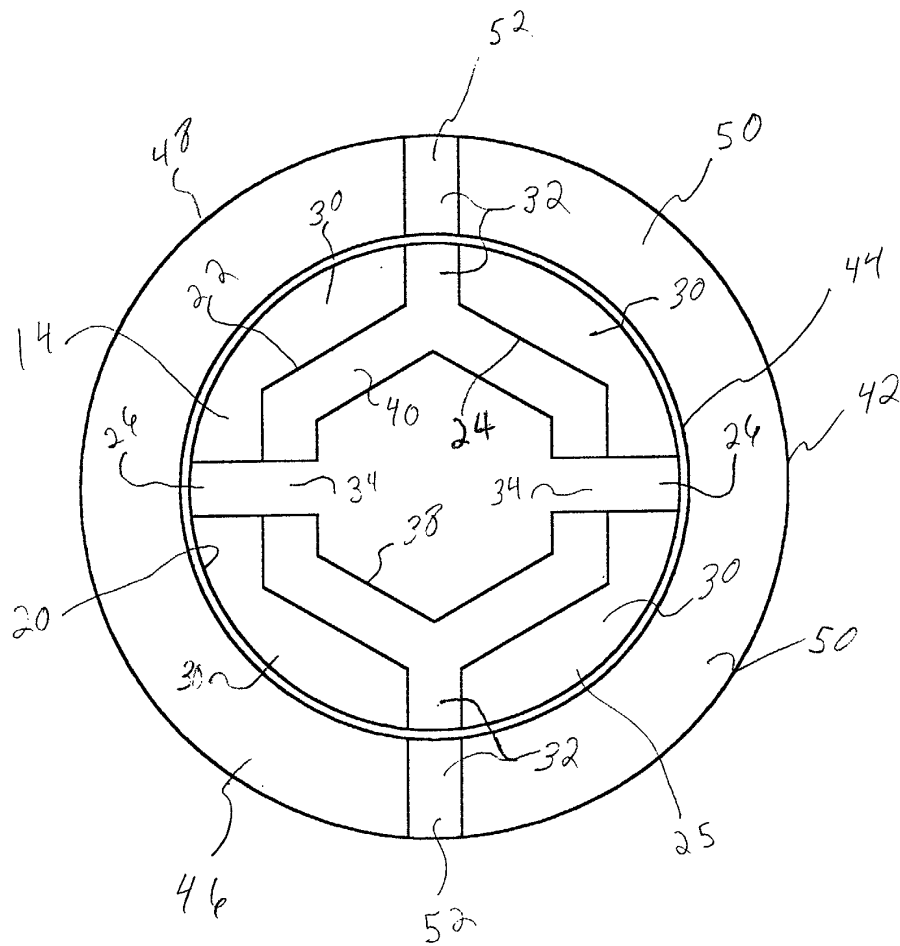


FIG. 5

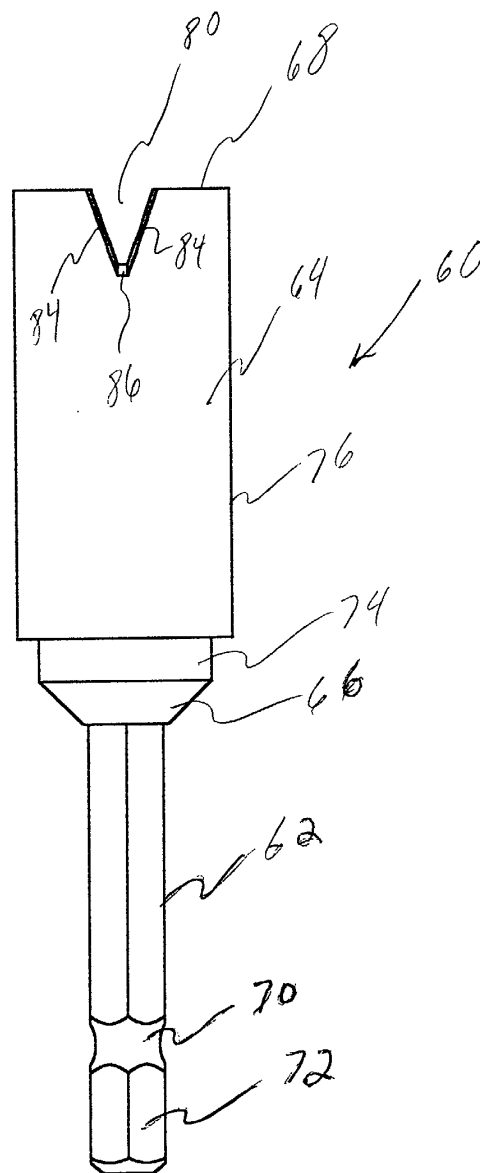


FIG. 7

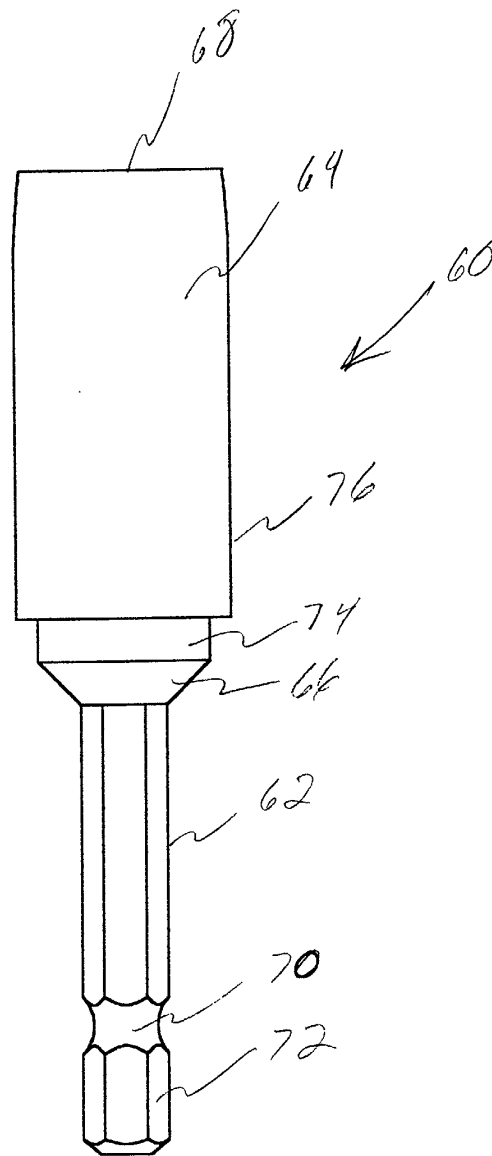


FIG. 8

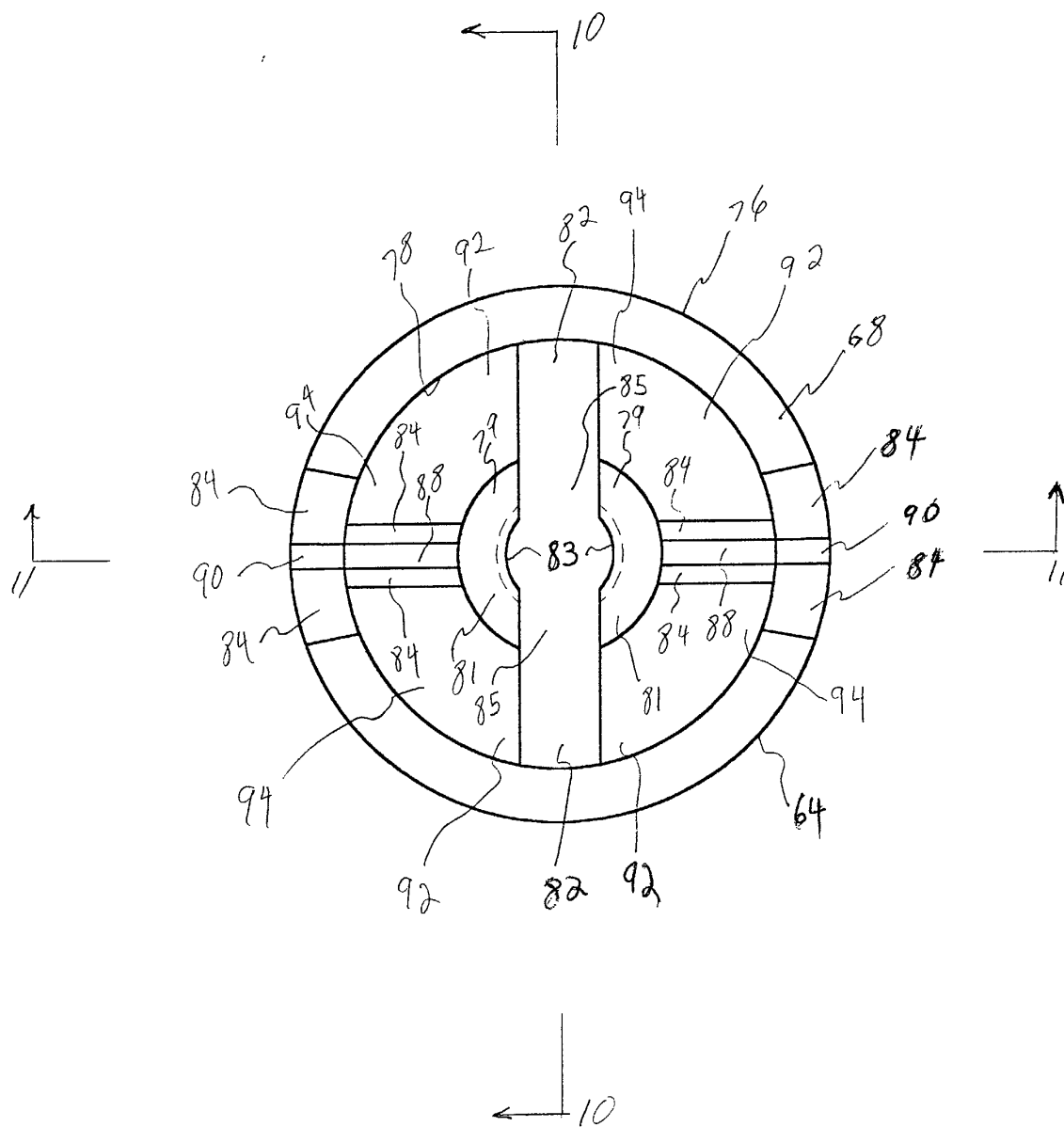


FIG. 9

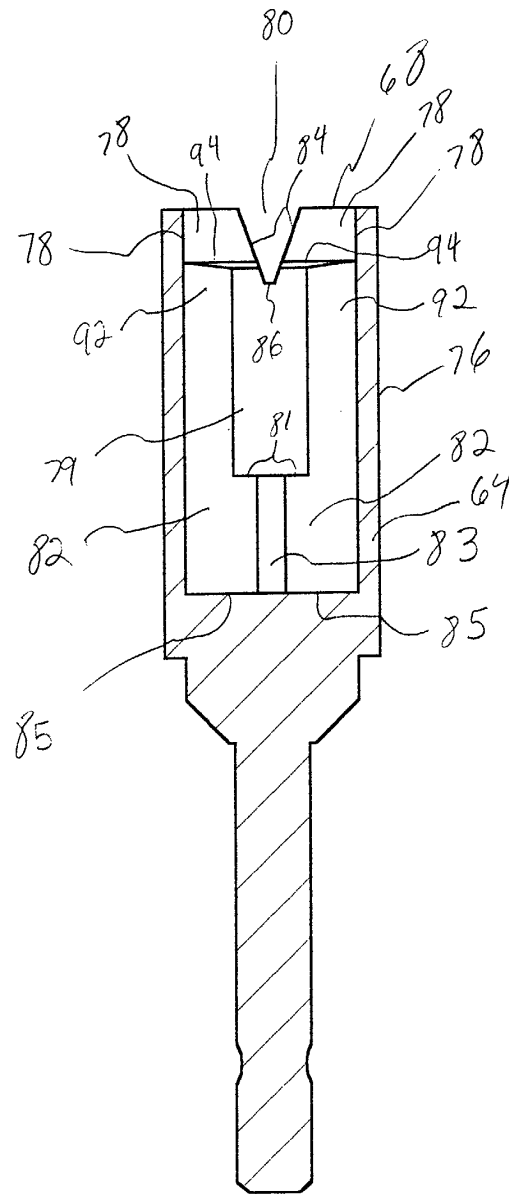


FIG. 10

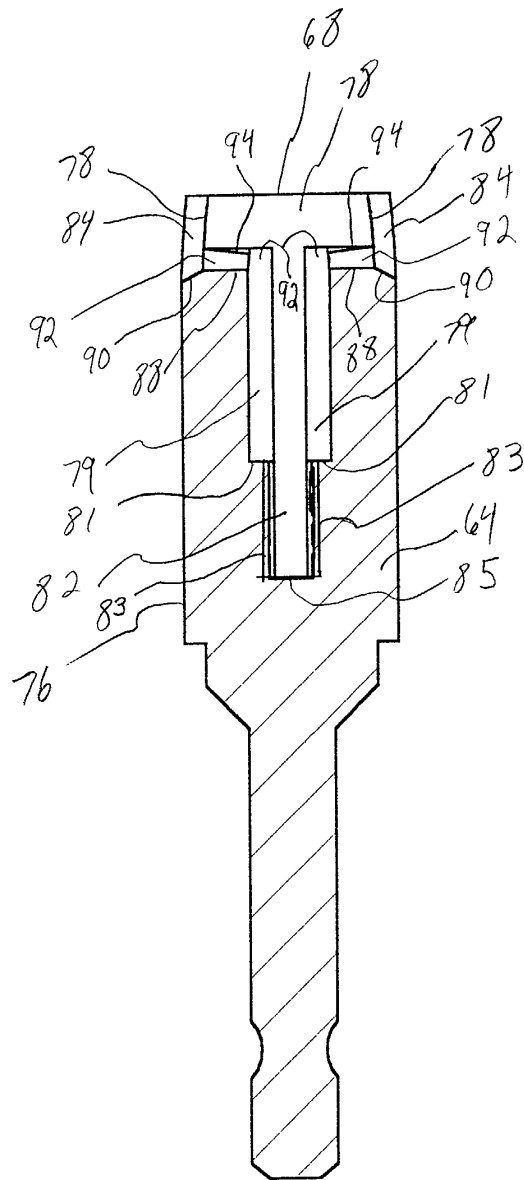


FIG. 11

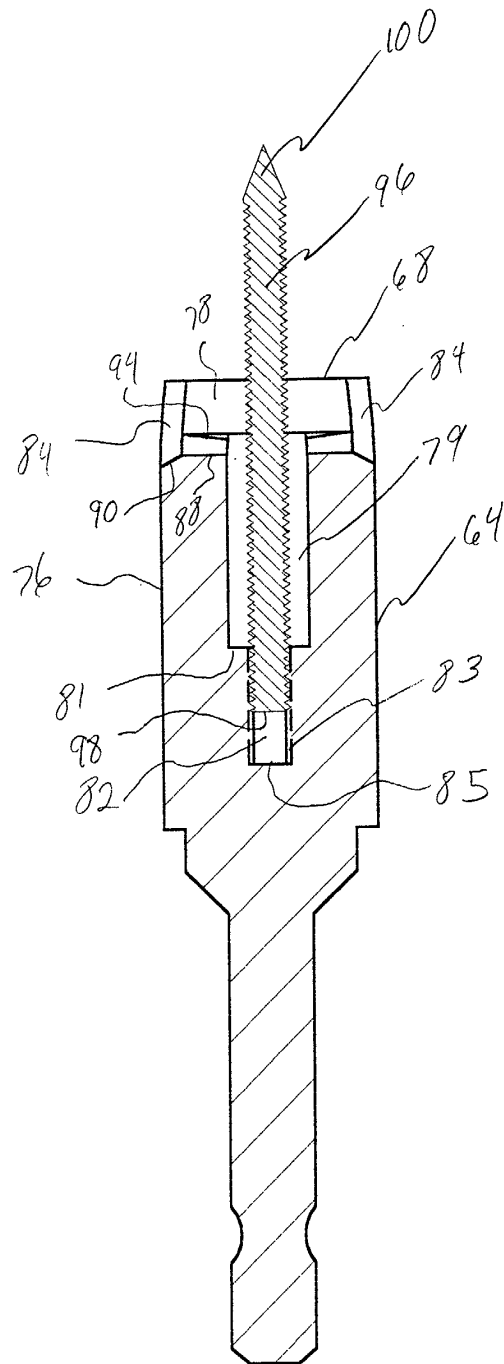


FIG. 12

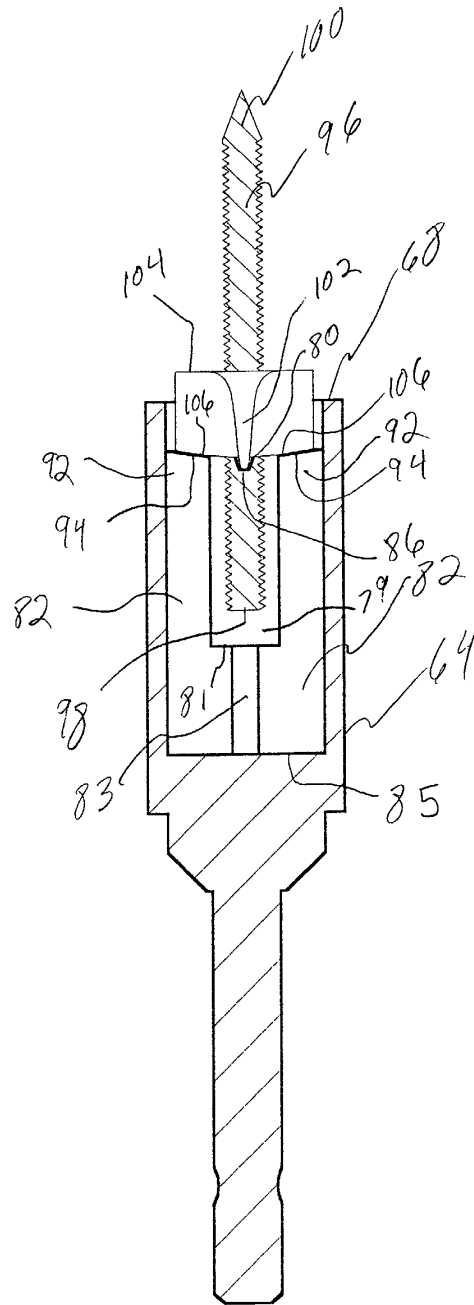


FIG. 13

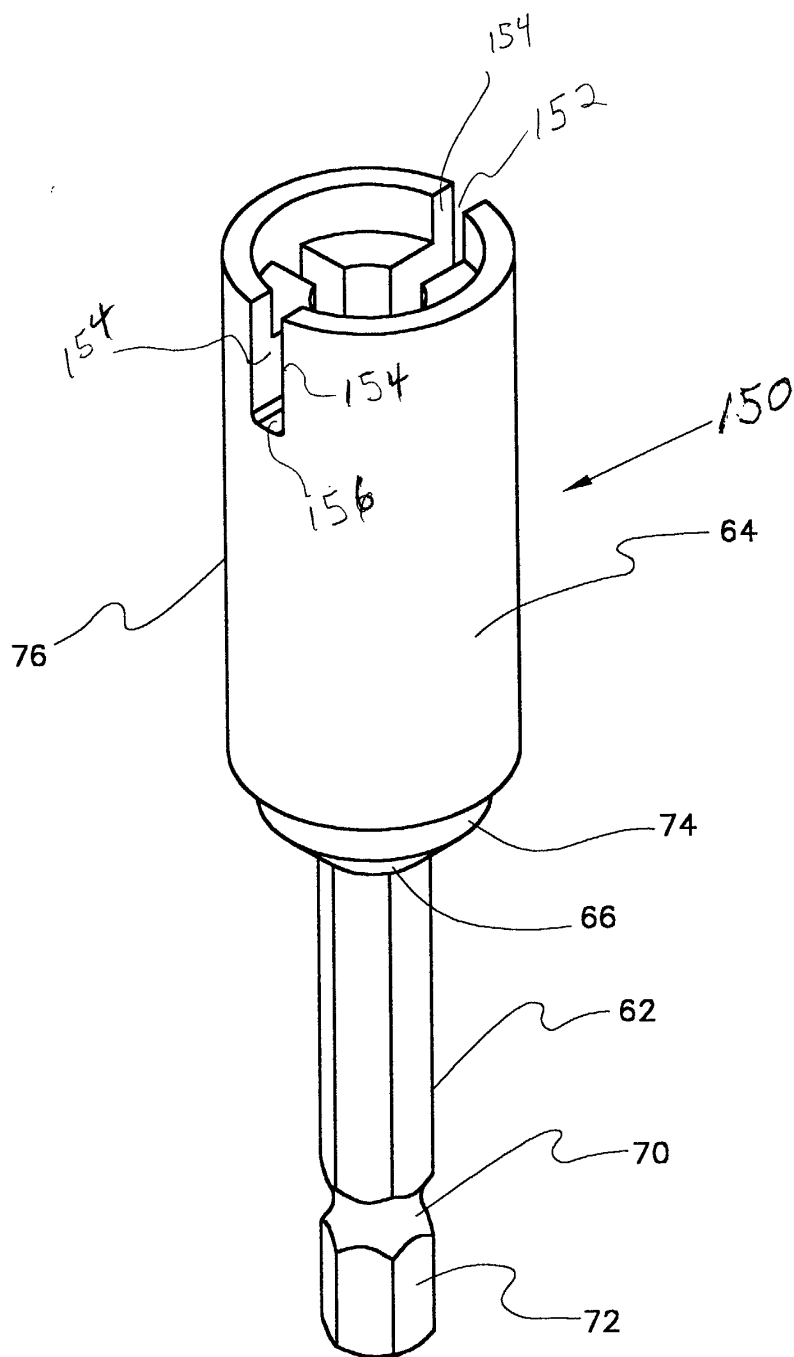


FIG. 14

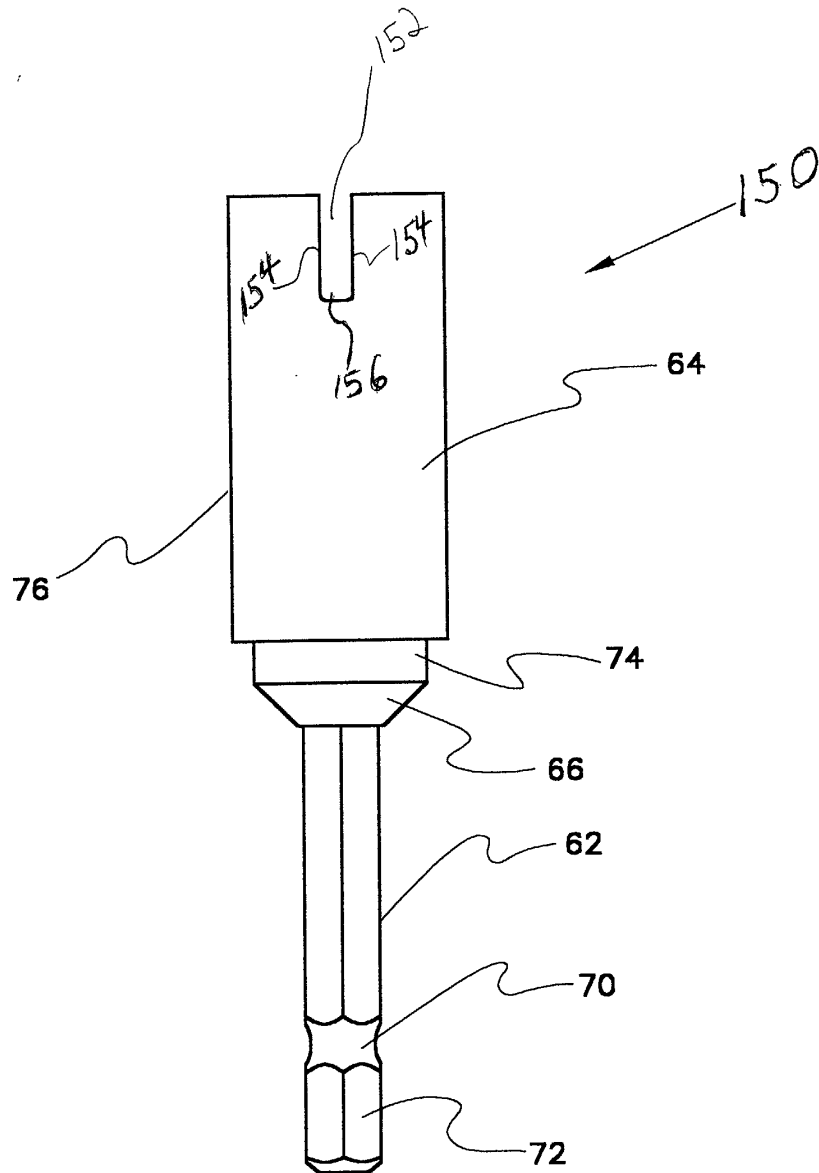


FIG. 15

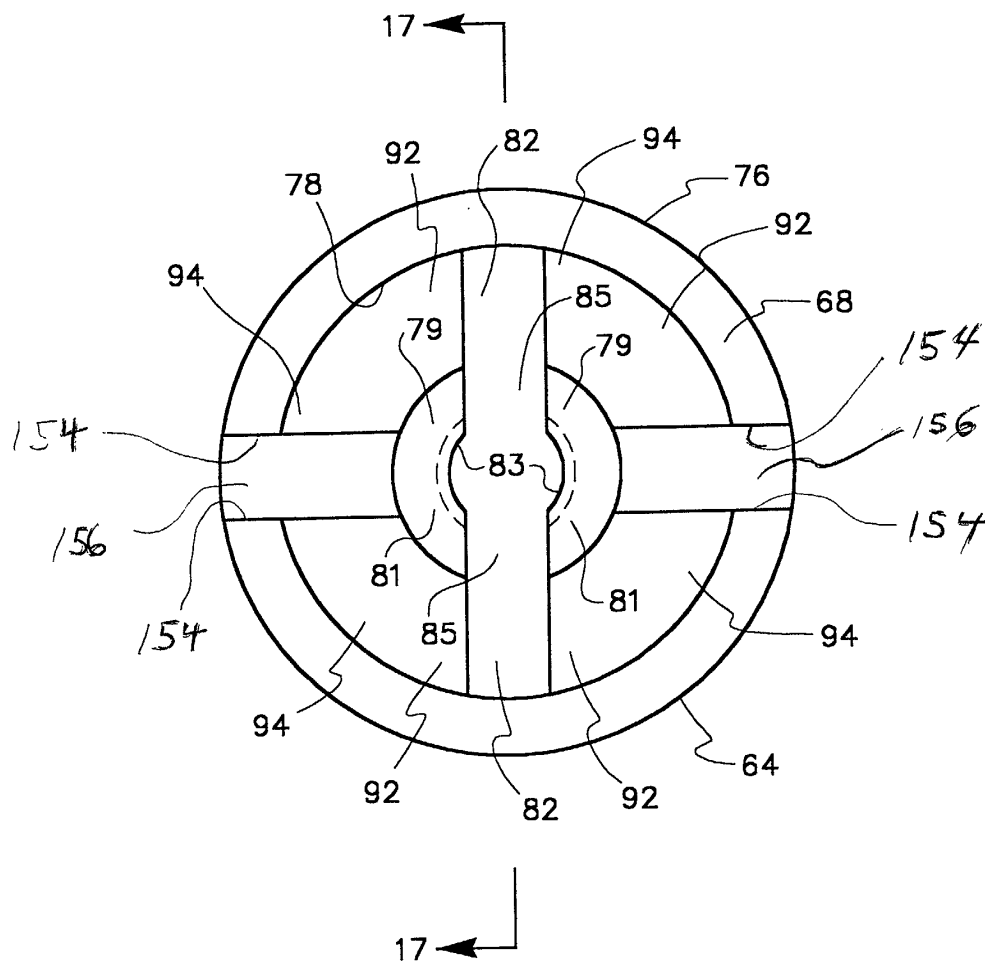


FIG. 16

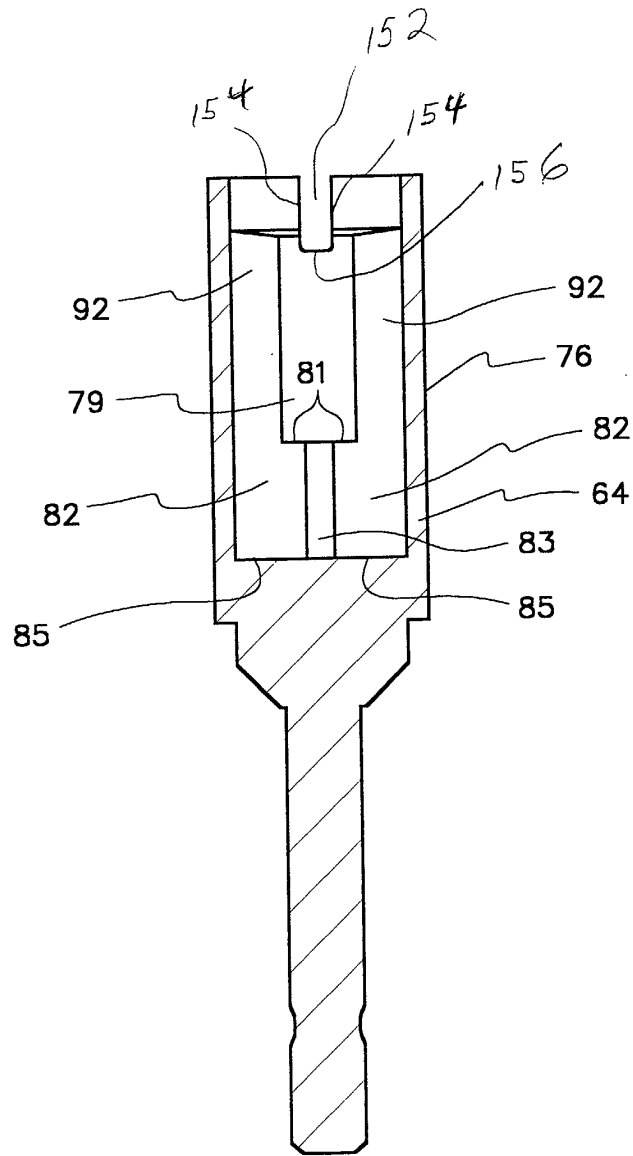


FIG. 17



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EUROPEAN SEARCH REPORT

Application Number
EP 02 07 8960

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 4 357 845 A (CORNIA JARED B) 9 November 1982 (1982-11-09) * column 4, line 1 - line 16 * * column 4, line 60 - line 65; figures 1-3,9,10 *	1-6,13	B25B13/50 B25B13/06 B25B23/10
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Y	US 4 823 650 A (TUTTLE JOHN E) 25 April 1989 (1989-04-25) * figure 1 *	6	
Y	DE 93 16 479 U (BIEL REINHARD) 31 March 1994 (1994-03-31) * figure *	11	
D,Y	US 4 724 731 A (ONOFRIO DANIEL J) 16 February 1988 (1988-02-16) * figures 1,2 *	11	
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Y	---	6,11	
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	-/--		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 March 2003	Examiner CARMICHAEL, G
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P04C01)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 07 8960

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	DE 44 32 657 A (MARKWORT ADOLF) 21 March 1996 (1996-03-21) * figures 1,2 *	1-3,5	
A	US 3 276 299 A (ARMEN HALBURIAN) 4 October 1966 (1966-10-04) * column 3, line 28 - line 39 *	10	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 March 2003	Examiner CARMICHAEL, G
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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European Patent
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Application Number
EP 02 07 8960

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-13



European Patent
Office

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 02 07 8960

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-13

Multi-functional fastener driver device suitable for transferring rotary motion to either a first or a second fastener

2. Claims: 14-27

Multi-functional wingnut fastener and winghead bolt driver device

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 07 8960

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

03-03-2003

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