MAGNETIC CHUCKING DEVICE

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This invention relates to chucking devices and particularly is a precision nut-setting tool or chucking device for receiving a nut to be threaded onto a pivotal stud, such as that used in pivotally connecting blades of shears, and is a continuation-in-part of my application Serial No. 226,041, filed September 25, 1962, now abandonded.

A final step in assembling shears, particularly linking shears, is the screwing and tightening of the nut on the pivotal stud. Since the proper function of the shears depends to a great extent upon the correct force with which the blades of the shears are pressed together, it is very important that the nut on the pivotal stud is tightened properly, that is, neither too tightly, nor too loosely. Furthermore, since these nuts are small, have a special shape and require a suitable wrench for tightening, the process of screwing these nuts onto the studs by hand is inefficient and inaccurate, and depends largely on the skill and attention of the workman.

This situation is improved by the present invention which comprises a chucking device for setting a small nut on a short stud which constitutes a pivot for the intersecting movable blades of shears, scissors or like tool. The device has a body, which is provided with a shank for insertion within the socket end of the drill shaft of a conventional drill press. Basically, the body which consists of two interengaging parts having cavities, contains in its inner cavity a spring-loaded hollow plunger having a flange so that this plunger cannot move outwardly beyond a set limit. In the hollow of the plunger is a permanent magnet for holding the nut prior to being screwed onto the stud. A non-magnetic insert at the end of the magnet regulates the intensity of the magnetic flux by which the nut is held in place. Provision furthermore is made for preventing the nut from rotating freely; in other words, the nut is held in place so that only the setting device will rotate it. More specific details are shown and described in connection with the device herein disclosed by way of example only and as illustrative of a preferred embodiment.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom or may be learned by practicing the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

It is the object of this invention to provide a novel construction for receiving a nut to be screwed onto a stud. Another object of the present invention is to provide a new chucking device which can be used in a machine tool having a rotating tool spindle, such as a drill press or the like.

A further object of the invention is to provide a production device for attaching a nut on a pivotal stud used in connecting shear blades, which is efficient, easy and safe to operate.

Various further and more specific purposes, features and advantages will clearly appear from the detailed description given herein and from the accompanying drawings which form part of this specification and which illustrate merely by way of example one embodiment of the device of the invention.

In the drawing:

FIG. 1 is a longitudinal section of the precision nut-setting tool or chucking device;
FIG. 2 is a top view of the chucking device;
FIG. 3 illustrates the application of the device in a bench-type drill press;
FIG. 4 is a detail longitudinal section of a portion of the chucking device of FIG. 2;
FIG. 5 is a plan view of a nut to be tightened on the shear pivot stud;
FIG. 6 is a bottom view of the chucking device of FIG. 4 (slightly enlarged) with nut applied; and
FIG. 7 is an exploded view of the elements which comprise the nut-setting tool or chucking device according to the invention.

In the following description and in the claims, parts will be identified by specific names for convenience, but such names are intended to be as generic in their application to similar parts as the art will permit. Like reference characters denote like parts in the several figures of the drawing.

Referring now in more detail to the drawing illustrating a preferred embodiment by which the invention may be realized, there is disclosed in FIG. 1, a nut-setting tool or chucking device denoted by the general numeral 10 comprising a body 11 which has a shank 12 for being inserted in any conventional spindle chuck of a machine tool, for example, in a bench-type drill press 30, as shown in FIG. 3. Body 11 has a cylindrical bore or cavity 13 which is internally threaded for receiving a bushing 14 made preferably of case-hardened steel and which is correspondingly externally threaded on its upper annular portion 15.

Bushing 14 has an annular flanged portion 14a which abuts against the lower face 15a of body 11, and further, has an annular portion 14b which extends from the flanged portion 14c. The outer wall of flanged portion 14c is preferably flush with the outer wall of body 11. Bushing 14 has a cylindrical bore or axial cavity 14d and a reduced cylindrical bore or cavity 14f communicating therewith, an annular shoulder 21 being formed thereby. It is understood that body 11 and member or bushing 14 may comprise a unitary housing.

Within bushing 14 is a concentrically located insert or plunger 16, which is provided with an annular flanged portion 20 adapted to coact with step or shoulder 21, a lower cylindrical portion 16a fitting axial bore 14f and a reduced upper cylindrical portion 16b which extends upwardly from flanged portion 20 within bore 14c. Portion 16a of plunger 16 is shorter than bore 14d. Below portion 16a of plunger 16, bore 14d is enlarged, providing an annular space 14e and by which enlargement an annular abutment or shoulder 14f is formed for the nut 28 when inserted in space 14e for a purpose hereinafter described.

One end of a helical spring 22 surrounding portion 16a of plunger 16 normally bears against flanged portion 20, and its other end bears against the upper extremity 23 of cavity 13. Thus, plunger 16 is resiliently held in bore 14c. Spring 22 is guided by the upper part 16a of plunger 16 and presses with its lower end plunger 16 through flange 21 or step or shoulder 21 of bushing 14. Plunger 16 has a bore 17, in which a permanent magnet or magnetic core 18 is located. A spacer or shoe 19 is located within bore 17 between magnet 18 and a stud or pilot 27, preferably made of magnetic material. Plunger 16 and spacer 19 are preferably made of non-magnetic material, such as, for example, brass, aluminum, bronze, carbon, etc.; plastics, such as, for example, nylon, Teflon, etc. Spacer or shoe 19 is adapted to limit, weaken or control the magnetic lines of force passing from magnet 18 to pilot 27. Pilot 27 projects within bore 17 and preferably projects slightly beyond space 14e at the bottom of bushing 14.

The lower extended cylindrical portion 14b recedes from flanged portion 14c of bushing 14 and forms an annular recess 25. Disposed within recess 25 and co-
extensive therewith is a ring-shaped bushing 24 whose outer wall is preferably flush with the outer wall of bushing 14. Bushing 24 is held in place by a set screw 20. Portion 14b of bushing 14 has a vertically disposed L-shaped slot accommodating a corresponding L-shaped key insert 26 having its horizontally disposed angular extension 26a projecting inwardly below and in engagement with shoulder 14d and slightly within space 14e. Key insert 26 has a recess 26c and is secured in position by means of a set screw 21 threaded in bushing 24 and engaging at recess 26d.

Device 10 is employed to secure a threaded nut 28 (which has a locating slot 28a) to the threaded stud 42 which projects from shear blade 32a to the threaded stud 42 which projects from shear blade 32b of shears 32, partly shown in dash lines (FIG. 4). For this purpose, there is provided the nut-receiving part or pilot 27 which has an intermediate flange or collar 27a abutting the lower end of portion 16a of plunger 16 within space 14e and against which nut 28 is magnetically held during operation of the device 10 as seen in FIG. 4. Slot 28 of nut 28 is made to register with key extension 26a, thus locking nut 28 against turning, relative to device 10 when the latter is in operation. Pilot 27 and key extension 26a serve as the nut locator means.

Bore 14e is slightly larger in diameter than nut 28 for ease of operation.

Shear blade 32a is positioned on shear blade 32b such that its pivot hole receives pivot stud 42 secured to shear blade 32b. The blade assembly, namely, the work, is placed on base 39 of drill press 30. Suitable locating means 39a may be provided on base 39 to align stud 42 with nut 28. For this purpose, the locating means 39a may be provided with a hole or recess in alignment with pilot 27 and a side stop 39b to prevent the work, such as the shears 32, from turning during the threading operation while nut 28 is inserted in space 14e on pilot 27, while device 10 is rotating, and during such rotation slot 28 will register with key extension 26a. Nut 28 is magnetically held within space 14e by pilot 27 which receives its magnetic force from permanent magnet 18 through spacer 19. As hereforestated, spacer 19 limits or controls the desired magnetic force capable of holding transmitted to pilot 27 on nut 28. By means of spacer 19, the magnetic lines of force from magnet 18 are weakened or reduced so that nut 28 can be aligned more easily with key extension 26a and still be strong enough to hold nut 28 in position within space 14e.

As illustrated in FIG. 3, device 10, when rotated, is locked to a mechanical tool spindle 31 of drill press 30, for tightening nut 28 on pivot stud 42 of shears 32. Tool spindle 31 is hand-operated vertically (upwardly and downwardly) by means of manually operable, spring-loaded pivot lever 33. Conventional connecting means (not shown) between lever 33 and spindle 31 may be employed for this purpose. Lever 33 has a rearwardly extending arm 34 provided with vertical extension 34a adapted to contact a cut-off microswitch 35 on extreme downward movement of lever 33 at the same time that lower extension 33a of lever 33 abuts against adjustable stop 35a. Lever 33 is provided further with arm 36, adapted to contact a starting microswitch 38 on its extreme upward movement for starting rotation of spindle 31 and attached nut-setting device 10. Microswitches 35 and 38 may be secured to the casing of power-driven tool or drill press 30, as shown in FIG. 4, or they may be attached to a power-controlled device (not shown). The microswitches function through the relay. Spring-loaded lever or handle 33 is automatically normally in up position with its arm or extension 36 in contact with starting microswitch 38.

As hereforestated, the device 10, according to the invention, is used for threading or tightening nut 28 on stud 27 a predetermined length or distance thereon. In normal position, the spring-loaded lever or handle 33 is in up position, and rotatable spindle 31 and nut-setting tool or device 10 attached thereto are in an upward position, that is, away from jig 39a, and are rotating clockwise. During this rotation, the operator places nut 25 on a finger of his hand and inserts the same in opening 14e in register with pilot 27. He holds the nut in this position until slot 28a of nut 28 registers with key portion 26a of key 26, at which time nuts 28 will rotate with device 10, the nut 28 being magnetically held against pilot 27. The operator now swings lever 33 downwardly, thereby moving in vertical downward direction spindle 31, and thus device 10 against the work, thus permitting engagement of the threads of nut 28 and stud 27 of shears 32. A slight pressure is applied manually to lever 33 by the operator in order to follow up the threading of nut 28 onto stud 42.

Mechanical stop 33a—45 in conjunction with power cut-off switch 35 determines the lowest possible position of device 10, which in turn determines the lowest setting of nut 28 on stud 42. A finer adjustment may be made by adjustable screw 12a on shank 12. At the moment this occurs, lever extension 33a engages stop 45 and extension 34a contacts switch 35, thus breaking the electric circuit causing spindle 31 to stop rotating. The nut 28 is now threaded onto stud 42. The operator then swings lever 33 downwardly in a similar manner so that the shears 32 to which the nut 28 has been threaded may be removed from device 10. After the shears are removed, the operator continues the upward swing of lever 33 until arm 38 contacts starting microswitch 38, at which time spindle 31 will start rotating again. A new set of shear blades is positioned on jig 39a and the aforementioned steps are repeated.

During the threading operation of nut 28 upon stud 42, plunger 16 with assembly 18, 19 and 27 recedes against spring action of helical spring 22, the latter urging plunger 16 back to step or shoulder 20 upon withdrawal of the tightened nut on the shears 32 from pilot 27.

The device of this invention is a precision nut-setting tool which does not require the special attention and skill of an operator and invariably produces more efficient, uniform and precise results. While the invention has been described and illustrated with respect to a certain preferred example which gives satisfactory results, it will be understood by those skilled in the art after understanding the principle of the invention that various other changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore in the appended claims to cover all such changes and modifications.

I claim:

1. A nut-setting device comprising a hollow internally threaded body having a shank for insertion in a rotatable tool, a member having a first part, a second part and a flange part intermediate said first and second parts, said first part threadedly engaging the threads of said body with said body in engagement with said flange part, said member having connecting axial bores, one of said axial bores being larger in diameter than the other of said axial bores and forming an annular shoulder thereon, said bores connect, an axially movable plunger extending within said bores, said plunger having a first portion, a second portion and a flange portion intermediate said first and second portions, said first portion and said flange portion being helical with a pitch smaller than the pitch of said bores, said flange portion abutting against said shoulder, said second portion of said plunger being shorter than said second part of said member forming an opening in said other of said axial bores forward of said plunger to accommodate a nut, a helical spring within said one of said axial bores, said spring having one end extending within said body and its other end disposed against said flange portion, said plunger having an axial bore, a substantially
permanent magnet within said plunger bore, a magnetic member projecting within said opening and extending within said plunger bore in spaced relation to said magnet, a non-magnetic member within said plunger bore and interposed between said magnet and said magnetic member, said magnetic member having an intermediate enlargement in said opening engaging an end of said second portion of said plunger and movable with said plunger, and means forming part of said device and cooperative with said nut for fixing said nut against rotation relative to said device.

2. A nut-setting device comprising a hollow body for connection with a rotatable tool, a member having a first part, a second part and a flange part intermediate said first and second parts, said first part being within said body, said member having connecting axial bores, one of said axial bores being larger in diameter than the other of said axial bores and forming an annular shoulder where said bores connect, an axially movable plunger extending within said bores, said plunger having a first portion, a second portion and a flange portion intermediate said first and second portions, said first portion and said flange portion being disposed within said one of said bores, with said flange portion abutting against said shoulder, said second portion of said plunger being shorter than said second part of said member forming an opening in said other of said axial bores forward of said plunger to accommodate a nut, said plunger having an axial bore, a substantially permanent magnetic member within said plunger bore and projecting within said opening and extending within said plunger bore in spaced relation to said magnet, a non-magnetic member within said plunger bore and interposed between said magnet and said magnetic member, said magnetic member having an intermediate enlargement in said opening engaging an end of said second portion of said plunger and movable with said plunger, means forming part of said device and cooperative with said nut for fixing said nut against rotation relative to said device, and resilient means to yieldingly resist pressure applied to said magnetic member and permit said plunger to retract.

3. A nut-setting device according to claim 2, and said means comprising an element projecting within said opening for engagement with said nut.

4. A nut-setting device according to claim 2, and said means comprising an element projecting within said opening for being receivable in a slot formed in said nut.

5. A nut-setting device according to claim 2, and said means comprising an element within said slot, said element projecting within said opening for cooperation with said nut.

6. A nut-setting device according to claim 5, and means for securing said element to said member.

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