Jan. 26, 1960 J. K. MATHEWS 2,922,174

CLEANING TOOL FOR BOXES OF TOOL JOINTS

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Fig. 1.

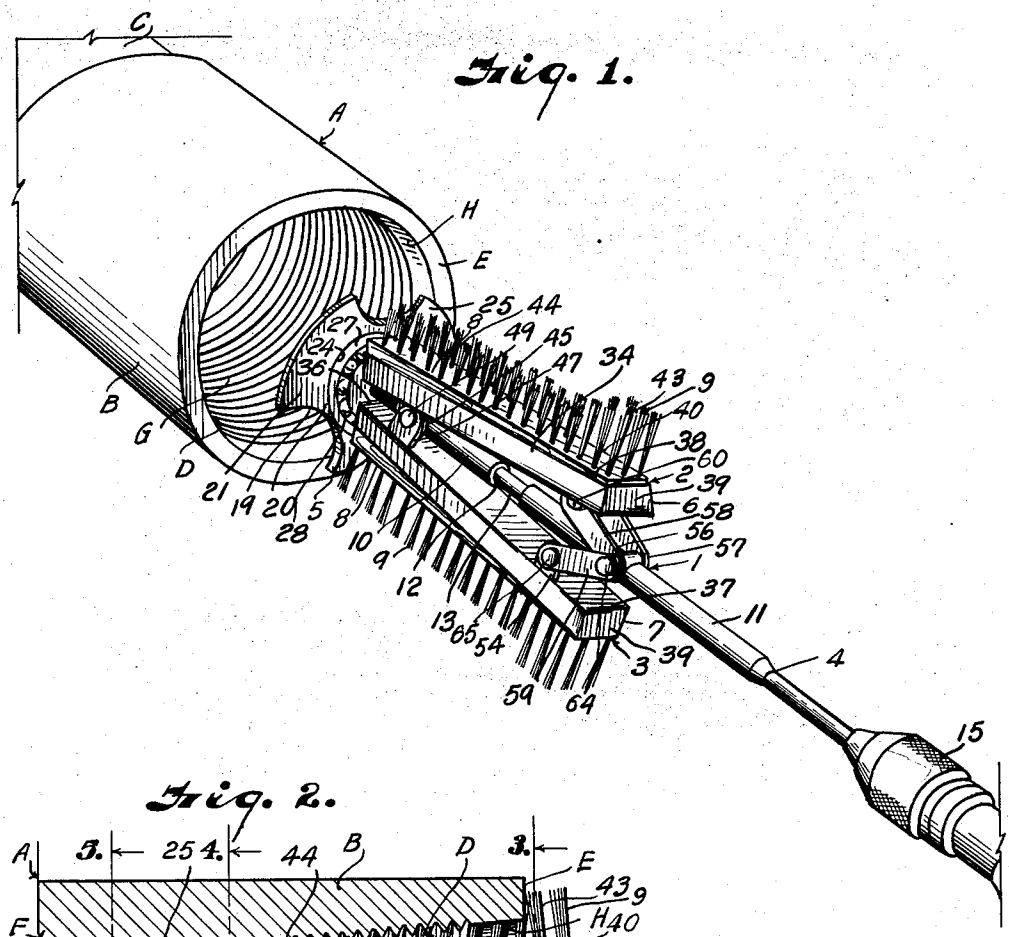
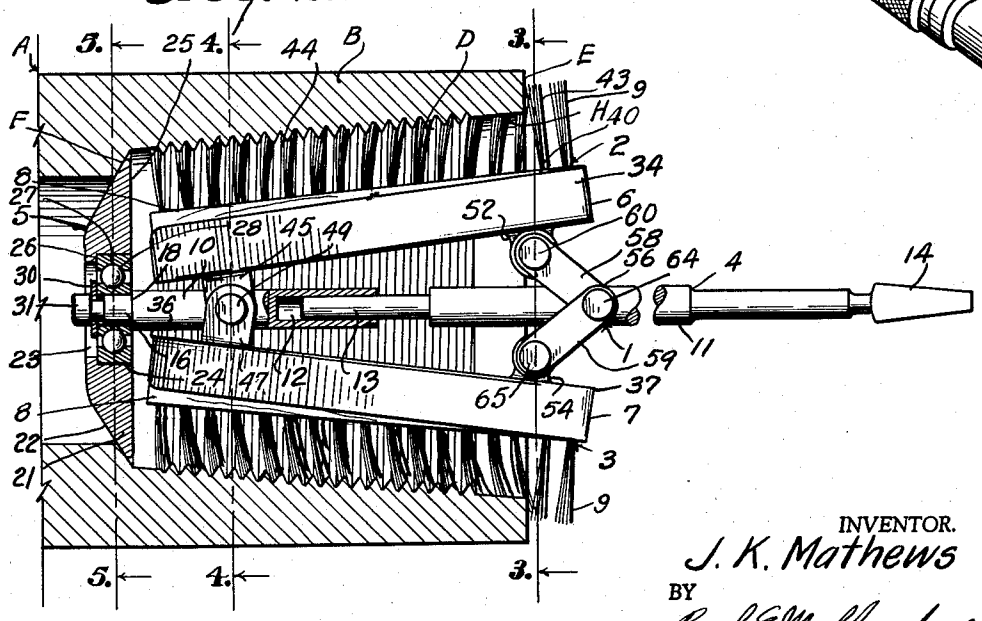


Fig. 2.



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Fig. 3.

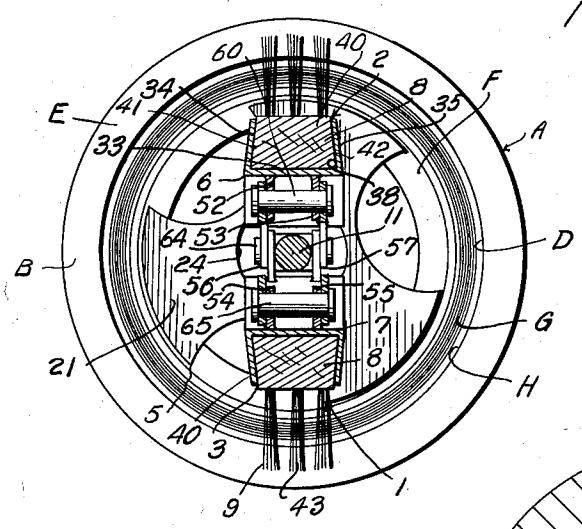


Fig. 4.

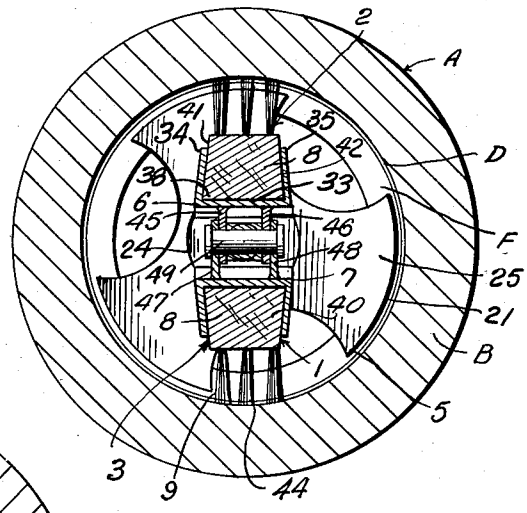
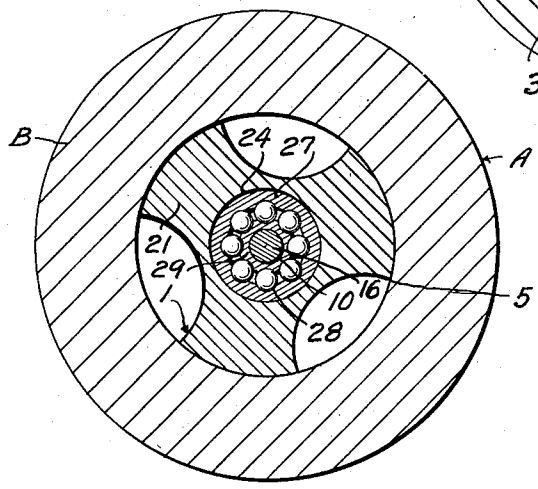


Fig. 5.



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Fig. 6.

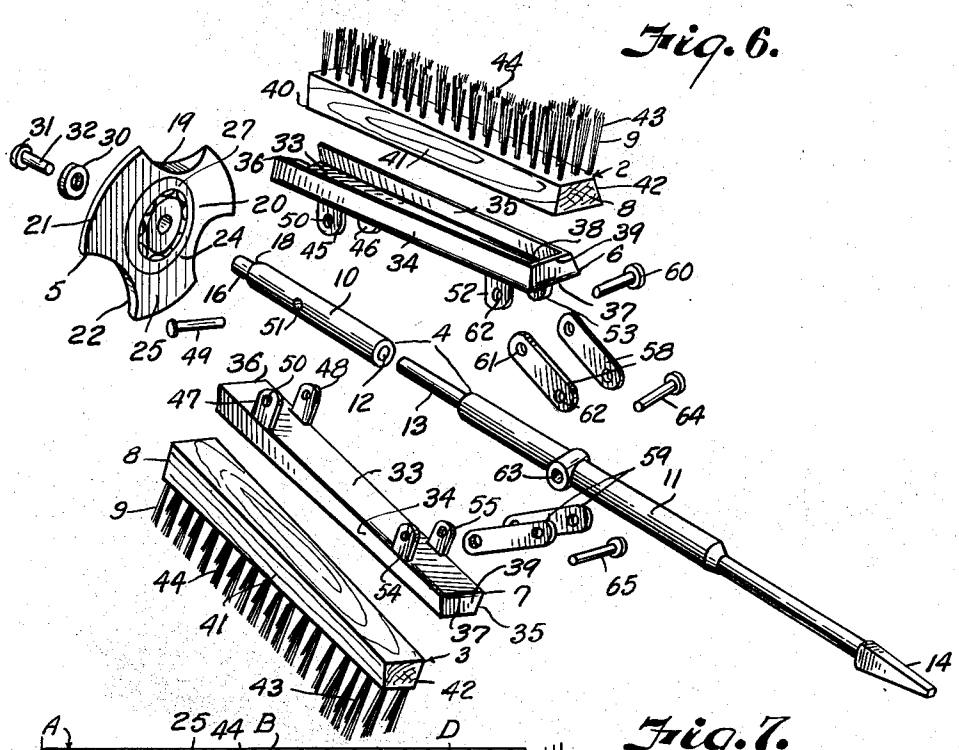


Fig. 7.

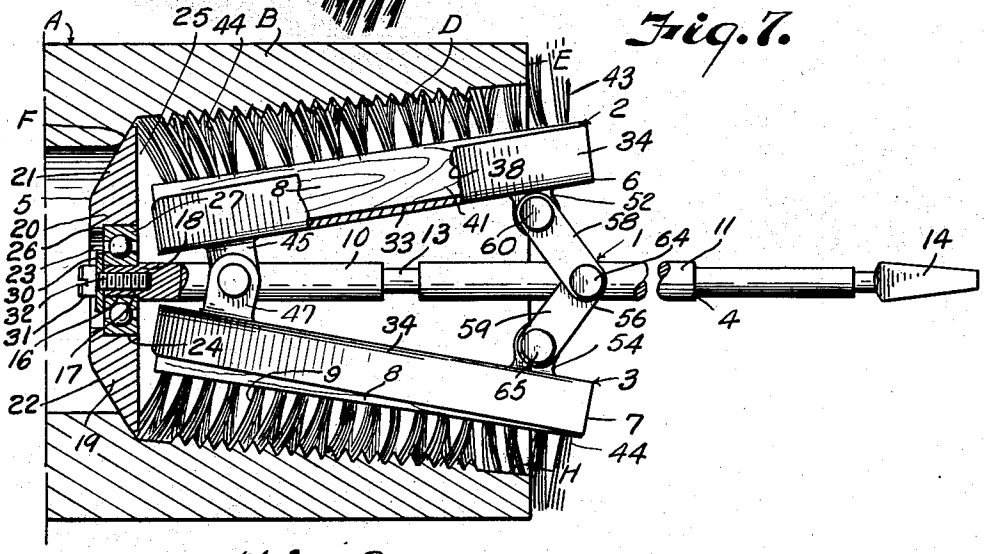
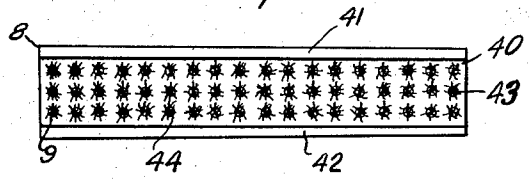


Fig. 8.



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CLEANING TOOL FOR BOXES OF TOOL JOINTS

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Application November 12, 1957, Serial No. 695,603

6 Claims. (Cl. 15—104.1)

This invention relates to a device for cleaning the shoulders and threads of the box members of tool joints, such as used for interconnecting sections of drill pipe in the rotary drilling of bore holes. The threads of tool joints must make up tightly to prevent loosening thereof and to assure maximum contact of the threads to withstand the vibration and heavy loads to which drill pipes are subjected. In order to facilitate making up of tight joints and to prevent galling of the threads, they are usually coated with a joint compound, which works satisfactorily as long as the threads are clean, but after the joints have been in service, the threads become clogged and/or coated with drilling mud and a mixture of such mud and joint compound that prevent tight makeup of the joints. Also, when the drill pipe sections have been out of use for a time, the threads tend to rust and the mud dries on the threads. Also, in handling the pipe sections on the ground, dirt may enter the boxes and accumulate in the spaces between the threads, to further the difficulty of maintaining tight joints.

It is, therefore, a principal object of the present invention to provide a simple and inexpensive tool for cleaning the shoulders and threads of the box members of tool joints when the drill pipe is racked within the derrick or on the ground.

Other objects of the invention are to provide a thread cleaning tool with movable brushes that are adapted to be turned freely into the box and to expand automatically under pressure contact with the threads when the brushes are fully engaged; to provide for immediate release of the pressure and retraction of the brushes to free the tool for easy withdrawal and fallout of the material that has been removed from the threads; to provide the tool with sufficient initial contact of the brushes with the threads of the box to draw the brushes into the box; and to provide the brushes with bristles that sweep the end faces and inner shoulders of the box when the cleaning pressure is applied.

It is a further object of the invention to provide a cleaning tool wherein the bristles ride into and out of the spaces between the threads for producing radial scraping action across the faces of the threads as well as a circumferential action during turning of the brushes within the box and at the time the greatest pressure is applied.

Another object of the invention is to provide the cleaning tool with a thrust bearing to reduce friction between the fixed and rotary elements of the tool.

In accomplishing these and other objects of the invention as hereinafter pointed out, I have provided improved structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a thread cleaning tool constructed in accordance with the present invention and showing the tool in position for insertion into the box of a tool joint.

Fig. 2 is a cross section through the box of the tool joint and showing the tool in side elevation with the

bearing or stop element of the tool seated on the internal shoulder, whereafter further indrawing of the bristles and axial pressure on the shank of the tool results in spreading of the brushes to enhance bearing contact of the bristles with the threads and end face of the box.

Fig. 3 is a cross section on the line 3—3 of Fig. 2.

Fig. 4 is a similar section on the line 4—4 of Fig. 2.

Fig. 5 is a cross section on the line 5—5 of Fig. 2.

Fig. 6 is a perspective view of the parts of the tool shown in disassembled relation to better show the construction.

Fig. 7 is a section similar to Fig. 2, but showing the tool fully engaged with the box.

Fig. 8 is a plan view of one of the brush heads, to better illustrate the longitudinal taper thereof.

Referring more in detail to the drawings:

1 designates a tool constructed in accordance with the present invention to clean the internal shoulders, threads and end faces of the box member A of a tool joint. For example, the box member of a standard tool joint comprises a cylindrical collar B that is carried on the end of a drill pipe C. The collar B has a tapered socket D opening inwardly from the outer end face E and terminating in an internal shoulder F and is provided with internal threads G. The threads G preferably start in inwardly spaced relation to the end face E to leave a smoothly tapered annular face or land portion H. The pin of the pin member (not shown) of a tool joint generally conforms to the inner contour of the box member and fits tightly therewith, with all of the threads of the pin engaging the faces of the threads of the box, so that each thread is capable of taking its part of the load. However, when dirt, scale, old compound, and other foreign materials accumulate on the threads G, end face E, land H, or the shoulder F, the pin and box cannot be set up properly, with the result that the surfaces of the pin member cannot engage all of the surfaces in the box member, consequently, uneven load is applied to the threads and failure of the joint is likely to occur. Also, an inadequate seal results between the pin and box members, so that leakage of the drilling fluid is apt to occur to cause loss of pressure and erosion of the parts of the joint.

Clean surfaces result in more effective seating of the shoulder F and added strength afforded by the shoulder seal results in a substantially stronger and trouble free drill pipe. In order to assure a proper connection of the tool joint members, the faces to be contacted must be clean and free of foreign matter.

In carrying out the invention, the tool 1 is provided with brush elements 2 and 3 that are easily inserted, but whereby pressure of the brushes is automatically increased to effect jamming of the bristles into the roots of the threads, and to produce a wiping and scraping action sufficient to clean all the contact surfaces of the joint.

The preferred form of the invention comprises a shank 4 having a head 5 on the end thereof and carrying brush holders 6 and 7 containing the backs 8 of the brush elements 2 and 3. The backs 8 carry bristles 9. The brush holders 6 and 7 are movably mounted on the shank 4 to move the bristles 9 into and out of contact with the surfaces to be cleaned and are actuated automatically responsive to telescoping of the shank 4. The shank 4, therefore, includes a head section 10 and a body section 11. The head section 10 has an axial bore 12 extending inwardly of an end thereof for slidably containing a pilot 13 on the forward end of a body section 11 of the shank. The opposite end 14 is shaped to be gripped by a chuck 15 of a brace or a portable hand drill, which may be electrically or pneumatically operated. If the shank is to be rotated by means of a brace, the end 14 of the shank is

of tapered polygonal shape, as shown in the drawings, and conforms to the end of a standard auger bit, as shown in Fig. 2. If the shank 4 is to be actuated by a hand drill, the end 14 conforms to the end of a standard drill bit. The head and main sections 10 and 11 of the shank are preferably of corresponding diameter, therefore, the pilot 13 is a reduced extension of the body section 11 and fits slidably within the bore 12, the bore 12 and pilot 13 being of length to provide the necessary relative axial movement of the shank sections, as later to be described. The outer end of the head section 10 of the shank has a reduced extension 16 provided with an internally threaded axial bore 17 and forming an annular stop shoulder 18 for mounting the head 5, previously mentioned. The head 5 is in the form of spider 19 having a center hub portion 20 and radially extending arms 21 adapted to seat upon the shoulder F of the box, as later described. In order to provide the hub portion 20 of necessary thickness and to permit the arms 21 to engage the taper of the shoulder F, the outer ends of the arms are beveled on their outer faces, as indicated at 22, and terminate in arcuate edges to fit freely within the outer diameter of the shoulder F. The hub 20 of the spider 19 has an axial opening 23 that is counterbored as at 24 from the inner face 25 of the spider to provide an annular shoulder 26. Securely retained in the counterbore 24 and seated on the shoulder 26 is an outer race 27 of an antifriction bearing 28. The inner race 29 of the bearing is pressed upon the reduced extension 16 of the head section 10 of the shank 4 to rotatably mount the shank in the head 5. The head 5 is fixed to the reduced extension 16 by means of a washer 30 and a screw 31, the shank 32 of the screw being engaged by the threads of the bore 17, as shown in Fig. 7.

The brush holders 6 and 7 are channel shaped and include a web 33 and side flanges 34 and 35. The web 33 of the holders is preferably wider at the forward ends 36 than at the rear ends 37, and the flanges 34 and 35 slope inwardly to cooperate with the web in forming an elongated tapered socket 38 of dovetail cross section. The narrower rear ends 37 of the holders are closed by an end flange 39.

The backs 8 of the brushes each comprise a block 40 having longitudinally tapering side faces 41 and 42 sloping inwardly toward the bristles 9 to conform with the dovetail cross section and wedge shape of the holders, whereby the backs of the brushes are adapted to be firmly engaged in the holders, but are removable for replacement of the brushes when the bristles become worn.

The bristles 9, as previously described, are arranged in tufts with the tufts 43 at the rear ends of the brushes being longer to sweep the end face E of the box when the brush is actuated, while the shorter tufts 44 engage and sweep the threads G, as later to be described.

The forward ends 36 of the holders have spaced apart ears 45—46 and 47—48 which extend laterally from the webs 33 thereof. The ears 45—46 are spaced apart to accommodate the head section 10 of the shank therebetween, and the ears 47—48 are spaced apart to engage the outer sides of ears 45—46, whereby the ears are connected to the head section of the shank by a hinge pin 49, the hinge pin passing through openings 50 in the ears and a registering opening 51 that extends transversely through the head section of the shank. The opposite or rear ends of the holders each have a pair of spaced apart ears 52—53 and 54—55, respectively, whereby the rear ends of the brush holders are connected together and to the body section 11 of the shank by toggles 56 and 57 located on the respective sides of the shank 4 and each comprising a pair of links 58 and 59. The outer ends of the links 58 are pivotally connected with the ears 52 and 53 of the brush holder 6 by a transverse pin 60 that extends through openings 61 in the ends of the links and through openings 62 of the ears. The opposite ends of the links 58 have openings 62 which register with a transverse opening 63 through the body section of the shank for passing a pin 64.

The other links 59 of the toggles are also pivotally mounted on the pin 64 and have their outer ends pivotally connected with the ears 54 and 55 of the other holder by a transverse pin 65. The pins 49, 60, 64 and 65 may be in the form of rivets, as shown.

In using the tool constructed and assembled as described, the end 14 of the shank 4 is inserted within a chuck 15 of a brace, portable drill, or other rotating mechanism by which the tool may be rotated about the axis of the shank 4. The toggles 56 and 57 are collapsed to bring the rear ends of the brush holders as close together as possible. The tool is then inserted in the tapered socket D of a tool joint box member A. The forepart of the tool will enter freely within the tapered socket until the tips of the foremost bristles 44 engage the threads G. Then, upon turning of the shank 4, the engagement of the bristles with the threads will cause the tool to be drawn into the socket of the box member until the arms 21 of the head member 5 engage the annular internal shoulder F of the box member, whereupon the bevels 22 on the forward faces of the arms contact the beveled shoulder to automatically center the head section 10 of the shank 4 within the socket of the box. This will stop further longitudinal movement of the head section 10 of the shank 4, but further rotation of the shank 4 and the brushes carried thereby will force the bristles forwardly to the foremost end of the threads. Simultaneously, an axial thrust is applied to the shank 4 to cause sliding movement of the pilot 13 of the body section 11 of the shank in the bore 12 of the head section 10. This relative movement of the shank sections causes the toggles 56 and 57 to force the brush holders apart and to enhance the pressure contact of the bristles with the faces of the threads G. With further rotation of the shank, the brushes will turn within the socket and wipe or scrape off any foreign matter adhering to both the front and rear faces of the threads. Since the brushes can move no further in an axial direction, the bristles will tend to be moved forwardly by contact with the threads until they can go no further, whereupon the ends of the bristles slide retractively across the faces of the threads. Consequently, the bristles move circumferentially and transversely of the rear faces of the threads to clean both face sides thereof. The longer bristles 43 at the rear ends of the brushes will overlap and wipe off any accumulated matter on the end face E of the box.

After turning the tool a few times, the axial pressure is released, and the body section 11 of the shank will be drawn retractively to break the toggles and automatically move the brushes toward the shank and thereby release the pressure of the bristles on the threads. When the pressure is thus released, the entire tool may be readily withdrawn for cleaning another box member of a tool joint.

When the bristles become worn or disarranged, the worn brushes are replaced with new brushes. This is readily effected by removing the screw 31 and backing the head 5 from off the reduced extension of the head section of the shank. The heads of the worn brushes may then be slid longitudinally from the tapering sockets 38 of the brush holders 6 and 7, after which new brushes may be slid into the holders. The head 5 is then replaced, followed by the washer 30 and retaining screw 31.

From the foregoing, it is obvious that I have provided a simple and reliable device for cleaning the surfaces and threads of the box members of a tool joint. It is also obvious that the device is easily inserted because of the indrawing action applied to the bristles by the threads. It is also obvious that the action of the brushes thoroughly cleans both faces of the threads of foreign matter. It is also obvious that the tool is easily withdrawn because of the automatic release of pressure of the bristles against the threads of the box member.

What I claim and desire to secure by Letters Patent is:

1. A tool for cleaning threads of a tool joint member of a drill pipe, said tool including a turning shank having one end adapted to be gripped in the chuck of a turning device, stop means on the other end of the shank having a bevel face for engaging an annular part of the tool joint member for centering said tool coaxially of the tool joint member and forming a rotary support for said shank, elongated brush elements carried by said shank and having outwardly extending bristles for engaging threads of the tool joint member for drawing the brush elements axially along said threads, and means on the shank and connected with the brush elements and acting against said centering means for increasing radial thrust of the bristles against said threads upon axial thrust of the turning shank.

2. A tool for cleaning the internal threads of the box member of a tool joint of a drill pipe, said tool including a turning shank having one end adapted to be gripped in the chuck of a turning device, a spider on the other end of the shank having a bevel face for engaging an annular shoulder within the box member for centering said tool coaxially of the tool joint member and forming a rotary support for said shank, elongated brush elements carried by said shank and having outwardly extending bristles for engaging threads of the tool joint member for drawing the brush elements axially along said threads to seat the spider, and means on the shank and connected with the brush elements and acting against said spider for increasing radial thrust of the bristles against said threads upon axial thrust of said shank in one direction and for releasing the bristles upon withdrawal of the tool from the box member.

3. A tool as described in claim 2 in which the brush elements have radial bristles on the ends of the brush elements remote from the spider and having ends extending beyond ends of the thread engaging bristles for sweeping end faces of the boxes when the spider engages said annular shoulder of the box member.

4. A tool for cleaning the threads of a tool joint member of a drill pipe, said tool including a turning shank having head and body sections relatively movable in the longitudinal direction of said shank, brush holders of channel shape and providing elongated tapering sockets of dovetail cross section, brushes having backs conforming to the shape of said sockets of the holders and having radially projecting bristles, means pivotally connecting the end of the brush holders having the wider ends of the sockets to the head section of said shank, toggles pivotally connecting the other ends of the brush holders to the body section of the shank for supporting the brush holders to maintain tightness of the brushes when the bristles are engaged with the threads of the tool joint under axial thrust of the turning shank, and a stop member providing rotatable support on the head section of the shank and having a beveled periphery adapted to engage an internal shoulder of said tool joint member to stop axial movement of the brush holders under said axial thrust and whereby an axial thrust applied to the body section of said shank effects actuation of the toggles to increase the contact of the bristles of the brushes with said threads and to release said contact pressure on the threads when the body section of the shank is moved axially in reverse direction to said thrust to withdraw the tool from the tool joint member.

5. A tool for cleaning internal threads of the box member of a tool joint of a drill pipe in which the box member has an internal annular shoulder encircling the bore of the tool joint at the inner terminal ends of the threads, said tool including a turning shank having relatively axially reciprocable head and body sections, a support forming a part of said tool for bridging said bore and having beveled circumferential portions to seat on the internal shoulder and to provide a journal for centering the head section coaxially of the bore of the tool joint, brush elements each having forward ends pivotally connected with the head section of the turning shank and having bristles extending outwardly with ends of said bristles being adapted to engage the internal threads of the box member for drawing the brush elements axially into the box member to seat the beveled circumferential portions of the support on the internal annular shoulder, and toggles pivotally connecting outer ends of the brush elements with the body section of the turning shank for increasing radial pressure of the ends of the bristles against said threads responsive to axial movement of the body section of the turning shank when the support is seated on said shoulder.

6. A tool for cleaning internal threads of the box member of a tool joint of a drill pipe in which the box member has an internal annular shoulder encircling the bore of the tool joint at the inner terminal ends of the threads, said tool including a turning shank having relatively axially reciprocable head and body sections, a support forming a part of said tool for bridging said bore and having beveled circumferential portions to seat on the internal shoulder and to provide a journal for centering the head section within the bore of the tool joint, brush holders each having forward ends pivotally connected with the head section of the turning shank, brushes removably carried by the holders and having bristles extending outwardly with ends thereof adapted to engage the internal threads of the box member for drawing the brush elements axially into the box member to seat the support on the internal annular shoulder, and toggles pivotally connecting opposite ends of the brush holders with the body section of the turning shank for increasing radial pressure of the ends of the bristles against said threads responsive to axial movement of the body section of the turning shank when the support is seated on said shoulder.

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