May 3, 1960 P. CAVINS 2,935,302

RELEASABLE TOOL-HOLDING SOCKET

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Fig. 1.

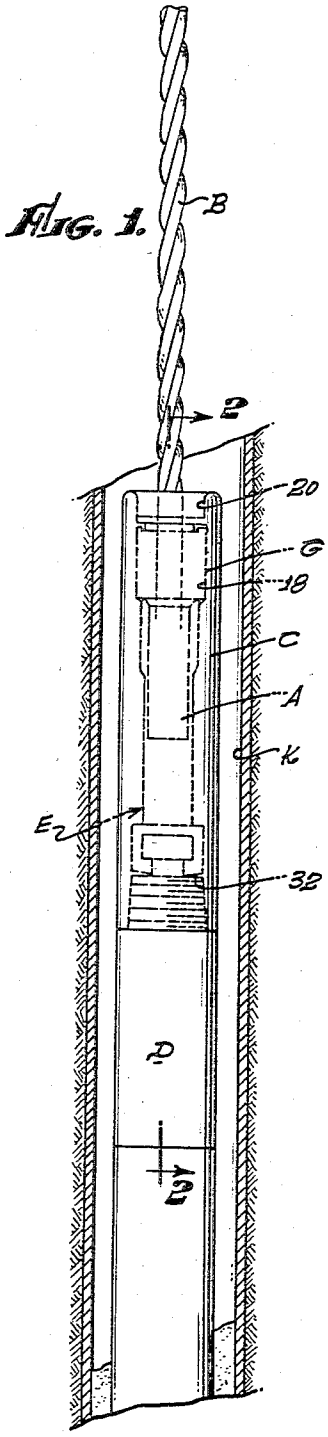


Fig. 2.

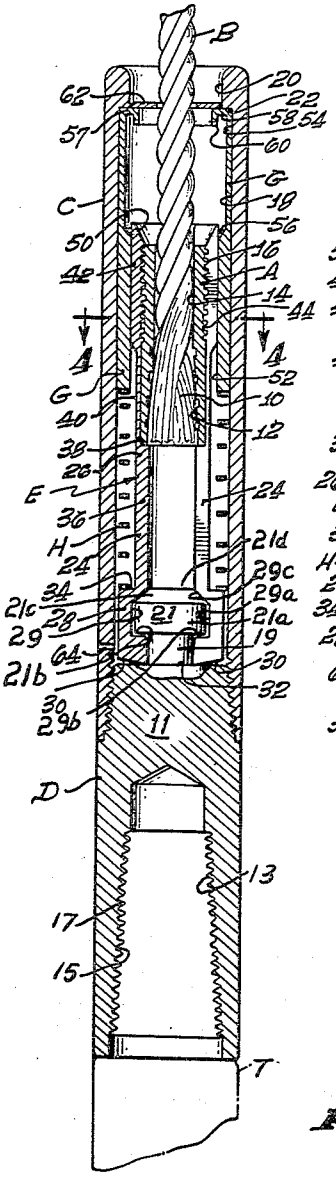
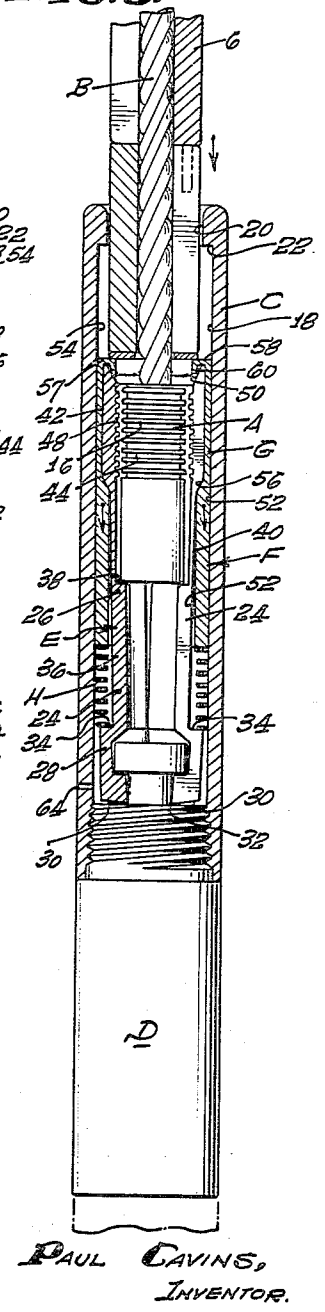


Fig. 3.



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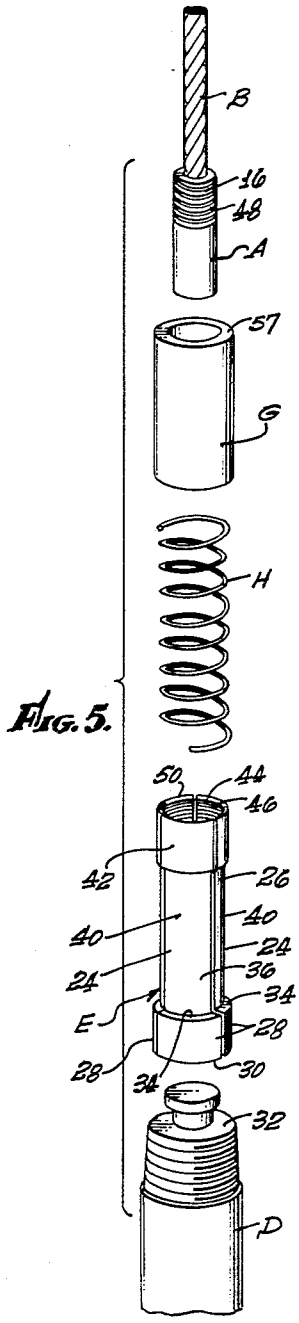


FIG. 5.

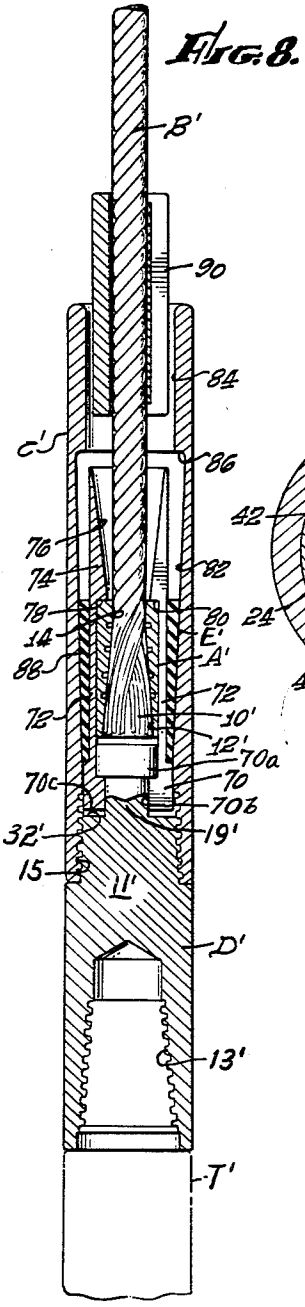


FIG. 8.

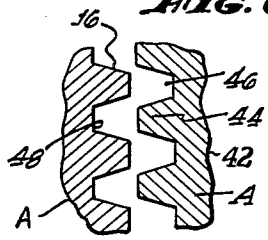


FIG. 6.

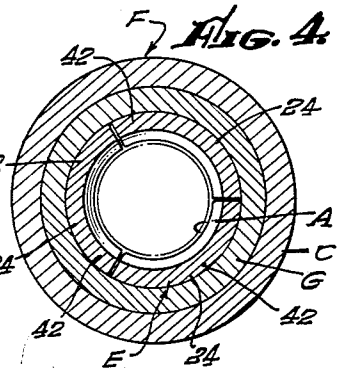


FIG. 4.

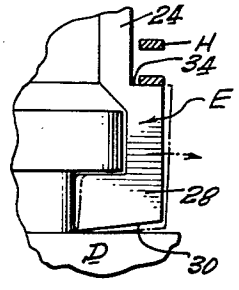


FIG. 7.

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RELEASABLE TOOL-HOLDING SOCKET

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4 Claims. (Cl. 255—26)

The present invention relates generally to the field of tool supporting devices, and more particularly to a quick-change tool socket that may be removably and interchangeably supported in a depending position from the lower end of an elongate flexible member.

Although many devices of this type, often referred to commercially as rope sockets, have been marketed in the past, these prior devices have proved unsatisfactory in that the wire line or cable to which they are affixed can only be separated from the socket when in a well bore by cutting or breaking the line or cable. A further disadvantage of some of the previously available sockets of this type has been the necessity of babbitting the socket to the wire line, which operation requires a fire with its always present hazards when built near an oil well installation.

A major object of the present invention is to provide a quick-change tool socket that eliminates the operational disadvantages of previously available devices of this type that can be interchangeably supported from a number of wire lines or cables, as well as one that permits the supporting line or cable to be separated therefrom when the device is disposed in a well bore.

Another object of the invention is to supply a tool supporting socket of extremely simple mechanical structure that can be fabricated from standard commercially available materials, is positive in operation, easy to use, and requires a minimum of maintenance attention.

These and other objects and advantages of the invention will become apparent from the following description of a preferred and alternate form thereof, and from the accompanying drawings illustrating same, in which:

Figure 1 is a side elevational view of the preferred form of the socket supported from a wire line in a well bore;

Figure 2 is a vertical cross-sectional view of the device when locked to the supporting line taken on line 2—2 of Figure 1;

Figure 3 is the same view as that of Figure 2, but showing the locking portion of the device in position to permit separation of the wire line therefrom;

Figure 4 is a transverse cross-sectional view of the device taken on line 4—4 of Figure 2;

Figure 5 is an exploded perspective view of the components, which when assembled, provide the present invention;

Figure 6 is a fragmentary enlarged cross-sectional view of the engaging and engageable members that support the device from the wire line;

Figure 7 is a fragmentary enlarged cross-sectional view of the lower portion of one of the locking members; and

Figure 8 is a vertical cross-sectional view of an alternate form of the invention.

Referring to the drawings for the general arrangement of the preferred form of the invention, it will be seen that a cylindrical thimble A is rigidly affixed to the lower end of a wire line or cable B that is adapted to be lowered

or raised in a well bore. An elongate rigid tubular body C is provided, the lower end of which threadedly engages a tool holding collar D, or should it be desired, this collar can be formed as an integral part of body C. Laterally movable locking means E are also provided which when in a first position rigidly engage thimble A to support the body from the wire line B, and when in a second position, the locking means is disengaged from thimble A to permit the line to be drawn upwardly and separated from the body. A longitudinally movable sleeve G is slidably disposed within the confines of body C and is at all times urged upwardly by a spring H to maintain the locking means E in the first position.

In detail, the lower end portion of line B terminates in an expanded conical stinger **10**, which by babbitting or other means, is rigidly mounted within the confines of a tapered bore **12** that extends longitudinally through the lower portion of thimble A. At substantially the midpoint of the thimble bore **12** develops into an extension **14** of substantially uniform cross section. Thimble A is formed of a rigid metal, and as shown in Figure 2, the transverse cross section thereof is greater than that of cable B. The upper exterior surface of thimble A is formed with a number of circumferentially extending, vertically separated teeth **16**, the detailed structure of which can best be seen in Figure 6. In cross section these teeth are preferably trapezoidal in shape, although they can be triangular, rectangular, or square if desired.

A longitudinally extending bore **18** is formed in body C as well as a short bore **20** located in the upper portion of the body that is in communication and coaxial alignment with bore **18**. At the junction of bores **18** and **20** a circumferentially extending shoulder **22** is defined, the purpose of which will later be explained in detail.

The tool holder D used with the preferred form of the invention, as can best be seen in Figures 3 and 5, includes a rigid cylindrical member **11** that is preferably formed with a tapped recess **13** which extends upwardly from the bottom thereof. Recess **13**, as is conventional with tool holders used in the oil fields, is adapted to be engaged by the upper threaded portion of any one of a variety of oil tools shown in phantom line in the drawings and generally identified by the letter T.

Threads **15** are formed on the upper exterior surface of member **11** that are adapted to engage a tapped portion **17** of body C, as clearly shown in Figures 3 and 8. A short shank **19** of circular transverse cross section extends upwardly above member **11** and terminates in a head **21** of enlarged transverse cross section. Head **21** is defined by a cylindrical side wall **21***a*, a lower flat ring-shaped face **21***b*, an upwardly and inwardly tapering ring-shaped side wall surface extension **21***c*, and a circular upper face **21***d*.

The tool holder D' used with the alternate form of the invention is identical to holder D except as to the structure of the head thereof. Elements comprising tool holder D' common to tool holder D are identified by the same numerals to which a prime has been affixed. A head **23** of enlarged transverse cross section is provided on the upper end of shank **19'** and is defined by a cylindrical side wall **23***a*, a flat lower ring-shaped surface **23***b*, and a circular top surface **23***c*.

Locking means E is susceptible of a variety of constructions, but in Figures 2 and 3 it is illustrated as including three independent elongate members **24** which can be grouped together to cooperatively form a cylindrical shell **26** as best shown in Figures 4 and 5. Each of the members **24** includes an arcuate base **28** which preferably has a slightly downwardly and inwardly tapering face **30** that rests on the upper face **32** of the tool holder D. A first horizontal circumferentially extending seat **34** is formed on base **28** from which an

elongate member 36 projects upwardly, and the interior surface of member 36 develops into a second horizontal arcuate seat 38 against which a portion of the lower surface of thimble A abuts. Above second seat 38 member 36 develops into an extension 40, which in turn develops into a heavier walled upper portion 42 on which a number of vertically spaced circumferentially extending teeth 44 are formed (Figure 6). Teeth 44 define circumferentially extending recesses 46 therebetween which may be engaged by teeth 16, and circumferentially extending recesses 48 are also defined between teeth 16 which are engageable by teeth 44. Thus a tooth structure is provided which is adapted to removably interlock thimble A to socket F. The extension 42, as best seen in Figure 2, terminates in a circumferentially extending, downwardly and inwardly tapered cam face 50, the purpose of which will become apparent hereinafter. Each of the bosses 28 has a recess 29 extending outwardly from the longitudinal interior surface thereof. Each of the recesses 29 is defined by surfaces 29*a*, 29*b* and 29*c* that are complementary to surfaces 21*a*, 21*b* and 21*c* respectively on head 21. Recesses 29 serve to interlock members 24 with head 21 when positioned adjacent thereto within the confines of body C. Thus, it will be seen that the members 24 comprising locking means E are separate elements that may be assembled to form the combination shown in Figure 5 where the members interlock not only with thimble A but head E a swell, and are held in this interlocking position due to cooperation with spring H, sleeve G and tubular body C.

Sleeve G (Figures 2 and 3) is formed with a longitudinally extending bore 52 of such diameter as to slidably and snugly engage the exterior surface of the extensions 42 and maintain locking means E in the first position wherein it is in engagement with thimble A. A counter bore 54 of larger diameter than bore 52 and longer than the thickened wall extensions 42 of locking means E is formed in sleeve G. Counter bore 54 and bore 52 define a downwardly and inwardly tapering circular shoulder 56 as shown in Figure 2. The upper end portion of sleeve G terminates in a ring 57 that is of inverted L-shaped transverse cross section, and the ring includes a horizontal leg 58 and a vertical leg 60.

Sleeve G (Figure 2) is at all times urged upwardly by the compressed helical spring H, the lower end of which rests on the first seat 34 and the upper end of which abuts against the lower surface of the sleeve. Spring H at all times maintains the upper surface of leg 58 in abutting contact with the shoulder 22. When the socket F is supported on the lower end of the wire line B in a well bore K (Figure 1) and it is desired to disengage the socket therefrom, a go-devil 63 in the form of a tubular member is provided that can slide down the wire line B and is of such external diameter that it can enter the confines of the bore 20 (Figure 3). The go-devil 63 is of such weight that when it rests on the upper surface of ring 57 the go-devil is sufficiently heavy to compress spring H and permit sleeve G to move downwardly relative to locking means E. As the sleeve completes the lower portion of its downward movement leg 60 engages the cam face 50 and moves the portions 42 of locking means E laterally outwardly until the external surface of the heavy-walled portions 42 contact the counter bore 54. As this movement occurs the locking members 24 rock outwardly on the tapered surfaces 30 whereby teeth 16 and 44 are disengaged to permit the thimble A to be raised upwardly and separated from socket F.

In operation it has been found that foreign material may tend to pass downwardly into the confines of socket F through bore 20. To prevent this, it is desirable to provide a washer 62 that lies on the upper surface of ring 57 through which the wire line extends. Washer 62 can be formed of heavy cardboard, plastic, or the like, as it is at no time subjected to any considerable force. To avoid the possibility that socket F may become filled with fluid and thereby prevent downward movement of locking sleeve G, one or more very small fluid escape ports 64 are formed in body C, as shown in Figure 2.

The use and operation of the invention have been described in detail and need not be repeated herein, other than to emphasize that the members 24 not only interlock with thimble A but with the head 21 of holder D as well. When members 24 occupy the position shown in Figure 2 they act as the connecting links to support the full load of tool T, as well as the weight of tool holder D and tubular body C from the line B. It will be particularly noted that the weight required in the go-devil 63 to disengage thimble A from locking means E is determined solely by the resiliency of the spring H. Accordingly, the invention can be relatively short in length and light in weight, for the only portion thereof that is subjected to the load of the tool T is the locking means E. The tubular body C and sleeve G are subjected to no substantial load and accordingly can be light in structure for the only stress to which they will be subjected is that brought on by the members 24 as they tend to pivot outwardly from one another to release the thimble A.

The alternate form of the invention as shown in Figure 8 is similar to the preferred form, except that a smooth-surfaced thimble A′ may be removably locked in socket F′, and the teeth 16 and 44 required in the preferred form are dispensed with. As in the preferred form of the invention, thimble A′ is rigidly affixed to the lower end of a wire line or cable B′.

This alternate form of tool socket includes an elongate tubular member C′ that threadedly engages a tool-holding D′. Locking means E′, as can be seen in Figure 8, includes two independent and laterally movable members 72. Each member 72 has an arcuate, inwardly extending base 70 that is defined by an upper flat face 70*a*, interior curved side surface 70*b* and lower face 70*c*. Faces 70*a* are complementary to faces 23*b* and are in contact therewith. Surface 70*b* and lower face 70*c* are positioned adjacent the exterior surface of shank 19′ and the surface 32′ respectively. Each member 72 has an upwardly disposed extension 74 having a downwardly and inwardly tapering interior surface 76, which surface terminates in a horizontally positioned seat 78. When body C′ is locked to line B′ these seats 78 engage a portion of a flat, upper ring-shaped surface 80 defined by the thimble A′.

The body C′ has a longitudinally extending bore 82 formed therein, the lower portion of which bore is threaded to engage the tool holder D′. The portion of bore 82 above the threads taper upwardly and outwardly. A coaxially disposed counter bore 84 of smaller diameter than bore 82 is formed in member C′, and at the junction with the bore 82 defines a horizontal circular shoulder 86. A resilient sleeve 88 is provided that is positioned within the confines of body C′. The exterior surface of this sleeve contacts the surface of bore 82, and the interior surface of the sleeve abuts against the exterior surfaces of members 72. Sleeve 88 is of such dimensions and resiliency that it at all times tends to maintain members 72 in the positions shown in Figure 8, wherein the upper surface 80 of thimble A′ abuts against the seats 78. A tubular go-devil 90 is provided that may be slid down the wire line B′, and it is of such external diameter that it can pass through counter bore 84. The go-devil 90 is of such weight and external diameter that when it contacts the tapered surfaces 76, the members are moved laterally apart to compress sleeve 88, which lateral movement is sufficient to permit disengagement of the thimble from the seat 78. Thereafter the thimble is free to move upwardly within the confines of the body C′, and the cable B′, go-devil 90 and thimble A′ can be raised to the ground surface.

Both the preferred and alternate forms of the invention are used in the same manner and as previously described in detail. These two forms of the socket permit the wire line B or B' to be disengaged from the socket when disposed in a well bore by simply dropping one of the go-devils **63** or **90** downwardly into the well bore, as previously described in detail. It will be seen that as described these inventions provide the operational advantage that the wire lines B and B' can be easily separated from the sockets should a tool be stuck in the hole, as well as the advantage that the sockets F and F' are interchangeable from one wire line to another.

Although my invention is fully capable of achieving the results and providing the advantages hereinbefore mentioned, it is to be understood that it is merely the presently preferred embodiments thereof, and that I do not mean to be limited to the details of construction above described other than as defined in the appended claims.

I claim:

1. In a tool-holding socket adapted to be releasably supported from a depending flexible elongate member in a bore hole, the combination of: a tool holder defined by a cylindrical body having a flat upper surface, a shank of smaller transverse cross section than that of said cylindrical body extending upwardly from the upper end thereof, a head formed on the upper end of said shank and having a transverse cross section greater than said shank but less than said cylindrical body, said cylindrical body defining at the lower end thereof an internally threaded upwardly extended recess, said threaded recess being adapted to be threadably engaged by a threaded portion of a tool to be held by said socket, external threads formed at the upper end of said cylindrical body extending downwardly therefrom; an elongate tubular body having an internally threaded lower end portion threadably mated with said male threaded upper end of said cylindrical body to maintain said cylindrical body and elongate tubular body in mated coaxial alignment, said elongate tubular body defining an internal longitudinal opening of substantially greater transverse cross section than the transverse cross section of said head; an elongate rigid thimble affixed to the lower end of said elongate member, said thimble being of substantially less transverse cross section than the transverse cross section of said longitudinal opening through said elongate tubular body and positioned within said elongate tubular body above said head, said thimble defining at the outer surface thereof a plurality of transversely extending shoulders; locking means disposed within said tubular body, said locking means including a plurality of longitudinally disposed rigid members, each of said members having a base portion and an upper portion, which base and upper portions are arcuate cylindrical segments, said members being disposed in cylindrical arrangement with the lower surface thereof proximate said upper surface of said cylindrical body and the upper surface of said rigid members being positioned above said thimble, said members each defining an arcuate recess extending from the inner surface of said lower portion, said arcuate recesses when said rigid members are disposed in cylindrical arrangement defining an annular recess mateable with said head to longitudinally affix said head, said annular recesses and said bottom surface of said rigid members being adapted to allow pivotal movement of the upper portion of said members laterally outward while retaining said head in longitudinal engagement within said annular recess, said upper portions of said rigid members defining by the internal surface thereof a cylinder mateable with the outer cylindrical surface of said thimble, said internal surface of each of said members having a plurality of shoulders

mateable with said shoulders on said thimble whereby said thimble and rigid members are longitudinally engaged when said members are in a first position, said shoulders on said rigid members being adapted to be laterally disengageable from said shoulders on said thimble by outward pivotal movement of said members about a pivot point proximate the lower end thereof, said rigid members thus being laterally movable from a first position at which the upper portion thereof longitudinally engages said thimble and the lower portion thereof longitudinally engages said head to a second position at which said upper portion is disengaged from said thimble, each of said rigid members having an outwardly projecting upper portion extending downwardly from the upper end thereof throughout a portion of the length of said members; a sleeve slidably mounted in said tubular member, said sleeve having an outside diameter substantially equal to the inside diameter of said elongate tubular body and an inside diameter at the lower portion thereof substantially equal to the outside diameter of said rigid members when said rigid members are cylindrically disposed in said first position, said sleeve having an upper portion of increased inside diameter substantially equal to the diameter of said rigid members when said rigid members are in second position, said sleeve being longitudinally movable from an upper position at which said first inside diameter engages said rigid members to maintain them in said first position thereof to a lower position at which said increased inside diameter of said sleeve is mated with said outwardly projecting upper portion of said rigid members to allow the outward pivotal movement of said members to said second position, said sleeve having an upwardly disposed inwardly extending shoulder; and a gravity actuated weight slidably movable along said elongate member, said weight being adapted to enter the upper end of said elongate tubular body to contact the inwardly extending shoulder of said sleeve whereby said sleeve is moved from said upper position to said lower position by the downward force of said weight.

2. A tool-holding socket as defined in claim 1 wherein a compressed helical spring is provided that surrounds said rigid members, the lower end of said spring being stationary with respect to said cylindrical body, the upper end of said spring being in bearing contact against the lower end of said sleeve, with the resiliency of said spring determining the magnitude of the weight of said gravity-actuated weight means required to move said sleeve from said upper to said lower position.

3. A tool-holding socket as defined in claim 2 wherein the top of said sleeve is provided with a downwardly and inwardly extending shoulder, the upper extremities of said rigid members being formed with downwardly and inwardly tapering faces, and said downwardly extending sleeve shoulder is capable of slidably engaging said downwardly and inwardly tapering faces to positively pivot said rigid members outwardly from one another when said sleeve is moved downwardly to said lower position thereof in said tubular member by said gravity-actuated weight means.

4. A tool-holding socket as defined in claim 3 wherein a sheet of frangible material extends across the upper extremity of said sleeve to prevent entry of foreign material into said tubular body.

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