Nov. 10, 1942. R. E. LEE 2,301,783

INSULATED ELECTRICAL CONDUCTOR FOR PIPES

Filed March 8, 1940

FIG. 1

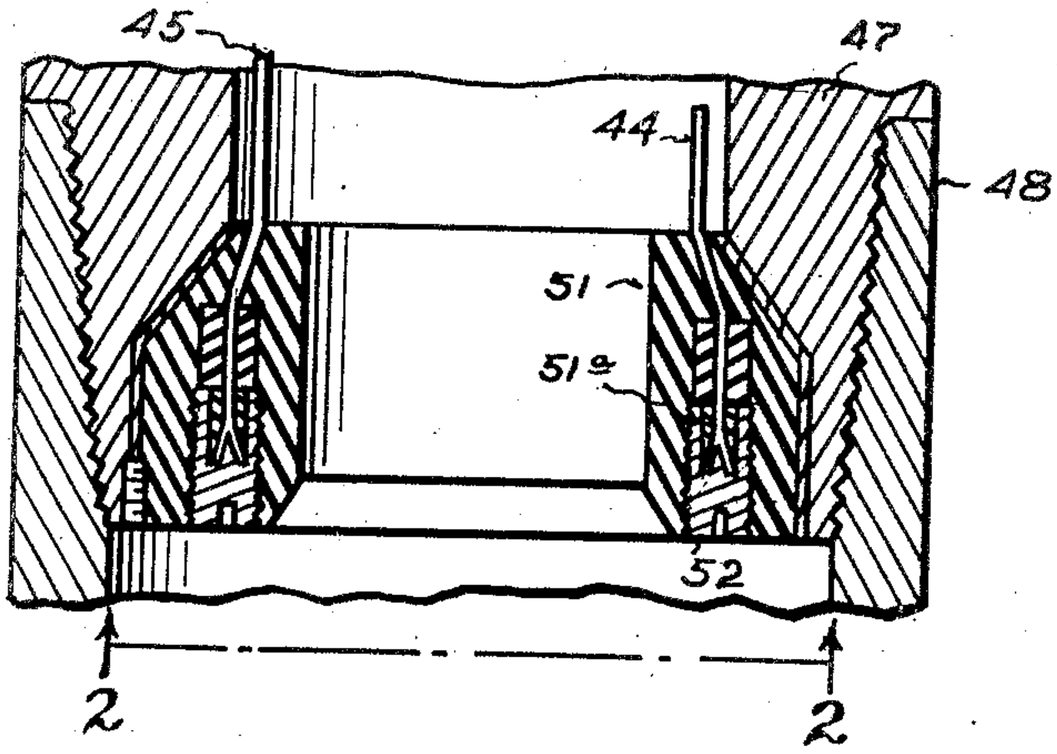


FIG. 2

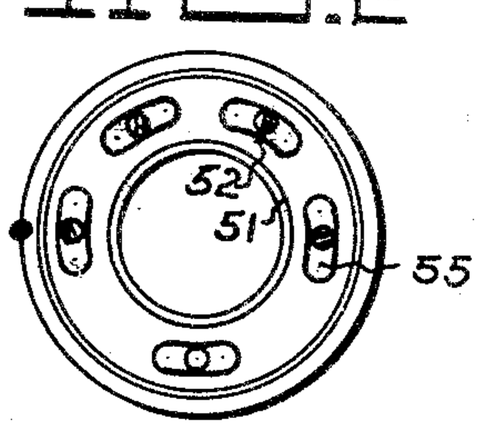


FIG. 4

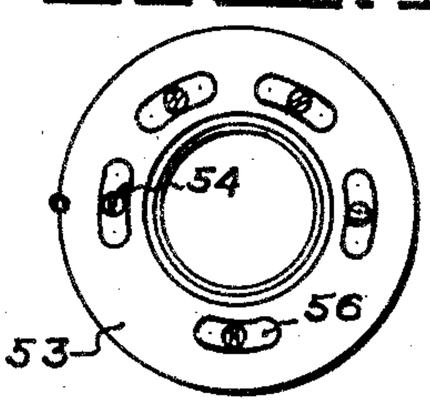
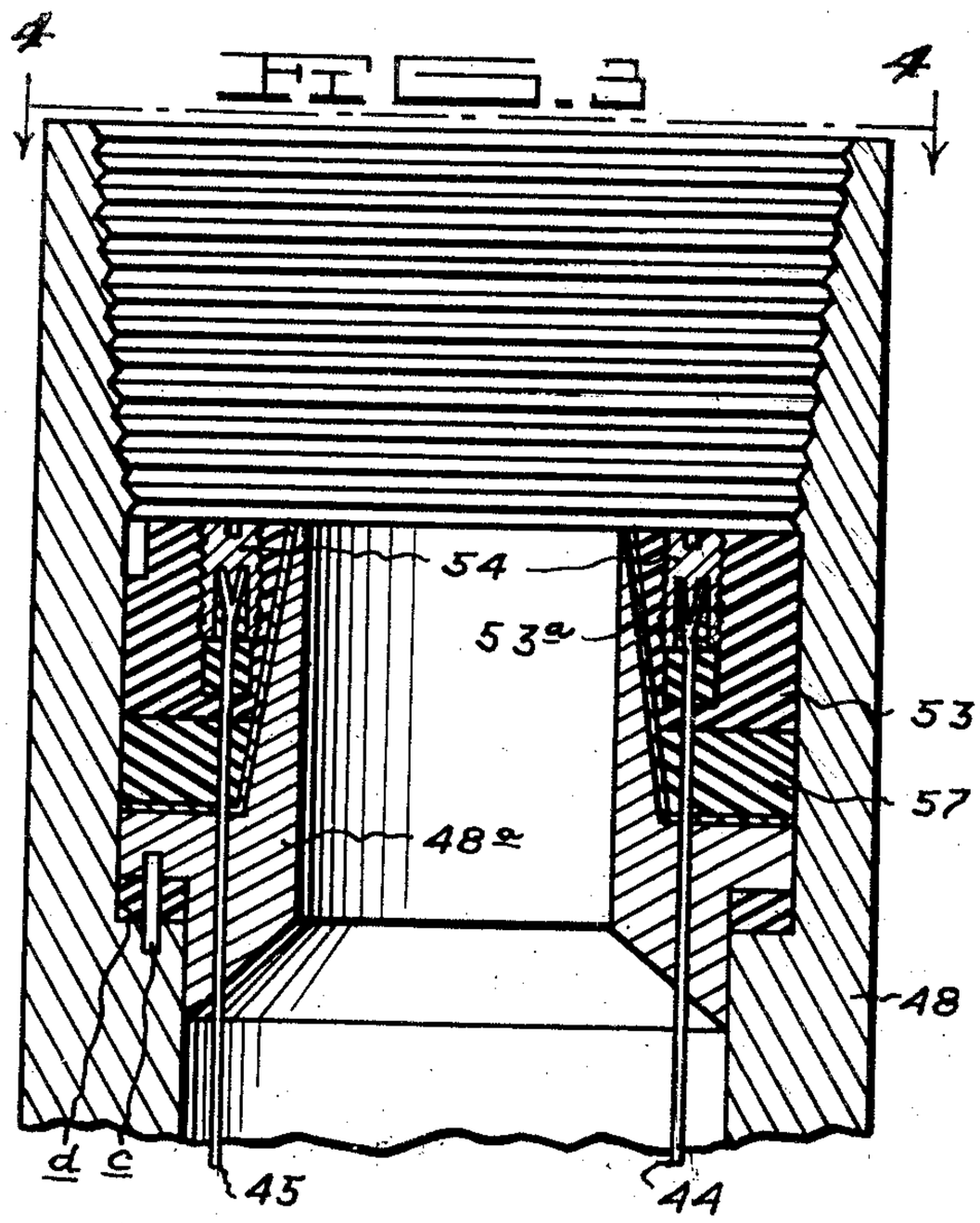


FIG. 3



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Patented Nov. 10, 1942 2,301,783

UNITED STATES PATENT OFFICE

2,301,783

INSULATED ELECTRICAL CONDUCTOR FOR PIPES

Robert E. Lee, Coleman, Tex.

Application March 8, 1940, Serial No. 322,937

4 Claims. (Cl. 173—326)

This invention relates to insulated electrical conductors for pipes, and it has particular reference to an apparatus whereby an electrical circuit may be completed between a drilling bit and the derrick floor and suitably insulated from the metallic parts of the drill stem, in a system such as described in my U. S. Letters Patent No. 2,196,-314, April 9, 1940, for Method of measuring the inherent terrestrial magnetism of the earth's crust.

The principal object of the invention is to provide an electrical coupling through tool joints on a drill stem, by means of which electrical contacts may be made during the normal operation of making up or breaking the tool joints when going in or coming out of the bore hole with the drill stem.

Another object is to provide an electrical coupling so arranged that a positive electrical connection will be made between corresponding conductors when the pipe sections are made up to full shoulder.

Yet another object is to provide means whereby electrical contacts may be made and maintained between non-rotating conductors at the surface of the earth and corresponding conductors so positioned within the drill stem that they will rotate with the rotation of the drill stem assembly.

A still further object is to provide effective insulating means for the electrical contacts adjacent the tool joints, which means are resilient and highly effective in excluding liquids and other foreign material from the electrical contacts.

Referring to the drawing:

Figure 1 is a fragmentary view in vertical cross section of the means for making electrical contact from the wires through the box and pin of a tool joint,

Figure 2 is a view taken on the line 2—2 on Figure 1,

Figure 3 is a fragmentary view in elevation of the companion assembly to Figure 1 and,

Figure 4 is a view taken on the line 4—4 on Figure 3.

In continuing with a more detailed description of the drawing, it will be understood that by means of the structure herein described and illustrated, sections of drill stem may be made up or taken apart without additional effort, and the electrical circuits are substantially and effectively insulated and sealed throughout the drill stem from the effects of the metallic parts as well as the circulating medium. Moreover, the circuits herein described are insulated and are completed without the aid of the earth as a ground. The tool joint pin section and the tool joint box section assemblies are illustrated in Figures 1 to 4 and by means of the assemblies illustrated and to be hereinafter described, the various electrical circuits which include wires 44 and 45 are insulated, sealed and completed.

As illustrated in Figure 1 an annular ring 51, formed as shown, serves to house the conducting wires of the circuits. These wires are electrically connected to metallic screws 52. The ring 51 is locked in a predetermined position relative to the tool joint pin section 47.

An annular ring 53 is positioned within the box section of the tool joint, and is locked against rotary motion thereto in a predetermined position, but is free to move longitudinally thereto within fixed limits. Metallic screws 54 serve to make electrical contact with their respective wires of the circuits. The screws 52 and 54 serve to effect contact with conducting segments 55 and 56, respectively. These segments are embedded within the rings 51 and 53. The purpose of these segments is to provide ample contact in a predetermined position when the tool joint is made up to full shoulder.

The annular ring 53 is mounted above an annular ring 57, which ring is comprised of a resilient and insulating material. This ring further serves as a sealing means. Thus it is obvious that desired contacts may be made by the normal operations of screwing up the tool joint to full shoulder and the resiliency of the ring 57 is effective in urging longitudinally the ring 53 which ring contacts under pressure the ring 51 when the tool joint is screwed up to full shoulder.

It will be noted that a pin *c* is positioned as shown in Figure 3 to prevent relative rotation between the member 48 and the member 48*a*. Interposed between these members is a packing ring *d*.

Within the annular insulated rings 51 and 53 resilient sockets 51*a* and 53*a* are provided as shown. The purpose of these resilient sockets is to insure positive contacts at all times between the respective wire conductors when the tool joint is made up to full shoulder.

It will be understood that non-conducting material may be used throughout the entire construction with the exception of the conducting elements, if so desired.

Manifestly, the construction as shown and described is capable of some modification and such modification as may be construed within the scope and meaning of the appended claims is also considered to be within the spirit and intent of the invention.

What is claimed is:

1. In a drill stem having a plurality of joined together sections, apparatus for completing an electrical circuit between a tool joint pin section and a tool joint box section of the drill stem comprising an annular ring disposed in the tool joint pin section at the end portion thereof and locked in a predetermined position therein, said ring being provided with a plurality of spaced

apart threaded recesses, a plurality of conducting wires extending longitudinally from said annular ring in the tool joint pin section through the drill stem in sealed-off relation from the central portion thereof, each of said wires having one end portion thereof extending into one of said threaded recesses of said ring, a plurality of metallic screws each engaging in one of said threaded recesses to make electrical contact with the conducting wire therein, a plurality of spaced apart conducting segments carried by said annular ring, each in contact with one of said screws, the said segments being equidistant from the center point of said annular ring, a second annular ring disposed in a predetermined position in the tool joint box section and locked against relative rotary movement therewith, said second ring being adapted to have limited longitudinal movement, said second annular ring being provided with a plurality of spaced apart threaded recesses, a plurality of conducting wires extending longitudinally from said annular ring in the tool joint box section through the drill stem in sealed off relation from the central portion thereof, each of said wires having one end portion thereof extending into one of said threaded recesses of said second annular ring, a plurality of metallic screws each engaging in one of said threaded recesses in said second ring to make electrical contact with the conducting wire therein, a plurality of spaced apart conducting segments carried by said second annular ring at a point equidistant from the center point of said second ring, each in contact with one of said screws, resilient means positioned in said tool joint box section to exert pressure against said second ring when the tool joint pin section and tool joint box section are screwed up to full shoulder, whereby the conducting segments carried by one ring each contacts its corresponding segment carried by the other ring.

2. In a drill stem having a plurality of joined together sections, apparatus for completing an electrical circuit between a tool joint pin section and tool joint box section of the drill stem comprising an annular ring disposed in the tool joint pin section at the end portion thereof and locked in a predetermined position therein, said ring being provided with a plurality of spaced apart threaded recesses, a plurality of metallic screws each engaging in one of said threaded recesses, each of said screws having a portion of its shank recessed, resilient means disposed in each recessed shank portion of said screws, a plurality of conducting wires extending longitudinally from said annular ring in the tool joint pin section through the drill stem in sealed off relation from the central portion thereof, each of said wires having one end thereof terminating in the resilient means in the recessed portion in the shank of each of said metallic screws, said conducting wires electrically contacting said metallic screws, a plurality of spaced apart conducting segments carried by said annular ring each in contact with one of said screws, the said segments being equidistant from the center point of said annular ring, a second annular ring disposed in a predetermined position in the tool joint box section and locked against relative rotary movement therewith, said second ring being adapted to have limited longitudinal movement, said second annular ring being provided with a plurality of spaced apart threaded recesses, a plurality of metallic screws each engaging in one of said threaded recesses in said second annular ring, each of said screws having a portion of its shank recessed, resilient means disposed in each recessed shank portion of said screws, a plurality of conducting wires extending longitudinally from said annular ring in the tool joint box section through the drill stem in sealed off relation from the central portion thereof, each of said wires having one end thereof terminating in the resilient means in the recessed portion in the shank of each of said metallic screws, said second-mentioned conducting wires electrically contacting said second-mentioned metallic screws, a plurality of spaced apart conducting segments carried by said second annular ring at a point equidistant from the center point of said second ring, each in contact with one of said screws, resilient means positioned in said tool joint box section to exert pressure against said second ring when the tool joint pin section and tool joint box section are screwed up to full shoulder, whereby the conducting segments carried by one ring each contacts its corresponding segment carried by the other ring.

3. Apparatus for completing an electrical circuit between pipe sections in threaded engagement comprising, an annular ring locked in the end portion of one pipe section, said ring being provided with a plurality of spaced apart threaded recesses, a plurality of metallic screws each engaging in one of said threaded recesses, each of said screws having a portion of its shank recessed, resilient means disposed in each recessed shank portion of said screws, a plurality of conducting wires each terminating in the resilient means in each recessed screw shank portion and in electrical contact with said screws, conducting segments carried by said annular ring, each in contact with one of said screws, a second annular ring disposed in the end portion of the engaging pipe section and locked against relative rotary movement therewith, said second ring being adapted to have limited longitudinal movement, said second ring being provided with a plurality of spaced apart threaded recesses, a plurality of metallic screws each engaging in one of said threaded recesses in the said second ring, each of said screws having a portion of its shank recessed, resilient means disposed in each recessed shank portion of said screws, a plurality of conducting wires each terminating in the resilient means in each recessed screw shank portion and in electrical contact with said screws, conducting segments carried by said second annular ring, each in contact with one of said screws, resilient means positioned in said second mentioned pipe section to exert pressure against said second mentioned annular ring when both pipe sections are screwed up to full shoulder, whereby the conducting segments carried by one ring each contact its corresponding segment carried by the other ring.

4. In a tube section, an annular ring locked in the end portion of the section, said ring being provided with a plurality of spaced apart threaded recesses, a plurality of metallic screws each engaging in one of said threaded recesses, each of said screws having a portion of its shank recessed, resilient means disposed in each recessed shank portion of said screws, a plurality of conducting wires each terminating in the resilient means in each recessed screw shank portion and in electrical contact with said screws, and conducting segments carried by said annular ring each in contact with one of said screws.

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