May 28, 1968 E. G. BOICE 3,385,130

DOVETAILED DRILL COLLAR

Filed Sept. 24, 1965

Fig. 2

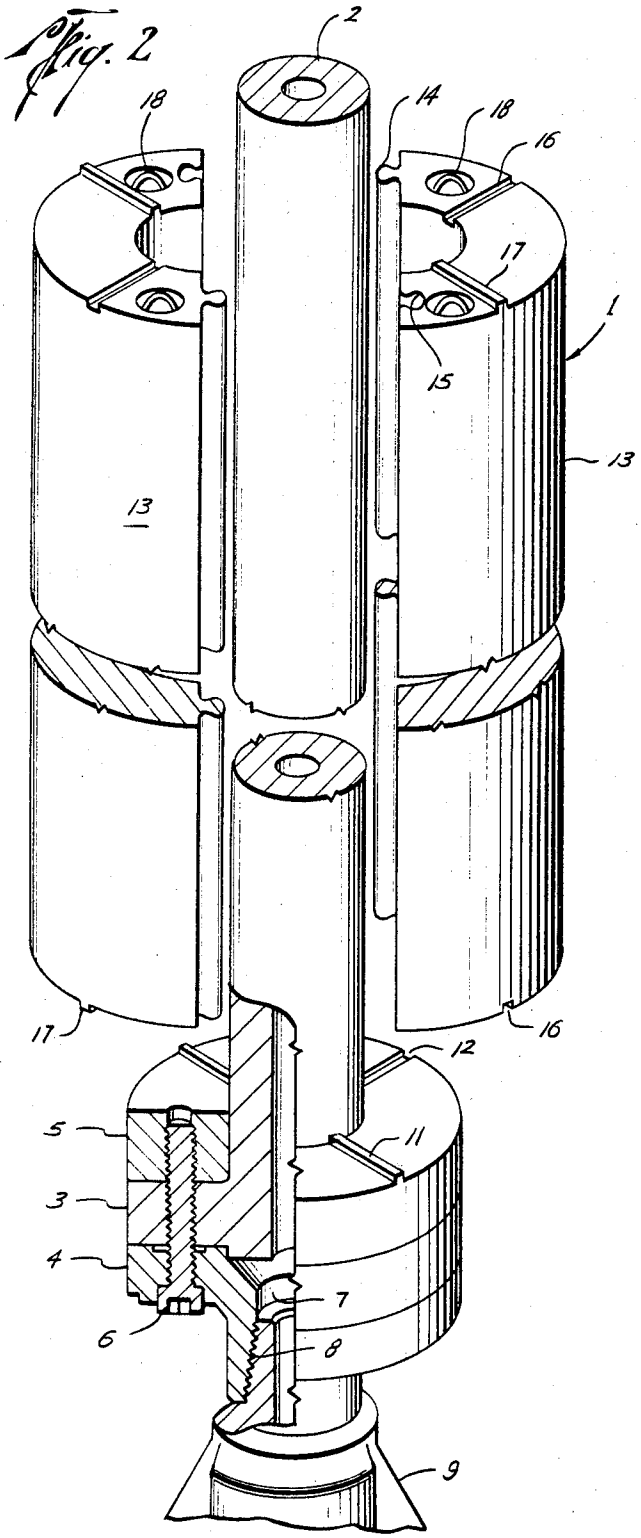
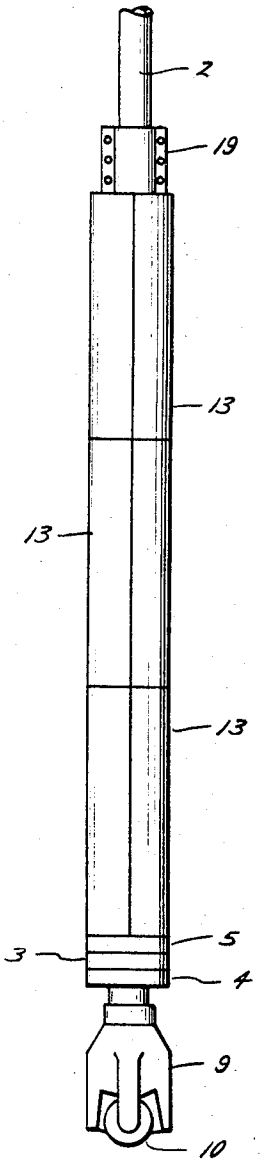


Fig. 1



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DOVETAILED DRILL COLLAR

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ABSTRACT OF THE DISCLOSURE

In the making of large bore holes on the order, for example, of 48 inches to 72 inches in diameter for use in atomic bomb tests, vertical mine shafts, access bores and ventilation or escape shafts for mines, it is necessary to employ in the drilling procedure an enormous amount of drilling weight for use with the large drilling bit. The drill collar may weigh between 100,000 to 300,000 pounds and its diameter may be nominally 60 inches when employing a bit 72 inches in diameter. A drilling rig conventionally can accommodate only three drill collars connected end to end for a distance of 90 feet but said conventional collars thus connected would not provide the necessary weight for drilling large bore holes. The drill collar herein disclosed is intended for use under large bore hole conditions.

The drill collar of this invention has a central stem to which weights may be added to or removed from laterally thereof without the necessity of raising the weights over the upper end of the central stem. The central stem may be on the order of sixteen inches in diameter. The drill collar may be supported in a normal fashion from the top of the central member when installing or removing the weights therefrom, since each of the weights is provided for lateral installation about the central stem. Thus, the weight does not have to be lifted over the top of the central stem, which usually is about 30 feet long, in order to install or remove such weight from the central stem.

This invention relates generally to apparatus for drilling wells and more particularly to a drill collar for connection to the lower end of a drill stem.

In the rotary drilling of deep wells, it is customary to employ heavy drill collars connected to the lower end of a lighter drill stem, and to connect a drill bit to the lower end of the lowermost collar. The drill collars provide the necessary weight for drilling and, being on the lower end of a lighter and more flexible drill stem, the drill collars act as a "plumb bob," thus tending to make the drill bit drill straight.

The drill collar of the invention is particularly useful for large bore holes since a large amount of drilling weight is desired for drilling with a large bit, but the limited axial room available in a drilling rig may not afford the necessary length required to supply the desired weight by connecting conventional drill collars end to end. In other words, a drilling rig may, for example, accommodate only three collars connected end to end, which collars extend for a total distance of approximately ninety feet. Three conventional collars thus connected may not provide the necessary or desired weight for drilling from the surface of the earth large bore holes on the order, for example, of forty-eight inches to seventy-two inches in diameter. Such large bore holes are commonly drilled for atomic bomb test devices, vertical mine shafts, access bores and ventilation or escape shafts for mines.

It is an object of this invention to provide a new and improved drill collar which is particularly useful in the drilling of large bore holes.

Another object is to provide a new and improved drill collar to provide a large amount of weight concentrated close to the drill bit and to the bottom of the hole being drilled.

Another object of the invention is to provide a new and improved drill collar having a central tubular member or mandrel upon which is placed a number of separate weights.

Another object of the invention is to provide a new and improved drill collar having a central member upon which separate weights may be placed, which weights may slidably engage with each other to secure them in confronting relationship with each other and about the central member.

Another object is to provide a new and improved drill collar having a central stem to which weights may be added to or removed from laterally thereof without the necessity of raising the weights over the upper end of the central member.

Another object of the invention is to provide a new and improved drill collar for large bore holes, which collar is efficient to operate and economical to manufacture.

Another object is to provide a new and improved drill collar for large bore holes, which collar may be disassembled and transported to another drilling site and assembled at the new drilling site.

Another object is to provide a new and improved drill collar which may be disassembled so that the parts thereof may be shipped or transported separately on a number of trucks or the like.

Other objects will become apparent from the following description and the accompanying drawings in which:

FIGURE 1 is a side elevational view of the drill collar of the invention.

FIGURE 2 is an exploded pictorial view, partly in section, showing the relationship of the various parts of the drill collar of the invention.

The drill collar of the invention is shown generally at **1**, comprising a central tubular member **2**, which may be made of steel or the like, and which is adapted to be threadedly engaged into the lower end of a hollow drill stem (not shown).

The tubular member **2** has a circular flange **3** adjacent to the lower end thereof. An adapter **4** is located under the flange **3**. A bolt ring **5** is located on top of the circular flange **3**. The adapter **4** is secured to the flange **3** by means of bolts **6**, which extend therethrough and through the flange **3** and are threadedly secured within the bolt ring **5**. The adapter **4** has a central opening **7**, the lower end of which is internally threaded as shown in **8** in order to threadedly receive a drill bit **9**.

The drill bit **9** may have a number of roller cutters **10** to drill the formation being encountered during the drilling operation, as is well known. Drilling fluid such as air or water may be circulated downwardly through the tubular member **2** and through the bit **5** and thence upwardly to the surface of the earth in the annulus between the drill bit **9** and the drill collar **1** and the wall of the bore hole being drilled.

The upper surface of the bolt ring **5** may have successive, radially extending raised ribs **11** and grooves **12**. Weights **13** are sector shaped in transverse section and are surrounding the central member **2**. The weights **13** may be identical and each is provided with a tongue **14** and a groove **15**.

The lower ends of the weights **13** are provided with grooves **16** and ribs **17** whereby when in place the groove **16** of the weight **13** will register with the rib **11** of the bolt ring **5** and the rib **17** will be disposed within the groove **12** of the bolt ring **5**. Similar grooves **16** and ribs **17** are provided on the other end of the weight **13** to register with corresponding grooves and ribs of adjacent weights when additional weights are supplied to the central member **2**.

The weights **13** may be composed of cast steel or the like or other suitable material so that sufficient and concentrated weight is provided for the bit in order that it may drill properly and straight.

Each weight **13** is provided with lifting rings **18** so that the weights may be lifted in place about the central member **2** or removed therefrom.

To assemble the drill collar of the invention, a weight **13** is lifted by the rings **18** and moved laterally to embrace the central member **2** and rotated in order that the rib **11** registers with the groove **16** and the rib **17** registers with the groove **12**, and is then lowered.

After this weight is in place, a second weight **13** is lifted by the rings **18** to a position where the bottom of this second weight is slightly above the upper end of the first weight, then the second weight **13** is moved laterally to embrace the central member **2** and to a position where the tongues **14** are aligned with the grooves **15**, whereupon the second weight is lowered to the same level as the first weight, the tongue and groove connection along the meeting edges of said weights serving to secure the weights laterally on the central member **2** and the groove **16** and the rib **17** serving to rotatably lock the weights to each other and to the bolt ring **5**.

After a sufficient number of weights **13** have thus been supplied to the central member **2**, a keeper **19** may be bolted around the central member **2** to keep the weights **13** axially in place on such member.

By way of example, the drill collar of the invention may weigh between 100,000 and 300,000 lbs., and the diameter of the collar may nominally be sixty inches, when drilling with a bit, for example, of seventy-two inches in diameter. The central member **2** may be on the order of sixteen inches in diameter and may have walls one and one half inches thick. Thus, it will be appreciated that the drill collar of the invention has a further advantage

in that it may be supported in a normal fashion from the top of the central member when installing or removing the weights therefrom, since each of the weights is provided for lateral installation about the central member. Thus, the weight does not have to be lifted over the top of the central member **2**, which usually is about 30 feet long, in order to install or remove such weight from the central member. Also, as mentioned, the weights may be identical in form, and when keyed together do not require the use of separate locking devices to retain them in place about the central member. Further, the drill collar may readily be disassembled for easier handling and transportation of the parts.

The invention is not limited to the embodiment shown. Various changes within the scope of the following claim will become apparent to those skilled in the art.

I claim:

1. A drill collar comprising a central tube, a retainer means on said tube, a pair of weights on said tube and stacked upon said retainer means, each of the weights being sector-shaped in transverse section, tongue and groove connections along the meeting edges of said weights, whereby the weights may slidably engage with each other.

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