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WEAR-RESISTING TOOL JOINT

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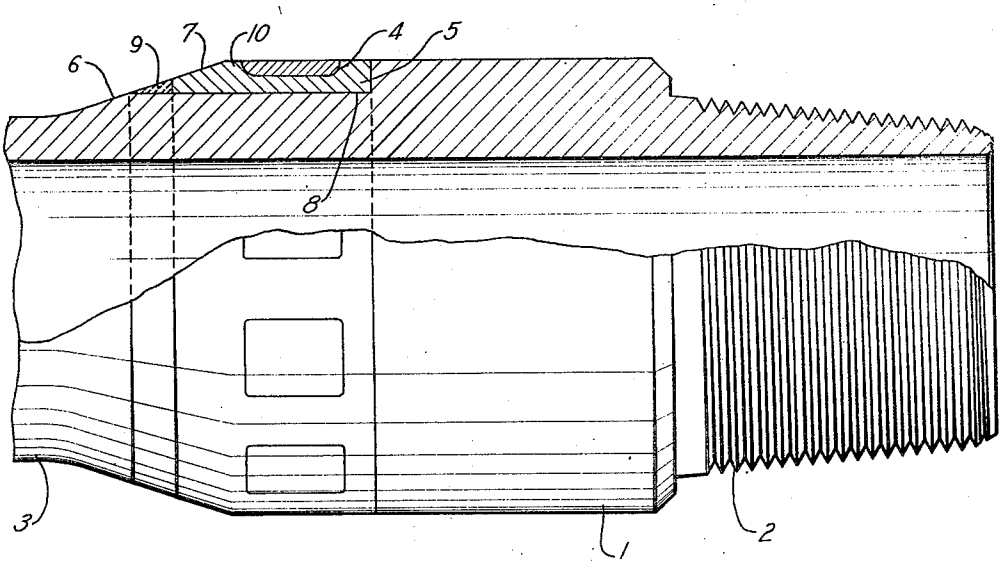



Fig. 1

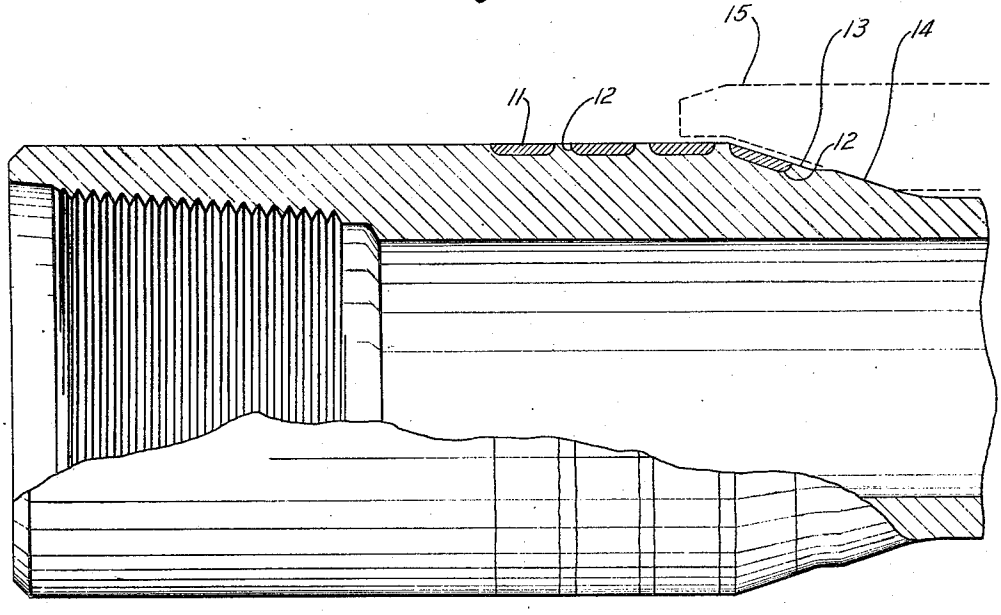



Fig. 2

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## WEAR-RESISTING TOOL JOINT

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Application October 27, 1941, Serial No. 416,632

1 Claim. (Cl. 308—4)

My invention relates to tool joints employed to connect together the sections of drill pipe for well drilling.

In the rotation of the drill stem in the operation of drilling the sections of the drill stem are connected together by tool joints which are of heavier construction than that of the pipe, the wall thickness being substantially greater. During the operation of rotating the drill stem the said drill stem is subjected to lateral bending strains of a material amount which tends to cause fatigue in the stem. Due to the fact that the tool joint is of larger diameter than the pipe the outer surface of the joint engages the wall of the well and tends to wear rapidly. Sometimes the tool joint will be worn to such an extent that it is unsafe to use farther even where the drill stem is still in good condition. This necessitates the replacing of tool joints after a comparatively short period of wear.

It is an object of my invention to decrease the amount of wear on the tool joint so that its life will be materially prolonged and the necessity for replacement will be reduced.

I desire to provide a hard facing material upon the outer surface of the tool joint which will remain in position and will not be broken up in the drilling operation.

With reference to the drawing herewith, Fig. 1 is a broken side view partly in section showing one means of applying the hard facing to the pin member of a tool joint.

Fig. 2 is a similar view showing a different arrangement for securing the hard facing material in position illustrated in connection with the box member of the tool joint.

This is a continuation-in-part of my prior application serial No. 287,695, filed August 1, 1939, for Tool joints, which matured into Patent No. 2,293,997, August 25, 1942.

In the operation of drilling it is customary to have the box member at the upper end of the drill stem section and the pin member pointed downwardly at the lower end of a drill stem section. Tools such as elevators employed in raising and lowering the drill stem are, therefore, engaged upon an elevator shoulder at the lower end of the box member.

In applying hard facing to tool joints it has been customary to place the hard facing in the form of plating secured to the outer surface of the joint by welding or otherwise. This hard facing may completely cover the surface of the joint where it is exposed to wear, or may be placed thereon in ridges projecting outwardly from the surface of the joint. Both of these methods are unsatisfactory. It has been found that when thus secured the hard facing material has insufficient attachment to the tool joint and will crack up and break away from the surface of the joint and thus fail to perform the service which is desired.

In properly attaching the hard facing to the tool joints I have found that if the hard facing is extended below the surface of the tool joint so that it will not project therefrom, and also if the hard facing material is protected by side walls to which it may be firmly attached, the previous difficulty with hard surfacing of the joint is overcome.

In carrying out this inventive idea I have shown in Fig. 1 a method of attachment of the hard surfacing which has been satisfactory. The material in this embodiment is secured in spaced recesses circumferentially around the joint. In this figure the body 1 of the tool joint is shown as provided with the usual taper and threaded pin 2. The tool joint is integrally secured with the pipe section 3 and it may be understood that this section of the pipe may be approximately thirty feet long.

I may attach the hard facing material in recesses in the surface of the joint itself, or, as shown in Fig. 1, I may form recesses 4 in the outer periphery of a detachable ring 5. This ring may be placed adjacent the tapered shoulder 6 between the joint and the pipe and the ring may be beveled at 7, so that it will accord with the taper on the shoulder 6. This ring 5 is formed with recesses in a circumferential row around the outer periphery of the ring and the ring is then mounted upon a reduced surface 8 upon the pipe and welded in position by a bond of welding material 9.

The hard facing material which is ordinarly employed is tungsten carbide which melts at a relatively high temperature. The recesses 4 are formed in the outer periphery of the ring and the hard surfacing material in granulated form is welded within the recesses with a binder of steel and integrally attaches itself to the walls of the recess. The side walls 10 of the recesses are curved somewhat due to the fact that the steel which secures the layer of hard facing material is in molten condition and as the bottom and side of the recesses are preheated, the walls tend to become rounded.

Although I have illustrated this hard facing as attached to the ring before the ring is placed in position, it is obvious that the recesses 4 may also

be formed in the outer surface of the tool joint and the hard facing material welded in position directly upon the joint. It is a matter of convenience, however, to place the hard facing material upon the ring and to fix the ring in position on the joint.

In Fig. 2 I have shown the hard facing material 11 as being disposed within parallel circumferential grooves around the outer surface of the joint. As the box member moves downwardly during the drilling operation the heaviest wear comes upon the lower shoulder and along the outer portion of the joint. I therefore prefer to place the grooves 12, in which the hard facing material is disposed, along the lower end of the box member. Also, one or more grooves may be placed directly upon the tapered elevator shoulder 13. As the tapered shoulder has to accommodate the elevators which engage the pipe in raising and lowering the same in the drilling operations it has been found that the elevator will wear excessively when it bears against the rings of hard facing material. For that reason a lower elevator shoulder 14 is provided, the tapered shoulder 13 being depressed slightly relative to the elevator shoulder 14 so that the elevator 15, shown in dotted lines, will not contact with the hard material within the grooves 12.

By placing the hard surfacing material within grooves in the pipe where it can be more firmly attached to the pipe and by making the grooves relatively parallel I provide a firm attachment for the hard facing material so that it can not be easily broken or removed from the groove. Further, as the outer surface of the hard facing metal is flush with the surface of the pipe there is no portion which projects from the joint so that it may be broken from its attachment. Tool joints thus formed have been found in service to last nearly three times as long as the tool joint without the wear-resisting material secured thereto. This is particularly true where the tool joints are operated in wells having abrasive formations therein.

The advantages of this construction will be understood by those skilled in the art.

What I claim as new is:

A tool joint member having a comparatively narrow circumferential groove therein with bottom and side walls, a band of metal containing particles of tungsten carbide fused into said groove and integrally engaging with said walls, the outer surface of said band being flush with the outer peripheral surface of said member.

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