United States Patent

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[54] **BUTTON BIT**
10 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **175/410,** 299/92
[51] **Int. Cl.** **E21c 13/00**
[50] **Field of Search** 175/410, 413, 374; 299/92

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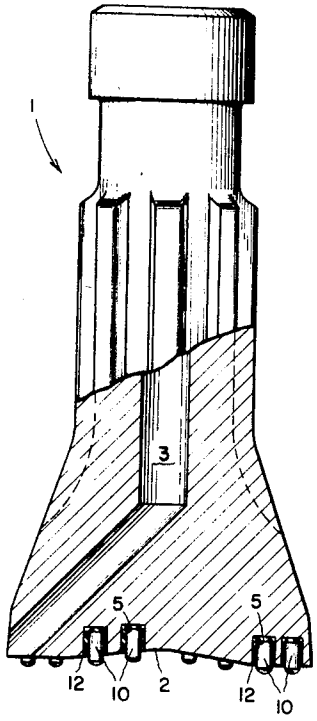
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ABSTRACT: A percussive rock drill bit of a type generally known in the art as a button bit wherein a plurality of wear-resistant metal inserts project from the working face of the drill bit. An elastomeric sleeve surrounds that portion of the sides of the insert which is embedded in the bit body. There is metal to metal contact be between the end of the insert and the bit body for transmitting blow energy from the bit body to the insert.



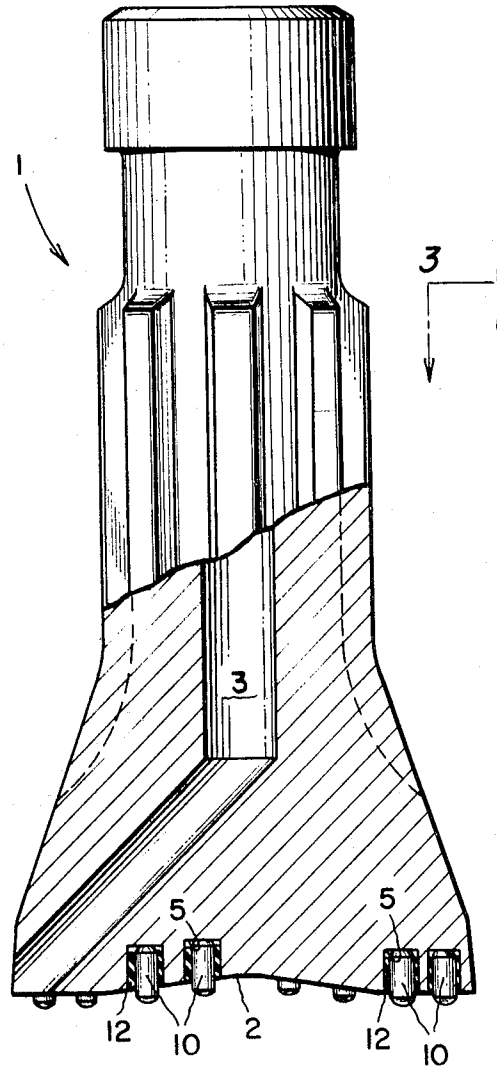


FIG. 1

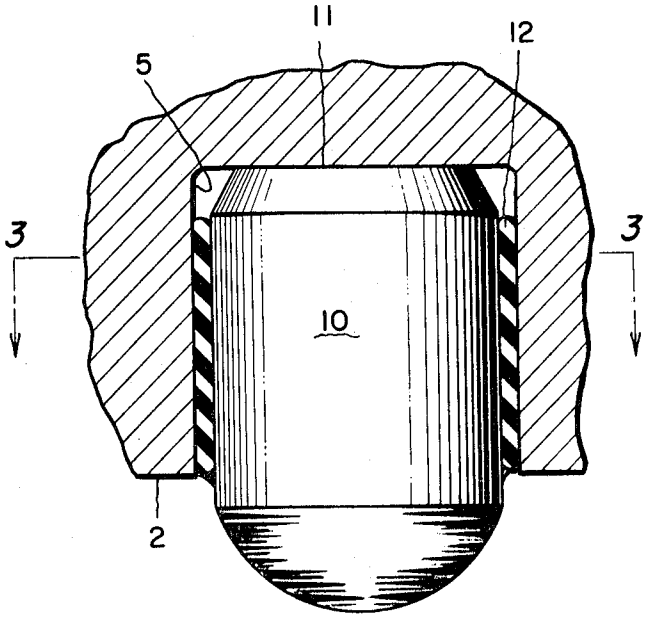


FIG. 2

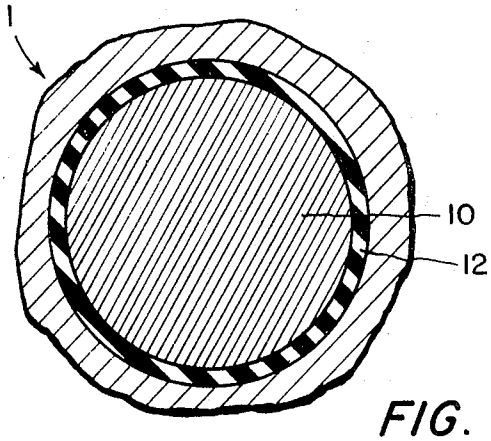


FIG. 3

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BUTTON BIT

BACKGROUND OF THE INVENTION

This invention relates to rock drill bits and in particular to rock drill bits generally known in the art as button bits and to a novel means for securing the wear-resistant inserts in the bit body.

Percussive rock drill bits include a bit body with a plurality of wear-resistant hard-metal inserts such as tungsten carbide projecting from the working face of the bit body. Button bits are a type of percussive rock drill bit in which there are a plurality of generally cylindrical wear-resistant inserts embedded in the working face. The end of the insert which projects outwardly is rounded. Prior to this invention, button bits were manufactured by drilling a plurality of holes in the working face of the bit body. The tungsten carbide inserts were placed in the holes and secured therein by means of brazing or by a shrink fit. Close tolerances must be kept in order to insure that the inserts are held in place when a shrink fit or a brazing technique is used. The proper relationship between the hole diameter and the size of the carbide insert must be maintained. If the spacing is too large, a shrink fit will not hold the insert in the bit body. Thus, it is often necessary to use a selective carbide insert assembly technique to insure the proper spacial relation between the bit body and insert. If an insert is oversized, it is necessary to insert that carbide into an oversized hole. This increases labor costs and hence the cost of the bit.

An additional disadvantage of prior methods of securing a carbide insert in the bit body is that heat treatment of the bit body must be substantially eliminated. With the shrink fit method, the bit body is heated to expand the hole. The insert is placed in the hole and the body is cooled. Any heat treatment of the bit body will be lost in this process. In general, the bit body must be kept soft. This reduces the wear capabilities of the bit body.

A further disadvantage of the present methods of securing the carbide inserts in the bit body is that if the insert should come loose from the bit body while the bit is being used in the field, the insert cannot be replaced in the field. If the insert is to be replaced in order to gain optimum performance from the bit, the bit must be returned to the factory for reconditioning and replacement of the missing insert.

With present methods of securing the insert in the bit body, fracture of the insert often occurs if placement is incorrect. It is believed that the rigid interface between the insert and the bit body which prevents any movement of the insert is a cause of many failures of the inserts,

SUMMARY

It is therefore the principal object of this invention to provide means for mounting a hard-metal insert in a drill bit body which will overcome the aforementioned disadvantages of prior mounting arrangements.

It is a further object of this invention to provide means for mounting a hard-metal insert in a drill bit body which will reduce manufacturing costs.

It is another object of this invention to provide a drill bit which will permit increased tolerances to thereby reduce bit manufacturing costs.

It is a still further object of this invention to provide mounting means for the hard-metal insert of a drill bit which will permit heat treatment of the bit body.

It is a still further object of this invention to provide drill bit insert mounting means which provides a shock-absorbing function for the insert.

In general, the foregoing and other objects will be carried out by providing a cutting implement for use with a rock drilling machine comprising: a bit body having a working face at one end; said working face having a plurality of openings therein; a wear-resistant insert mounted in each of said openings so that there is intimate contact between one end of said insert and the bottom of the opening within which it is mounted; and an elastomeric sleeve positioned between the sides of said insert and said bit body.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be described in connection with the accompanying drawing wherein:

FIG. 1 is a sectional view of a rock drill bit embodying the present invention;

FIG. 2 is a fragmentary view on an enlarged scale of a portion of the drill bit of FIG. 1; and

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 of the drawing there is shown a percussive drill bit generally indicated at 1 of the type and generally known in the art as a button bit. As is well known in the art, the bit is adapted to receive an impact from a drilling machine (not shown) and be rotated to thereby drill a hole. The bit is provided with a working face 2 and an axial passage 3 for conducting fluid such as compressed air for blowing cuttings out of the hole being drilled.

The working face 2 of the bit 1 is provided with a plurality of blind bores 5 which are adapted to receive hard-metal inserts 10 made of a suitable material such as tungsten carbide.

Conventionally, the drill bit is heated to expand the blind bores 5, the inserts 10 are placed in the bores 5 and the drill bit cooled. Contraction of the bit body around the insert secured the insert in place. By the present invention, the insert 10 is held in the bore 5 by means of an elastomeric sleeve 12. The sleeve surrounds that portion of the sidewalls of the inserts which is embedded in the bit body 1. The end wall 11 of the insert 10 remains in intimate contact with the bit body so that when the drill bit receives an impact from the drilling machine, blow energy may be transmitted from the bit body 1 to the insert 10.

The elastomeric sleeve 12 may be of any resilient material such as neoprene or the like. Preferably, the sleeve 12 is bonded to the tungsten carbide insert 10. If desired, the sleeve 12 may also be cemented to the walls of the bore 5 by means of a suitable adhesive such as the expoxi-type adhesive.

The diameter of the bore 5 should be smaller than the free outside diameter of the sleeve 12 so that the sleeve 12 is compressed between the insert 10 and the walls of the bore 5. Dimensional tolerances of the hole 5 and insert 10 need not be as close as with prior art arrangements because the sleeve 12 will permit a larger or smaller clearance between the insert and bore than is permitted with prior arrangements. This will reduce manufacturing costs because the necessity of using selective insert assembling techniques can be substantially eliminated. The compressive preload of the sleeve 12 between the sidewalls of the insert 10 and the walls of the bore 5 retains the insert 10 in the bore 5. The sleeve 12 must be of sufficient thickness to retain the insert in the cavity by a friction fit and to provide sufficient flexibility to optimize the stresses in both the sleeve and the bore between the insert and the sleeve and between the sleeve and the bit body. The sleeve 12 serves three basic functions. First, it holds the insert in the bit body thereby eliminating the shrink fit or brazing techniques presently employed. Second, the sleeve 12 serves as a shock absorber tending to reduce failure of the insert. Third, the sleeve 12 serves to eliminate the high initial stresses in both the insert and the bit body which are normally associated with a shrink fit. With present methods of securing the insert in the bit body, if the insert moves a slight amount during impact, stresses in the insert will be increased tending to cause fracture of the insert. The resilient sleeve 12 will permit a slight movement of the insert 10 relative to the bit body 1 without increasing stresses in either the bit body or the insert and hence tend to reduce failure of the inserts.

By the present invention, it will be possible to place the insert in the bit body while the bit body is cold. This will permit the bit body to be heat-treated in the desired manner before

the insert is placed in the bit. Since the bit body can be heat-treated to the desired extent, a stronger bit body and thus longer lasting bit can be achieved. Prior methods did not permit heat treatment because of the heating required for the shrink fit process. The bit body could not be heat-treated after the insert were in place because the inserts would come loose from the bit body.

From the foregoing it should be apparent that the objects of this invention have been carried out. The tolerances can be reduced because the elastomeric sleeve will expand and contract an amount which will permit larger hole and insert size tolerances. Selective carbide insertion is eliminated. Heat treatment can be performed on the bit body thus insuring a longer lasting drill bit. Because a shrink fit or brazing is not required, the inserts can be field replaced with a tool which permits easy insertion of the insert and sleeve.

I Claim:

1. A cutting implement for use with a rock drilling machine comprising:

a bit body having a working face at one end;

said working face having a plurality of openings therein;

a wear-resistant insert mounted in each of said openings so that there is intimate contact between one end of said insert and the bottom of the opening within which it is mounted; and

an elastomeric sleeve positioned only between the sides of said insert and said bit body.

2. The cutting implement of claim 1 wherein said elastomeric sleeve is bonded to said insert.

3. The cutting implement of claim 2 wherein said elastomeric sleeve is bonded to said bit body.

4. The cutting implement of claim 1 wherein said opening is a blind cylindrical bore having a diameter smaller than the free diameter of said sleeve.

5. The cutting implement of claim 4 wherein said sleeve is bonded to said insert.

6. A rock drill bit comprising:

a bit body having a working face at one end;

a plurality of button-type wear-resistant inserts each having one end and at least a portion of its sides mounted in said bit body and projecting outwardly from said working face, said one end directly contacting said body; and

a resilient sleeve surrounding each of said inserts and positioned only between the sides of said insert and said bit body.

7. The rock drill bit of claim 6 wherein said resilient sleeve is bonded to said insert.

8 The rock drill bit of claim 6 wherein the working face of said bit body is provided with a plurality of blind bores having a diameter smaller than the diameter of said resilient sleeve and each of said inserts and said sleeve are mounted in one of said bores.

9. The rock drill bit of claim 8 wherein said sleeve is bonded to said insert.

10. The rock drill bit of claim 9 wherein said sleeve is bonded to said bit body.

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