United States Patent

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[54] **PERCUSSION BIT**
7 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **175/410,** 175/420
[51] **Int. Cl.** **E21c 13/01**
[50] **Field of Search** ..... 175/398, 399, 409—414, 415—420

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ABSTRACT: The invention concerns a bit of the percussion type having a bit body with slots for receiving hard blocks, such as cemented tungsten carbide blocks. The slots taper outwardly toward the bottom and the blocks also taper outwardly toward the bottom and are introduced endwise into the slots, preferably with an interference fit. Keys are provided for locking the blocks in the slot.

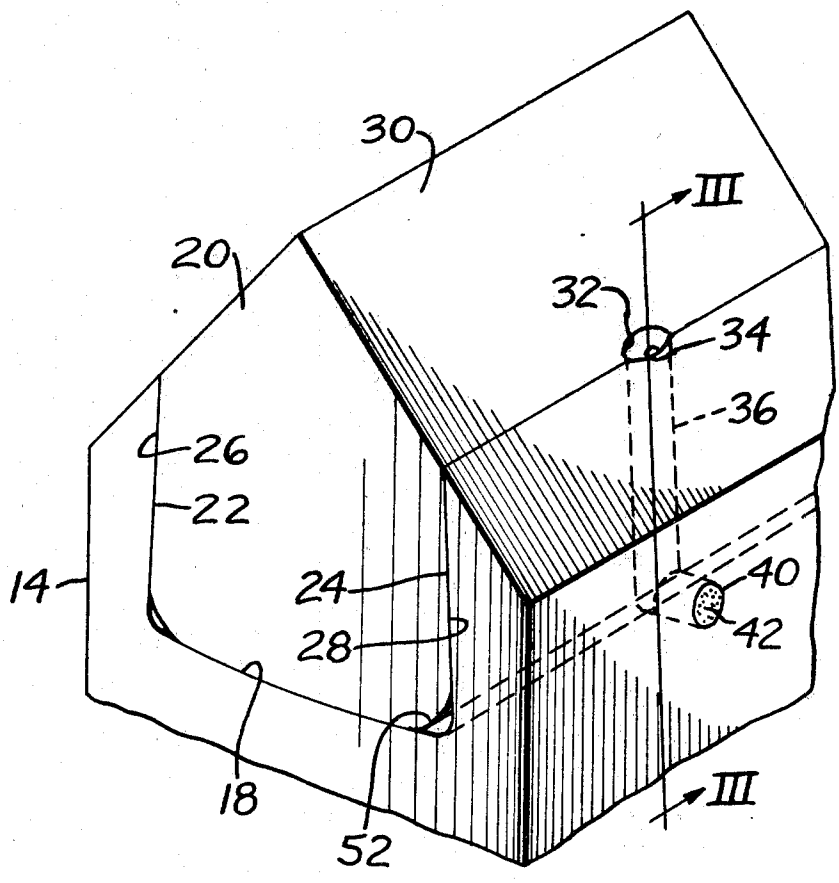


FIG-1

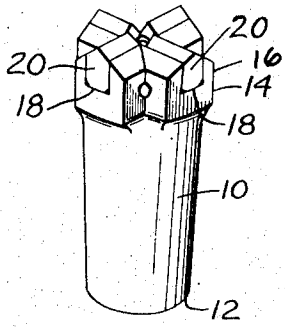


FIG-2

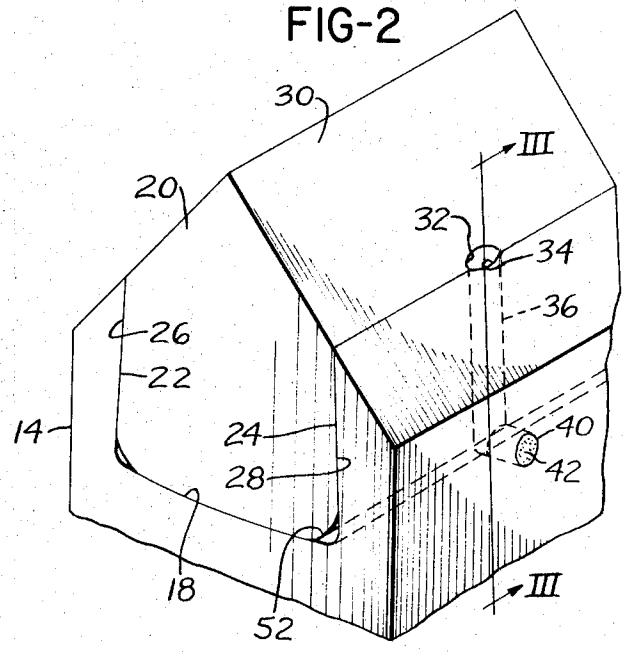


FIG-3

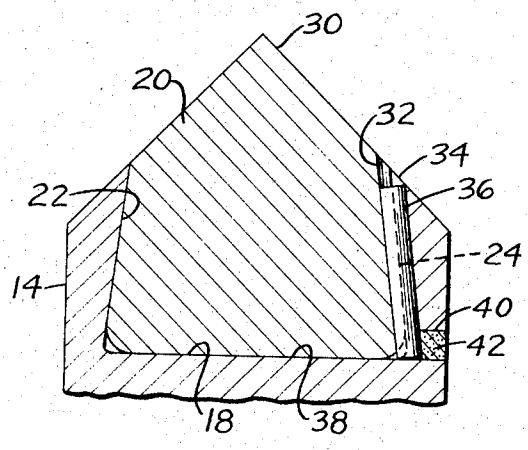


FIG-4

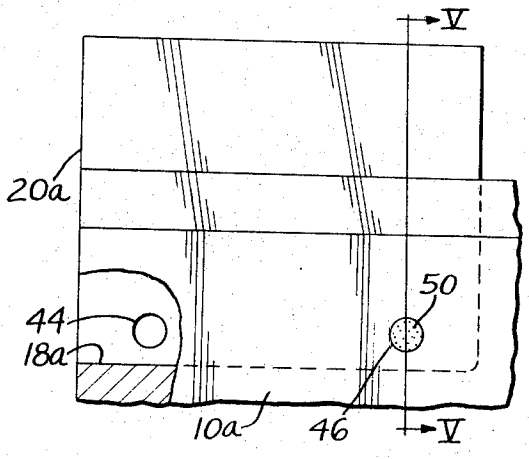
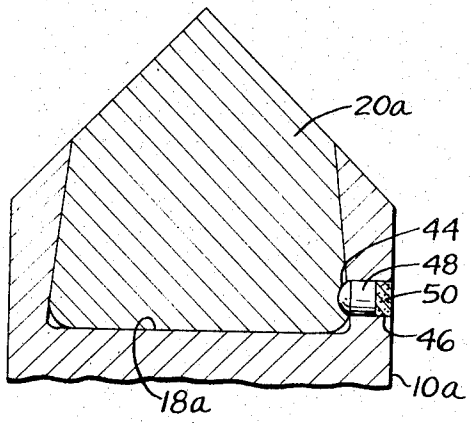


FIG-5



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PERCUSSION BIT

The present invention is concerned with a percussion bit having hard inserts mounted therein in a novel manner and to a method of mounting the hard inserts in the percussion bit.

Percussion bits of the nature referred to generally take the form of a high strength steel body with hard inserts mounted in the working end of the body for engagement with the formation being drilled. The inserts are usually made of cemented tungsten carbide and are normally brazed in place in the steel bodies. The brazing of the inserts in place in the steel bodies, however, is not only time consuming and expensive but the differential expansion and contraction of the carbide material of the inserts and the body which can lead to premature failure of one or the other or both thereof.

The primary objective of the present invention is the provision of a rock bit structure in which the hard carbide inserts are held in place in the steel body without brazing.

Another objective of this invention is the provision of the percussion bit and a method of making the same in which no high temperatures are employed during the mounting of the inserts into the body so that thermal stresses are not developed in the inserts and body.

The objectives referred to as well as other objectives and advantages of the present invention will become more apparent upon reference to the following detailed specification taken in consideration with the accompanying drawings, in which:

FIG. **1** is a perspective view showing a typical percussion bit constructed according to the present invention;

FIG. **2** is a fragmentary perspective view showing in more detail the novel manner of mounting the hard inserts into the body of the bit;

FIG. **3** is a vertical sectional view indicated by line III–III on FIG. **2**;

FIG. **4** is a fragmentary view showing another manner of securing an insert in place in the bit body and;

FIG. **5** is a sectional view indicated by line V–V on FIG. **4**.

Referring to the drawings in more detail, in FIG. **1**, **10** indicates a bit body of substantially conventional shape. The bit body tapers from a smaller end **12** to a larger end **14**. The larger end is the working end of the bit and the bit is adapted for being secured at its smaller end **12** to a suitable actuating motor as by means of a threaded bore in the bit body.

The working end of the bit body is in the form of a plurality of boxlike wings **16**, each of which has a slot or pocket **18** therein extending substantially radially of the bit body and open at its radially outer end and at the top, which is the side of the pocket toward the working of the bit end. Mounted in each slot **18** is a block **20** of hard wear resistant material; cemented tungsten carbide, for example.

As will be seen in FIG. **2**, each slot **18** has its sidewalls **22** and **24** converging toward the open side of the slot. Similarly, each block **20** has its sidewalls **26** and **28** converging toward the wedge-shaped tip **30** of the block which projects from the working end of the bit. The walls **26** and **28** of block **20** at any transverse section there through are at least slightly farther apart than the sidewalls **20** and **24** of the slot **18** at the same level. Each block **20** thus has an interference fit in its slot **18**. The block **20** can be pressed into position in the slot, but preferably, the bit body is heated to expand the slot **18** and then, while the body is hot, the unheated block **20** is put in place in the slot and which assembling operation might be accompanied by the application of pressure.

The tapering configuration of the block in the slot in which it is disposed prevents the block from coming out of the bit body in the axial direction but the possibility exists that the block will shift in the direction of the length of the slot under the heavy impacts to which it is subjected in use. In order to prevent the block from shifting axially in its slot, the block is preferably formed with a groove **32** extending to an angle of the length of the block, and when the block is mounted in its slot, groove **32** registers with a groove **34** formed in the adjacent sidewall of the block. The registering grooves form a keyway for receiving a key to lock the block in its slot.

When the block is in position in its slot and grooves **32** and **34** are in registration to form the keyway, a key in the form of a pin **36** is driven or pressed into the registering grooves. Pin **36**, which may be round but is preferably somewhat oval, terminates near the bottom wall **38** of the slot and extends past a bore **40** formed in the bit body and intersecting groove **34**.

Pin **36** is fixedly held in place in grooves **32** and **34** as by welding or brazing or the like in bore **40** as indicated **42** in FIG. **3**. It will be apparent that pin **36**, for ease of manufacture, extends in an axial plane of the bit body but it is not necessary for the pin to extend in exactly this direction in order to prevent block **20** from shifting laterally in its slot.

FIGS. **4** and **5** show a modification in which the block **20***a* mounted in slot **18***a* of bit body **10***a* is provided with a pair of recesses **44** in one sidewall. These recesses **44** register with holes **46** in the bit body when the block is in position in its slot. Steel pins **48** are inserted in holes, as by pressing, or bores **46** so that they extend into the recesses **44** in block **20***a* and welding or brazing as at **50** is placed in the outer ends of bores **46** to hold the pins **48** in place.

One, or the other, or both, of each notch and block, near the bottom of the notch and block, are relieved to avoid the creation of extremely high localized stresses at the corners of the notch which could lead to cracking of the bit body. This is done, as shown in FIG. **2**, by relieving the inner corners of the block as at **52**, which can be done by forming a bevel on the inner corners of the block or by rounding the corner of the block with a relatively large fillet. It would as also be possible to relieve the notch in the region of the bottom corner of the block if so desired.

In the manner described above, the blocks are joined to the bit bodies without heating the bit body and, therefore, without setting up thermal stresses and strains in the carbide blocks and in the bit body which could lead to premature failure of the bit. Also, the cost and time that go with brazing the blocks in place in the bodies is eliminated so that the bit can be produced more economically than according to prior art practices.

Modifications and adaptations of the present invention falling within the scope of the appended claims will occur to those skilled in the art.

I claim:

1. In combination; a steel body having a peripheral wall and slot means in the form of at least one slot in the body and block means of hard cemented metal carbide in said slot means in the form of at least one block; said slot means being closed on the bottom and the sides and open at the top and at one end intersecting said peripheral wall so as to have at least one open end accessible from the side of said body, said slot having the same width from end to end between said sides in any given transverse plane, said sides of the slot converging toward the open top of the slot, said block being insertable axially into said slot and substantially filling said slot with a portion of the block projecting beyond the open top of the slot, the sidewalls of said block converging toward said portion of the block at substantially the same angle as the sides of said slot and engaging the said sides of the slot when the block is disposed in the slot, the bottom end of said block opposite said portion thereof engaging the bottom of said slot, the sidewalls of said block being spaced farther apart in any given transverse plane than the sides of the slot located in the same plane prior to mounting the block in the slot whereby the block has an interference fit in the slot, and key means disposed between said block and said body at one side of said block and engaging both said block and said body and locking the block to the body to prevent movement of the block longitudinally of the slot.

2. The combination according to claim **1** in which at least one sidewall of said block has recess means extending laterally into a sidewall thereof near the bottom of the sidewall, said body having bore means registering with said recess means when said block is disposed in said slot, and said key means comprising steel plug means fixed in said bore means and projecting therefrom into said recess means.

3. The combination according to claim 2 includes welding fixing said plug means in said bore means.

4. The combination according to claim 1 in which said key means is in the form of steel rod means disposed between at least one sidewall of the block and the adjacent side of the slot and at an angle to the length of the slot, said one sidewall of the block and the adjacent side of said slot having registering groove means therein closely receiving said rod means.

5. The combination according to claim 4 which includes connecting means fixing said rod means to at least one of said block and said body.

6. The combination according to claim 5 in which said body has a bore extending therein and intersecting the groove means in the body near the bottom of said slot and said connecting means connects said rod means to said body and is in the form of a fused connection of said rod means to said body where said bore intersects said groove means.

7. The combination according to claim 6 in which said fused connection is welding and said bore is substantially filled with welding.