

July 7, 1970

J. MILLER

3,519,092

PERCUSSION BIT

Filed Sept. 16, 1968

FIG-1

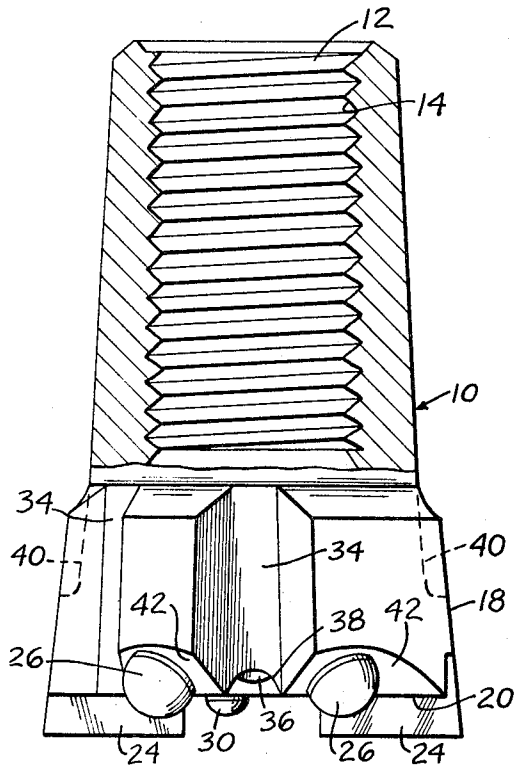


FIG-2

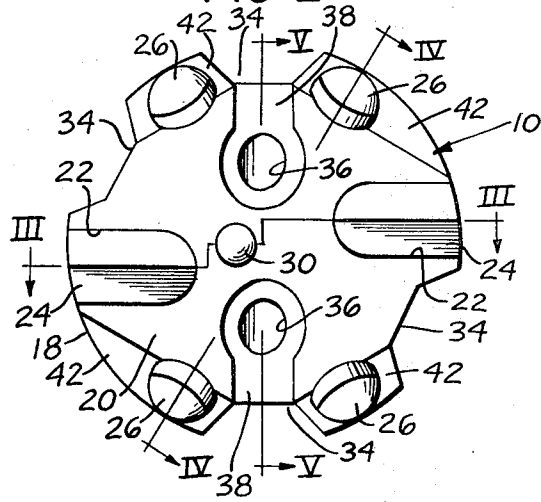


FIG-3

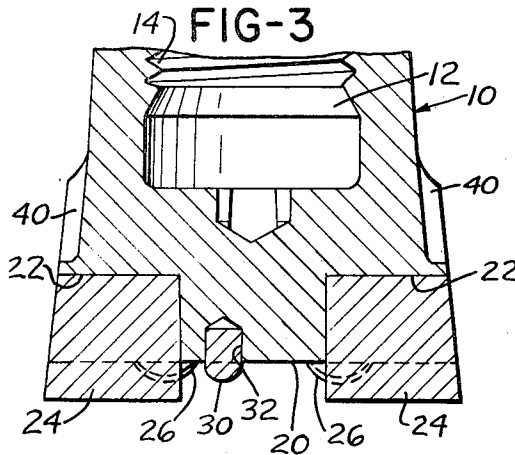


FIG-4

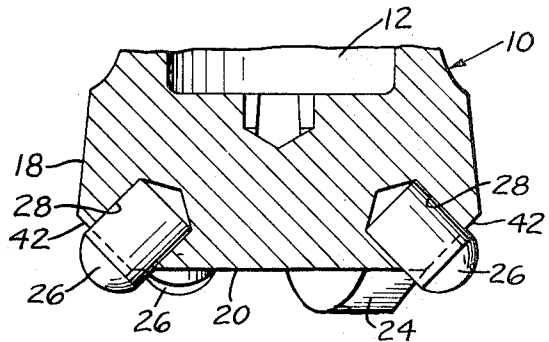


FIG-6

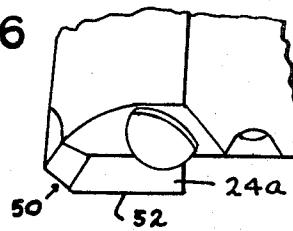
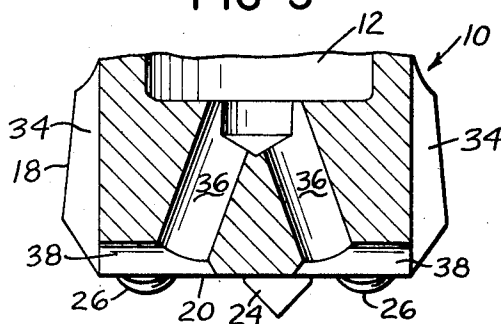


FIG-5



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3,519,092

## PERCUSSION BIT

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Filed Sept. 16, 1968, Ser. No. 760,002

Int. Cl. E21c 13/00

U.S. Cl. 175—410

12 Claims

### ABSTRACT OF THE DISCLOSURE

Percussion bit having a body with at least two non-radial wedge shaped hard inserts in the working end of the bit body substantially diametrically opposite locations, and with rod-like hard inserts having rounded ends mounted in the working end of the bit body between the wedge shaped inserts and near the periphery of the bit body.

This invention relates to percussion bits and is particularly concerned with a bit of this nature having a novel placement and combination of hard cutting inserts mounted in the cutting face.

Percussion bits are, of course, well known, and take the form of steel bodies, generally forged, which are mounted for reciprocation and rotation and drill by breaking out material against which they impact.

Bits of this nature may have wedge shaped inserts mounted on the cutting face, or may have cylindrical inserts, or button type inserts, with rounded ends mounted therein. Sometimes the bits employ a combination of wedge shaped inserts and buttons but, in such cases, the buttons are usually located in the center of the working face of the bit and are provided to break up the central core taken by the bit. In other cases, the working ends of the bits have only button type inserts mounted therein in distributed relation.

The present invention proposes to employ a combination of wedge shaped cutting inserts and button inserts in a way which increases the rate at which the bit cuts and also substantially increases the useful life of the bit.

In brief, a bit constructed according to the present invention comprises a body having a working face and having inserted into the working face of the body in circumferentially spaced relation two or more wedge shaped inserts which are not radial and between which, at about the outer portion of the working face of the bit, are inserted button type inserts. One or more smaller buttons may be mounted in the central region of the working face for breaking up the core taken by the bit.

A particular object of the present invention is the provision of a novel bit construction which employs both block-like inserts having a wedge shape on one side and button type inserts as primary cutting and breaking elements.

A further object of the present invention is the provision of a percussion bit which will have a more rapid penetration rate than heretofore known bits.

Still a further object of this invention is the provision of a percussion bit which has substantially longer life than previously known percussion bits.

Still further object of this invention is the provision of a percussion bit which is relatively easy to manufacture but which is characterized in long life and a rapid penetration range.

These and other objects and advantages of the present invention will become more apparent upon reference to the following detailed specification taken in connection with the accompanying drawings in which:

FIG. 1 is a side view, partly broken away, of a rotary

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percussion bit constructed according to the present invention;

FIG. 2 is a view looking in at the bottom or working face of the bit of FIG. 1;

FIG. 3 is a vertical longitudinal section through the bit and is indicated by line III—III on FIG. 2;

FIG. 4 is a sectional view through the lower portion only of the bit body and is indicated by line IV—IV on FIG. 2;

FIG. 5 is a fragmentary sectional view indicated by line V—V on FIG. 2; and

FIG. 6 is a fragmentary view showing a modified type of wedge shaped insert.

Referring to the drawings some what more in detail, the bit illustrated therein comprises a body 10 having a central hole 12 which is provided with threads 14. In other types of bits, the bit can be operatively connected to the lower end of a drilling rig by other means, such as splines.

Body 10 tapers generally outwardly from its smaller upper end 16 to a larger lower end 18 and which lower end 18 is the working end of the bit. The bit terminates in a substantially flat bottom face 20. The bottom face 20 is provided with circumferentially spaced grooves or slots 22, each of which is non-radial. Slots 22 are parallel and are offset laterally from a diameter parallel to the grooves. Grooves 22 are adapted for receiving cutting inserts 24 of a hard material, such as cemented tungsten carbide. Inserts 24, in cross section have a rectangular portion which is disposed in respective groove and a gabled, or wedge shaped, portion which protrudes from the working face of the bit body. In the bit shown, as will best be seen in FIG. 2, two of the inserts 24 are provided substantially diametrically opposite each other and having their longitudinal axes parallel but laterally offset in respectively opposite directions from a diameter parallel to the said axes.

Interposed between the cutting inserts 24, and circumferentially spaced from each other, and also from the inserts 24, are cylindrical rod-like, or button type, inserts 26 of hard material such as cemented tungsten carbide. In the bit illustrated, four of the cylindrical elements 26 are provided. Each of these elements, as will be seen in FIG. 4, is in the form of a relatively short rod-like member rounded at its projecting outer end. The inserts 26 are mounted in holes 28 drilled into the bottom of the bit body. Holes 28, as will be seen in FIG. 4, are angular to the axis of the bit body so the inserts 26 will be effective at the periphery of the hole being cut by the bit.

The inserts may be brazed in place and are thus solidly affixed to the bit body but it has also been found satisfactory to press the cylindrical inserts into holes drilled to a size to provide an interference fit for the inserts.

As the bit operates it will be evident that there will be a certain region located radially inwardly of the inner ends of cutting elements 24 that will not be directly engaged by any of the cutting elements, and this might tend to build up a core-like projection in the center of the hole that would interfere with continued cutting of the material at the bottom of the hole. This core-like projection is readily removed by the provision of one or more small inserts 30 mounted in respective holes 32, as shown in FIGS. 2 and 3. These inserts protrude from the working face of the bit body and may have their axes parallel to or inclined to the axis of the bit body.

As will best be seen in FIG. 2, the bit body is provided with a plurality of longitudinal flutes 34 extending along at least the enlarged lower end part 18 of the bit body. These flutes provide passage for the crushed material loosened up by the bit so that the bit can proceed on downwardly in the hole being drilled.

Further, air under pressure may be supplied to the central hole 12 which can pass downwardly to the bottom of the bit via the drilled passages 36 which will be seen in FIGS. 2 and 5. Each of these passages communicates at its lower end with a laterally extending groove 38 which leads radially outwardly into communication with the flutes 34 which are disposed between the button inserts 26 on each side of the bit body.

In the usual bit body, having either block-like inserts, or button type inserts, in the working face, the bit body tapers inwardly in the upward direction at an angle of about 3 degrees on each side, namely, at about a 6 degree included angle. It has been found with the bit of the present invention, however, the life thereof is so much greater than the life of the usual bit body, that it is of advantage to taper at least the large lower end portion 18 at a substantially greater angle; about 6 to 8 degrees on each side having been found to be satisfactory. The greater angle of the bit body facilitates regrinding of the periphery of the body after the inserts 24 commence to round at their outer corners. Such regrinding of the bit body will restore the bit to initial operating efficiency. With the body tapered at the greater angle as aforesaid, the steel of the body will readily wear away with the outer surface of the inserts and the bit will not wedge in the hole.

A further feature of the bit of the present invention is to be found in the added reliefs indicated at 40 in FIGS. 2 and 3 and disposed behind the wedge shaped inserts. The relief regions 40 permit easier grinding of the bit body and likewise permit the steel to wear away more easily as the ends of the wedge shaped inserts wear down.

As will be seen in FIG. 4, the bit body at the juncture of the bottom surface 20 with the periphery of the enlarged portion 18 is bevelled adjacent the button inserts 26 at 42. This makes it easier to drill holes 28 and also produces effective exposure of elements 26.

FIG. 6 shows how a block shaped insert 24a could have the outer end bevelled as at 50. The sharp peak 52 on each of the inserts of FIG. 6 continues clear to the radially outer end of the insert, as do the inclined side walls forming the sharp peak but, at the outer end of the insert, the angularity of the side walls changes as shown in FIG. 6. When inserts 24a are shaped as shown in FIG. 6, the bit stays sharp longer than when the inserts are shaped as in FIG. 1.

In the case of either modification, the bit seems to combine a cutting action with a breaking action as the bit is rotated and impacted on the bottom of the hole and a rapid boring action is thereby obtained.

Only two specific embodiments of the invention has been illustrated and described herein, but it will be understood that other modifications and adaptations can be arrived at falling within the purview of the appended claims.

What is claimed is:

1. A percussion bit comprising; a bit body generally round in cross section and tapering outwardly toward the lower working end thereof, the working of end said bit body being substantially perpendicular to the axis of the bit body, at least one pair of substantially diametrically opposite non-radial slots in said working end of said bit body and blocks of hard wear resistant material fixed in and protruding from said slots in the axial direction of said bit body, the protruding portion of said blocks being wedge shaped in cross section, said bit body having holes in the working end thereof circumferentially spaced from each other and from said blocks, said holes being located near the circumference of said working

end and having their axes inclined to the axis of said bit body so as to converge therewith toward the upper end of said bit body, and rod shaped inserts of hard wear resistant material fixed in said holes and protruding therefrom and extending in the radial direction substantially to the circumference of the working end of said bit body.

2. A percussion bit according to claim 1 in which said bit body is beveled at the juncture of said working end of the bit body with the side wall of the bit body in the region where said holes for said rod-like inserts extend into said bit body.

3. A percussion bit according to claim 1 in which the said wedge shaped protruding portions of said blocks angle upwardly at the outer ends of said blocks.

4. A percussion bit according to claim 2 in which at least one further rod-like insert of hard wear resistant material is mounted in said bit body and protrudes from the working end of said bit body in the region radially inwardly from the radially inner ends of said blocks.

5. A percussion bit according to claim 4 in which said rod-like inserts comprise a pair thereof between each two adjacent blocks, the inserts of each said pair of rod-like inserts being circumferentially spaced from each other and also from said adjacent blocks.

6. A percussion bit according to claim 5 which includes a fluid passage extending axially into said bit body from the upper end thereof to near said working end of the bit body, and further passage means leading from said fluid passage through the working end of the bit body.

7. A percussion bit according to claim 6 in which said working end of said bit body is provided with groove means leading from the ends of said further passage means laterally to the periphery of said bit body.

8. A percussion bit according to claim 7 in which said bit body comprises axial flutes leading from the working end of the bit body at least partway along the length of the bit body.

9. A percussion bit according to claim 8 in which said flutes includes a flute disposed circumferentially between each said pair of rod-like inserts, each such flute communicating at its one end with a said groove means.

10. A percussion bit according to claim 9 in which said bit body tapers inwardly toward the top in at least lower portion at an included angle between the sides on the order of from about 10 degrees to about 16 degrees.

11. A percussion bit according to claim 10 in which said bit body abruptly reduces in diameter at a region spaced upwardly from the said working end thereof while tapering inwardly toward the top of the bit body on both sides of said region.

12. A percussion bit according to claim 11 in which said bit body comprises relief undercuts extending from said axial region toward said working end of said bit body in the same axial planes of the bit body axis that contain the outer ends of said blocks, said relief undercuts terminating short of said blocks.

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U.S. Cl. X.R.

175—418