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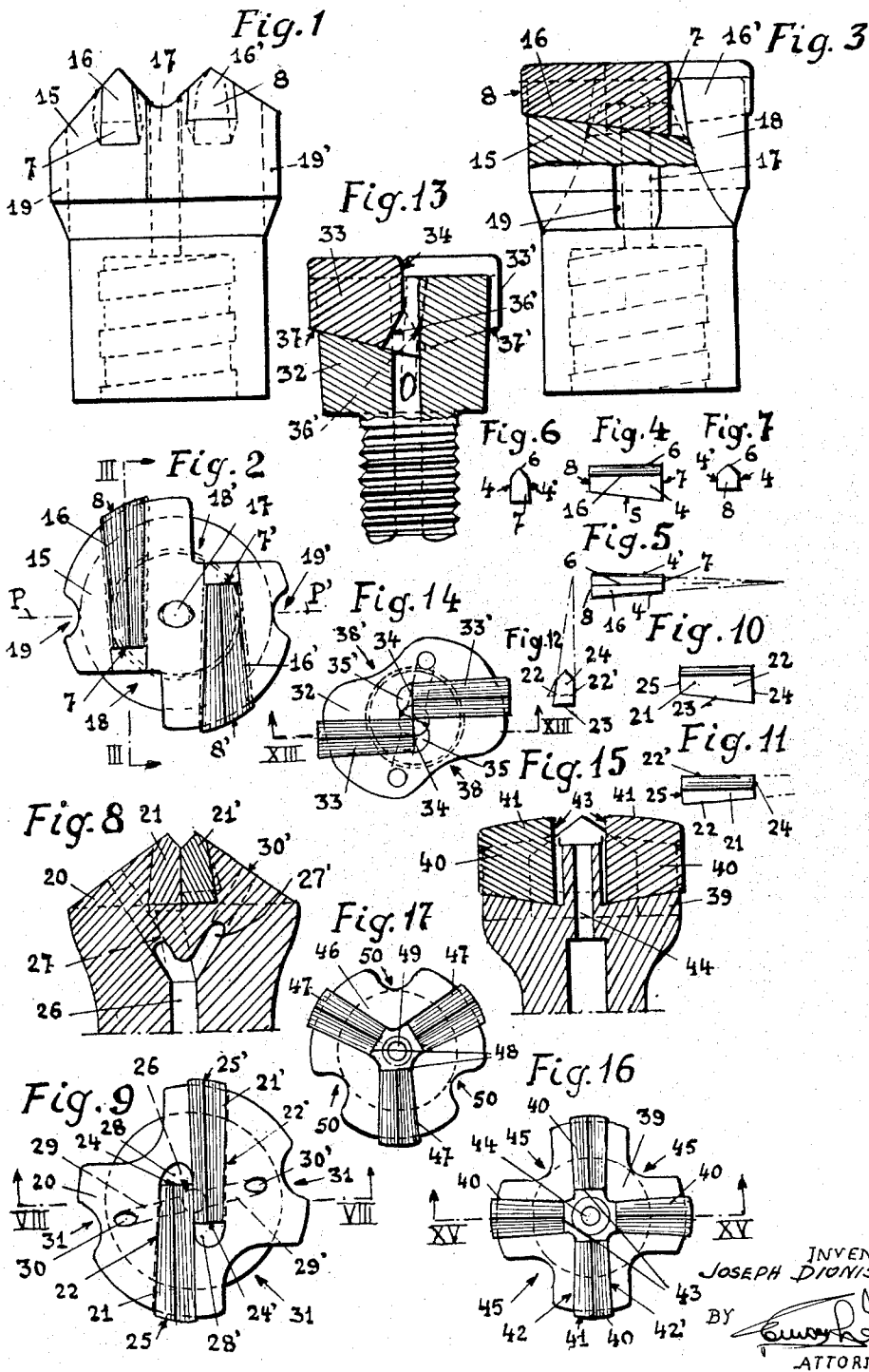
J. DIONISOTTI

3,140,749

WEDGE INSERTS FOR DRILL BIT

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2 Sheets-Sheet 1



INVENTOR.
JOSEPH DIONISOTTI

BY 
ATTORNEY

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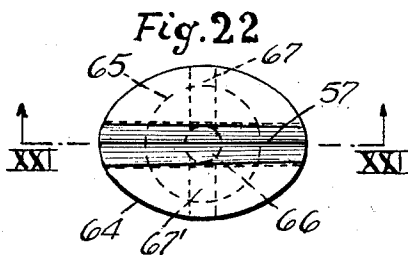
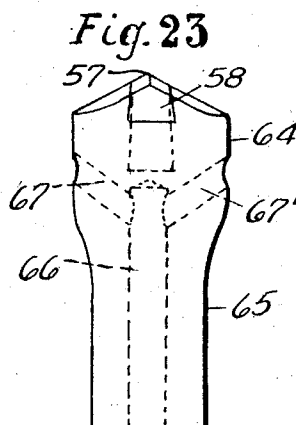
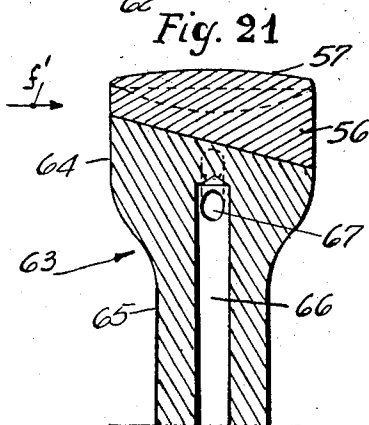
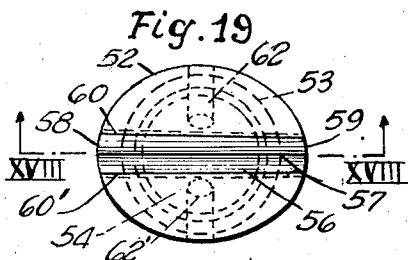
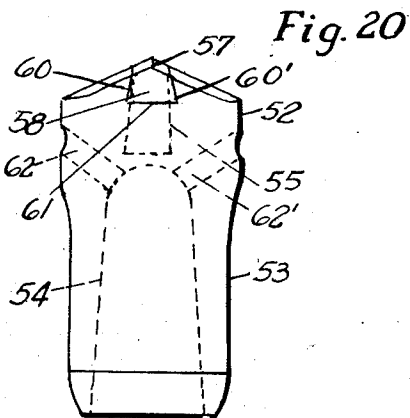
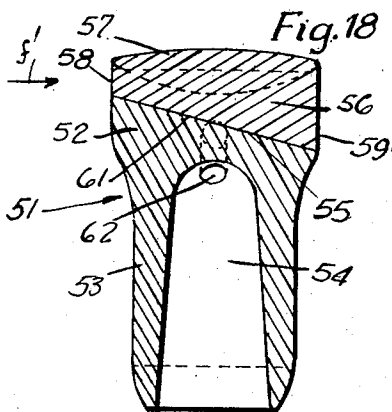
J. DIONISOTTI

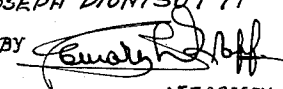
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WEDGE INSERTS FOR DRILL BIT

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2 Sheets-Sheet 2



INVENTOR
JOSEPH DIONISOTTI
BY 
ATTORNEY

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WEDGE INSERTS FOR DRILL BIT

Joseph Dionisotti, Monthey, Valais, Switzerland

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4 Claims. (Cl. 175-410)

The present invention relates to a rock drilling tool, comprising at least one cutter insert detachably disposed and housed within the tool head.

A distinctive feature is that the housing has two converging sides corresponding to two converging sides provided on the insert. The base of the insert is inclined longitudinally from its front face to its rear face, and all of said sides converge in a direction such that, by the pressure exerted on the insert during the operation of the tool, the insert is wedged firmly in said housing. The angle of the base of the insert has for its purpose the wedging of the insert in its seat as a result of shocks and the rotation of the tool.

The accompanying drawing shows several practical embodiments of the invention, by way of example.

FIGS. 1 to 3 show the first embodiment of a bit; FIG. 1 being a side elevation; FIG. 2 a plan view of FIG. 1, and FIG. 3 a cross sectional view on the line III—III of FIG. 2.

FIGS. 4 to 7 show, on a smaller scale, the detail of one of the inserts secured to the bit shown in FIGS. 1 to 3, FIG. 4 being a longitudinal view in elevation; FIG. 5 a plan view of FIG. 4; FIG. 6 a view in profile of the front face of the insert; and FIG. 7 a view in profile of its rear face.

FIGS. 8 and 9 show a second embodiment of a bit; FIG. 8 being an elevational sectional view on line VIII—VIII of FIG. 9; and FIG. 9 a plan view of FIG. 8.

FIGS. 10 to 12 show, on a smaller scale, the detail of one of the inserts secured to the bit shown in FIGS. 8 and 9; FIG. 10 being a longitudinal view in elevation; FIG. 11 a plan view of FIG. 10; and FIG. 12 a view in profile of the front face of the insert.

FIGS. 13 and 14 show a modification of the second embodiment of the bit; FIG. 13 being a sectional view in elevation on line XIII—XIII of FIG. 14, and FIG. 14 a plan view of FIG. 13.

FIGS. 15 and 16 show a third embodiment of a bit; FIG. 15 being a sectional view in elevation on line XV—XV of FIG. 16, and FIG. 16 a plan view of FIG. 15.

FIG. 17 shows a plan view of a modification of the third embodiment of the bit shown in FIGS. 15 and 16.

FIG. 18 to FIG. 20 show a drilling tool according to a fourth embodiment.

FIG. 18 is an elevational section on line XVIII—XVIII of FIG. 19, of a detachable cutter head, provided with an insert disposed along the major axis of an ellipse.

FIG. 19 is a plan view of FIG. 18.

FIG. 20 is a side view of the same, on the side of the insertion of the insert in its housing.

FIGS. 21 to 23 show a modification of the fourth embodiment of FIGS. 18 to 20, in which the insert is fixed to the end of a cutter rod.

FIG. 21 is a section in elevation on line XXI—XXI of FIG. 22.

FIG. 22 is a plan view of FIG. 21.

FIG. 23 is a side view thereof, similar to FIG. 20.

In the first embodiment shown in FIGS. 1 to 3, the bit comprises a head 15, of general cylindrical shape, provided with two inserts 16, 16', disposed parallel with one another and placed head to foot on each side of a central hole 17 through which air is blown to discharge the drilling fragments.

Each of said inserts 16, 16', is directed perpendicularly to the axis of the bit and comprises, for example in the

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case of the insert 16, sides 4, 4' (FIGS. 4 to 7), converging, on the one hand from the base 5 in the direction of the rectilinear cutting edge 6 and on the other hand from the rear face 8 in the direction of the front face 7 of the insert. The lower face of the base 5 is inclined from the front face 7 to the rear face 8 of the insert. The front face 7 of the insert 16 is situated on the same side is located adjacent to the center of the head 15 of the bit.

The inserts 16, 16' are fitted into the corresponding and respective grooves of the head 15 of the bit, so that the front face 7 of the insert 16 is situated on the same side as the rear face 8' of the insert 16' relative to an axis P—P' (FIG. 2), perpendicular to the parallel edges 6, 6' of the said inserts.

The head 15 of the bit is provided, moreover, on its periphery with angular recesses 18, 18' (FIG. 2) made in the extension of the grooves of the inserts 16, 16' respectively, and semi-cylindrical recesses 19, 19', located at the ends of a diameter passing through the axis P—P' defined above. The said recesses are designed to aid in the discharge of drilling waste.

In the second embodiment of the drilling tool, shown in FIGS. 8 and 9, the head 20 of the bit, of a general conical shape, is provided with two inserts 21, 21' disposed head to foot and juxtaposed one to the other over a small length of their respective front parts. To this end, the insert 21 (FIGS. 10 to 12), for example, has an outer side 22 of double convergence, vertical and horizontal, the said side being similar to the side of the insert 16 (FIG. 5), and an inner side 22', vertical, the said side being perpendicular to the base 23 over the whole length of the insert. The base 23 is inclined from the front face 24 to the rear face 25 of the insert, the said front face being of larger section than the rear face, and situated on the periphery of the bit.

The head 20 of the bit is provided with a central duct 26 through which the scavenging air is subdivided into two median ducts 27, 27' issuing through orifices 28, 28' respectively, in front of the front faces 24, 24' respectively, of the inserts 21, 21' respectively, and into two side ducts 29, 29' respectively issuing through orifices 30, 30' respectively, adjacent to the outer sides of the said inserts. The head 20 is further provided on its periphery with longitudinal recesses 31, of a general semi-cylindrical shape. The said recesses are disposed in a similar manner to those of the first embodiment.

The orifices 28, 28', for the exit of air, are also capable of being used for the extraction of the inserts from their housings, with a view to regrinding the latter, by the insertion of a pointed rod, of the pin-punch type.

In a modification (FIGS. 13 and 14) of the second embodiment, the head 32 of the bit, having a general oval cross-section, is provided with two inserts 33, 33', disposed head to foot, in a similar manner to that of the inserts 21, 21' respectively, the front faces 34, 34' respectively being situated in the center of the said head in a prolongation one of the other and in the axis of orifices 35, 35', of the median ducts for blowing air.

Each of the front faces 34, 34' of the inserts is provided with a cut face 36, 36' respectively, terminating in the base 37, 37' respectively, the said cut face being designed to facilitate the insertion of a tool for disengaging the inserts from their housing. The periphery of the head 32 of the bit is further provided with two longitudinal recesses 38, 38', the locations of which are disposed symmetrically with respect to the axis of the bit on a diagonal line, as shown in FIG. 14, the said recesses being designed for the discharge of the drilling waste matter.

The foregoing modification is especially applicable to bits of small dimensions, for example of a diameter 1.36 inches.

In a third embodiment (FIGS. 15 and 16), the head

39 of the bit, of general cylindrical shape, is provided with four inserts 40, similar to the insert 16 (FIGS. 4 to 7), disposed like the arms of a cross. Each insert 40 is provided with a cutting edge 41, curved and inclined outwardly to form together with the plane of sides 42, 42', which converge towards the longitudinal axis of the bit, a rounded edge. In this arrangement of the inserts 40, their front faces 43 are situated adjacent to the centrally disposed duct 44 for scavenging air. The head 39 is further provided with four longitudinal recesses 45, each of said recesses being situated between two adjacent inserts, and designed for the discharge of drilling waste matter.

In a modification of the third embodiment, shown in FIG. 17, the head 46 of the bit, of general cylindrical shape, comprises three inserts 47, similar to the inserts 40. The inserts are disposed star-wise with three arms the center of which is situated on the axis of the bit. The front face 48 of each of the inserts 47 is situated adjacent to a central hole 49 for scavenging air.

In each of the three sectors defined by two of the inserts 47, the periphery of the head 46 of the bit has a longitudinal recess 50 for the discharge of drilling waste matter.

In the fourth embodiment shown in FIGS. 18 to 20, the rock drilling tool is constituted by a detachable cutter head 51, the upper part 52 of which has a cross-section of elliptical shape and the lower part 53 of which, of cylindrical shape, is provided with a central recess 54, of conical shape, the said cutter head being adapted to be fixed by forced fitting on a cutter rod, not shown in the drawing.

The upper part 52 has a groove 55, directed according to the long axis of the ellipse, the said groove forming the housing for an insert 56. The insert 56 is provided with a cutting edge 57, curved and inclined symmetrically towards its two ends 58 and 59 to form together with the sides 60, 60', a rounded edge. The sides 60, 60' converge, on the one hand, from the end 58 in the direction of the end 59 and on the other hand, converge towards the working part of the insert, to form said rounded edge, the end 58 being larger and not as high as the opposite end 59. The face of the base 61 of the insert 56 is also inclined from the end 58 to the end 59, the walls and the bottom of the groove 55 have the same angles as the sides and the base of the insert.

The cutter head 51 is moreover provided with at least one duct, but preferably two ducts 62, 62' for scavenging air. The ducts are directed along the smaller axis of the ellipse, issuing at the periphery of the upper part 52 and communicating with the central recess 54.

The insert 56 is fixed on the head of the cutter in known manner, for example by driving it in with hammer blows, in the direction of the arrow *f'* (FIG. 18), into the groove 55 having the same angle, without the necessity of soldering.

It will also be understood that the detachable head of the cutter could be fixed to the cutter head by a screw.

In the modification shown in FIGS. 21 to 23, the insert 56 described above, is fixed directly to the cutter rod 63, the end 64 of which is similar to the upper part of the detachable cutter head 51 shown in FIGS. 18 to 20. The lower part 65 of the rod 63 is of cylindrical shape, and has a central cylindrical recess 66, for scavenging air, and at least one duct, but preferably two ducts 67, 67', similar to the ducts 62, 62' of FIGS. 18-20, issuing on the periphery of the end 64 of the cutter rod 63.

The bits of the embodiments and modifications which have just been described are adapted to operate by rotation and percussion simultaneously. As a result of the slant given to the bases of the inserts, the percussion of the bit causes the insert to slide downwardly, that is to say in the direction of the axis of the bit.

Moreover, the inserts do not run the risk of dropping out of their housing since, their outer face rubs against

the wall of the hole to be drilled. To this end, when the insert is fitted in its housing, the outer face of the insert projects, preferably, from the periphery of the bit, as shown in the various figures of the drawing. When the inserts begin to wear, they are extracted from their housings for regrinding. After this operation, the insert is again inserted in its groove with the additional insertion of a sheet of foil or other similar material in order to compensate, due to the convergence of the flanks, the play produced by the shrinking of the inserts after grinding.

The cutting edge of the inserts, instead of being rectilinear, could be slightly curved, so as to attack the rock at the center of the drilling hole. In fact, when the edge is rectilinear, the insert has a tendency to leave its groove at the beginning of the drilling by attacking the rock by means of the outer end of its edge.

The inclined base of the inserts has, moreover, the advantage that, in withdrawing the insert from its housing, it rises in the direction of the head of the bit, thus allowing the cutting edge and the flanks of the insert to be reground several times. The reduction of the material due to repeated regrindings is tolerated until the insert is very greatly shortened. In this way, the sharpness of the edges is preserved intact for a longer time and the periphery of the head of the bit has practically no wear, provided that the inserts are removed from their respective housings, for regrinding at the required time.

In principle, the inserts are merely driven into their groove without it being necessary to solder them, but it is obvious that they could also be soldered in the usual manner.

I claim:

1. A rock drilling tool comprising a head, having a pair of grooves therein, said grooves having a pair of converging sides and an inclined base, a detachable insert disposed in each of said grooves, said inserts having a cutting edge, a rear face, a front face, a pair of sides converging from said rear face to said front face and a flat base inclined longitudinally from said front face to said rear face, said inserts disposed in said grooves with their longitudinal axes parallel to each other and the front face of one of said inserts disposed in a direction opposite to the front face of the other of inserts, all of said sides and bases converging in a direction so that following installation of said inserts in said grooves the pressure exerted on the inserts during operation of the tool causes said inserts to be wedged firmly in said head, said head having a central opening through which scavenging air for discharging the waste of the drilling operation passes, each of said inserts directed perpendicularly to the center axis of the tool, the front faces of said inserts being of greater height than the rear faces thereof and situated adjacent the center axis of the head, the rear faces of said inserts being of greater width than said front faces thereof, said head having at least two diametrically opposite arcuate peripheral recesses to facilitate discharge of drilling waste matter.

2. A rock drilling tool comprising a head, having a pair of grooves therein, said grooves having a pair of converging sides and an inclined base, a detachable insert disposed in each of said grooves, said inserts having a cutting edge, a rear face, a front face, a pair of sides converging from said rear face to said front face and a base inclined longitudinally from said front face to said rear face, said inserts disposed in said grooves with their longitudinal axes parallel to each other and the front face of one of said inserts disposed in a direction opposite to the front face of the other of said inserts, all of said sides and bases converging in a direction so that following installation of said inserts in said grooves the pressure exerted on the inserts during operation of the tool causes said inserts to be wedged firmly in said head, said head having a central opening between said inserts through which scavenging air for discharging the waste

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of the drilling operation passes, each of said inserts directed perpendicularly to the center axis of the tool, the front faces of said inserts being of larger cross-section than the rear faces thereof and situated adjacent the center axis of the head, said head having on its periphery two angular recesses formed in the prolongation of the grooves of the two inserts respectively, and also having two semi-cylindrical recesses, respectively situated at the ends of a diametrical axis perpendicular to the orientation of the two parallel inserts, said recesses being designed for the discharge of drilling waste matter.

3. A rock drilling tool comprising a head, having a pair of grooves therein, said grooves having a pair of converging sides and an inclined base, a detachable insert disposed in each of said grooves, said inserts having a cutting edge, a rear face, a front face, a pair of sides converging from said rear face to said front face and a base inclined longitudinally from said front face to said rear face, said inserts disposed in said grooves with their longitudinal axes parallel to each other and the front face of one of said inserts disposed in a direction opposite to the front face of the other of said inserts, all of said sides and bases converging in a direction so that following installation of said inserts in said grooves the pressure exerted on the inserts during operation of the tool causes said inserts to be wedged firmly in said head, said inserts juxtaposed one to the other over a short length of their respective sides, each of the juxtaposed inserts having an outer side of double convergency, both vertically and horizontally, and a vertical inner side perpendicular to the base over the whole length of the insert, said base inclined from the front face to the rear face of the insert, said front face having a larger cross-section than the rear face situated on the periphery of the head, the head of the tool having a central duct for blowing air, said duct subdivided into two median ducts issuing respectively between the front faces of said inserts and the periphery of said head, and side ducts connected to said central duct and issuing between the outer sides of the inserts and the periphery of said head, and the periphery of the head of the tool having semi-cylindrical longitudinal recesses for the discharge of the drilling waste matter.

4. A rock drilling tool comprising a head, having a

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pair of grooves therein, said grooves having a pair of converging sides and an inclined base, a detachable insert disposed in each of said grooves, said inserts having a cutting edge, a rear face, a front face, a pair of sides converging from said rear face to said front face and a base inclined longitudinally from said front face to said rear face, said inserts disposed in said grooves with their longitudinal axes parallel to each other and the front face of one of said inserts disposed in a direction opposite to the front face of the other of said inserts, all of said sides and bases converging in a direction so that following installation of said inserts in said grooves the pressure exerted on the inserts during operation of the tool causes said inserts to be wedged firmly in said head, the front faces of said inserts situated adjacent the central axis of the head, a central bore in said head and a pair of median ducts in communication therewith having orifices adjacent said front faces, each of said front faces having a cut face terminating in the base of the insert adjacent said ducts, the said cut face being designed to facilitate the insertion of a tool for disengaging the insert from its housing, the periphery of the head of the tool being of oval shape and having two longitudinal recesses for discharging of the drilling waste matter, said recesses disposed symmetrically relative to the central bore of the head on a diagonal line relative to the longitudinal axis of said inserts.

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