Jan. 10, 1956 J. LAMPRECHT 2,730,335

AIR CORE DRILL

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Fig. 1

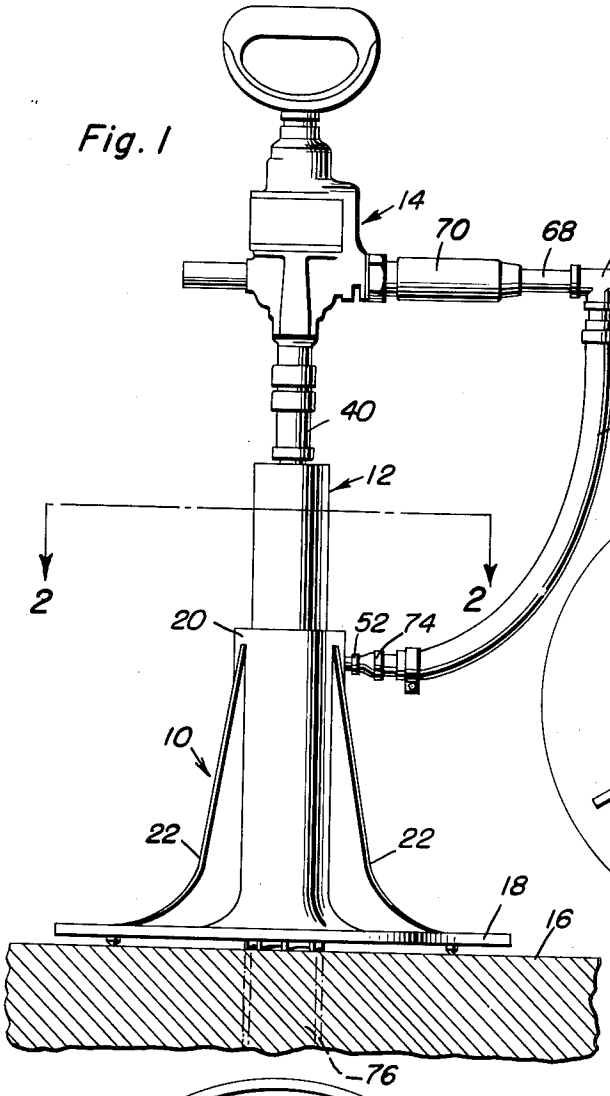


Fig. 2

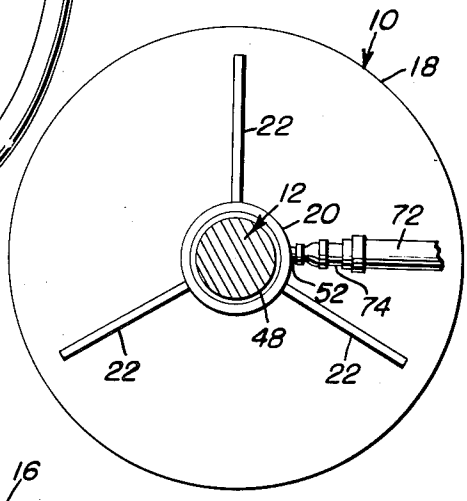


Fig. 3

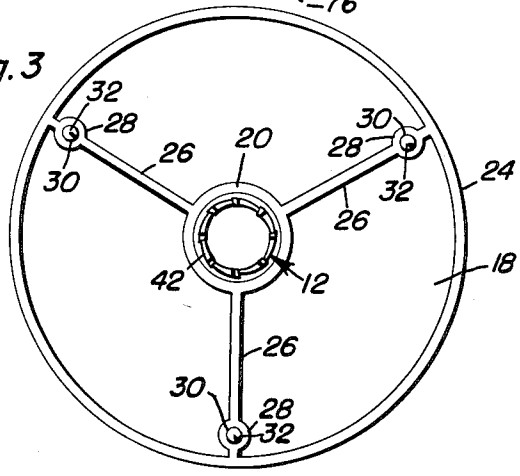
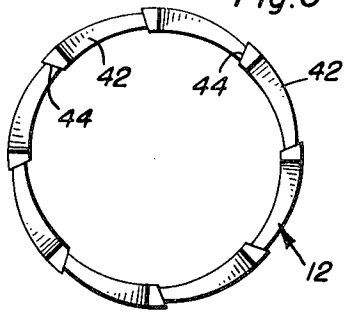


Fig. 6



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Fig. 4

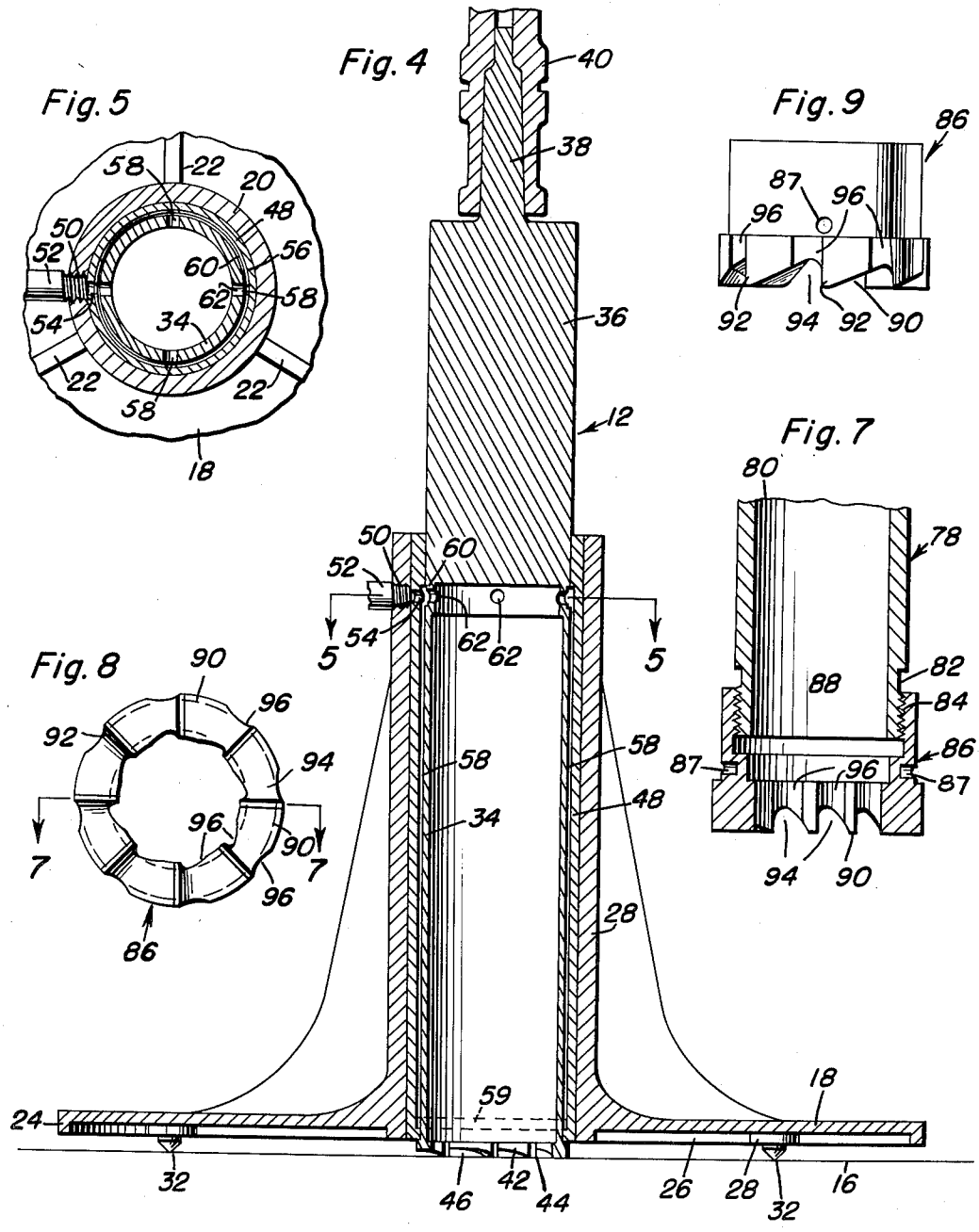


Fig. 5

Fig. 9

Fig. 7

Fig. 8

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AIR CORE DRILL

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4 Claims. (Cl. 255—72)

This invention relates in general to air core drills for cutting sample cores, and more particularly to an air core drill having means for disposing of the debris from drilling.

A primary object of this invention is to provide a core drill assembly having means for disposing of the debris from drilling in the dry state, whereby a drilling operation may not be hampered by bad weather conditions.

Another object of this invention is to provide an improved cylindrical drill for cutting cores from material, said drill having means supplying air under pressure to the interior thereof whereby dust and particles formed by the drilling operation may be directly blown out of the hole being drilled by the compressed air.

Another object of this invention is to provide an improved core drill assembly, said core drill assembly including a supporting base and a cylindrical drill, said supporting base having a fitting thereon for attachment of an air line thereto, means communicating said fitting with the interior of the cylindrical drill whereby air may be applied to the interior of the cylindrical drill while disposed in the supporting base and engaged in a drilling operation.

A further object of this invention is to provide an improved core drill assembly, said assembly being of relatively simple construction whereby it may be economically manufactured.

With these objects definitely in view, this invention resides in certain novel features of construction, combination and arrangement of elements and portions as will be hereinafter described in detail in the specification, particularly pointed out in the appended claims, and illustrated in the accompanying drawings which form a material part of this specification, and in which:

Figure 1 is a side elevational view of the air core drill assembly, which is the subject of this invention, the drill of the assembly being illustrated in its position prior to drilling into a slab of material on which its supporting base is supported, a proposed hole in the slab of material being shown in dotted lines;

Figure 2 is a transverse horizontal sectional view taken substantially upon the plane indicated by the section line 2—2 of Figure 1 and showing the general relationship between a cylindrical drill and its supporting base;

Figure 3 is a bottom plan view of the core drill assembly of Figure 1, the cylindrical drill being in position within the limits of the supporting base;

Figure 4 is an enlarged transverse vertical sectional view taken along the longitudinal axis of the core drill assembly of Figure 1, the air motor for rotating the cylindrical drill being broken off and only the bottom chuck portion being illustrated;

Figure 5 is a fragmentary transverse horizontal sectional view taken substantially upon the plane indicated by the section line 5—5 of Figure 4 and showing the general arrangement of passageways for the passing of air through the supporting base into the interior of the cylindrical drill;

Figure 6 is an enlarged bottom plan view of the cylindrical drill of Figures 1 through 5 and showing the general arrangement of and construction of the cutting teeth at the lower end thereof;

Figure 7 is an enlarged longitudinal vertical sectional view of the lower portion of a modified form of cylindrical drill, the modified cylindrical drill having a detachable cutting head threadedly engaged on the lower end thereof;

Figure 8 is a bottom plan view of the cutting head of Figure 7 and showing the general construction of the cutting teeth formed thereon; and,

Figure 9 is a side elevational view of the modified cutter head of Figure 7.

Similar characters of reference designate similar or identical elements and portions throughout the specification and throughout the different views of the drawings.

Referring now to the accompanying drawings in detail, it will be seen that there is illustrated in Figure 1 the complete air core drill assembly which includes a supporting base 10, a cylindrical drill 12 rotatably mounted in the supporting base 10, and a conventional rotating air drill motor 14, as is disclosed in Patent No. 1,750,013, dated March 11, 1930, connected to the upper end of the drill 12 for rotating same. The supporting base 10 is engaged on the material 16 to be core drilled.

The supporting base 10 includes a circular base plate 18 which has integral therewith and projecting upwardly therefrom a concentric tubular portion 20. Also projecting upwardly from the upper surface of the base plate 18 is a plurality of reinforcing ribs 22 extending between the base plate 18 and the tubular portion 20 in order to reinforce the connection between the tubular portion and the base plate.

As is best illustrated in Figure 4, the base plate 18 is provided with a depending annular flange 24 along its outer circumferential edge in order to reinforce same. It will be noted that the bottom of the annular flange 24 lies in the same horizontal plane as the bottom of the tubular portion 20 which projects below the main surface of the base plate 18. Extending radially from the bottom of the tubular portion 20 are reinforcing ribs 26 on the underside of the base plate 18. As is best illustrated in Figure 3, the reinforcing ribs 26 terminate at the annular flange 24 and are enlarged adjacent said annular flange. The enlarged portion of each rib 26 is referred to by the reference numeral 28 and is generally circular in plan view. The enlarged portion 28 is also provided with a centrally located aperture 30 in which is disposed a sharp steel pin 32. The points of the steel pin 32 lie in a common horizontal plane and are adapted to engage the upper surface of the slab 16 and restrain movement of the supporting base 10 therealong.

Referring now to Figure 4 in particular, it will be seen that the cylindrical drill 12 has a cylindrical lower portion 34 and a solid upper portion 36. The solid upper portion 36 has integral therewith a concentric shank 38 which is of a conventional Morse taper and is illustrated as being engaged in a portion of a chuck 40 carried by the air drill motor 14. It will be understood that the chuck 40 tightly engages the tapered shank 38 of the cylindrical drill 12 in order to rotate same.

Referring now to Figures 4 and 6, in particular, it will be seen that the bottom of the cylindrical drill 12 is enlarged symmetrically on each side of the main drill wall, and formed to present a plurality of circumferentially spaced cutting teeth 42, so as to cut an annular hole in a slab, etc., leaving vertical annular spaces on each side of the drill wall. Each cutting tooth 42 includes a forward cutting edge 44 at the bottom of the tooth 42, the cutting edge 44 being at an angle to a horizontal radial line through the drill axis, the cutting edge 44 projecting equally both inwardly and outwardly of the cylindrical

portion 34 of the drill 12, and forms with the latter a generally T-shaped cross-section, as is best illustrated in Figure 4. The portion of the tooth 42 to the rearward of the cutting edge 44 reduces symmetrically in radial thickness circumferentially, in a direction opposite to that of rotation, so as to equal the drill wall thickness at a point just forward of the next tooth 42 to the rearward, and the under surface of the back portion of each tooth 42 curves upwardly toward the next tooth 42, both of these taperings resulting in spaces between each pair of adjacent teeth 42, through which spaces the compressed air in the center of the drill 12 passes radially outwardly from the annular space between the inner surfaces of the annular hole being drilled and the drill wall, to the annular space between the outer surfaces of the drill wall and the annular hole being drilled.

In order that the supporting base 10 may be easily transported, it is preferably formed of aluminum and, therefore, does not provide a suitable bearing surface for the cylindrical drill 12. The tubular portion 20 of the supporting base 10 is provided with a concentric interior bearing sleeve 48 which is preferably formed of bronze. Since the cylindrical drill 12 has pressure applied thereon along a vertical axis only, it will be understood that the purpose of the bearing sleeve 48 is merely to guide the cylindrical drill 12 and restrain same against any movement from a position concentric with the center line of the hole being drilled.

During the normal drilling of a hole to obtain a core, the cutting teeth 42, which are formed of a hardened material, will cut the slab 16 and form dust and small particles of material. Inasmuch as the dust and small particles of material hinder the drilling operation and should be disposed of, it is the purpose of this invention to provide means for disposing of said dust and drilling particles without utilizing fluids. Inasmuch as a compressed air source is required for the air drill motor 14, it is the intention of this invention to utilize said compressed air source for directly blowing the dust and particles formed by the drilling operation out of the hole being drilled. Therefore, the tubular portion 20 of the supporting base 10 is provided adjacent its upper end with a radial bore 50 which is internally threaded and adapted to have threadedly engaged therein an air line fitting 52. Extending radially through the upper portion of the bearing sleeve 48 and in alignment with the bore 50, is a bore 54. Formed in the interior surface of the bearing sleeve 48 in vertical alignment with the bore 54 is a horizontally disposed annular groove 56 which communicates with the air line fitting 52 through the bores 50 and 54. Communicating with the annular groove 56, in the bearing surface of the bearing sleeve 48 and extending vertically downwardly therefrom is a plurality of spaced longitudinal grooves 58 for supplying air throughout the length of the bearing sleeve 48. However, it will be noted that the longitudinal grooves 58 terminate short of the lower end of the bearing sleeve 48 in a horizontally disposed annular groove 59, and air is prevented from escaping at the bottom of the grooves and air is also prevented from escaping from the inner faces of the grooves by the cylindrical portion 34 of the cylindrical drill 12.

In order that air under pressure may be supplied to the hole being drilled, it is necessary that the interior of the cylindrical bottom portion 34 of the cylindrical drill 12 be communicated with the grooves formed in the bearing surface of the bearing sleeve 48. Therefore, the upper end of the cylindrical portion 34 has a horizontally disposed annular groove 60 formed in its outer surface, the annular groove 60 communicating with the plurality of axial bores 62 extending through the side wall of the cylindrical portion 34. When the cylindrical drill 12 is in its uppermost position, the annular groove 56 in the bearing sleeve 48 is in vertical alignment with the annular groove 60 in the cylindrical drill 12 and air

passes through the bore 54 from the air line fitting 52 into the annular groove 56, from the annular groove 56 into the annular groove 60, and then into the interior of the cylindrical bottom portion 34 through the bores 62 therethrough. As the drilling operation proceeds, the cylindrical drill 12 moves downwardly in the bearing sleeve 48 and the annular groove 60 moves out of vertical alignment with the annular groove 56. Air is then supplied to the annular groove 60 through the longitudinal grooves 58 after passing into the annular groove 56.

Referring now to Figure 1, in detail, it will be seen that there is illustrated a main first air supply line 64 which is provided with a T-fitting 66. Extending from one connection of the T-fitting 66 is an air supply line 68 which is connected to a fitting 70 on the air drill motor 14. Extending from the other connection of the T-fitting 66 is an auxiliary air line 72 which through conventional pipe fitting 74 is connected to the air line fitting 52 for supplying air to the tubular portion 20 of supporting base 10. During a drilling operation, as the cylindrical drill 12 is rotated by the air drill motor 14 and moved downwardly into the slab 16 in response to pressure applied thereto and as a result of the cutting of the cutting teeth 42, dust and particles of material are formed from the drilling. Inasmuch as the hole being drilled is of a larger width than the thickness of the cylindrical lower portion 34 of the cylindrical drill 12 above the tooth level, air will be permitted to pass downwardly between the inner surface of the cylindrical portion 34 and a core being cut, the core being illustrated by dotted lines in Figure 1 and referred to in general by the reference numeral 76. Compressed air then further passes downwardly between the core 76 and the drill 12 at the rear of each of the cutting teeth 42 just in front of the cutting edge 44 of the next cutting tooth 42. After the compressed air has reached the bottom of the hole being drilled, it passes outwardly radially through the spaces 46 formed in the underside of the drill 12 and moves upwardly between the outer surface of the cylindrical portion 34 and the outer cylindrical surface of the hole being drilled to the top of the hole being drilled. The swift movement of the compressed air past the cutting edges 44 of the teeth 42 results in the carrying of the dust and small particles of material outwardly and upwardly of the hole simultaneously with their forming.

The novel construction of the supporting base 10 and the cylindrical drill 12 permits the use of compressed air to remove the dust and particles without the use of a liquid. By utilizing compressed air only to remove the dust and particles formed by drilling, it will be readily apparent that the air core drill, which is the subject of this invention, may be utilized in all types of weather conditions. Therefore, it is obvious that the improved core drill overcomes an objection of the commonly used core drills in that it does not utilize water or other liquids for removal of the dust and particles formed in drilling, thus eliminating the difficulties encountered in low temperatures due to the freezing of the water.

Referring now to Figures 7, 8, and 9 in particular, it will be seen that there is illustrated a modified form of cylindrical drill, this cylindrical drill being referred to in general by the reference numeral 78. The cylindrical drill 78 has a cylindrical lower portion 80 which is provided with an annular recess 82 adjacent its lower end, and the lower end thereof is externally threaded as at 84. Threadedly engaged with the threaded portion 84 of the cylindrical drill 78 is a removable cutter head which is referred to in general by the reference numeral 86. The cutter head 86 is provided with suitable spanner wrench openings 87 to facilitate removal.

It will be noted that the removable cutter head 86 is recessed at its upper end and internally threaded to provide threads 88 which interengage with the threads 84 of the cylindrical drill 78. The removable cutter head 86 is generally of an inverted T-shape cross-section and has

hardened teeth 90 formed at the lower end of same, the teeth having cutting edges 92. Each tooth 90 tapers upwardly rearwardly of the cutting edge 92 thereof towards the next tooth 90 to form a space 94 just in front of the cutting edge 92 of the next tooth 90. In order that the dust and particles formed by drilling may pass upwardly around the cutter head 86, the enlarged portion of the cutter head is provided with a plurality of vertically extending spaces 96 which are generally in alignment with the transversely extending spaces 94.

It will be understood that the cylindrical drill 78 is intended as a replacement for the cylindrical drill 12 and is formed at its upper end (not shown) with a solid portion having a concentric shank extending upwardly therefrom for engagement with the chuck 40 of the air drill motor 14. It will be understood that the diameter of the cylindrical drill 78 is the same as the cylindrical drill 12 and is intended to be utilized in combination with the supporting base 10. By utilizing a removable cutter head, such as the cutter head 86, it is not necessary to replace the entire cylindrical drill upon the breaking or the dulling of the cutting teeth.

Inasmuch as the different forms of tools utilized with the base 10 require different spacings between the face and the material being drilled, it may be necessary to vary the length of the pins 32 to properly initially seat the base 10 on the surface to be core drilled.

The operation of this device will be understood from the foregoing description of the details thereof, taken in connection with the above recited objects and drawings. Further description would appear to be unnecessary.

Minor modifications of the device, varying in minor details from the embodiment of the device illustrated and described here, may be resorted to without departure from the spirit and scope of the invention, as defined in the appended claims.

Having described the invention, what is claimed as new is as follows:

1. A core drill for cutting cylindrical samples from rock, tile, cementitious and other materials, said core drill comprising a cylindrical drill having cutting teeth at the lower end thereof, a supporting base for said cylindrical drill adapted to overlie the surface of the material to be drilled, said cylindrical drill being mounted in said supporting base for rotation and for axial movement therethrough, an air line attachment carried by said supporting base, passage means in said supporting base and cylindrical drill in communication with said air line attachment for delivering air to the interior of said cylindrical drill, said cylindrical drill having a cylindrical main wall portion, said cutting teeth being circumferentially spaced and projecting inwardly and outwardly of said main wall portion of said cylindrical drill to provide clearance on each side of said main wall portion when disposed in a hole drilled by said cutting teeth, said cutting teeth having areas of reduced width providing vertically extending recesses along both the outer and inner peripheries thereof, each of said recesses terminating at the forward edge of the next tooth, the cutting teeth having cutting edges circumferentially spaced to provide axially extending recesses intersecting said vertically extending recesses whereby air applied to the interior of said cylindrical drill will be free to pass downwardly through said drill and upwardly out of a hole being drilled.

2. A core drill for cutting cylindrical samples from rock, tile, cementitious and other materials, said core drill comprising a cylindrical drill having cutting teeth at the lower end thereof, a supporting base for said cylindrical drill adapted to overlie the surface of the material to be drilled, said cylindrical drill being mounted in said supporting base for rotation and for axial movement therethrough, an air line attachment carried by said supporting base, air passages in said supporting base and cylindrical drill for delivering air to the interior of said cylindrical drill, said supporting base being provided with an internal longitudinally extending bearing surface guidingly engaging the exterior of said cylindrical drill, said air passages including a plurality of longitudinally extending grooves formed in said bearing surface, an annular groove at the upper ends of said longitudinal grooves communicating same, a bore through said supporting base and said bearing surface communicating said air line attachment with said annular groove for supplying air thereto, said passages in said cylindrical drill being communicated with said grooves.

3. The core drill of claim 2 wherein said air passages in said cylindrical drill include a plurality of bores through said cylindrical drill, an annular groove in the outer surface of said cylindrical drill communicating said bores, said annular groove being disposed within said supporting base and communicating with the longitudinal grooves in the bearing surface.

4. The core drill of claim 2 wherein said bearing surface is a portion of a bearing sleeve disposed in said supporting base.

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