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PROVISIONAL APPLICATION under 37 C.F.R. § 1.53 (b)(2) TRANSMITTAL FORM

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Dear Sir:

Enclosed Application parts are:

___	Spec w/claims	Number of Pages	___
X	Spec w/o claims	Number of Pages	6
___	Formal drawings	Number of Sheets	___
X	Informal drawings	Number of Sheets	2
___	Other:		

Inventors:

Last Name	First Name	MI	Residence (City and State)
Cox	David	M.	Springtown, Texas

Title of Invention:
Rock Bit for Directional Drilling

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Was this invention made under Government contract? X No ___ Yes

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Respectfully Submitted,

Daniel V. Thompson
Registration No. 29,706

Date: 2/5/97

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Abstract:

A directional earth boring tool for boring all earth formations such as dirt, sand, rock and/or any type combination of formations, utilizing a bit body containing fixed and semi-floating cutting points and one or more fluid channels for the purpose of lubricating and dispersing cut and/or fractured formations. a high impact point-fracturing method of removal of dense or rock formations and also creates a high-velocity orbital node while drilling softer or less dense formations. The beveled cavity within the bit design allows the bit to be steerable in all formations. The bit body is attached to the boring drill body, which contains at least one or more fluid channels, by means of an interference connection that withstands transverse loading. The asymmetrical method of attachment incorporates resultant reactions from the drill stem and drill body derived from input torque and thrust supplied by drilling machine, to create a random elliptical pattern while boring which also creates a hole larger than the concentric design of the drill body would typically allow.

Field of the invention:

This invention relates to directional drilling techniques that could be used in several industries, such as water well drilling , oil field, but substantially to horizontal directional drilling and more specific to earth and rock formation boring, utilizing low pressure, high volume and one or more fluid conduits within the boring bit body for the purpose of lubricating the bit and suspending spoils.

Background of invention:

This bit is designed for the purpose of lateral or horizontal directional drilling and can be applied

to any process that incorporates a need to bore or drill through any earth bound formation that requires the ability to bore rock or any type of formation and still remain directable, specifically to the horizontal directional drilling industry. This industry, sometimes called trenchless digging, installs utilities around or through immovable objects, such as roadways, rivers and/or lakes, etc. The boring technique traditionally operates from a boring device or machine that pushes and/or rotates a drill string consisting of a series of connected drill pipes with a directable drilling device, head or tool to achieve an underground path or direction through which a conduit or utility device can be installed.

Traditional methods of drilling include a drill body and a drill blade of some type that usually concentric in design and creates a cylindrical hole and typically uses high pressure high velocity jetting to create steerability and cooling of drill body or blade. Our invention uses fluids for the purpose of lubricating and suspending the spoils, this is common in most oilfield related drilling and is not used in any way to steer the product by way of jetting. In contrast to present drill bit devices or tools, the heel-down method of attachment to the drill body helps to create the random elliptical orbital motion that causes the high impact fracturing technique when used in conjunction with the thrust and rotation movement of the associated drill string.

The method described above is directly related to the size and weight of all the associated drill parts in conjunction with the boring technique utilized. In other words, the exact capabilities of this drill bit are unknown at this time due to the fact that new techniques or procedures of operation through multiple formations are being developed every day.

The concave channel within the drill bit body is used to reduce the cross-sectional density of the face of the bit during steering as well as providing an alignment guide during boring process.

Narrative:

Asymmetrical directional drilling bit for rock or other earth formations.

Operational assumptions:

1. Drilling of hard rock formations is defined as a fracturing process as opposed to a cutting or shearing operations as used in many Earth drilling applications. It is known that earth boring for horizontal directional drilling may be a combination of cutting or shearing and jetting. The jetting methods employ a system of high pressure, high velocity fluids with the specific purpose of making a suspension, or solution of earth formations and flowing these suspensions or solutions into the surrounding formations or out of the bore hole. Cutting or shearing systems use fluids to lubricate the drilling tools as well as carry off the spoils of drilling. Rock formations do not cut or shear well, and do not dissolve or contain binding components that are easily disassociated with water solvents or hydraulic forces of jetting.

2. No current drilling bit and process combines the operational parameters of rock fracturing, and high included angle offsets for directional steering in soft earth formations.

Theory of Operation

3. The new Asymmetrical Directional Drilling point for Rock and Hard Earth Formations combines the techniques of point contact fracturing for rock with a high angle of attack for hard

earth as well as soft formations. Fracturing is accomplished with application of hard carbide points on random elliptical torque vectors created as the asymmetrical geometry of the bit forms eccentric rotational paths by combination of rotation and thrust moments. Drilling of rock like shales that are typically considered to be compressed and extremely dense and dry clays are also enhanced by the aggressively pointed geometry of the drill bit.

4. The asymmetrical geometry enhances the performance of the drill rack by multiplying the fracturing effect through leverage on the main drilling points. As the drill bit rotates the offset drill points randomly fracture and engage as center points of rotation and multiply transverse moments 3 to 8 times the actual transverse moments that can be produced at the same diameter in a symmetrically formed fixed diameter drill bit.

5. Bore hole size is defined and controlled by stabilizing the forward cutting points on a trailing shoe that contains replaceable, semipermanent carbide buttons that will fracture off irregular surfaces and help smooth the borehole as well as reduce the abrasive wear on the body of the bit.

6. Rock or Hard Earth steering is accomplished by partial rotation boring method. This method is applied by thrusting the bit into the bore face at a predefined rotational index position and rotating to a similarly defined end rotation position and then pullback. The procedure is then repeated as often as necessary to form the borehole into the desired amount of turn.

NOTE!

Many Test bores have already been successfully completed where the "partial rotation bore"

process has successfully navigated through hard shales, sandstone, light limestone, Austin chalk, and concrete with and without steel reinforcing.

7. Steering in soft surface formations is easy using the standard non rotating push-steer techniques as would be used with a flat paddle bit. The semi-elliptical channel cut into the steering shoe guides the bit to help it maintain a path parallel to the plane of the arc created by steering the bit. This reduces cross drift when push steering.

NOTE!

The "steering channel" also reduces the frontal blank surface area greater than 50% resulting in less chances of "formation buildup". This enhances push steering performance as well as eases the ability of drilling spoils to flow under the bit when straight boring.

8. This drill bit DOES NOT USE JETTING OR DIRECTED FLUID APPLICATION to enhance the performance of the drilling action. Drilling fluid is required to clean the drill bit and remove spoils from the bore hole. The drill bit will not generate high pressure during normal drilling applications.

A unique shear relief structure is provided to reduce the loads on fasteners used to attach the rock bit to the sonde housing. The shear relief includes a longitudinal recessed groove A (Fig. 1), having a rectangular cross-section, and a matching raised tongue (not shown) on the back side of the rock bit. The tongue extends substantially the entire length of the rock bit back side, for substantially complete engagement of the groove A. In operation, the shear relief removes

substantially all the shear load on the fasteners B (Fig. 2) used to hold the rock bit to the sonde housing. Fasteners B provide clamping pressure only, while the shear relief absorbs the enormous shear forces applied to the rock bit.

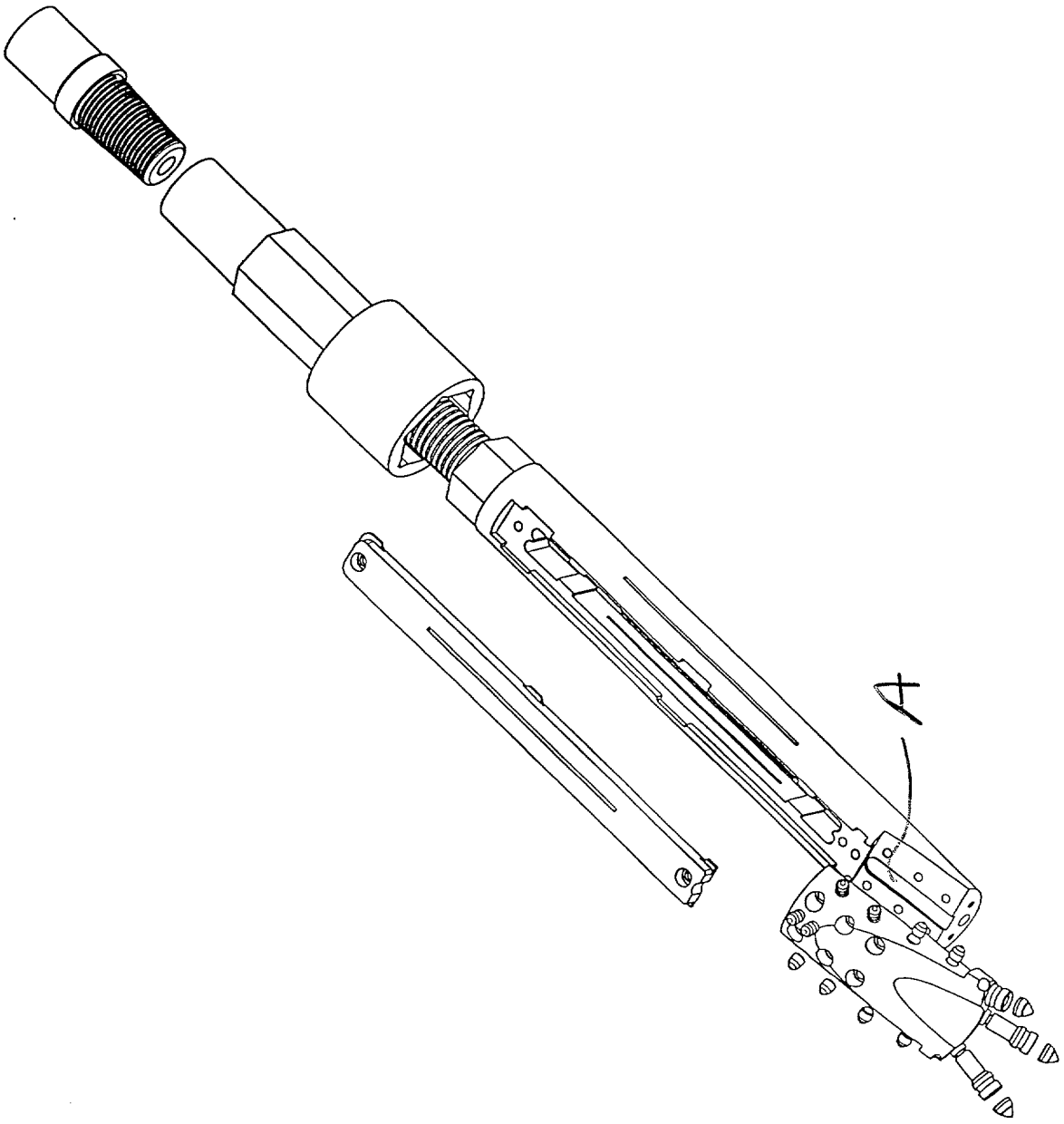

FIG. 1

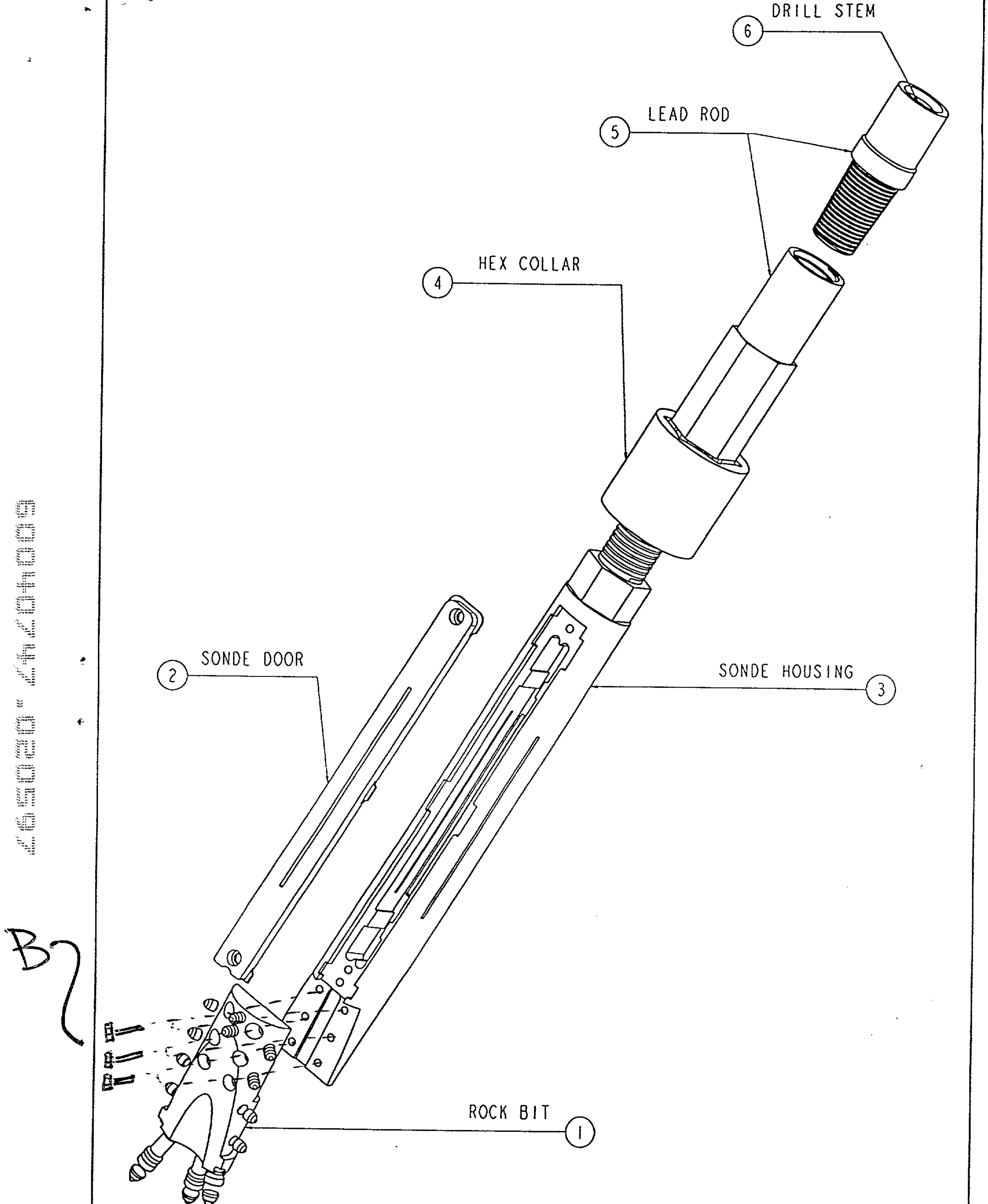

FIG. 2