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[54] **PERMAFROST DRILLING METHOD**
4 Claims, 1 Drawing Fig.

[52] U.S. Cl. **175/57,**
 166/DIG. 1, 61/50

[51] Int. Cl. **E21b 7/00**

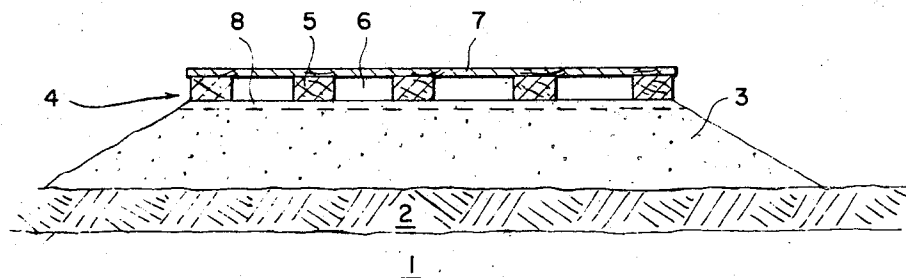
[50] Field of Search 175/57, 65,
 5, 9; 166/DIG. 1; 61/50

[56] References Cited

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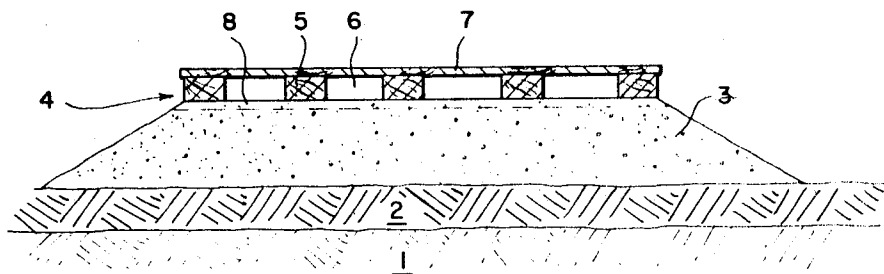
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ABSTRACT: A pad for drilling at least one borehole through the earth, the pad being composed of a first layer of particulate material adjacent the earth, a second layer composed of spaced-apart members to form a plurality of channels therein, and a third layer composed of support material. A method for drilling a borehole through tundra and permafrost without substantially thawing same by using the above described pad for carrying out the drilling procedure.



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3,602,323



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PERMAFROST DRILLING METHOD

BACKGROUND OF THE INVENTION

Heretofore in drilling in the North Country, particularly in areas where permafrost and tundra are prevalent, it was thought that drilling rigs and their associated apparatus such as mud pits, mud pumps, drill pipe racks, and the like, had to be supported on pilings which extended a substantial distance into the permafrost or else the drilling rig and its associated apparatus would not have adequate support in the summer when the tundra thaws.

However, the use of pilings has disadvantages in that they are quite expensive to emplace and when arranged to support a specific drilling rig in a particular direction, the arrangement of the pilings will most likely not be adequate for subsequent rigs such as work-over rigs that may be desirably emplaced over the borehole and will be arranged to point the rig in a direction different from that desired for subsequent rigs. Therefore, the pilings have limited utilization as well as expensive emplacement. Further, it has been found that some melting of the permafrost can occur around these pilings in the summertime so that they do not always give the most rigid support desired for the rig.

SUMMARY OF THE INVENTION

It has now been found that pilings can be replaced with a less expensive and more versatile drilling rig pad composed of a plurality of layers of materials as described hereinafter, one layer having channels therein to provide for a substantial amount of airspace between at least two of the layers of the pad.

When the drilling pad of this invention is employed, drilling of a borehole can be carried out through tundra and permafrost without substantially thawing or otherwise damaging the tundra or the permafrost but yet still rigidly supporting the drilling rig.

The pad can be left in place after the borehole drilling has been completed and other rigs moved onto the pad and pointed in any desired direction without having to make structural alterations to the pad itself. Thus, the pad is much more versatile than an arrangement of pilings.

Thus, the pad and method of this invention are useful in drilling boreholes in the earth in general and are particularly useful in drilling in areas where tundra and permafrost exist.

Accordingly, it is an object of this invention to provide a new and improved drilling pad. It is another object to provide a new and improved drilling pad for use in areas where tundra and permafrost exist. It is another object to provide a new and improved method for drilling a borehole through tundra and permafrost without substantially thawing either the tundra or the permafrost. It is another object to provide a method for drilling a borehole in areas where tundra and permafrost exist without damaging the tundra or permafrost and while at the same time rigidly supporting the drilling rig and its associated apparatus.

Other aspects, objects, and advantages of this invention will be apparent to those skilled in the art from this disclosure and the appended claims.

DETAILED DESCRIPTION OF THE INVENTION

The drawing shows a pad embodying this invention.

More specifically, the drawing shows a permafrost zone 1 surrounded by a tundra zone 2 which acts as insulation for the permafrost zone, thereby maintaining the permafrost zone perpetually frozen.

The first layer 3 of the pad of this invention is composed of particulate material such as gravel, crushed rock, natural occurring rock, sand, and the like. This first layer is spread out and piled on the tundra 2 for the desired area of the pad and for the height required to prevent thawing into the tundra 2 which is directly under the first layer 3 at any time during the

warmest part of the year. Thus, the area of tundra 2 under first layer 3 remains perpetually frozen, even in the summertime, because the thaw line in the summer does not reach below the first layer 3. Thus, the height of first layer 3 can vary widely depending upon the material from which it is composed, its geographical location, and the like. Generally, however, the thickness of first layer 3 would be at least about 6 inches.

A second layer 4 is imposed on top of first layer 3 and is composed of a plurality of spaced-apart members 5 which form a plurality of open channels 6 in the second layer. Members 5 can be composed of any structurally strong material, be it iron, cement, wood, and the like. Members 5 are preferably wooden beams or logs.

Channels 6 can be of any desired cross-sectional area and preferably extend for the full length of the pad so that channels 6 run from one end of the pad to the other. It is preferred that at least a part of the channels 6 be at least partially, if not totally, open to the atmosphere surrounding the pad so that a free flow of ambient air can pass through the channels at any time. Channels 6 can be of any desired cross-sectional area in volume but preferably are of sufficient volume to prevent substantial amounts of heat from passing from the next higher layer 7 to the next lower layer 3.

Third layer 7 is composed of support material since it is a working surface of the pad and the surface upon which the rig and its associated apparatus will be placed. If the rig and associated apparatus are to be moved around, it can be desirable to emplace skid rails or other means for moving the rig on this third layer 7. Third layer 7 can be formed from any material which will give a substantially continuous working surface, be it concrete, boards, and the like. If boards or other similar individual members are used to compose third layer 7, they can be laid substantially contiguous with one another to form a substantially continuous layer but they can have some spacing therebetween, if desired. However, the individual members used to make up third layer 7 can be laid contiguous with one another to form a solid and continuous working layer.

Individual members 5 can be laid directly on first layer 3 if the members 5 will not ultimately sink substantially into layer 3 such as when that layer thaws in the summertime. If desired, a fourth layer 8 composed of support material such as the same or different support material used to make up third layer 7 can be interposed between second layer 4 and its members 5 and the top of first layer 3. Fourth layer 8 can be composed of a plurality of contiguous members such as boards and the like or a plurality of spaced-apart members as described for third layer 7. In addition, fourth layer 8 can be composed of any material such as concrete and the like used for the third layer 7. The composition of the third and fourth layers need not be the same, although it is presently preferred that the second, third, and fourth layers be composed of wooden material such as planking for the third and fourth layers and wooden beams or logs for the second layer.

By utilizing the layer concept of this invention, and particularly the concept of disposing airspace between the working third layer 7 and the base layer 3, it has been found that pilings can be eliminated completely and the rig and any other apparatus that may be desirably used in drilling, completing, and working over the borehole or boreholes drilled through tundra 2 and permafrost 1 still effected. Further, with the pad of this invention any type rig can be moved onto the pad after the initial borehole is drilled and the rig oriented in any direction. Further, a plurality of directional boreholes can be drilled from the single pad so that a single pad can be employed for a large number of boreholes drilled in varying directions from the pad.

The pad of this invention can be built up in a body of water for drilling an offshore well or it can be built up on top of the tundra for drilling one or more wells through the tundra and permafrost without substantially thawing either the tundra or the permafrost. In the method of this invention, the normal drilling procedure is carried out on the third or working layer 7 of the pad so that the tundra 2 remains untouched in the

area of drilling except for the boreholes that pass therethrough.

As an example, gravel, as employed for the first layer 3, is piled to a height of about 3 feet. Layer 8 is then formed from a plurality of boards about 3 inches thick to get a substantially solid layer 8. On layer 8 is disposed a plurality of wooden beams about 10 inches thick and about 10 inches wide, the beams being emplaced on 3- to 5-foot centers so that each channel 6 is a cross-sectional area of about 10 inches by about 26 inches, each channel extending for the full length of the members 5 and therefore extending for the full length of the pad, all channels 6 being completely open to the air surrounding the pad. Layer 7 is then formed from boards 3 inches thick laid contiguous with one another to provide a continuous and solid working surface. Skid rails can be emplaced on top of layer 7 to provide means for sliding the rig and other apparatus into place on the pad and for removing same from the pad.

Reasonable variations and modifications are possible within the scope of this disclosure without departing from the spirit and scope of this invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a method for drilling a borehole through permafrost without substantially thawing same, the improvement comprising providing a first layer adjacent the earth and composed of particulate material, providing a second layer on said first layer and composed of spaced-apart members to form a plurality of open channels through said second layer, said channels being at least partially open to the atmosphere surrounding said pad for free flow of ambient fluid therethrough, providing a third layer on said second layer and composed of support material, said channels being of sufficient volume to prevent substantial amounts of heat from passing from said third layer to said first layer, and carrying out the drilling steps while operating from said third layer.

2. A method according to claim 1 wherein there is a fourth layer between said first and second layers, said fourth layer being composed of support material, and the drilling steps are carried out while operating from said third layer.

3. A method according to claim 2 wherein said first layer is composed substantially of gravel, and said second, third, and fourth layers are composed substantially of wooden members.

4. A method according to claim 1 wherein said first layer is composed substantially of wooden members.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,602,323 Dated August 31, 1971

Inventor(s) Frank J. Schuh

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 32, "o" should read ---or---.

Column 4, line 22, after "substantially" should be inserted ---of gravel, and said second, third, and fourth layers are composed substantially---.

Signed and sealed this 23rd day of May 1972.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents