Jan. 14, 1969 M. D. OOSTERBAAN 3,421,328

INSULATED UTILITY CONSTRUCTIONS

Filed June 28, 1965 Sheet 1 of 2

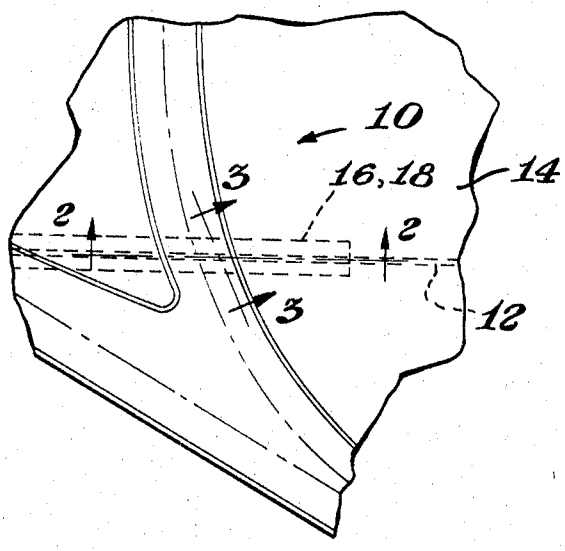

Fig. 1

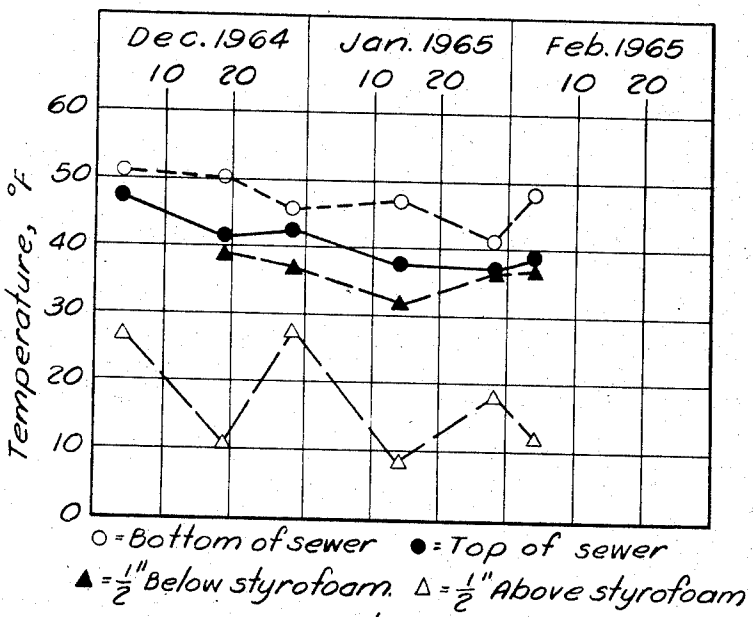

Fig. 4

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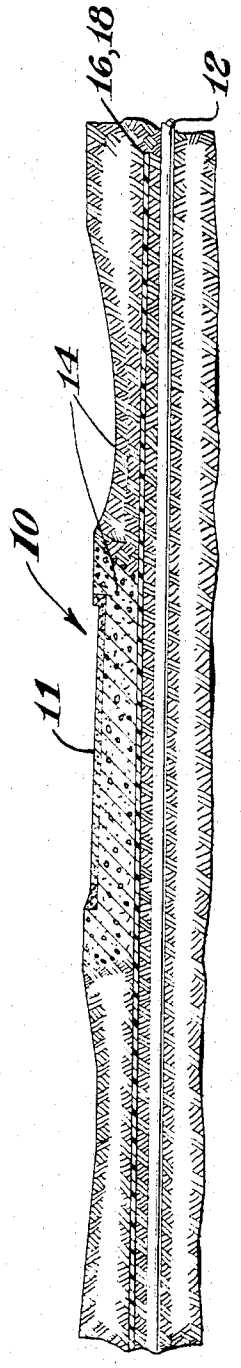

Fig. 2

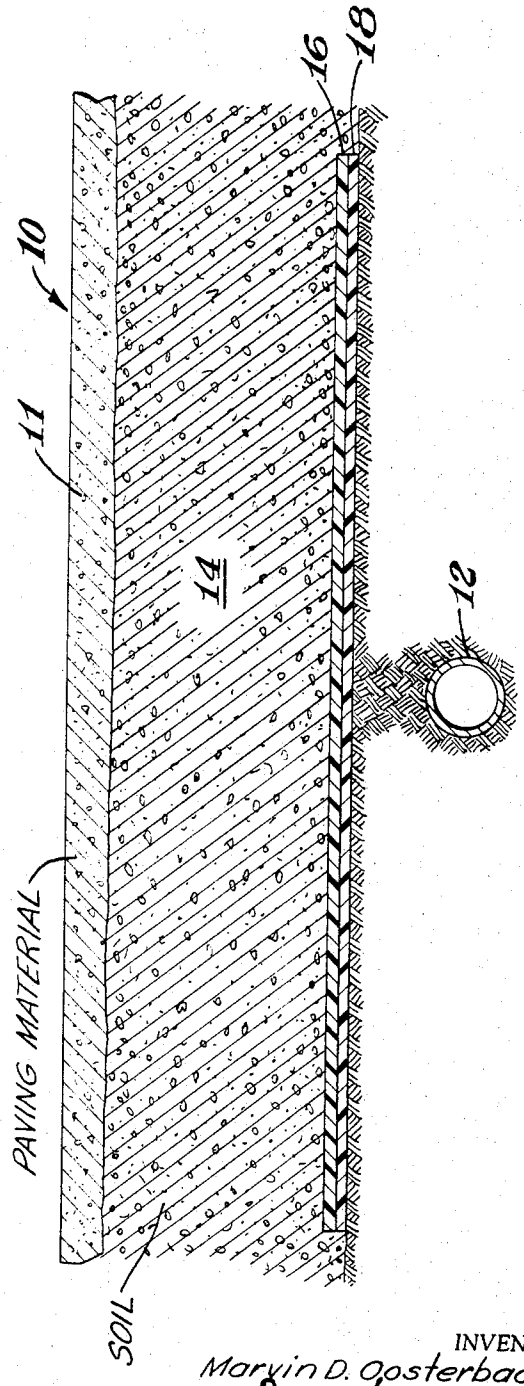

Fig. 3

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United States Patent Office 3,421,328
Patented Jan. 14, 1969

3,421,328

INSULATED UTILITY CONSTRUCTIONS

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Filed June 28, 1965, Ser. No. 467,508
U.S. Cl. 61—72.1 4 Claims
Int. Cl. F16l 1/00; E03b 7/12

ABSTRACT OF THE DISCLOSURE

A utility line construction for carrying freezable liquids through a soil exposed to a freezing environment. A substantially water impermeable plastic foam insulating layer is located above the utility line and specifically adapted to provide a frost-free zone thereabove such that the utility line can be located at a fixed depth where such freezable liquids would otherwise have become frozen.

This invention relates generally to underground thermal insulation of utilities. More particularly, the invention concerns a novel construction providing high insulating properties, with respect to frost penetration, for utilities such as sanitary sewer lines.

To protect sanitary sewers and similar utility constructions wherein water and other freezable components are conveyed, it has generally been necessary to install them beyond the depth of frost penetration. Usually in the United States, this has required an excavation of some five to six feet into the soil or rock. In Canada or in extremely frigid areas of the United States it has not been unusual to go as deep as eight feet. Likewise, where already existing installations of utilities had initially been located at a proper depth to prevent frost penetration, later excavations over these installations, such as might be required by urban renewal projects or highway construction, would often remove a substantial portion of the soil above the utilities and thus subject them to freezing during winter months.

Accordingly, this invention presents a utility construction wherein the depth of earthen materials above the utility installation or line, if any, need only be a fraction of that which was heretofore required under usual conditions of frost penetration.

Briefly then, the concept of the present invention evolves about the placing of a layer of plastic foam material having high insulating properties above the utility line as a barrier to frost penetrations, thus eliminating the necessity of placing utility lines and the like at substantial depths below the soil surface.

Yet additional advantages of the present invention, and its numerous cognate benefits and features are even more apparent and manifest in any by the ensuing description taken in conjunction with the accompanying drawing in which, wheresoever possible, like characters of reference designate corresponding material and parts throughout the several views thereof, in which:

FIGURE 1 is a fragmentary plan view of a highway slip ramp construction over a utility line, which construction embodies the concepts of the present invention;

FIGURE 2 is an enlarged fragmentary cross-sectional view thereof taken generally along the reference line 2—2 of FIG. 1;

FIGURE 3 is a greatly enlarged fragmentary cross-sectional view thereof taken generally along the reference line 3—3 of FIG. 1; and

FIGURE 4 is a graphical representation of the effects of frost penetration on the temperatures in the insulated construction of FIG. 1 during a typical winter season.

The highway slip ramp **10** of the drawing is comprised of a highway paving material **11**, such as cement or asphalt, located over a vitrified clay sanitary sewer pipe line **12**, which sewer line is at some depth below the surface of soil or earthen material **14**. This arrangement illustrates an actual construction wherein the principles of the present invention were employed to overcome certain problems which will become more evident hereinafter.

Before slip ramp **10** was constructed, sewer line **12** had been installed at a sufficient depth below soil **14** to prevent frost from penetrating to the sewer line **12**. In the region in which the sanitary sewer line **12** was installed, this was a depth of over five feet. When necessity required the construction of a highway in this area, an excavation for slip ramp **10** was made over the sewer line **12**, which excavation resulted in the sanitary sewer line **12** being left at only about two and one-half feet below the final grade. Without the concept of the present invention, this situation would have required the expensive and time-consuming operation of lowering the entire sewer line to its original depth to prevent damaging frost penetration into the sewer line.

However, following the principles of this invention, a continuous area some one hundred feet long and ten feet wide was excavated to about six inches above the sewer line **12**. Then eight foot long boards of one inch thick expanded polystyrene, such as produced by The Dow Chemical Company under the trademark "Styrofoam," were placed crosswise to the sewer line **12** in this area as illustrated in FIG. 3. The boards formed two continuous layers **16** and **18** providing a two inch thickness of insulating material between the soil-roadway surface and the sewer line **12**. There then remained only about two feet of soil **14** between the pavement of the slip ramp **10** and the top of the insulating layers **16** and **18**. In this construction, the minimum temperature realized just beneath the insulating layers was recorded (FIG. 4) as 32° F. while the temperatures at the top and bottom of the sewer line were recorded at that time as 37° F. and 47° F., respectively. At no time during the recording was the pipe line subjected to freezing temperatures, there being a frost-free zone completely about the pipe line during the given degree-day environment involved in this construction.

In addition to the embodiment of FIGS. 1–3, it should also be obvious that initial insulation of utility lines carrying freezable fluids, an insulating barrier, such as expanded polystyrene, over such lines would substantially reduce the excavation depth required to install such utilities. Also, it is conceivable that with the proper foam thickness a highway paving material such as asphalt or concrete can be placed directly on the insulating barrier material. Thus, the present invention should be comprehended in all of its alternative embodiments and should not be limited by the specific embodiments heretofore described.

With regard to the insulating barrier itself, it should be further understood that other expanded plastic materials having similar qualities of insulation, heat capacity, imperviousness to vapor transport, compressibility, strength and thermal conductivity as expanded polystyrene and also contemplated as being included as workable in constructions of the present invention. One of such other possible layer materials can be closed cell expanded urethane, for example. It is further conceivable that the barrier can take on an inverted U-shaped configuration providing a tunnel effect over a utility line.

Accordingly, what is claimed as new is:

1. In a construction for carrying a freezable liquid through a generally frost penetrable material having a surface exposed to an alfresco environment experiencing

below freezing temperatures, said construction comprising a utility pipe line located at a fixed depth below said surface where said liquid would normally freeze in such environment, a substantially water impervious layer including a thermally insulating plastic foam barrier material located continuously longitudinally and laterally between said surface and said utility pipe line, said foam barrier material extending beyond opposite lateral sides of said utility pipe line, said foam barrier material being selected of a thickness sufficient to prevent frost penetration to said utility pipe line for a given degree-day environment thereby providing a frost-free zone completely about said utility pipe line.

2. The construction of claim 1 wherein said frost penetrable material comprises earthen material.

3. The construction of claim 1 wherein said frost penetrable material comprises earthen material covered by a highway paving material.

4. The construction of claim 1 wherein said plastic foam barrier material comprises expanded polystyrene.

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U.S. Cl. X.R.

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