

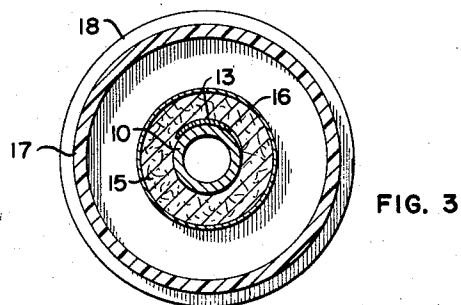
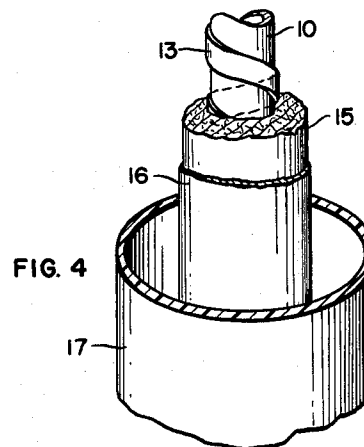
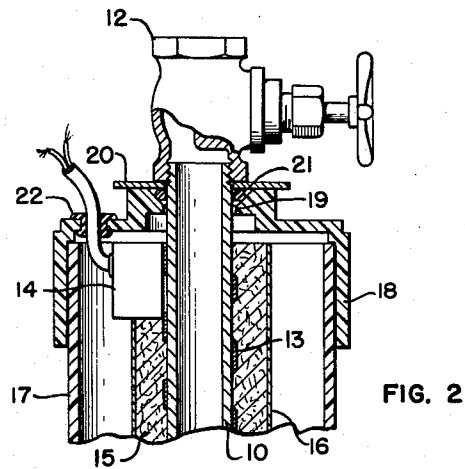
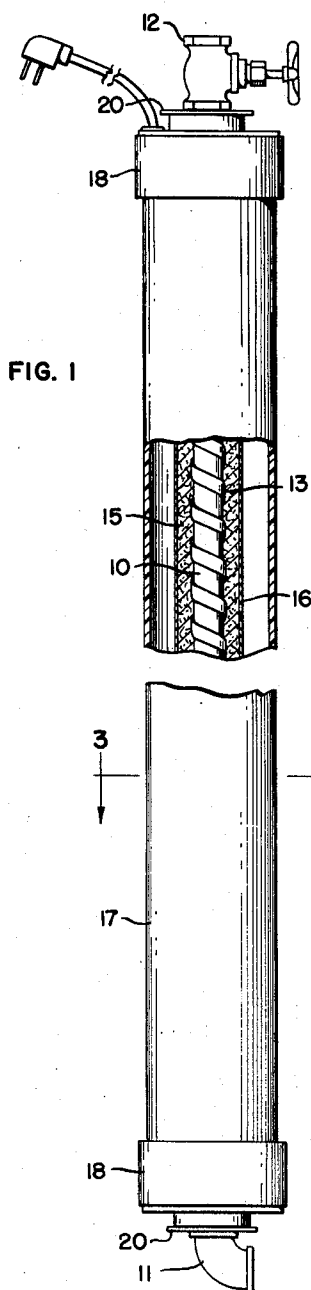
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C. W. TRUE

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FREEZELESS WATER SUPPLY

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INVENTOR
CECIL W. TRUE
BY *LeVelle Stok*
PATENT AGENT

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FREEZELESS WATER SUPPLY

Cecil W. True, 825 S. Maple, Watertown, S. Dak.

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This invention relates to water supply systems and more particularly to apparatus for preventing water supply systems from freezing in sub-freezing weather.

Considerable difficulty is encountered in stock watering systems, water supply systems for trailers and the like due to freezing of the supply pipes during sub-freezing weather. This is especially true in regions where sub-freezing temperatures persist for prolonged periods of time sufficient to cause the ground to become frozen to a depth of several feet below the surface.

In water supply systems of the type mentioned above, the water is supplied through a riser pipe from an underground source located below the frost line to a point of use above the ground or at least above the frost line. Since the riser pipe passes through a region which may have a temperature which is considerably below the freezing point of water, the water in the riser pipe freezes and blocks the pipe, interrupting the flow of water, and often bursting the pipe. This freezing up of the riser pipe is especially true when water is supplied intermittently and therefore may stand in the riser pipe for long periods of time.

The most common method used to prevent the riser pipe from freezing is to place an electric heat tape in contact with the pipe and then to stack a plurality of cylindrical tiles around the pipe. The hollow space between the pipe and the tiles is then filled with insulation. In dry soil this method produces fairly satisfactory results, but a relatively large amount of labor is involved since a hole must be dug around the riser pipe to allow a workman room to place the tile. The tile and insulation must then be placed by hand, and finally the hole must be filled back up. As a result, such an installation is relatively expensive.

In addition to being expensive to install initially, the above-mentioned prior art method often fails to prevent freezing of the riser pipe when it is used in soil which contains much moisture or water. Such failures are caused by the water seeping into the insulation filled area between the tile and the pipe during periods of thawing. Then, when the temperature drops, this water acts as an excellent conductor for the heat produced by the heat tape causing this heat to be passed out into the surrounding ground instead of being supplied to the riser pipe. As a result the pipe freezes, and the entire installation must be dug up and replaced.

Accordingly, it is an object of this invention to provide a freezeless water supply system which overcomes the disadvantages found in the prior art systems.

It is a more specific object of this invention to provide a freezeless water supply system in which the riser pipe and its associated insulation and heating material may be installed as a single unit.

It is another object of this invention to provide a freezeless water supply system in which water in the ground through which the riser pipe passes does not affect the efficiency of the system.

The aforementioned objects are accomplished by a preferred embodiment of this invention in which an electric heat tape is wrapped around or fastened to a riser pipe which supplies water from a source below the frost line to a point of utilization above the frost line. A layer of insulation surrounds the pipe and heat tape, and a vapor barrier layer is wrapped around the outside of the insulation. The unit thus formed is then encased in a length

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of plastic pipe having an inside diameter substantially greater than the outside diameter of the insulated pipe. A cap having a hole in its center of sufficient diameter to allow the riser pipe to pass through it is placed over each end of the plastic pipe and watertight seals are made between the caps and both pipes.

The unit thus formed has the insulated riser pipe encased in a watertight housing with a dead air space between the housing and the insulated pipe.

Other advantages and features of this invention will become apparent to those skilled in the art upon consideration of the following detailed specification taken in conjunction with the drawing in which:

FIG. 1 is a partial cut away view of a preferred embodiment of the invention;

FIG. 2 is an enlarged view of a portion of FIG. 1;

FIG. 3 is a cross section taken along the line 3—3 in FIG. 1; and

FIG. 4 shows details of the embodiment of FIG. 1.

Referring now to the drawing, in which the same reference numbers designate the same elements in all the figures, there is shown a riser pipe 10 which is connected by means of an elbow 11 to an underground water supply (not shown) which is located below the frost line. The upper end of the riser pipe 10 is connected through a globe valve 12 to a suitable utilization device such as a stock waterer or a house trailer (not shown).

Since the riser pipe 10 must pass through a zone in which it is subjected to temperatures which may be considerably below the freezing temperature of water, an electric heat tape 13 is spirally wrapped around the riser pipe 10 throughout its length to heat the pipe in order to prevent it from freezing. In order to automatically control the application of current through the heat tape 13, a thermostat 14 is connected between the heat tape and a suitable source of current (not shown). The thermostat 14 is placed at the upper end of the riser pipe 10, since the coldest temperatures occur at this point. When the temperature in the region of the thermostat 14 drops below a predetermined level which is usually at or above the freezing temperature of water, the thermostat causes current to flow through the heat tape 13; and when the temperature rises above this predetermined level, the thermostat operates to interrupt current flow in the heat tape 13. It is important to locate the thermostat 14 in the region subjected to the coldest temperatures.

In order to prevent the heat generated in the heat tape 13 from being conducted or radiated out into the surrounding ground, a layer of suitable insulating material 15, such as fiberglass, is wrapped around the pipe 10 and tape 13. The insulation 15 causes the heat generated in the tape 13 to be applied to the riser pipe 10. A vapor barrier wrapper 16 aids in holding the insulation layer 15 in place and protects the insulation layer 15 from moisture condensation.

A pipe 17 preferably made of Styrene alloy plastic, encases the insulated riser pipe 10 and has an inside diameter sufficiently larger than the outside diameter of the insulated riser pipe to form an air space around it. This air space acts as additional insulation and increases the efficiency of the apparatus. A molded plastic cap 18 is placed over each end of the pipe 17. Each cap 18 has a sleeve portion which just fits over the outside of the pipe 17 and a waterproof cement is used to join the sleeve of the cap to the outside of the pipe 17 to form a watertight joint. The ends of the riser pipe 10 pass through a hole 19 in the center of each cap 18 and a washer 20 is slipped over the exposed ends of the pipe 10.

The entire unit is clamped together by screwing on the elbow 11 at the threaded lower end of the pipe 10 and the valve 12 at the threaded upper end of the pipe 10.

This moves the caps 18 toward one another until the ends of the outer pipe 17 engage the shoulders or ends of the caps 18. Further tightening of the elbow 11 and the valve 12 causes a compression force to be applied to the outer pipe 17 and a tensioning force to be applied to the riser pipe 10 to cause the unit to be firmly clamped together. As most clearly seen in FIG. 2, the openings in the end caps 18 through which the ends of the riser pipe 10 pass are slightly beveled and an O-ring 21 is placed in the recess formed by the bevel. When the elbow 11 and the valve 12 are tightened, the washers 20 compress the O-rings 21 to form a watertight seal between the riser pipe 10 and the end caps 18. As a result, no water can enter the air space between the outer pipe 17 and the insulated riser pipe 10 even if the entire unit is completely submerged in water.

The electrical leads for supplying current to the heat tape 13 pass through a grommet 22 which is placed in a small opening in the upper cap 18. The grommet 22 forms a watertight seal around the leads and the opening to prevent moisture from entering the pipe 17 through the lead opening.

The above-described water supply unit may be pre-assembled, so that installation at the place of use merely involves connection of the water supply pipe to the elbow 11 and connection of the valve 12 to the utilization device. For some applications, it may be desirable to locate the valve 12 inside the pipe 17. If this is done, additional means is used to clamp the upper cap 18 to the outer pipe 17 and the valve 12.

It should be noted that the heat tape 13 may be laid along the length of the riser pipe 10 parallel to its axis instead of wrapping the tape 13 spirally around the pipe 10 as shown in the drawing. Although the outer pipe 17 is preferably made of plastic, other materials may be used if so desired. Various other changes and modifications may be made by those skilled in the art, such as placing the thermostat 14 outside the pipe 17, without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. A fluid supply system including,
 - (a) a liquid supply pipe,
 - (b) electric heating means for heating said supply pipe to prevent it from freezing,
 - (c) an insulation layer surrounding said supply pipe and said heating means to cause substantially all the heat generated by said heating means to be applied to said supply pipe,
 - (d) a vapor barrier wrapper applied over said insulation layer, said wrapper acting to protect said insulation layer from moisture condensation,
 - (e) an outer pipe having an inside diameter substantially greater than the outside diameter of said insulated supply pipe for encasing said supply pipe leaving an air space between said outer pipe and said vapor barrier wrapper,
 - (f) a pair of end caps cooperating with said supply pipe and said outer pipe for establishing and maintaining the spaced relationship of said pipes,
 - (g) means for clamping said end caps to said pipes to form a unitary structure, and
 - (h) means for causing said structure to be watertight.
2. A water supply system for supplying water from a source to a point of use including
 - (a) a riser pipe,
 - (b) an electric heat tape placed in contact with said riser pipe substantially along its entire length for heating said riser pipe to prevent it from freezing,

- (c) an insulation layer covering said riser pipe and said heat tape to cause substantially all the heat produced by said heat tape to be applied to said riser pipe,
 - (d) a vapor barrier wrapper encasing said insulation layer to protect said insulation layer from moisture condensation,
 - (e) an outer pipe having an inside diameter greater than the outside diameter of said insulated riser pipe for encasing said riser pipe leaving a space between said outer pipe and said vapor barrier wrapper,
 - (f) a pair of end caps cooperating with said riser pipe and said outer pipe for establishing and maintaining the spaced relationship of said pipes,
 - (g) means for clamping said end caps to said pipes to form a unitary enclosed structure, and
 - (h) means for sealing said end caps to said pipes to prevent water from entering said enclosed structure.
3. A water supply system for supplying water from a source to a point of use comprising:
 - (a) a water supply pipe having a length m and being externally threaded on each end;
 - (b) an electric heat tape spirally wrapped around said supply pipe substantially throughout its length for heating said supply pipe to prevent it from freezing;
 - (c) a layer of heat insulating material covering said supply pipe and said heat tape;
 - (d) a vapor barrier wrapper covering said layer of insulating material to protect said insulating material from moisture condensation;
 - (e) an outer pipe of length n , where n is less than m , and having an inside diameter greater than the outside diameter of said insulated supply pipe for encasing said supply pipe leaving a space between said outer pipe and said vapor barrier wrapper;
 - (f) a pair of end caps each having a hole in the center and a sleeve portion, said supply pipe passing through the holes in said end caps and said sleeve portions fitting over the outside of said outer pipe to maintain the spaced relationship of said pipes;
 - (g) means for forming a watertight seal between said end caps and said supply pipe;
 - (h) means screwed onto the threaded portion of said supply pipe for clamping said end caps onto said outer pipe; and
 - (i) means for forming a watertight seal between at least one of said end caps and said outer pipe.
 4. A water supply system according to claim 3 wherein a thermostat is located in the space between said pipes and is connected to said heat tape to control electric current flowing through said heat tape in response to temperature variations.

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