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SUBSURFACE HEATING SYSTEM AND UNIT THEREFOR

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FIG. 1

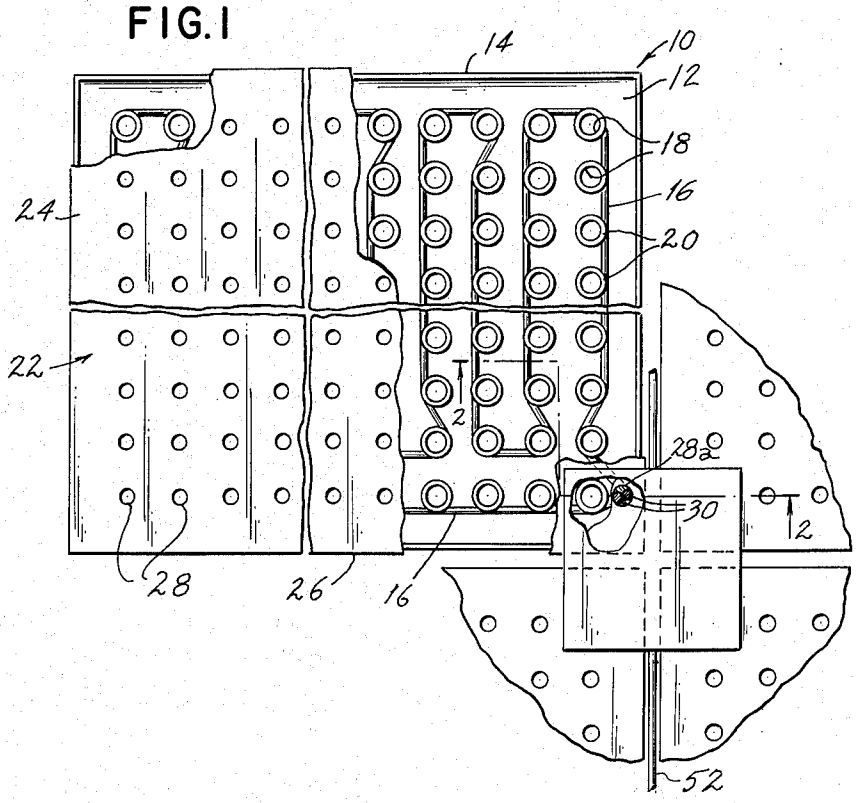
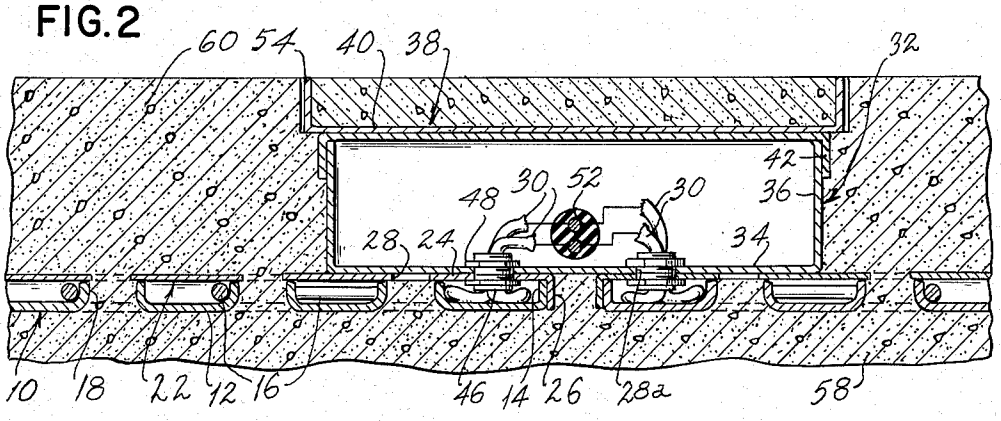



FIG. 2




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# SUBSURFACE HEATING SYSTEM AND UNIT THEREFOR

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The present invention relates to a subsurface heating installation, particularly to installation for the heating of outdoor surfaces subject to heavy traffic, as street pavements, outdoor walks, or the like, to keep them free of snow and ice, and especially to electrically energized heating units or panels for use in such installation.

It is an object of the present invention to provide heating units for subsurface heating installation of the character described which are relatively compact and of light weight and yet rigid and sturdy to resist damage from weight pressure such as it might be subjected to from heavy traffic.

It is also an object of the present invention to provide heating units for such subsurface heating installation which may be prefabricated at place of manufacture and readily and easily and conveniently transported to a place of use and there installed, without the need for undergoing any additional processing or structural modification at such place.

It is another object of the present invention to provide heating units of the character described, that may be completely integrated with the pavement in which they are installed.

It is still another object of the present invention to provide heating units of the character described which may be readily, simply and easily connected to an electrical circuit servicing the installation with a minimum of time and a minimum of labor.

It is a further object of the present invention to provide heating units of the character described in which electric heating elements or resistances are protected to a maximum; against damage by friction or pressure.

It is yet a further object of the present invention to provide subsurface heating installations or systems that are highly efficient in the utilization of the heat generated in them for its object of heating the surface above it, with a minimum of heat loss.

It is still a further object of the present invention to provide a subsurface heating system composed of individual heating units or panels of the character described which may each be individually connected in an electric circuit, so that the portion of the system as a whole will be affected to a minimum when any one unit is out of order; the remaining units in the installation not being affected thereby; and in which any defective unit may be readily repaired or replaced with the disturbance of but a minimum of pavement area; thereby assuring substantially continuous operation of the system with substantially minimum interference with traffic.

The foregoing and other objects and advantages of the subsurface heating installations and of the heating units used therefor of the present invention will become more readily apparent to those skilled in the art from the embodiment thereof shown in the accompanying drawings and from the description following. It is to be understood, however, that such embodiment is shown by way of illustration only, to make the principles and practice of the invention more readily comprehensible, and without any intent of limiting the invention to the specific details therein shown.

In the drawings:

FIG. 1 is a more or less diagrammatic, top plan view of a subsurface heating installation embodying the present invention; with one of the heating units or panels shown in full and broken across to indicate indeterminate length, and partly broken away to show structural detail; such unit shown as connected to an electric circuit by a splicing box joining it with the other units; the latter units shown in fragment; and



FIG. 2 is a section taken along the line 2—2 of FIG. 1 showing the installation embedded in the pavement.

Referring now in greater detail to the embodiment of the present invention illustrated in the drawings, the same show the subsurface heating installation composed of a group of units, namely four units or panels; each such panel or unit preferably consists of a housing, preferably of sheet metal and prefabricated of rectangular shape, comprising a receptacle portion, generally designated as **10**, formed with a bottom wall **12**, and an upstanding flange or side wall **14**. The receptacle or box **10** may be relatively shallow in depth, not greatly exceeding the thickness of the suitably insulated electric heating element or wire **16** disposed therein, as hereinafter explained. The receptacle **10** is formed with a plurality of preferably circular openings **18**, in its bottom wall **12**, arranged preferably in evenly spaced rows. At least some of the openings, including the end ones, in each row, may be formed with an inwardly extending flared flange **20**, that overhangs the marginal edge portion of such opening for a purpose which will hereafter be made clear.

Each of the units also comprise a cover portion for the box **10**, generally designated as **22**, and comprising a top wall **24**, and a depending flange **26**. The top wall **24** may likewise be provided with rows of evenly spaced openings **28**, which may preferably be the same size of the opening **18** and may be arranged to register with the opening **18**.

In assembling the unit, the heating element **16**, may be zig-zagged across the bottom **12** of the box **10**, starting from adjacent a common opening **18**, such as **18***a*, alongside of an edge of the box **10**, preferably a corner thereof, such as the opening **18***a*, by being laid and tensed against the flanges **20** of the flanged openings **18**, in any desired, suitable arrangement such as the arrangement indicated in FIG. 1 of the drawings. The heating element **16** may be anchored in such position in any desired, suitable manner. It will be apparent that, thus arranged, the heating element **16** will be, at least partly in the curvature of the flanges **20** of the flanged holes **18**, adjacent which it is tensed and held thereagainst against being shifted and otherwise disturbed. It will be understood that when only selected holes **18** are flanged, at least such holes should be selected as will provide pivot points for the zig-zag pattern selected for the heating element **16**. Both ends of the heating element **16** may then be connected to splicing wire **30**, which may be passed to the exterior of the housing through the cover opening **28***a*, in register with the opening **18***a*.

It will also be apparent that the cover **22** when positioned in the box **10** will not only be supported by the edges of the box flange **14**, but also along its entire top wall area by the edges of its opening **26** resting on the flanges **20**, so that such cover **22** does not contact the heating element **16** in any manner that might damage it or its insulation.

The heating unit thus described may be readily and economically produced and assembled at a central point of production and is compact and of light weight to be readily and easily transported to the point of use. At the point of use, the unit may be connected into the installation with one to four additional units by means of a splicing box **32**. Such splicing box may consist of a receptacle or box generally designated as **32**, including a bottom wall **34** and an upstanding flange **36**, and of a cover, generally designated as **38**, including a top wall **40** and depending flange **42**. The bottom wall **34** of the

receptacle may be formed with openings **44**, which may be arranged to register with the opening **18***a*, in each of the heating units in the installation with which it is to be used.

A threaded eyelet **46** is then passed through the lead opening **28***a* in the unit and into the corresponding opening **44** in the splicing box and the splicing wires at the end of the heating element of the unit and passed into the splicing box through such eyelet. The eyelet may receive a nut **48** within the box **32**, which may secure the bottom of the splicing box to cover **22** of the unit and, above the nut **48**, a threaded bushing sleeve **50**. A cable or main lead wire **52**, connected in an electric circuit may be passed through the receptacle **32** of the splicing box and the splicing wires, from each unit connected thereto, to thereby electrically connect the unit in the electric circuit. The cover **38** of the splicing box may then be put into place.

Preferably the top wall **40**, of the splicing box cover **38**, may overhang the depending flange **54** along its edge forming a hollow into which paving material may be poured; such flange and paving material being of a height to bring the level of the splicing box even with the level of the paving over the unit.

After the units are in place on the pavement base **58**, and connected in the system through the splicing box, as set forth above, the surface paving material **60** may be poured thereover to a height to bring it to a level with the top surface of the cover **38** of the splicing box. It will be readily apparent that when the paving **60**, which may be of concrete, is poured over the unit, it will enter into the unit through the openings **26** of the cover **22** and fill up the box **10**, and through the opening **18** in the box **10** fuse or connect with the supporting or base paving layer **48**, to thereby safely and securely anchor the unit.

This completes the description of the subsurface heating units of the present invention and of the heating system in which they may be installed. It will be apparent that such heating units are of relatively simple construction, compact and light weight, and easily and economically assembled and electrically inter-connected into a continuous self-grounding electric system and installed in a pavement. It will also be apparent that the heating unit of the present invention is strong, sturdy and trouble-proof to a maximum and that systems into which they are connected are likewise highly efficient and capable for prolonged use and operation and may be adjusted and repaired without undue stoppage of and interference with the working of the system and with a minimum of time and labor.

It will further be apparent that numerous modifications and variations may be made in the subsurface heating unit of the present invention and in the systems in which they may be connected and installed, by any one skilled in the art, in accordance with the principles of the invention hereinabove set forth and without the exercise of any inventive ingenuity. I desire, therefore, the protection of the patent law for any and all such modifications and variation that may be made within the spirit of the invention and the scope of the claims hereto appended.



What I claim is:

**1.** A heating unit for subsurface heating installation, comprising a relatively shallow tray including a bottom and an upright flange, said bottom having a plurality of spaced openings formed therein arranged in spaced rows at least selected of said openings in each of said rows including the end openings of each of said rows, each formed with an inwardly extending outwardly flared flange overhanging the marginal edge portion thereof, and an electrical heating element arranged in zig-zag manner on said bottom between said rows of openings disposed against said flanges, a cover for said tray including a top wall and a depending flange adapted to fit on the exterior of said flange of said bottom, said top of said cover having a plurality of openings formed therein, said heating element having each of its ends terminate adjacent one of said cover top openings, each said end having a splicing wire secured thereto extending through said opening.

**2.** The heating unit of claim **1**, wherein said openings in said cover are arranged to register with the openings of said tray bottom.

**3.** The heating unit of claim **1**, wherein said one opening is disposed adjacent an edge of said cover.

**4.** The heating unit of claim **1**, in combination with a splicing box, said splicing box comprising a bottom section including a bottom wall and an upright flange, said bottom wall having at least one opening formed therein, a threaded eyelet engaging the underside of said unit cover and passing through said one opening thereof through said opening in said splicing box bottom, means engaging said eyelet within said splicing box bottom securing said splicing box bottom to said unit cover, said splicing wires extending into said splicing box through said eyelet, said splicing box bottom adapted to have a cable connected in an electrical circuit passed therethrough and said splicing wires adapted to be connected to said cable.

**5.** The combination of claim **4**, wherein said splicing box includes a cover comprising a top wall and a depending flange fitted over the flange of said bottom.

**6.** The combination of claim **5**, wherein said cover top is formed with an upright flange along its edges, forming a tray, and paving material is disposed within said tray.

**7.** The combination of claim **5**, wherein said splicing box cover top wall extends beyond the said depending flange thereof and is formed with an upright flange at its edges forming a tray, said tray filled with paving material.


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