Aug. 16, 1955 H. E. VOEGELI 2,715,457

PACKAGED TUBING COIL

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FIG. 1

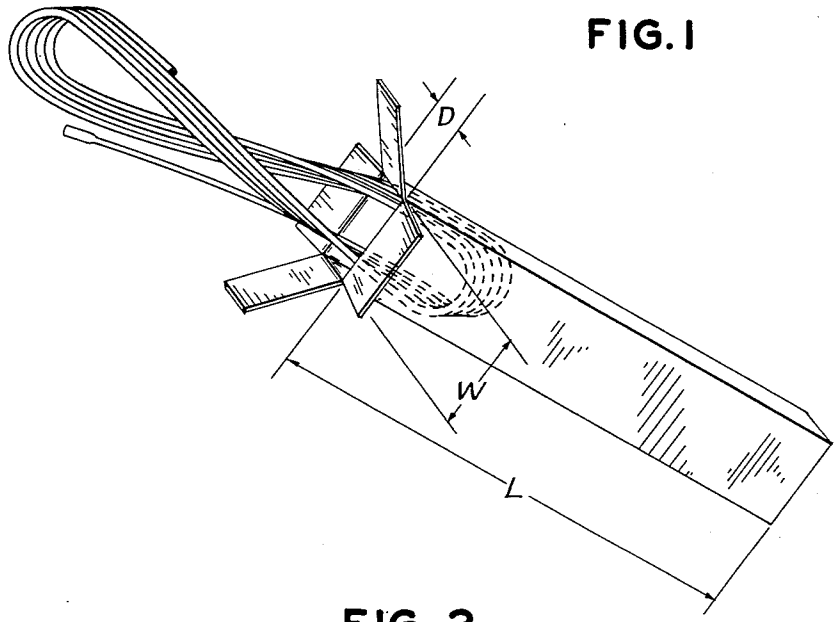
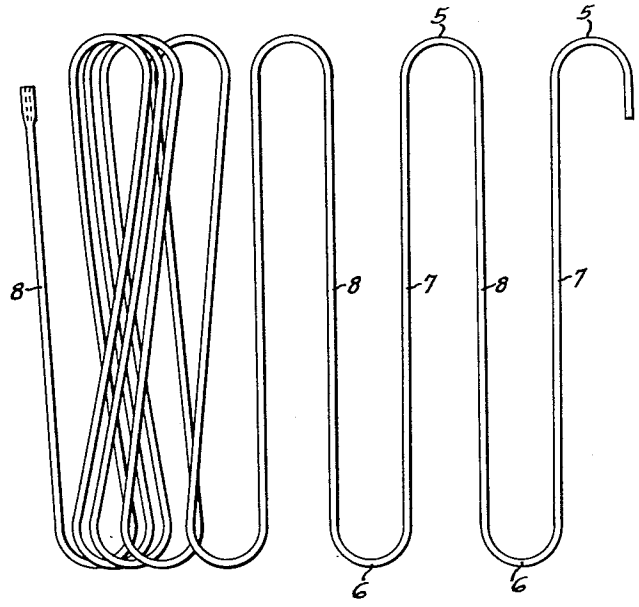


FIG. 2



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PACKAGED TUBING COIL

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2 Claims. (Cl. 206—46)

This invention relates to the packaging of long lengths of tubing that have been preformed for radiant panel heating of homes, offices, and building spaces. The tubing coil, when extended for use, is of serpentine configuration and covers a rather large area, but when packaged in accordance with the invention it is of substantially no greater length or width than one of its loops, and is of minimum thickness.

As its name implies, radiant panel heating involves heating a wall, floor or ceiling panel of considerable area to a suitable degree of warmth so that the heated panel may warm persons and objects within the room to a comfortable temperature by radiation without necessarily heating the air in the room. A common method for heating the panels is to circulate hot water through heating coils embedded therein. Such coils are ordinarily of serpentine configuration, comprising a long length of tubing formed with a series of reverse (alternately right-hand and left-hand) bends, each bend being joined to the next in the series by an intervening short substantially straight section of the tubing. It has been the usual practice heretofore to form the heating coil for each wall or ceiling panel by hand labor at the building site from tubing shipped in conventional circular coils. Each panel heating coil must of course cover a substantial area, and the awkwardness of packaging and shipping a preformed coil, coupled with a prevailing (but incorrect) view that standardized coil sizes cannot be devised for general use, has heretofore prevented adoption of preformed, machine-made radiant heating panel coils.

The fact is that prefabricated radiant heating panel coils made from a long length of tubing (e. g. 50 to 75 feet) can be proportioned for use in a convenient number of multiples in most common sizes of rooms; and I have devised a simple packaging for such coils which makes shipping them an easy matter. The packaged coil of tubing according to the invention comprises a relatively long length of the tubing formed with a series of reverse bends at relatively short intervals, each successive bend being in substantially the same plane as but in the opposite direction to the preceding bend, whereby when the coil is extended it possesses a serpentine configuration characterized by a series of reverse bends joined to each other by substantially straight tubing sections all lying in substantially the same plane. The coil is packaged for shipment by having each of its bends closed through somewhat more than 180°, and having all the straight tubing sections which join successive pairs of bends crossing from one side of the packaged coil at one end thereof to the other side of said coil at the other end thereof. Successive straight tubing sections cross alternately over and under each other adjacent the center of the coil, with alternate straight sections lying substantially side by side on one side of the coil and with the intervening straight sections lying substantially side by side on the other side of the coil. Thus the packaged coil is no thicker at its center than at its ends, and may be opened

from its packaged form to its extended form without twisting of the tubing about its longitudinal axis.

The invention is described below with particular reference to the accompanying drawings, in which

Fig. 1 illustrates a coil in packaged form, partially inserted in a shipping container; and

Fig. 2 shows the coil partially opened to its extended position.

The heating coil in its extended form, as it is installed in the floor, wall, or ceiling panel, comprises a continuous relatively long length of metallic tubing, advantageously copper, which is formed with a series of reverse U-shaped bends 5, 6, etc. Each successive pair of bends is joined by a relatively short straight tubing section 7, 8, etc. The distance by which the successive bends 5, 6 are spaced apart determines the width of the extended coil, and is selected so that the extended coil will be of a convenient standard size for general use. The number of loops in the coil (the term "loop" is herein used to mean the portion of the complete coil extending from one bend to the next bend in the same direction—e. g. from one bend 5 around an adjacent bend 6 to the next bend 5 in the series) is selected so that when the coil is fully extended it will be of a convenient standard length. It is contemplated that the bends will be factory-made with the assistance of proper bending tools, so that all of the bends are uniform and accurately made, and so that the straight sections 7, 8 are free from undesirable twists or bends.

The coil is packaged for shipment by closing the bends 5, 6 by enough more than 180° so that each straight tubing section 7, 8 crosses from one side of the packaged coil at one end thereof to the other side of said coil at the other end thereof. Instead of building up the packaged coil in the form of a repeated superimposed series of figure 8's, however (which would result in undesirable bulkiness at the center of the packaged coil), it is built up by arranging the straight sections 7, 8, etc., so that they cross alternately over and under each other adjacent the center of the packaged coil, with the alternate straight tubing sections 7 lying together substantially side by side and crossing over all of the intervening straight tubing sections 8.

As best indicated in Fig. 1, the closed coil is held in its packaged form by a protective carton 9 or other enclosure having an inside length L only slightly greater than the maximum distance measured across the outside of the tubing between successive reverse bends 5, 6, an inside width W only slightly greater than the outside diameter of each of said reverse bends, and an inside depth D only slightly greater than the outside diameter of the tubing multiplied by the number of loops in the coil (in general the number of loops will be equal to one half the total number of reverse bends 5, 6).

It is thus apparent that the packaged coil is adequately compact for easy shipping, yet is but slightly distorted from its extended form and can be fully opened to the extended form by simply opening each of the reverse bends to about 180° from their closed packaged form of a little greater than this angle. It is of significance that the coil can be closed to its packaged form and opened again to its extended form without twisting the tubing about its longitudinal axis, or otherwise subjecting it to undesirable deformation. Such minor long-radius bending of the straight sections as may be occasioned by closing the coil to minimum size for packaging is inconsequential.

It is advantageous for one end of the coiled tubing to be belled outwardly to form a female coupling element 10 of inside diameter only slightly greater than the outside diameter of the tubing at its other end. It is then a simple matter to connect two or more separate coils to

make one large continuous coil for a large wall or ceiling heating panel.

When the coil is installed in a wall or ceiling panel, the extent to which it is opened may of course be varied to obtain whatever spacing apart of the centers of the straight tubing sections **8** is most advantageous to secure proper proportioning of heat distribution to compensate for variable rates of heat loss at outside building walls as compared with inside walls, at windows as compared with windowless wall areas, etc. It is thus understood that the coil in its extended form may have the reverse bends curved through 180° so that the straight tubing sections **8** are parallel as shown in the right-hand part of Fig. 2, or it may have such bends curved through somewhat less or somewhat more than 180° so that adjacent straight tubing sections diverge from or converge toward each other. In the former case the spacing apart of the centers of adjacent straight tubing sections is the same as the diameter of curvature of the reverse bends, and in the latter cases such spacing is either more than such diameter (if the reverse bends are less than 180°) or less than such diameter (if the reverse bends are more than 180°).

Installation of coils preformed and packaged in accordance with the invention is readily and rapidly accomplished by relatively unskilled workmen, who have only to remove the packaged coil from its protective enclosure, extend it to its open form manually, and secure it in place in the wall, floor, or ceiling panel, making such connections between adjacent coils as are required by the flow diagram for the heating fluid. In most cases it is possible and preferable to lay out a radiant heating panel to make use of an even multiple of the preformed and packaged heating coils herein described, but it is of course possible to cut the coiled tubing and to use the resulting fractional coils as desired. Even when resort is had to this expedient, it is found that the assembly of heating panels is much easier and more economical with coils preformed and packaged in accordance with the invention than when tubing is custom-coiled on the job to fit the heating panel.

I claim:

1. The method of packaging a coil of metallic tubing made up of a relatively long length of tubing formed with a series of reverse bends at relatively short intervals, said coil when extended possessing a serpentine configuration characterized by a series of reverse bends joined to each other by substantially straight tubing sections all lying in substantially the same plane, which comprises closing each of said bends through an angle enough greater than 180° so that all the substantially straight tubing sections which join successive pairs of bends cross from one side of the closed coil at one end thereof to the other side of said coil at the other end thereof, crossing successive straight tubing sections of the closed coil alternately over and under each other with alternate straight sections lying side by side to one another and all extending across the remaining straight sections, and confining the coil in such closed configuration, whereby said coil as packaged is no thicker adjacent its center than adjacent its ends and whereby upon releasing said coil from its confinement it may be opened to its extended form without twisting of the tubing about its longitudinal axis.

2. A coil of metallic tubing comprising a relatively long length of tubing formed with a series of reverse bends at relatively short intervals, each successive bend being in substantially the same plane as but in the opposite direction to the preceding bend, whereby when said coil is extended it possesses a serpentine configuration characterized by a series of reverse bends joined to each other by substantially straight tubing sections all lying in substantially the same plane, said coil having each of said bends closed through somewhat more than 180° and having all the substantially straight tubing sections which join successive pairs of such bends crossing from one side of the coil at one end thereof to the other side of the coil at the other end thereof, successive straight tubing sections crossing alternately over and under each other adjacent the center of the coil, alternate straight tubing sections lying side by side and in substantial contact with one another, whereby said coil has a thickness adjacent its center no greater than the sum of the thicknesses of tubing at its ends and whereby said coil may be opened to its extended form without twisting of the tubing about its longitudinal axis, all of said tubing also being free of substantial twisting about its longitudinal axis in its coiled form.

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