

[54] **GRATE**
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[58] **Field of Search**.....**52/656, 473, 633, 690, 645, 52/664, 177, 181, 180, 666, 20, 108; 94/11, 13, 27; 161/117; 156/211; 15/215, 216, 217; 44/34**

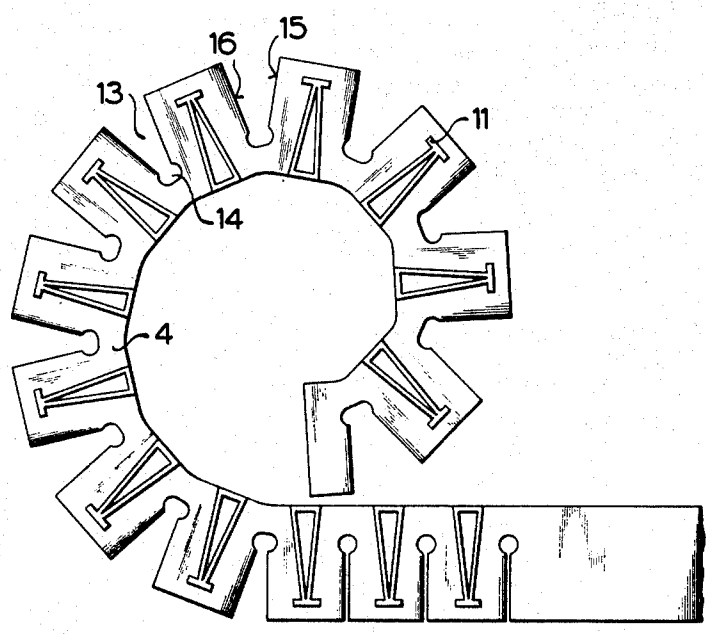
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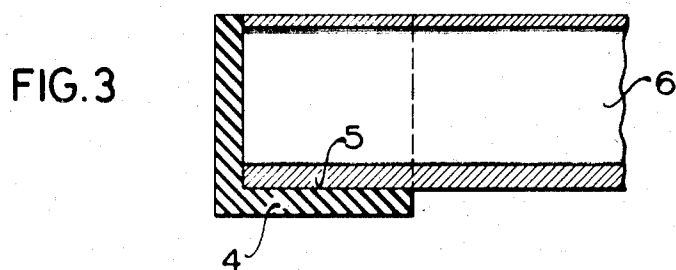
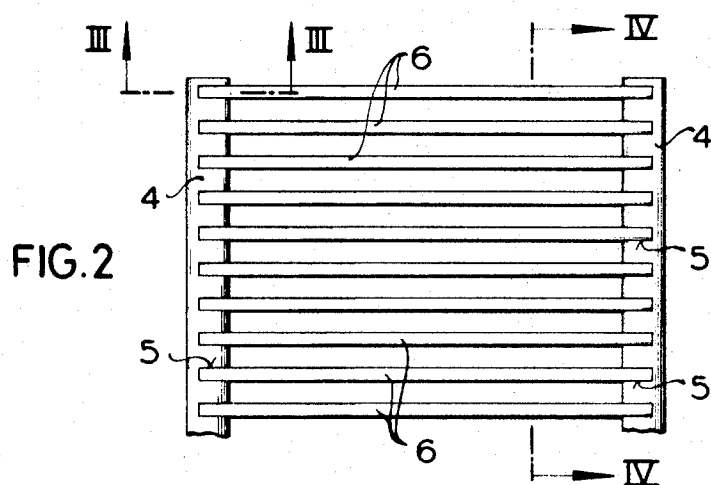
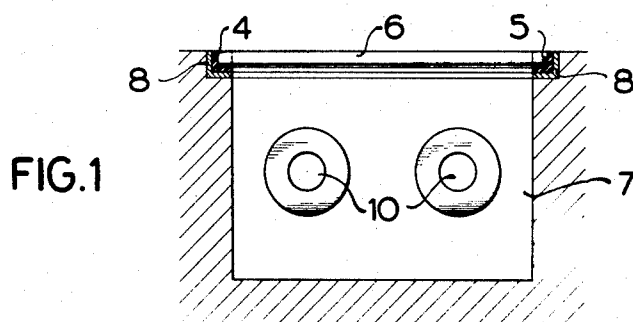
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[57] **ABSTRACT**
A row of elongated parallel bars is provided each having spaced opposite ends. At their opposite ends the bars are connected by two elongated spacing and connecting strips extending along the row and consisting of elastically yieldable material. Each of these strips is provided on one side with longitudinally spaced recesses each accommodating a portion of one of the bars in mating relationship, and at the other side intermediate consecutive ones of the recesses the strips are provided with slots extending towards the one side to facilitate rolling up of the grate in the direction towards the one side.

11 Claims, 5 Drawing Figures





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FIG. 4

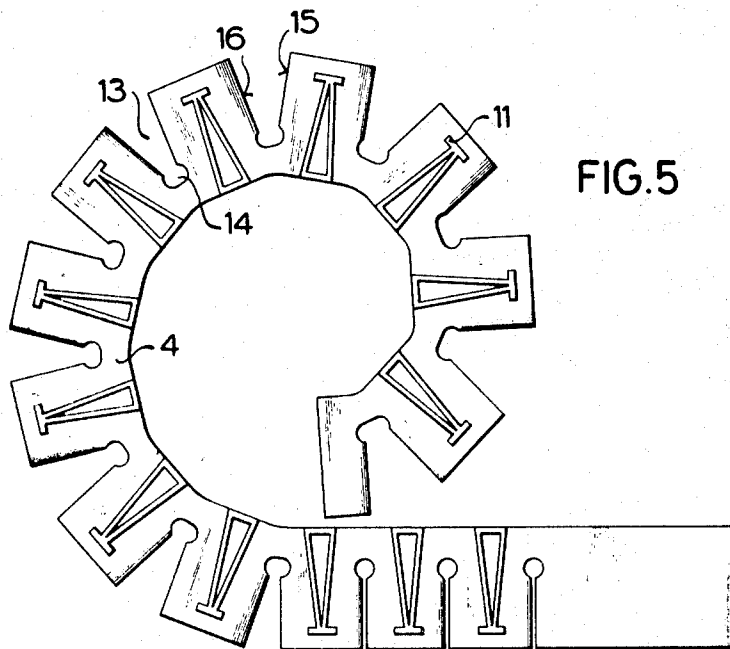
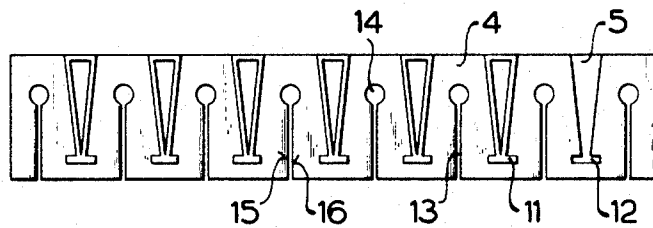


FIG. 5

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GRATE

BACKGROUND OF THE INVENTION

The present invention relates generally to a grate, and more particularly to a grate which may be used advantageously but not exclusively for covering heating channels, storm or other drains or the like.

Such grates are of course already known and in themselves are not novel. However, they are still capable as well as in need of being improved. One improvement which has already been made in grate constructions of this type is to connect the individual grate bars at their opposite ends with spacer and connector strips of an elastically yieldable material, such as natural or synthetic rubber or synthetic plastic resin material or the like. The purpose is to make the grate somewhat flexible so that it can follow variations in the contour of the open side of a channel or the like over which it is to be positioned, and also to maintain the grate bars in position without undue noise, it being evident that the material of the spacing and connecting strips will serve to cushion the grate bars which are usually of metallic material. This construction is rather inexpensive to make and the grate bars are arranged in recesses of quadratic or rectangular cross-section which are provided in the spacer strips so that they can be withdrawn upwardly—that is transversely to the elongation of the spacer strips—as seen with reference to the upper side of the grate bar. Such grate constructions can be rolled up when it is necessary to gain access to the channel over which they are positioned, for instance for cleaning or the like, and in so doing the elongated spacing strips are elastically deformed. However, because the spacing strips must be relatively thick they do not yield very readily and therefore rolling-up of such a grate can take place only on a rather large radius.

SUMMARY OF THE INVENTION

It is an object of the present invention to overcome certain of the disadvantages set forth above with respect to the prior art.

More particularly it is an object of the present invention to provide an improved grate construction which is not possessed of such disadvantages.

Still more specifically the invention aims to provide an improved grate construction which can be rolled up in a much tighter and smaller-diameter roll than is possible with the known prior-art grate constructions, and wherein the grate bars cannot be withdrawn from the spacer strips in any direction other than lengthwise of the respective grate bars.

In pursuance of the above objects, and others which will become apparent hereafter, one feature of the invention resides in a grate, particularly for covering open channels and the like, which comprises a row of elongated at least substantially parallel bars each having spaced opposite ends, and at least two elongated spacing and connecting strips of elastically yieldable material each extending along this row and connecting the bars in the region of one of their ends. The strips each have one side provided with longitudinally spaced recesses and accommodating a portion of one of the bars and an opposite side which is provided with elongated slits each located between two consecutive ones of these recesses and extending towards the one side.

By the provision of these slits I assure that the strips—and therefore the entire grate construction—can be rolled up on a much smaller radius, that is it will form a roll of a much smaller diameter than heretofore possible. Of course, the grate will be rolled up in such a manner that the slits will be located at the radially outer side of the respective convolutions which are being formed.

It is advantageous that the slits have a depth which is on the order of approximately 80 percent of the thickness of the strips so that only approximately 20 percent of the thickness of the strips must undergo elastic deformation upon rolling up. Because the opposite surfaces bounding the respective slits will normally abut when the grate is positioned flat, that is when it is not rolled up, the grate bars are reliably maintained in their respective positions and cannot tilt with reference to one another.

It is advantageous that the inner ends of the slits be provided with enlargements, that is that the cross-section of the slits be enlarged at the inner end, because this prevents tearing of the material of the strips in the region of the inner end when the grate is rolled up.

To prevent withdrawal of the grate bars from the recesses of the strips in which they are accommodated, the invention also contemplates providing the grate bars—or at least the portions thereof which are accommodated in the recesses—as well as the recesses with an undercut complementary cross-sectional configuration. Thus, the grate bars can be inserted and withdrawn only lengthwise of themselves, but cannot be removed in direction transversely of the elongation of the strips. This is important because it prevents intentional removal of the grate bars—due to vandalism, for instance—or accidental removal, which could result in accidents.

It is advantageous although not to be considered limiting for the grate bars to be hollow and to have a cross-sectional configuration of trapezoidal shape, with the cross section being provided in the region of the narrower end of the trapezium with lateral projections, and of course with the recesses being of complementary cross-sectional configuration. Not only does this provide for the desired undercutting and thus reliable retention of the grate bars in their associated recesses, but also it assures a large surface area over which weight and forces acting upon the grate bars are transmitted to the spacing and connecting strips. The width of the grate bars at the narrower end of the trapezium, plus the combined lateral width of the projections provided in this region, advantageously equals the width of the grate bars at the wider end of the trapezium. With such a construction the upper and lower surfaces of the grate bars are of identical area despite the fact that the cross-sectional configuration of the grate bars themselves is trapezoidal or substantially trapezoidal. By making the grate bars hollow I effect a saving not only in material but also of weight.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a diagrammatic transverse sectional elevation illustrating a channel with a grate according to the present invention shown in position;

FIG. 2 is a fragmentary top-plan view of FIG. 1, on an enlarged scale;

FIG. 3 is a fragmentary section, on an enlarged scale, taken on line III—III of FIG. 2;

FIG. 4 is a fragmentary section, also on an enlarged scale, taken on line IV—IV of FIG. 2; and

FIG. 5 is a diagrammatic end-elevational fragmentary view, showing the novel grate partly rolled up.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing now the drawing in detail it will be seen that the novel grate according to the present invention comprises two parallel elongated spacing and connecting strips 4 of elastically yieldable material, such as rubber, whether of the natural or synthetic type, synthetic plastic resin material or the like. They are provided at longitudinally spaced locations and in one longitudinal side 4a—which hereafter will be designated as the upper side due to the position which it normally assumes when the grate overlies an open side of a channel such as illustrated in FIG. 1—with recesses 5 (see FIG. 4) each of which accommodates a portion of an elongated grate bar 6. The grate bars 6 are arranged in parallelism with one another and the portions accommodated in the recesses 5 are conventionally their opposite end portions although the strips 4 could of course be arranged inwardly of the end portions just as there could be more than two strips, for instance two located at the end portions and one intermediate the end portions. FIG. 1 shows the novel grate overlying an upper open side of a channel 7 in which heat pipes containing heating pipes 10, and the strips 4 are supported on a frame 8 of angle irons or the like which is arranged at the upper edge of the channel 7.

The cross-sectional configuration of the strips 4 is shown in the drawing, particularly in FIG. 3, and is seen to be essentially quadratic. However, it can of course be of a different shape but what is essential is the fact that the strips 4 can be produced in a continuous manner in form of a coil or the like from which sections of requisite length are simply severed when a grate such as the one shown in the drawing is to be produced. As also shown in the drawing, and particularly in FIG. 4, the grate bars 6 are hollow but of course they could be solid. They are of metal but could be of other materials, for instance a synthetic plastic, and an illustrated embodiment of substantially trapezoidal cross-section. At the narrower downwardly directed end of the trapezium they are provided with lateral projections 11 and the width of the grate bars 6 at the narrower end of the trapezium, including the projections 11, equals at least substantially the width at the wider end of the trapezium, although this is not a feature which is to be considered limiting.

FIG. 4 also shows that the cross-sectional configuration of the recesses 5 and the strips 4 is complementary to that of the grate bars 6, with cut-outs 12 being provided for the lateral projections 11. Thus, the grate bars 6 can be inserted into the recesses 5 only axially, that is lengthwise of their respective elongation and they can

be withdrawn only in the same manner. This makes it impossible to withdraw them transversely of the elongation of the strips 4, that is upwardly as seen with respect to the positioning of the grate in FIG. 1, avoiding the possibility that accidentally or due to calculated vandalism one or more of the grate bars could be readily removed with the resultant danger of accident to persons unaware of this fact. In the claims the upper side of strip 4 in FIG. 4 is referred to as the first side, and the lower side is referred to as the second side.

As the drawing also shows, particularly in FIG. 4, the height of the grate bars 6 is substantially greater than their width and it is their width which is oriented lengthwise of the strips 4. With this construction it is possible to use narrow grate bars which, however, despite their narrow configuration are capable of supporting significant loads. The spacing between consecutive ones of the recesses 5—and therefore between consecutive grate bars 6—is advantageously double the width of the grate bars 6, themselves so that relatively large spaces are free between consecutive grate bars, a consideration which may for instance be of importance with respect to the flow of heat between the grate bars.

FIG. 3 particularly shows that the recesses 5 are open-ended, as will already have been inferred from the statement that the grate bars 6 are inserted endwise into the recesses. The drawing also shows that the depth of the recesses 5 corresponds preferably to the height of the grate bars 6 so that the latter are flush with the upper sides 4a of the strips 4.

Because of its flexible or bendable characteristic the novel grate is capable of conforming itself to all unevennesses which may be present in the frame 8, or whatever other surface on which it is to be supported. This, in conjunction with the firm retention of the grate bars in the strips 4, prevents banging or other noise of the grate bars.

If access is to be had to the channel 7, the grate is simply lifted off and rolled up about a line extending in parallelism with the grate bars 6, with the rolling-up of course being accomplished in upward direction away from the slits or incisions 13 which extend into the strips 4 from the side 4b—normally the downwards directed side—which is opposite the side 4a. These incisions or slits advantageously have a length or depth corresponding to approximately 80 percent of the thickness of the strips, that is the distance between the sides 4a and 4b. This assures that only a relatively small material thickness of the strips 4 need be flexed when the grate is to be rolled up (as in FIG. 5) and this not only facilitates rolling up but permits rolling up on a much smaller radius than heretofore possible. To prevent tearing of the material at the ends of the slits 13, the inner ends of the slits are provided with enlargements 14 which in the illustrated embodiment are of cylindrical cross-sectional configuration and extend transversely of the elongation of the strips 4, that is essentially in the same orientation as the axes of the grate bars 6. The manner in which the slots or slits 13 facilitate rolling up of the grate is illustrated in FIG. 5 and it will be appreciated that when the grate is flat or nearly flat, the side faces 15 and 16 bounding the opposite sides of the slots 13 will abut against one another whereby tilting of the grate bars 6 is reliably precluded.

Of course, various modifications may be made in the illustrated exemplary embodiment without departing from the scope or concept of the present invention. Thus, the cross-sectional configuration of the grate bars 6 and the strips 4 may be other than shown, the configuration of the slits or slots 13 may be different just as that of the enlargements 14 may be varied, different materials may be used, and the like.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a shaped grate, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended

I claim:

1. A grate, particularly for covering open channels and the like, comprising a row of elongated at least substantially parallel bars each having spaced opposite ends; and at least two elongated spacing and connecting strips of elastically yieldable material extending along said row and each connecting said bars in the region of one of said ends, said strips each having a first side and a second side opposite said first side and undercut recesses provided in said first side, each of said recesses accommodating a complementary portion of one of said bars, said undercut recesses and said complementary portions preventing withdrawal of said bars from said recesses in directions other than lengthwise of the respective bars said bars being flush with said first side of said strips, and said second side of each of said strips being provided with slits extending in direction towards said first side.

2. A grate as defined in claim 1, wherein said recesses and at least said portions of said bars are of complementary non-circular cross-sectional configuration, whereby to prevent rotation of said bars with respect to said strips.

3. A grate as defined in claim 1, wherein said strips are at least predominantly composed of a material selected from the group comprising natural and

synthetic rubbers, and synthetic resin materials.

4. A grate as defined in claim 1, said strips having a predetermined thickness between said first and said second side; and wherein said slits have a depth corresponding to substantially 80 percent of said thickness.

5. A grate as defined in claim 1, said slits having inner ends closer to said first side and each slit having a widened inner end portion.

6. A grate as defined in claim 5, wherein said widened inner end portions have a cross-sectional configuration resembling a cylinder whose axis extends transversely to the elongation of the respective slits.

7. A grate as defined in claim 1, wherein said bars are hollow profiled bar members.

8. A grate as defined in claim 1, said bars having a predetermined maximum dimension in direction lengthwise of said strip, and consecutive ones of said recesses being spaced by a distance corresponding at least substantially to twice said maximum dimension.

9. A grate as defined in claim 1, wherein said recesses and said bars are of complementary cross-sectional configuration.

10. A grate, particularly for covering open channels and the like, comprising a row of elongated at least substantially parallel bars each having spaced opposite ends; and at least two elongated spacing and connecting strips of elastically yieldable material extending along said row and each connecting said bars in the region of one of said ends, said strips each having a first side and a second side opposite said first side and undercut recesses provided in said first side, each of said recesses accommodating a portion of one of said bars, and said recesses and at least said portions of said bars being of complementary cross-sectional configuration, said recesses and said undercut complementary portions preventing withdrawal of said bars from said recesses in directions other than lengthwise of the respective bars, and said second side of each of said strips being provided with slits extending in direction towards said first side, and wherein said cross-sectional configuration is substantially trapezoidal with the narrower end of the trapezium being closer to said second side, and wherein said bars are provided with lateral projections located at and wider than said narrower end of their respective cross-section and said recesses are provided with complementary lateral cut-outs located at the narrower end of their respective cross-section and accommodating said projections.

11. A grate as defined in claim 10, wherein the transverse dimension of said bars at said narrower end of their cross-section plus said lateral projections at said narrower end at least substantially equals the transverse dimension of said bars at the wider end of their respective cross-section.

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