Nov. 10, 1964 H. S. NAGIN ETAL 3,156,168

GRATING

Filed April 21, 1960

Fig.1

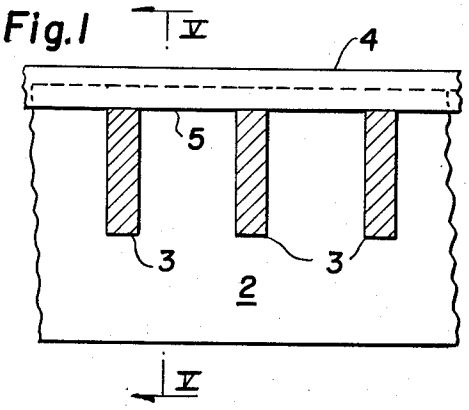


Fig.2.

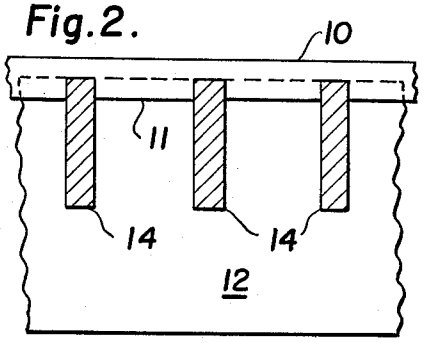


Fig.4.

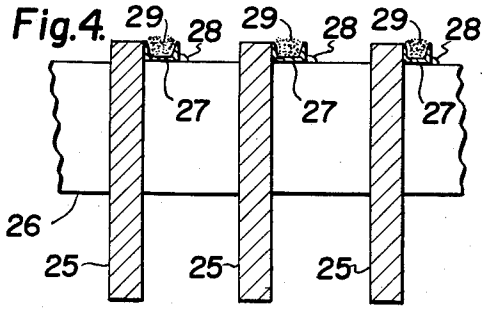


Fig.3.

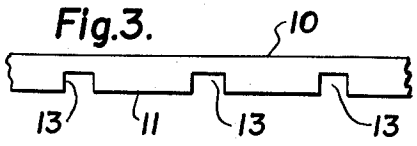


Fig.6.

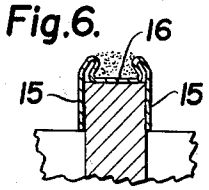
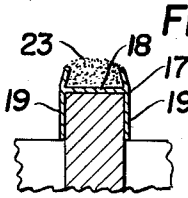


Fig.7.



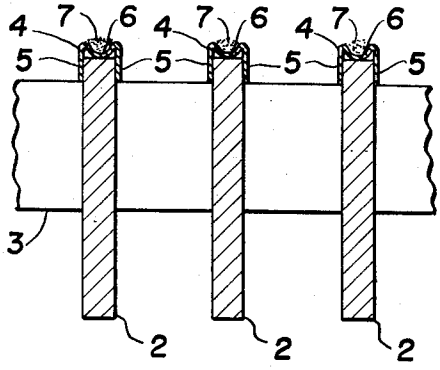


Fig.5.

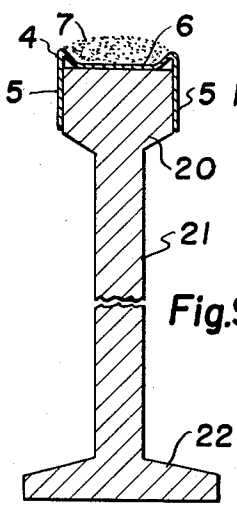


Fig.9.

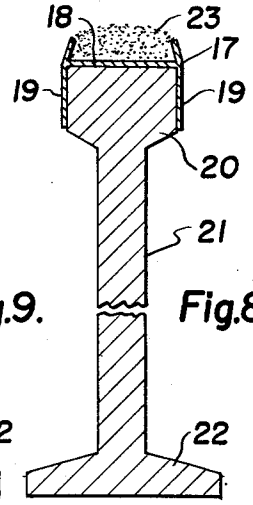


Fig.8.

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GRATING

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Filed Apr. 21, 1960, Ser. No. 23,687
4 Claims. (Cl. 94—5)

This invention is for a metal grating, and relates especially to that type of metal grating especially used on highway bridge floors.

Bridge floors comprised of gratings are desirable from the standpoint of resistance to wear, the fact that the deck per unit of area has a relatively low dead weight, and the deck is self-cleaning. One objection is that the back wheels of a vehicle may not track behind the front ones, causing the back end of the vehicle to have a slight side sway, and in some cases skidding occurs on wet or icy gratings.

In the copending application of Harold Nagin, Serial No. 471,666, filed November 29, 1954 for Composite Grating Structure, now issued as Patent No. 2,941,455 on June 21, 1960 there is disclosed a grating wherein the intersecting sets of bars are provided with grooves in their upper edges, these grooves being filled with a resin-abrasive mix that provides a good anti-friction surface. Such grating, however, is expensive, which limits its wide-spread utility for bridge floors.

The present invention has for its object to provide an improved grating which will have good traction qualities, and although less desirable than the one shown in the above application, will afford a secure road surface under practically all conditions.

The present invention has for a further object to provide a traction member applicable to conventional gratings as now constructed, including gratings which are already in use.

Our invention may be more fully understood by reference to the accompanying drawings, in which:

FIG. 1 is a transverse section through a fragment of a grating embodying our invention;

FIG. 2 is a similar view through a modified construction;

FIG. 3 is a side elevation of one form of strip for use in making the grating;

FIG. 4 is a view similar to FIG. 1 of another modification;

FIG. 5 is a transverse section through one form of abrasive strip and part of the grating bar, the section being in the plane of line V—V of FIG. 1.

FIG. 6 is a view similar to FIG. 5 of another modification;

FIG. 7 is a view similar to FIG. 5 of another modification;

FIG. 8 is a view similar to FIG. 5 of still another form where the bar is widened at the top; and

FIG. 9 is still another view, somewhat similar to FIGS. 5 and 8.

According to one form of the invention, a grating may be prepared with intersecting main bearer bars and cross bars, with the top edges of one set of bars being below the top edges of the other. Usually the bars having the higher top edges will be those which are crosswise to traffic. In most cases these are the main bearer bars.

Our invention, as shown in FIGS. 1 and 2 and FIGS. 5 to 9, provides a channel-like section that can be set astraddle the raised edge of one set of bars and welded or otherwise firmly secured thereto, the channel containing an abrasive filling. In FIG. 4 there is such a channel set alongside the projecting upper edge of one set of bars.

In FIG. 1, there is shown a section of a conventional grating comprised of two sets of parallel bars intersecting at right angles, the bars of one set being designated 2, and those of the other set are designated 3. In this instance the bars 2 are the bearer bars and 3 the cross bars. Instead of the bars having their upper edges in the same plane as is usual in the art, bars 2 project above the bars 3, but this condition could be reversed. A strip 4 is welded to the top of the bars 2, this strip having a channel in its top surface filled with a resin-abrasive mix.

In FIG. 5 there is shown one form of strip 4. It has parallel side portions 5 that are spaced from each other a distance such that the projecting top edge of a bar will fit snugly between them. The top edges of the sides turn inwardly and downwardly to form a groove or channel 6. The channel 6 is filled, preferably to a level above the edges of the channel, with a bonded abrasive material 7 secured therein. We prefer to use a filling of hard, wear-resistant abrasive grains, such as aluminum oxide or silicon carbide coarse abrasive grains and a liquid epoxy resin and a catalyst therefor. Epoxy resin is a known material and there is no novelty in the resin itself. We have found an epoxy resin having a viscosity at 25° C. of from 40 to 160 poises and an epoxide equivalent ranging between 180 and 195 to be satisfactory for this purpose. Resins of this viscosity are of light, syrupy consistency. They are the reaction product of epichlorohydrin with a bifunctional hydroxyl containing compound. That which is most generally used is a dihydric phenol. The catalyst or curing agent is usually a polyamine, of which the more commonly used are diethylene triamine, ethylene diamine, dimethylaminopropylamine, diethylaminopropylamine, piperidine and pyridine, the first-mentioned one being the one most generally used. The amount of catalyst and the selection of the catalyst may be varied according to the pot life which is desired, the curing time and temperature. Usually a ratio of about 10% by weight of catalyst to resin is satisfactory for our purposes.

When the resin cures in situ in the channel 5, it adheres strongly to the metal and the bonded mass has high impact and wear-resistance, and has unexpected resistance to weathering.

The strip with its filling is set astraddle the raised edge of the bar 3, and the under face of the channel sets on the top of the bar while the sides 5 extend a short distance down the sides of the bar. These sides are welded at intervals to the bar. By this arrangement, the zone of welding is remote from the part of the strip that carries the abrasive-resin filling, and the welding can be accomplished without danger of damaging the resin-abrasive filling, which must not be subjected to temperatures anywhere nearly as high as that required for welding. Instead of welding, epoxy resin adhesive may be applied to bar 3 and the inner faces of the sides 5 which straddle the bar 3. Also, mechanical fastening may be used.

The strips so formed can be prepared with the resin-abrasive filling therein separately from the grating and

applied to the grating afterward, or applied in the field. When a grating with the strips thus applied is installed on a bridge floor with the strips crosswise to traffic, the wheels get good forward traction, and side slip or skidding is practically impossible. The spacing between bars on a bridge floor is of the order of four inches from center to center, and consequently the strips so applied are similarly spaced.

Whereas the arrangement shown in FIGS. 1 and 5 contemplates having the top edges of the bearer bars extend above the plane of the cross bars, the invention may also be used where the top edges of the cross bars and the main bearer bars are at the same level. This is illustrated in FIGS. 2 and 3. In these figures the strip is of substantially the same section as that shown in FIG. 5, but as shown in FIG. 3, the downwardly-turned side flanges are notched to fit over the cross bars. In FIGS. 2 and 3, **10** designates the channel-shaped member which is set on the top edge of the bearer bars, and which has downwardly-turned sides **11** that embrace the the sides of the bearer bars **12**. The strip is notched or cut away at **13** to clear the cross bars **14**. There is a filling as above described of abrasive material and resin in the groove or channel in the top of the member **10** corresponding to the mass **7** in FIGS. 1 and 5.

In the modification shown in FIG. 6, the structure is much the same as that shown in FIG. 5, except that the strip which has downwardly-extending sides **15** has its upper edges folded inwardly and downwardly at divergent angles toward the bottom web **16** of the channel, the channel thus having a dove-tail shape to more firmly hold the abrasive-resin compound.

In FIG. 7 the section is a rolled or extruded section. It is designated generally as **17**, and it has a web **18** with side flanges **19** that extend above and below the plane of the web **18**. The side flanges **19** embrace the sides of the bar to which the strip is applied, and these downwardly-turned sides can either be adhesively secured to the bar by an epoxy resin, or preferably they are secured in place by welding at intervals along the length of the strip. The portion of the sides **19** which is above the web **18** may be turned inwardly to a slight extent.

In FIG. 8 there is shown a section the same as that shown in FIG. 7, and the same reference numerals have been used to designate the corresponding parts. However, in FIG. 8, the bearer bar is shown as being of a modified I-beam section with a wide head **20**, a web **21**, and a base flange **22**. In both FIGS. 7 and 8 the resin-abrasive mix is designated **23**. In FIG. 9 the strip is of the same shape as that shown in FIG. 5. but the channel is wider and the space between the downwardly-turned flanges is greater, illustrating how the form of strip shown in FIG. 5 may be proportioned to fit on a bearer bar of the section shown in FIG. 8.

In all of the forms here described the strip is in the form of a clip or metal member which sets astraddle the bar to which it is applied. It has a channel or groove along the top with the groove having a bottom web that engages the top edge of the bar, and the groove is filled with the mixture of abrasive material and epoxy resin cured in situ in the groove. In each of these forms the sides of the strip or channel extend downwardly below the bottom web of the channel so that the channel may be welded to the bars at a level where the heat of welding will not damage the resin-abrasive mix. If adhesive such as epoxy resin is used instead of welding, the downwardly-turned sides extending below the top edge of the bar form an extended area for adhering the strip to the bar. Any of the forms of strip here shown may be notched as illustrated in FIG. 3 for use where both sets of bars have their top edges in the same plane. Also these strips could be firmly held in place by wire ties or other mechanical fastenings. Instead of the strip being a continuous strip, it may be formed into short lengths which may be set on the bearer bars between the cross bars, constituting clip-like sections instead of a continuous clip-like strip.

In the arrangement shown in FIG. 4 the grating is of the construction shown in FIG. 1, that is, the bearer bars have their edges projecting above the edges of the cross bars. In this view the bearer bars are designated **25** and the cross bars are **26**. Instead of the abrasive-filled channel being set astraddle the projecting edge of the bearer bar, the channel **37** in this figure is set alongside the protruding edge of the bearer bar, being nested against the edge and resting on the cross bars. A small mass of welding metal at **28** where the channel extends across the cross bars may secure the channel in place. The resin-abrasive mix which is in the channel, and which preferably extends slightly above the top of the channel, is designated **29**. While this is a satisfactory construction, care must be taken to avoid overheating the metal when the weld is made at **28**, lest the resin-abrasive compound be burned.

With the present invention the channel-shaped bars carrying the abrasive-resin mix can be separately formed and filled with the resin compound and then applied to the grating. While we have indicated a preference for placing these strips or channels on or alongside the bearer bars, they could be placed alongside the cross bars, and if desired, the cross bars could have their edges project above the level of the bearer bars.

While we have shown and described certain specific embodiments of our invention, it will be understood that various changes and modifications may be made therein.

We claim:

1. A grating having two sets of spaced parallel bars, the bars of one set extending crosswise of the other with the bars of one set extending through the bars of the other, and strip-like clips set astraddle the bars of one set only and extending above the top surface of the grating, said strip-like clips having a longitudinal channel in the top thereof and depending sides below the channel, and a filling of abrasive grains and resin in the channels of said strips with the resin bonding the grains to each other and to the interior of the channels and forming a tread surface on the grating and means securing the depending sides of the strips to the bars on which they are set.

2. A grating comprising a set of several parallel bearer bars and a set of several parallel cross bars extending transversely of the bearer bars in fixed intersecting relation, and separate parallel strips secured to the top edges of one set of bars only and extending across the bars of the other set at a level above the top edges of the bars which they cross, said strips each comprising a section having a channel-like groove at the top with side flanges extending downwardly from each side thereof to a level below the bottom of the groove, the flanges being spaced a distance corresponding to the width of the top edge of the set of bars on which they are placed, the strips setting astraddle the bars on which they are placed with the side flanges extending below the top edges of said bars and being welded to the bars at a level below the top edges of said bars, the channel being filled with bonded abrasive grains adhered to the channel and providing a traction surface for the grating.

3. A grating comprising two sets of intersecting bars joined together, channel members secured to the top edges of one set of bars only and extending crosswise of the other set above the top edges of said other set, said channels having a filling of abrasive grains and resin therein and adhered thereto, the channels being of H-section and set astraddle of the bars to which they are secured with side portions extending down against each side face of the respective bars on which they are set, said side portions being welded to the side bars at a level below the resin and abrasive filling.

4. A grating comprising two sets of intersecting bars joined together, channel members secured to the top

edges of one set of bars only and extending crosswise of the other set above the top edges of said other set, said channels having a filling of abrasive grains and resin therein and adhered thereto, the channels being of H-section and set astraddle of the bars to which they are secured, the sides of the H sections below the top edges of the bars on which they set being notched to fit over the bars of said other set which extend at right angles thereto, and being welded to the bars on which they set below the level of the resin and abrasive filling.

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