

Nov. 22, 1960

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2,960,918

GRATING

Filed Sept. 27, 1956

2 Sheets-Sheet 1

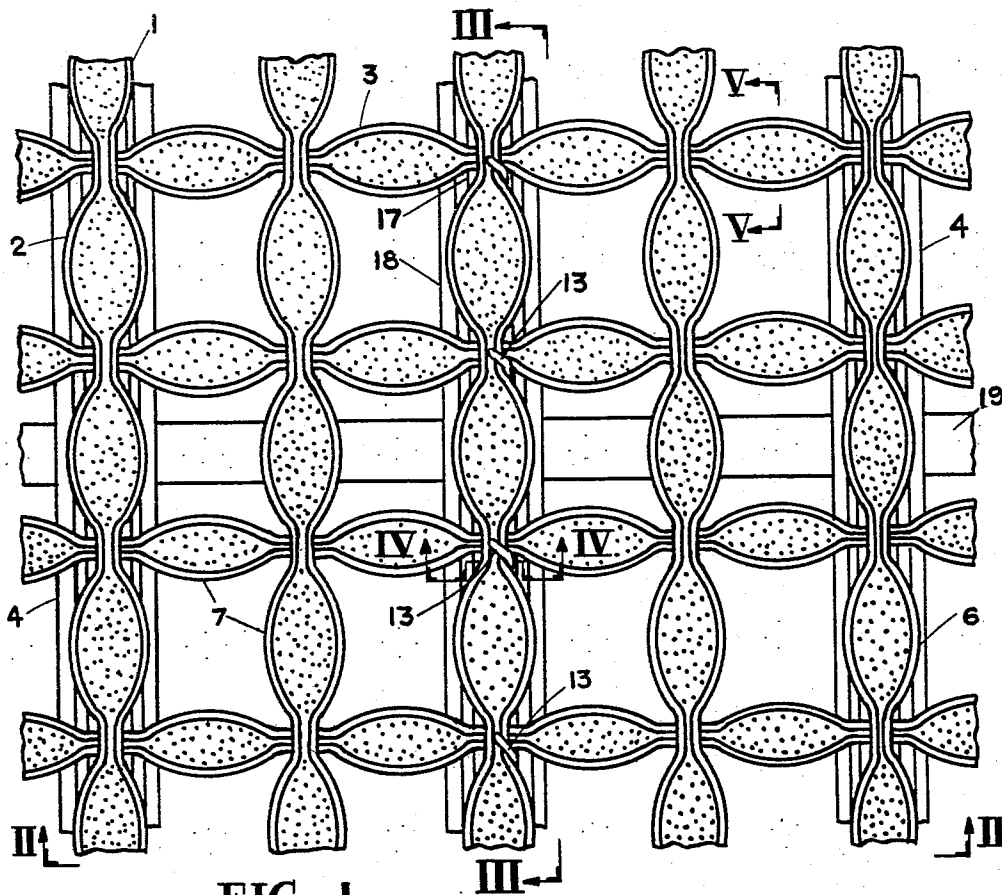


FIG. 1

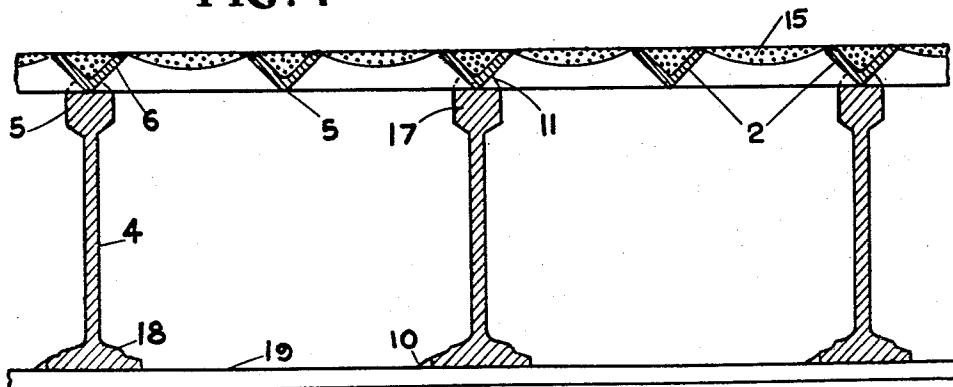


FIG. 2

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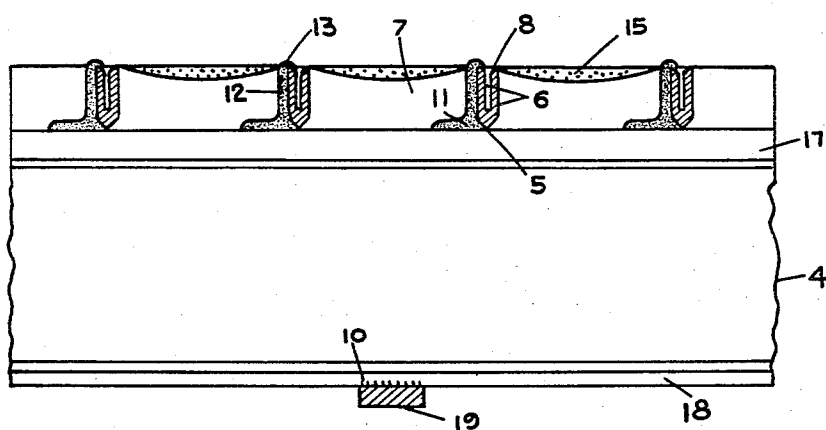


FIG. 3

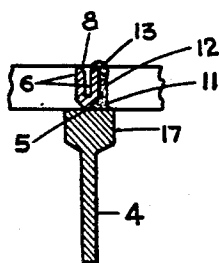


FIG. 4

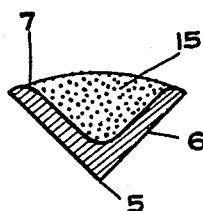


FIG. 5

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2,960,918

GRATING

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6 Claims. (Cl. 94—30)

This invention is for a new composite grating such as those used in bridge floors and other traffic bearing surfaces, as well as platforms, sidewalks and elsewhere.

Grating members of the type referred to generally have longitudinally extending bearer bars or main load carrying members, and another set of transversely extending bars, called cross bars. The cross bars are usually welded or otherwise secured to the bearer bars with the tops of the two sets of bars lying in the same plane, thereby forming a reticulate grating.

In my copending application Serial No. 456,380, filed September 16, 1954, now Patent No. 2,895,389, I have shown a grating designed to provide an improved traction surface by having a relatively thin coating of abrasive grains secured over the tread surface by an epoxy resin. Such a mixture will adhere firmly to the metal, even under heavy traffic conditions.

In my copending application Serial No. 471,666, filed November 29, 1954, a grating is provided in which one or both sets of bars has the top edge of each bar provided with a trough-like formation into which a filling of resin and abrasive mixture is placed, the filling being heaped to a level above the tops of the troughs.

The present invention has for its principal objects the provision of an improved and unique grating, and more especially, composite grating formed of metal with anti-skid traffic bearing composition applied thereto. A further object is to provide a grating having desirable properties when used either for light traffic, such as sidewalk gratings, subway gratings, engine room walks and the like, or adapted for use under heavy road traffic, as on highway bridges, ramps, freight platforms, or the like.

According to this invention an improved grating is constructed from intersecting sets of bars, one or both of which comprise angle bar sections set vertically with the flanges of the angles being squeezed together at the areas of intersection with the bars of the other set, thereby providing a succession of pockets or cells of V-shaped section widest at the middle and tapering in width but increasing in depth towards their ends. These pockets are then filled with a paving composition until the top of the grating is substantially flat and level. Thus at the points of intersection the metal may be exposed, while between the areas of intersection the composition extends above the metal but is most effectively retained in the grating. This is an especially desirable condition on highways where it reduces the tendency of the wheels to "track" or skid on the metal and provides a succession of relatively wide composition areas and smaller metal areas on which the wheels roll while the open cells through the grating are corresponding smaller, giving improved riding qualities. For other uses the grating also provides a desirable surface, providing good footing. Incidentally the construction provides a grating of pleasing and attractive appearance. The grating may be used merely as such, or advantageously integrated with bearer bars or load carrying members for heavy traffic conditions.

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Other objects and advantages will appear when taken in connection with the accompanying drawings, wherein:

Fig. 1 is a plan view of a portion of a grating embodying the invention;

Fig. 2 is a transverse section in the plane of line II—II of Fig. 1;

Fig. 3 is a longitudinal section of the same grating in the plane of line III—III of Fig. 1 showing how the main bearer bars are secured to the main supporting beams and the cross bars at the points of intersection of the bars;

Fig. 4 is a portion of a transverse section in the plane of line IV—IV of Fig. 1; and

Fig. 5 is a portion of a longitudinal section in the plane of line V—V of Fig. 1.

Referring to the drawings in detail, there is shown a composite grating 1 comprised of one set of bars 2 which are intersected by cross bars 3, the whole grating being supported upon and integrated with main load-carrying or bearer bars 4.

Each of the grating bars 2 and 3 is formed from an angle bar section, the flanges 6 of which are squeezed together at regular short intervals 8, thereby forming a succession of cells or pockets 7 of V-shaped section with the squeezed portions connecting the pockets. The bars thus formed are joined together in intersecting relation with the intermediate edges 5 of the angles turned downwardly and the pockets 7 opening upwardly. The squeezed portions 8 are at the points of intersection. The bars may be pressure welded at the intersections, that is, the bars of one set are initially located above the others and they are then subjected to pressure while electric current at the areas of contact causes such heating of the metal that the two bars will be forced together and welded and the tops of the bars at the intersection are brought to substantially a common level. Instead of being pressure-welded, the flattened intersecting portions of the bars may be notched to interfit in the conventional egg crate manner and then welded, but after assembly the tops of both sets of bars at the intersections are flush. The squeezing of the sections in this manner at relatively close intervals causes the edges of the pockets to curve laterally of the longitudinal axis of the sections, with the pockets being widest at the middle. At the same time, the squeezing of the flanges together increases the depth of the sections at the points of intersection and the edges of the pockets are therefore concaved in vertical contour, as shown in Fig. 2, so that viewed from the side, the edges of the bar appear to be inwardly scalloped.

The grating thus constructed may be used in this form, but for heavy traffic, it may be set on spaced parallel bearer or load-carrying bars 4, here shown as I-beam sections, these bars being positioned under alternate angle bars 2, the intermediate edges 5 of the angle bars setting on the tops of the heads 17 of the bearer bars. 19 designates the lower cross bars or lower load-distributing bars joining the bottoms 18 of the bearer bars at intervals. The grating may then be welded to the bearer bars by welds 11 (see Figs. 3 and 4) which also may extending up the outside of the grating at the corner formed by the intersecting grating bars as indicated at 12, the weld being preferably extended to the top of the grating at 13. When thus welded to the bearer bars, the grating bars 2 become integrated with the bearer bars, increasing their depth and hence their load-carrying capacity, while the cross bars 3 distribute the load.

Gratings as thus formed are made up in panels, and after the grating has been assembled, the pockets 7 are filled with a tough, wear and impact-resistant resin-aggregate anti-skid composition, the pockets being filled to the level of the highest parts of the grating, i.e., the

areas of intersection, and therefore extend above the level of the side edges of the pockets. The composition is one having a high degree of adhesion to the metal. The two sloping sides of the pockets provide extensive surface to which the material can adhere, while the mass of composition diminishes in the lower part of the grating, thus making a most economical use of the composition which is relatively expensive. At the same time the flat top areas of the composition provide relatively large tread surfaces. The scaphoid or boat shape of the pockets is one which also aids in effectively retaining the composition in the grating.

The resin-abrasive composition, which per se is no part of the present invention, may be of any of the various compounds described in my application Serial No. 456,380, filed September 16, 1954, of which the present application is an improvement, or disclosed in the application of Harry S. Nagin and Donald H. Russell, Serial No. 427,873, filed May 5, 1954, in both of which the resin is comprised in substantial part or entirely of an epoxy resin and the abrasive is a particulate or granular material such as grains of aluminum oxide or other abrasive, sand, or an abrasive in conjunction with sand. Epoxy resins, when cured with a suitable catalyst, may be cured in situ at room temperature. They adhere tenaciously to the metal over all temperature conditions to which a grating is normally subjected in use, neither becoming excessively brittle when very cold, nor softening when exposed to hot sunshine. They are the reaction products of epichlorohydrin and diphenylolpropane, and are available as liquids, semi-liquids, and solids. In the practice of the present invention I prefer to use an epoxy resin having a light syrupy consistency at room temperature. Commercially suitable resins having suitable viscosities for my purpose are typified by two preparations available under the trade name "Epon" as "No. VI" and "No. 828." These resins are more fully described in a printed technical bulletin SC58-92 published by Shell Chemical Corporation in 1958 as to their viscosities and epoxide equivalents. These are typical and not exclusive examples. To cure these resins, it is necessary to use a catalyst such as a polyamine which is introduced at the time that the resin abrasive composition is prepared and remains therein. I have found diethylene triamine to be satisfactory in the ratio of about 10% by weight of catalyst to resin. The abrasive aggregate is preferably coarse granular aluminum oxide.

While the material aboved described is especially desirable for severe traffic conditions, I may use any other suitable filling, as for example asphalt with or without abrasive particles therein, Portland cement with or without abrasive aggregate, or even preformed molded blocks or inserts secured in the angles by an adhesive, such as an epoxy resin or other adhesive material or by other securing means.

When the grating formed of the intersecting angle bars formed in the manner described is secured to the bearer bars, the cross angle bars form load-distributing bars, and as explained above, the longitudinal angles give increased depth to the bearer bars, increasing their load-carrying capacity.

As indicated above, while I have shown a specific form

of grating, this should be considered as illustrative only and various modifications and changes may be made in the grating within the contemplation of my invention and under the scope of the appended claims.

I claim:

1. A composite grating comprised of two sets of intersecting bars, the bars of at least one of the two sets having two side walls that are connected at their bottom edges, the side walls being bowed outwardly in the plane of the grating between their points of intersection with the bars of the other set to form upwardly-opening pockets with downwardly-converging sides between the points of intersection, the pockets being joined by narrow connecting portions having the two side walls parallel, said bars of the other set having two parallel side walls at the intersection, said bars intersecting at said narrow connection portions with the bars of the other set, the bars being welded to each other at the intersections, the bars of both sets having their upper edges in the same plane at the intersections.

2. A composite grating comprised of two sets of like intersecting bars, the bars of each set having two side walls that are connected at their bottom edges, the side walls being bowed outwardly in the plane of the grating between their points of intersection with the bars of the other set to form upwardly-opening pockets with downwardly-converging sides, the pockets being joined by narrow connecting portions having the two sides walls parallel, the said connecting portions of the two sets of bars being located at the intersections of the bars, the bars being welded to each other at the intersections with the bars of both sets having their upper edges in the same plane at the intersections.

3. A composite grating as defined in claim 2 wherein the edges of the V-shaped pockets are concaved, and a tread material filling the pockets and extending above the concaved edges to the level of the top of the grating at the intersection.

4. A composite grating as defined in claim 3 in which the tread material is a resin-abrasive mix which adheres firmly to the metal.

5. A composite grating as defined in claim 3 in which the tread material comprises a mixture of abrasive grains and an epoxy resin, the mixture having a high impact resistance and strong adhesion to the metal.

6. A composite grating as defined in claim 3 in which load-bearing bars are welded along the bottom edges of at least some of the bars of one set and are coextensive therewith.

References Cited in the file of this patent

UNITED STATES PATENTS

865,180	Horner	Sept. 3, 1907
1,603,678	Furey	Oct. 19, 1926
1,665,846	Denni	Apr. 10, 1928
1,784,895	Dunker	Dec. 16, 1930
2,246,898	Sayre	June 24, 1941

FOREIGN PATENTS

519,055	France	1921
851,219	France	1939
811,033	Germany	Aug. 16, 1951