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GRATING AND METHOD OF MAKING SAME

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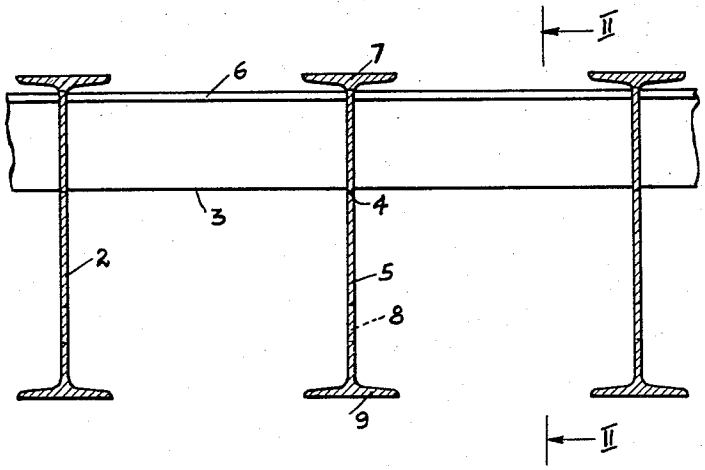


Fig. 1.

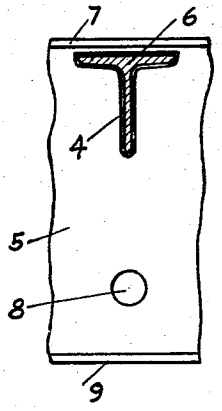


Fig. 2.

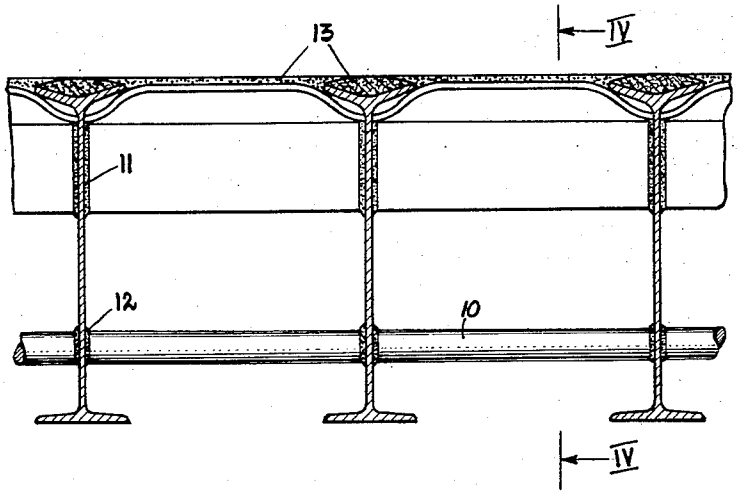


Fig. 3.

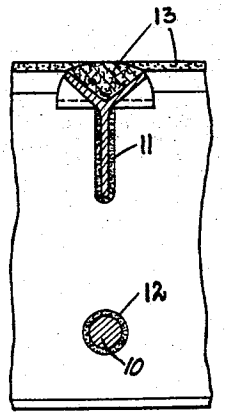


Fig. 4.

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GRATING AND METHOD OF MAKING SAME

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4 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, and method of making same.

Grating members of the type referred to above generally have one set of longitudinally-extending, parallel bearer bars or main load-carrying members and another set of transversely-extending, parallel 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 a strongly adhesive shock-resistant resin such as 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 admixture is placed, the filling being to a level above the tops of the troughs.

The principal object of the present invention is the provision of a novel and improved grating, and more particularly a 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 or 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 in which both sets of bars have the top edge of each bar pressed or deformed into trough-like formations into which a paving composition is placed, the filling preferably being heaped to a level above the tops of the troughs. The bearer bars are sections having a vertical web with a flange at the top, as, for example, I-beams having T-shaped slots cut therein at regular intervals into which slots cross bars of T-section cross bars may be inserted. The upper section or flange of each T-section cross bar is then bent upward at its outer edges into the cross section of a V or trough, except at areas of intersection with the bearer bars at which point the flange remains horizontal. At the same time the upper flange of the bearer bars which are similarly flanged at the top, are bent upward into a shallower V section. With the paving composition heaped above the level of the edges of both V formations throughout the grating structure, no metal is exposed in the tread surface, thereby providing a high degree of anti-skid protection.

My invention may be more fully understood by reference to the accompanying drawings, wherein:

Fig. 1 is an end elevation of an assembly of two of the components of the grating structure embodying the invention, preliminary to being processed into a finished structure;

Fig. 2 is a sectional view taken in the plane of line II—II of Fig. 1;

Fig. 3 is a transverse sectional view of the finished grating structure embodying the invention and including the components shown in Fig. 1 after they have been processed and integrated with additional components; and

Fig. 4 is a sectional view of the finished grating structure taken in the plane of line IV—IV of Fig. 3.

As shown in Fig. 1, the bearer bars **2** are first assembled with bearer bars having flat top flanges, such as I-beams which are traversed near the top by cross bars **3**. As shown in Fig. 2, a plurality of T-shaped slots **4** are cut through each web **5** of each I-beam just beneath the top, and when the bearer bars are aligned, T-shaped cross bars **3** are pushed through the openings, the openings being so positioned that the top flange **6** of the T-shaped cross bar **3** is adjacent the top flange **7** of the I-beam section in bearer bars **2**. At intervals much less frequent than the T-slots, openings **8** are formed in each web **5** adjacent the lower flange **9** of the I-beam section for the reception of lower cross bars **10**. These bottom cross bars are generally spaced several feet from one another, while the top cross bars are but a few inches apart.

In integrating the grating bars into a composite grating structure the flange **6** of each cross bar **3** is bent upward in the area between the bearer bars **2** into a V-shaped cross-section, so that the bar is of Y-section between the bearer bars, leaving the top of the T-section flat where the cross bars traverse the bearer bars, as shown in Fig. 4, thus forming in each cross bar a series of V-shaped troughs disposed individually in the spaces between adjacent bearer bars, which flattens into a T section at the areas of intersection with the bearer bars. The flanges **7** of the bearer bars **2** are similarly bent upward throughout their entire length, thereby providing a continuous, longitudinal, V-shaped trough in the top of each bearer bar, the troughs in the bearer bars being somewhat shallower than those in the cross bars. The bending may be effected in dies in a press, the flanges of the cross bars and bearer bars in one area and then another being bent at the same time, or an entire panel may be processed at one time if a large enough press is provided. Alternatively, the bearer bars may initially be formed with the flanges being in the V-shape or trough form shown, so that only the cross-bars need be deformed after assembly.

After the bars are thus deformed, they are interlocked by the deformation of the cross bars so that the cross bars can not move relatively to the bearer bars to any appreciable extent, but to eliminate vibration and rattle, they may be lightly welded, as indicated at **11**. This welding is not necessary at every intersection. Bottom cross bars **10**, if placed in the manner indicated, are welded in place as indicated at **12**.

Gratings as thus formed are made up in panels, and after the grating has been assembled, as by welding, the troughs are filled with a tough, wear and impact-resistant, resin-aggregate, anti-skid composition designated **13**. It is preferred that the resin-aggregate be filled into the troughs to a depth to overfill them, whereby the composition in the troughs extends to a plane above the level of the tops of the grating bars, and traffic will contact the composition only.

The resin-abrasive composition which per se is not part of the present invention, may be 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. It is preferred, however, that the abrasive aggregate be coarse, extremely hard wear-resistant material such as silicon-carbide or granular aluminum oxide. 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 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." Resins of a suitable character are disclosed in Technical Bulletin SC 58–92 published by Shell Chemical Corporation December 1958. Epon resin #828 has a viscosity at 25° C. of 100–160 poises, and an epoxide equivalent of 180–195. 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, but many other catalysts are commercially available and known to the art.

While the material above described has been found to be especially satisfactory where there are severe traffic conditions, I may use other filling material, as for example asphalt, with or without abrasive aggregate, Portland or like hydraulic cement with or without abrasive grains or other resin and aggregate mix, or even rubber or rubber-like substances bonded to the metal. Whatever the material used, it should fill the pockets or troughs to substantially a uniform height.

From the foregoing it will be seen that I have provided in the preferred embodiment of this invention a composite grating structure having a tread surface in which both the bearer bars and the cross bars are formed with a strip of resin-abrasive composition along the top, constituting wholly or substantially entirely the traffic surface for the grating. Also, I have provided a novel method of assembling a grating.

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 traffic bearing grating of the class described comprising a first set of parallel bars having vertical webs with trough-like top flanges thereon, a second set of bars intersecting and passing through the webs of the first and below the trough-like tops of the first bars and having trough-like spans in the spaces between the areas of intersection and having flat top portions at the areas of intersection wider than the trough-like spans, the edges of the trough-like spans of the second set of bars being in substantially the same plane as the edges of the flanges of the first set.

2. A composite grating as defined in claim 1 in which the second bars are welded to the first bars.

3. A traffic bearing grating of the claims described comprising a series of parallel main bearer bars each having a vertical web with a trough-like flange along the top and with V-shaped openings through the web adjacent the top, a series of cross bars, each passing through aligned T-shaped openings in the main bearer bars, the cross bars being of T-shaped section where they pass through the openings and of Y-shaped section in the spans between the bearer bars, the edges of the Y-shaped sections of the cross bars between the main bearer bars and the edges of the top flanges of the main bars being in substantially the same plane.

4. A composite grating as defined in claim 3 in which the troughs of the bearer bars and the trough formed in V-shaped sections of the cross bars are filled to a uniform height above the level of the metal with a mixture of resin and abrasive bonded to the metal.

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