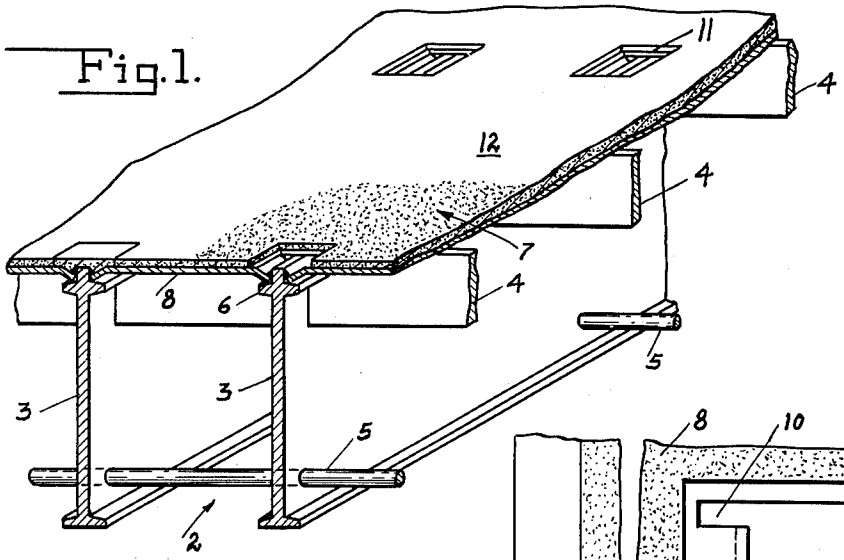
May 31, 1966 H. S. NAGIN 3,253,289

BRIDGE FLOOR AND WEAR PLATE THEREFOR

Filed April 3, 1963

Fig. 1.



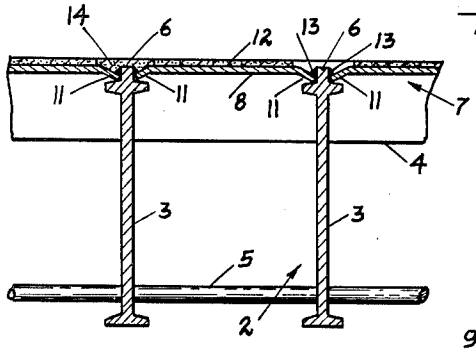




Fig. 2.

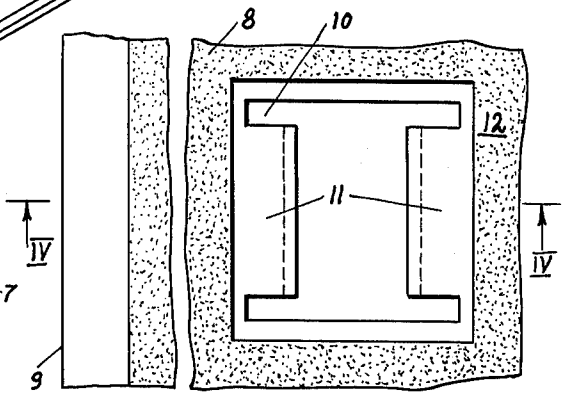



Fig. 3.

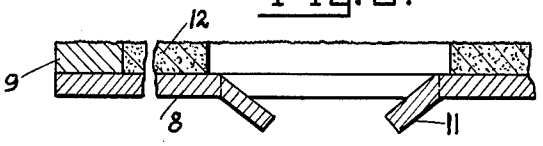



Fig. 4.

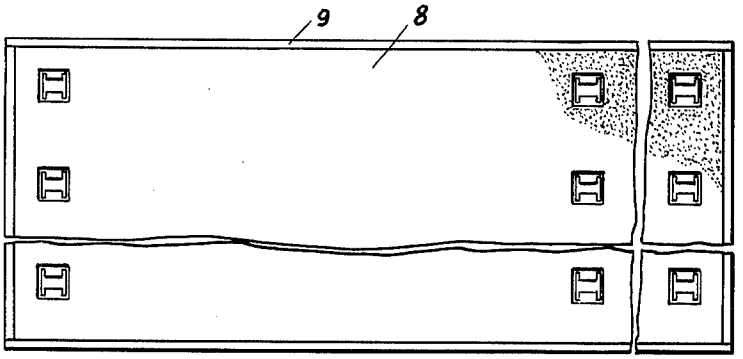



Fig. 5.

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# BRIDGE FLOOR AND WEAR PLATE THEREFOR

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8 Claims. (Cl. 14—73)

This invention relates to bridge floors, and particularly highway bridge boors is for an improved floor construction and wear plate for application to bridge floors.

The invention is applicable either to new floors or for the repair of existing floors and for purpose of illustration and not by way of exclusion, it will be hereinafter described particularly for the repair of existing flooring.

Lightweight bridge floors are commonly comprised of panels of open grating made of parallel main bearing bars connected by cross bars extending crosswise of the bearing bars and welded thereto. Often the bearing bars which are several inches in depth are of modified I-beam section while the cross bars are usually rectangular bar sections. In many cases, the cells formed by the grating may be filled with concrete instead of being completely open.

Under conditions of heavy traffic the bars may wear smooth and increase the tendency of a car to skid. This may be corrected to a considerable extent by notching the edge of the grating bars in a well-known manner, but in time these notches also become smooth, polished and worn. When this occurs the grating may have to be replaced, which is expensive and interferes with traffic. Where the floor is a grating filled with concrete, not only does the grating wear, but the concrete becomes cupped.

While it has been proposed to repair such floors by applying checker plates thereto, these wear smooth quite rapidly and a problem is involved in securing them in place. Also, while it has been proposed to cover such plates with a composition of resin and coarse abrasive aggregate, a greater problem is involved in securing them over the grating because of the destructive action of the heat of welding on the resin-abrasive coating.

The present invention provides an anti-skid surfacing plate applicable to bridge floor gratings which is of unique construction and which can be applied to the grating securely and rapidly by workmen working on top of the bridge floor and without damage to the anti-skid surfacing material. The invention further provides a novel bridge floor in which the surfacing plate integrates the grating so that if, as frequently happens, imperfect welds have broken or loosened, it is effectually repaired.

According to the preferred form of the invention a metal plate of the desired size and thickness is provided with opposed downwardly-sloped integral lugs that converge toward each other but the terminals of which are spaced sufficiently to snuggly receive the top edge of a grating bar. These pairs of lugs are located at intervals over the surface of the plate at places where they may straddle the bars of one set and avoid the intersections of the two sets of bars. Since bridge floor gratings are of generally uniform construction, the plates can be punched to provide the lugs at a manufacturing plant with assurance that they may be taken from stock and fitted to the grating in the field. The plates then have the surface covered with a mixture of aggregate, preferably coarse hard abrasive grains and a resin which is cured in situ, as for example aluminum oxide grains and epoxy resin with or without extenders or copolymers such as road oil, pine oil or polyamides or combinations thereof.

In the drawings:

FIG. 1 is a section in perspective showing a fragment of a bridge floor embodying this invention;



FIG. 2 is an end elevation of FIG. 1;

FIG. 3 is an enlarged fragmentary plan view of a single punched-out area of the plate and a portion of the margin;

FIG. 4 is a transverse section in the plane of line IV—IV of FIG. 3; and

FIG. 5 is a top plan view of a plate.

Referring in detail to the drawing, 2 designates a conventional form of a light open grate bridge floor having main modified I-beam section bearing bars 3 and cross bars 4. Load-distributing bars below the neutral axis are indicated at 5. In this particular grating the I-beam bearing bars have a narrow ridge 6 along the top, but in other forms of gratings the bearing bars may have just a plain bar section, similar to but of greater depth than the cross bars. The grating per se may be one of many forms and per se forms no part of this invention.

According to this invention the grating has its area, or the traffic lanes of its area, covered with wear plate units 7. These plates may be made in standard sizes so that each one, or even multiples thereof, can generally be used in most bridge floors. If, for example, the plates extend crosswise of the length of the bridge and the bridge provides two twelve-foot traffic lanes, two such plates each twelve feet in length and perhaps three feet wide may be placed end to end, and of course similar plates are arranged side by side to provide a complete deck. This is merely indicative of one size and manner of placing the plates and is in no way to be construed as limiting the size of the plates or manner of using them.

Each plate unit 7 comprises a rolled metal base plate 8 of the desired size for convenient handling and use in the field. Welded around the margins of the top surface of the plate is a narrow metal border strip 9, which is a fraction of an inch wide and perhaps 3/16" to 1/4" thick as compared to the plate 8 which may be several feet long and a few feet wide.

At predetermined locations over its area the plate has I-shaped slots punched therethrough, providing clearance openings 10 at each end of two confronting lips 11. These lips 11 are bent downwardly as best seen in FIG. 4 so that the free confronting edges thereof are below the plane of the bottom of the sheet and are spaced from each other a distance just large enough to allow the top edge of one of the grating bars, such as the ridge 6 of the bearer bars, to easily but snuggly enter the space between them. The punched areas are so located with reference to the grating to which they are to be applied that when the plate is set on the grating in the position in which it is intended to be used, the pairs of confronting downwardly-sloped lips 11 never coincide with the intersections of the two sets of bars. They may be located to straddle either the main bearer bars, as shown, or the cross bars, but without being additionally punched to provide three clearance openings 10 they should be spaced to avoid intersections. Since the size of the gratings is pretty closely standardized, this positioning of the lips presents no problem for shop production of the plates.

After the plates have been punched, and either before or after the lips have been bent down and the marginal strips have been applied, the punched-out areas are covered with preferably square expendable inserts having a release coating thereon to which resin will not adhere, and the entire remaining area of the plate inside the border strips is filled with a filling 12 of reactive resin with a catalyst or curing agent and hard abrasive aggregate and leveled off to the level of the margin strips 9. The margin strips provide a surface to support a roll or strike-off for leveling the mix to a uniform depth. The resin abrasive mix may then be cured at ambient temperatures if desired, but preferably to increase shop ca-

pacity and accelerate curing of the resin. An epoxy resin produced from the reaction of bisphenol and epichlorohydrin which is liquid at room temperature, a viscosity at 25° C. between 40 and 160 poises, and an epoxide equivalent of 180–195 is typical of one such resin and the curing agent or catalyst may be diethylenetriamine or other polyfunctional amine. The resin, if desired, may be combined with a polyamid resin especially used for copolymerization with epoxy resin.

The resin cures in situ on the metal plate and firmly bonds thereto. It is hard, weather-resistant, impact-resistant, and the abrasive grains are dense in order to provide a long wear-resisting anti-skid surface. The marginal strips, while not necessary, are desirable to protect the completed units in handling and shipping and avoid attrition of the edges of the resin. Because the plates can be fabricated and the resin applied at a central point of manufacture, the resin can be mixed and cured under most favorable conditions.

When the plates are shipped into the field for use, they are set on the bridge floor in the position in which they are to be used with either the bearing bars or the tops of the cross bars projecting into the spaces between the opposing lugs or lips **11**. The plates are then welded to the bridge floor by flowing welding metal at **13** into the valleys between the sloping lips **11** and the top edges of the grating bars that extend up between them. Good strong welds can be made in this way by a man standing on the plate and without access to the underside of the bridge floor at all. The welding not only secures the plate in place, but serves to integrate the grating bars with the plate so that if in the area covered by the plate there are any loose bars, such looseness can have no detrimental effect.

After the welding is completed, a small mass of resin and abrasive grains of putty-like consistency may be troweled or applied over the welds to completely fill the cavities left in the plates during manufacture with material similar to the main body of the filling material. This protects the welds from the weather and provides a smooth floor area.

The floor can be quickly covered and put into use with a minimum inconvenience to traffic. Where the cells of the bridge floor grating are filled with concrete, as is sometimes the case, the concrete may be chipped away at those places where the welds will occur so that the plates may be laid down as before and the exposed edges of the bars at the proper locations may enter between the lugs **11**.

While I have shown and described a preferred embodiment of my invention, various changes in the construction may be made within the contemplation of my invention and under the scope of the following claims.

I claim:

**1.** A wear plate for application to the grating of a bridge floor wherein the grating has intersecting bearing bars and cross bars, said wear plate comprising a metal plate having a plurality of spaced pairs of opposed lugs thereon, the lugs of each pair sloping downwardly from the plane of the plate at convergent angles and having confronting free lower ends that are spaced from each other a distance such as to straddle the top edge of a grating bar when the plate is placed over the grating, the area of the plate above the pairs of lugs being open to afford access to the lugs when the plate is placed over an area of grating for welding them to bars which they straddle, and means on the surface of the plate providing a traction surface for vehicle wheels.

**2.** A wear plate for application to a traffic bearing grating having intersecting bearing bars and cross bars, said wear plate comprising a sheet metal plate adapted to set on and cover a predetermined area of the grating, said plate having a plurality of spaced pairs of opposed integral lugs thereon, the opposed lugs of each pair sloping downwardly at convergent angles from the plane of the sheet with confronting lower ends that are spaced to receive the top edges of grating bars between them with the ends bearing against the sides of the bars below the top edges and provide between each lug and the bar which it engages a valley in which welding metal may be retained, the pairs of lugs being positioned to engage the grating bars between the places where the bars intersect.



**3.** A wear plate for application to a grating as defined in claim **2** in which the plate is provided with a surfacing material of resin and abrasive grains adhered to the top surface thereof, the area of the plate above the lugs being free of the surfacing material.

**4.** A wear plate for application to a traffic bearing grating as defined in claim **2** in which the top surface of the wear plate has marginal strips welded thereto at its edges, and a layer of surfacing material over the top surface confined within the marginal strips and being at least as deep as the thickness of the marginal strips, the surfacing layer comprising a mixture of resin and coarse abrasive grains bonded in situ to the surface of the plate, the areas of the plate above said pairs of lugs being free of the surfacing layer to afford access to the lips when the plate is to be welded to a grating.

**5.** The combination with a traffic bearing grating having bearing bars and intersecting cross bars, of a traffic bearing covering thereover comprised of a wear plate covering an area of the grating comprehending portions of several bearing bars and cross bars, the wear plate comprising a flat metal plate having pairs of integral opposed lugs struck from the body of the plate and extending downwardly from the plate at convergent angles, the lugs of each pair terminating below the plane of the plate, the ends of the opposed lugs of each pair having the top edge of a portion of a grating bar fitted therebetween with the lugs welded along the top ends of the lugs to said portions of the bars at intervals over the area of the plate, and means on the top of the plate providing a traction surface thereover.

**6.** The combination defined in claim **5** wherein the traction surface is formed of a layer of resin and coarse abrasive material bonded in situ to the top of the plate, the area of the plate above said lugs being clear of said layer.

**7.** The combination defined in claim **5** wherein the traction surface is formed of a layer of resin and coarse abrasive material bonded in situ to the top of the plate, the area of the plate above said lugs being clear of said layer, the areas of the plate above the lugs containing a separately applied filling material that is substantially flush with the top of said layer.

**8.** The combination defined in claim **5** wherein the traction surface is formed of a layer of resin and coarse abrasive material bonded in situ to the top of the plate, the area of the plate above said lugs being clear of said layer, each plate having a marginal metal strip on the top surface thereof around its edges of the same thickness as said layer.


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