Aug. 14, 1945. H. S. NAGIN 2,382,898

TREATMENT OF GRATING STRUCTURE

Filed Dec. 16, 1941 4 Sheets-Sheet 1

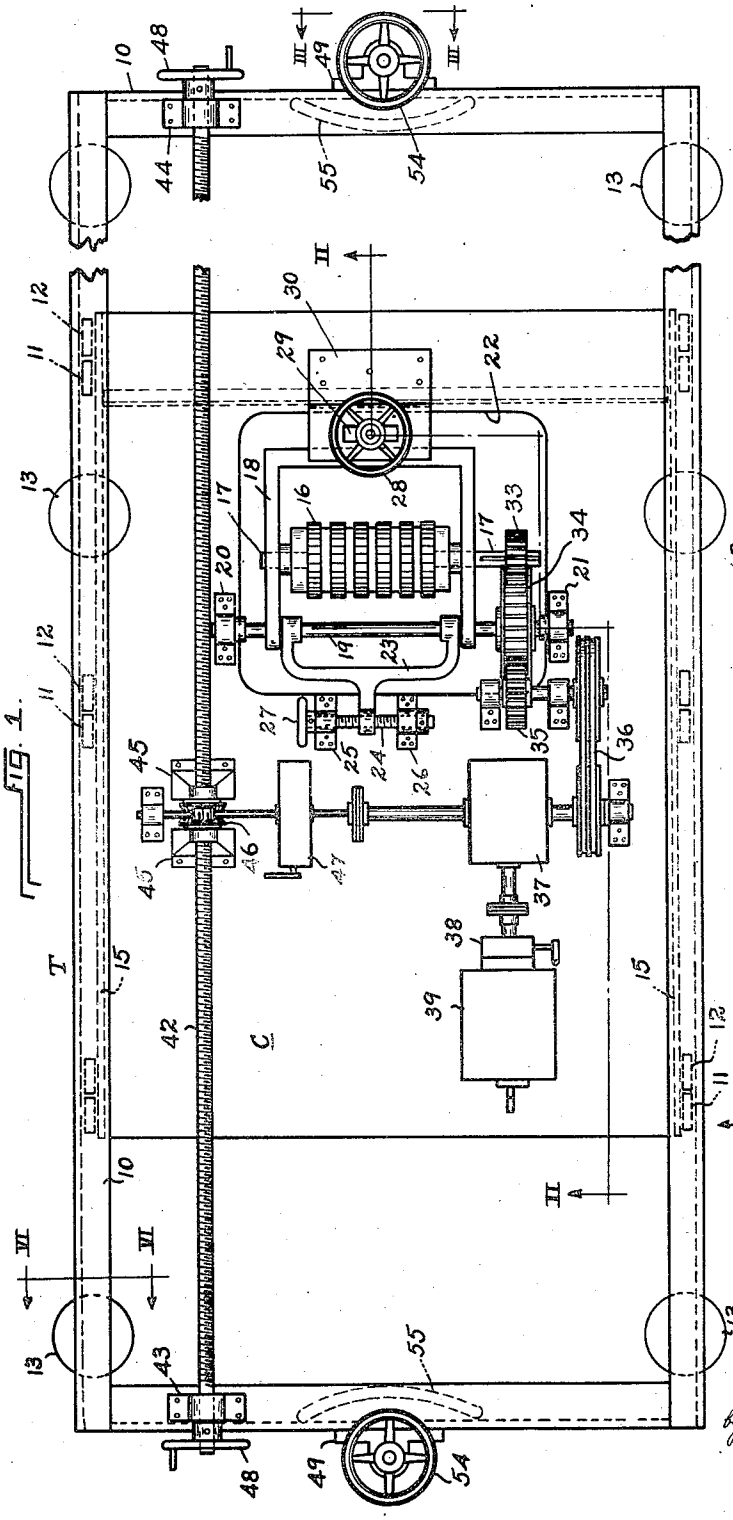


FIG. 1.

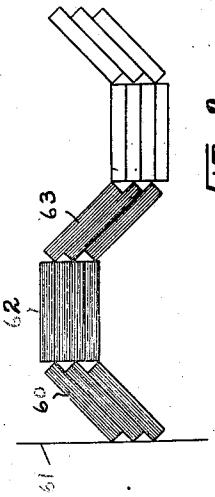


FIG. 9

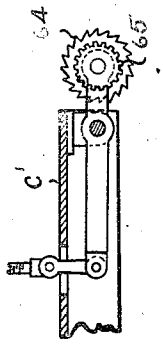


FIG. 11.

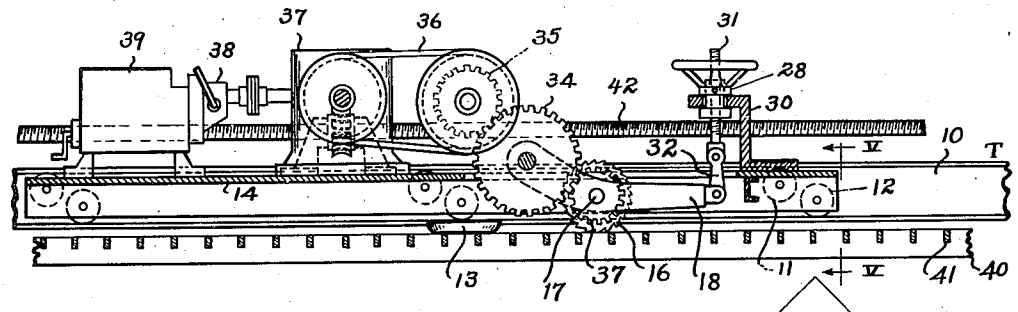
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Aug. 14, 1945. H. S. NAGIN 2,382,898

TREATMENT OF GRATING STRUCTURE

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FIG. 2.



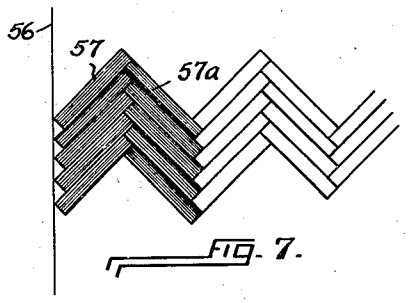


FIG. 7.

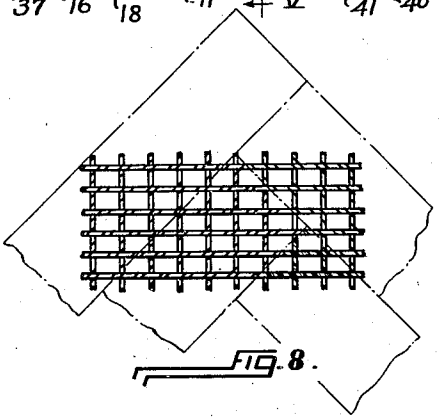
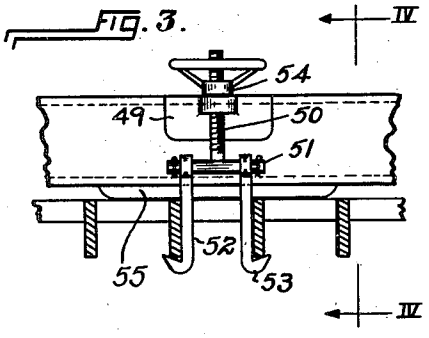


FIG. 8.

FIG. 3.



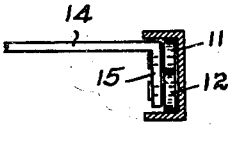


FIG. 5.

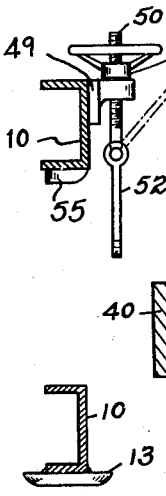


FIG. 4.

FIG. 6.

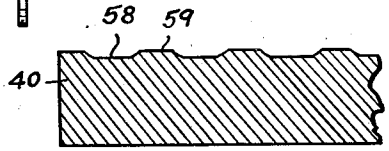


FIG. 10.

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TREATMENT OF GRATING STRUCTURE

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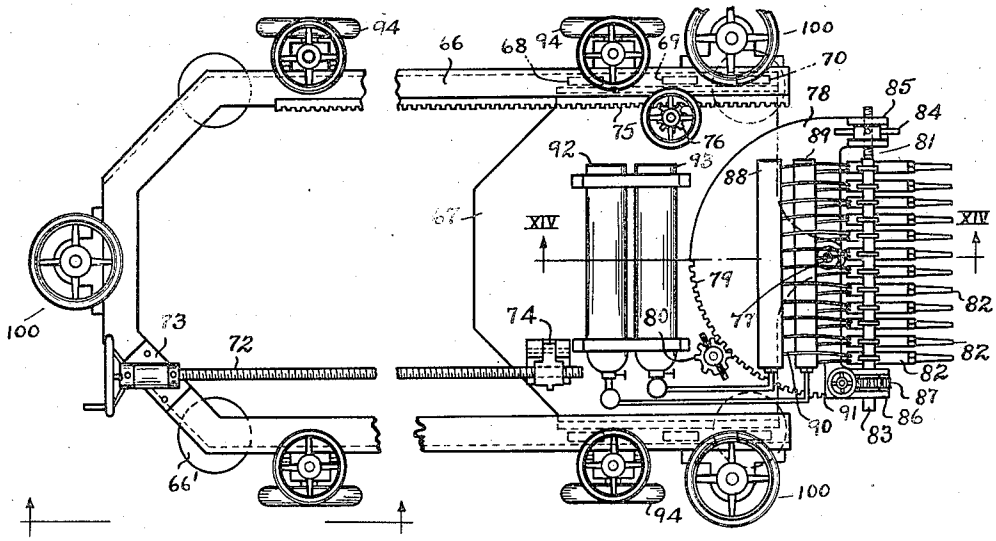


FIG. 12.

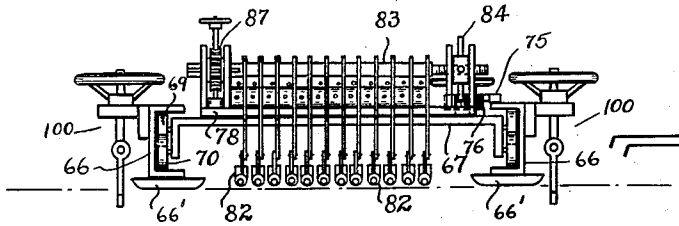


FIG. 13.

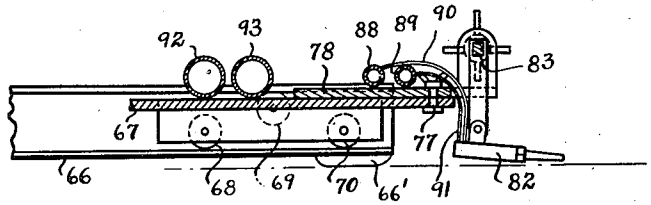


FIG. 14.

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TREATMENT OF GRATING STRUCTURE

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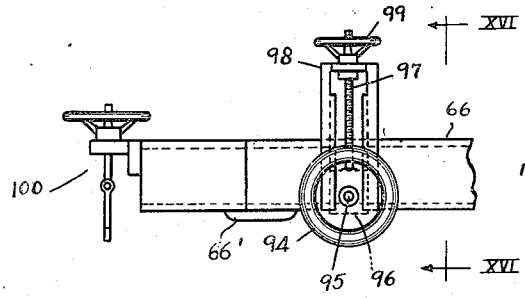


FIG. 15.

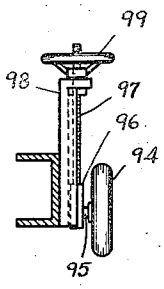


FIG. 16.

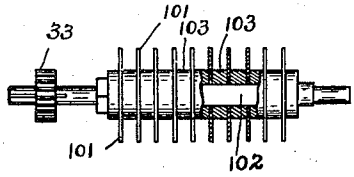


FIG. 17.

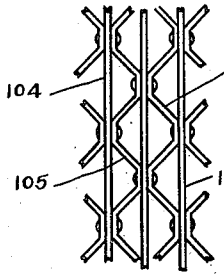


FIG. 18.

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Patented Aug. 14, 1945 2,382,898

UNITED STATES PATENT OFFICE

2,382,898

TREATMENT OF GRATING STRUCTURES

Harry S. Nagin, Pittsburgh, Pa., assignor to Reliance Steel Products Company, a corporation of Pennsylvania

Application December 16, 1941, Serial No. 423,141

6 Claims. (Cl. 90—11)

This invention relates in general to treatment of grating structures. It is particularly useful in connection with so called "open bridge floors" and will be described with reference thereto; although it is to be understood that it is also useful in treating other surfaces.

Open-grid bridge floors, ofttimes referred to as "open bridge floors" are formed of main bearing bars laid parallel to one another at spaced distances apart and cross bars which are disposed angularly to the main bars and rigidly connected thereto. In place of cross bars which may be straight or bent, recticulated bars are sometimes used to connect the main bars. The reticulated bars extend along and between the main bars, and are secured thereto but do not cross the main bars.

Such floors rest directly on supports to which they are secured. The spaces between the bars making up the floor remain open and the tops of the bars themselves form the traffic surface, which has a more or less honeycomb appearance.

Under certain traffic conditions, it has been observed that vehicles passing over such surfaces have a noticeable tendency to skid especially in wet or snowy weather. There is also a tendency for a vehicle to "wander" especially when the floor includes reticulated bars.

I have discovered that by grooving the traffic supporting surface of the bars, the anti-ship quality of the floor is much improved and the tendency of vehicles to skid and wander is overcome. I have discovered a method and apparatus for grooving or scarfing the floor which effectively overcomes the difficulties recited. The scarfing operation may be performed by metal cutters, saws, grinding discs or by burning.

In the drawings I have shown for purpose of illustration certain preferred embodiments of my invention. In the drawings wherein like characters of reference denote like parts throughout:

Figure 1 is a fragmentary view in plan of suitable apparatus for practising my invention.

Figure 2 is a vertical cross section along the line II—II of Figure 1,

Figure 3 is an end view in elevation along the line III—III of Figure 1,

Figure 4 is a vertical sectional view along the line IV—IV of Figure 3,

Figure 5 is a vertical sectional view along the line V—V of Figure 2,

Figure 6 is a vertical sectional view along the line VI—VI of Figure 1,

Figure 7 is a diagrammatic plan view showing one pattern of grooves made according to my invention,

Figure 8 is a diagrammatic plan view showing the groove pattern illustrated in Figure 7, applied to one design of bridge floor,

Figure 9 is a diagrammatic plan view of another pattern of grooves,

Figure 10 is a sectional view in elevation of a bar showing the grooves in the top edge,

Figure 11 is a fragmentary vertical sectional view of a modified detail,

Figure 12 is a fragmentary view in plan of a modified apparatus,

Figure 13 is an end view in elevation of Figure 12, some of the details being omitted,

Figure 14 is a fragmentary vertical sectional view along the line XIV—XIV of Figure 12,

Figure 15 is a view in elevation showing a portion of the apparatus along the line XV—XV of Figure 12,

Figure 16 is a sectional view along the line XVI—XVI of Figure 15,

Figure 17 is a view partly in elevation and partly in section of a modified detail of the structure, and

Figure 18 is a fragmentary view in plan of a known type of flooring which may be treated in accordance with the invention.

In the drawings (Figures 1 through 6) there is shown an apparatus for forming grooves in the top surface of the bars forming an open bridge floor and thus improve the friction qualities thereof. The apparatus comprises in general a metal track member or frame T of inwardly faced channel bars 10 on edge and a carriage C considerably shorter than the frame and mounted therein on wheels 11 and 12 so as to permit longitudinal movement of the carriage with respect to the frame, but no appreciable side movement or up and down movement. On the bottom of the track member T a number of inverted cup members 13 are fastened. These dished members permit the track member to be readily moved or skidded to desired positions along the somewhat uneven surface of the bridge floor, which it is desired to treat.

The carriage C comprises a platform 14 of sheet metal or plate the longitudinal sides of which are bent to form flanges 15 on which the wheels 11 and 12 are journalled. The wheels 11 and 12 bear against the top and bottom flanges respectively of the side channel bars of the frame.

The platform 14 has mounted thereon a rotatable cutter 16 which is mounted on shaft 17 and

rotates therewith. The shaft 17 is rotatably received in the U shaped bracket 18 the ends of which are in turn rotatably and slidably mounted on a shaft 19 the ends of which are journalled in the bearings 20 and 21, mounted on the platform 14. A window 22 through which the operations of the cutter 16 may be observed and repairs and adjustments performed is placed in the platform at a suitable location as indicated. The cutter mounting bracket 18 is adjusted to a desired position along the shaft 19 by means of a Y shaped shifting fork 23 which may be adjusted by operation of the cooperating threaded rod 24. The ends of the rod 24 are received and axially restrained by bearings 25 and 26 on platform 14. On one end of the rod a hand wheel 27 is fixedly mounted.

The up and down movement of the cutter 16 is controlled by the operation of the wheel nut 28 received in slot 29 in the Z bracket 30 mounted on the platform 14. Passing through the nut 28 is a threaded rod 31 which is pivotally connected to a link 32 which in turn is pivotally connected to the bracket 18.

The shaft 17 has a splined end which extends beyond the bracket 18 and mounted on the end is a gear wheel 33 which meshes with an intermediate flanged gear 34 which is rotatably mounted on shaft 19. The projecting sides of gear 34 engage the edges of gears 33 and 35. The gear 34 also meshes with a drive gear 35 which may be driven through the V belt and pulley drive 36 from the gear reduction box 37 which in turn is connected through the clutch 38 with the prime mover, here shown as an internal combustion engine 39. The speed of the engine 39 is such and the power transmission system to the cutter 16 is designed so that the cutter is rotated at the speed desired for economically and expeditiously cutting or scarfing the traffic surface comprised of metal main bars 40 and cross bars 41.

A transverse screw 42 for moving the carriage C is rotatably mounted and restrained against axial movement at its ends (in brackets 43 and 44) on the end members of the track member or frame T. The screw is parallel to the longitudinal axis of the frame T. Mounted on the platform 14 and between the spaced brackets 45, 45 is a worm drive 46 which engages the screw 42 and is in turn driven from the gear reduction box 37 through the interposed clutch 47. The screw 42 may also be turned by the hand wheels 48 fixed on the screw at each end thereof.

Hold down clamps are connected to the track member T at suitable locations, here shown as the center points of the frame ends. Each of the clamps comprise a bracket 49 which may be conveniently welded to the frame. The bracket has a projecting portion, through a vertical slot in which a threaded rod 50 of a T member having wing portions 51 slidably extends. Each of the wing portions have slidably and rotatably mounted thereon an anchor bar 52 having a horizontally extending hooked end 53. The upper end of the threaded rod 50 is engaged by a threaded hand nut 54. The anchor bars can be swung to a position such as indicated by the broken lines 52*a* in Figure 4. This is a convenience when it is desired to move the frame T. When in anchoring position as in Figure 3 the hooked ends 53 of the anchor engage the bottom edges of the bars 40 forming the floor. Arcuate skid members 55 are secured to the under side of the frame T at a position adjacent the hold down clamps. The apparatus may be mounted on wheels such as for example as is described in connection with the embodiment shown in Figures 12, 15 and 16.

Figure 7 is a diagrammatic representation of a portion of a bridge floor in which the grooves are cut in bands in the pattern indicated. In this figure the side of the bridge floor or curb is represented by the line 56 and the frame T is disposed so that the cutter bar moves along the bridge floor at a suitable angle, say of about 45°. The bearer bars of the floor usually extend parallel to the curb, although in some instances they extend at right angles. The longitudinal axis of each series or bands or cuts 57 and 57*a* run in different directions, and this obviates the tendency of the grooves to urge the wheels of a vehicle in one direction. In Figure 8 the bands of cuts are shown diagrammatically in relation to the bars forming the bridge floor.

The pattern of the cuts shown in Figure 9 differs from the pattern shown in Figure 7. The pattern consists of bands of cuts 60 extending at an angle to the curb 61 and cross bands 62, and bands 63 whose axes are at an angle to the axes of the bands 60 and 62. The transverse components of the bands are less than the distance apart of the wheels of the usual automobile. About three feet is a convenient length.

In Figure 10 there is shown a portion of a bridge floor bar 40, the top of which has been cut or serrated in accordance with my invention. The grooves bear numerals 58 and the lands the numerals 59. The dimension of the groove may be varied, for example it may be $\frac{5}{16}$" to ½" wide and the lands from $\frac{3}{16}$" to ½". It is to be understood that these dimensions are illustrative only and that they can be larger or smaller.

In Figure 11 there is shown a portion of a modified end of the carriage C'. In this construction the cutter bar 64 is mounted so as to project beyond the end of the carriage C' and beyond the end of the associated frame member T'. The cutter is driven by the gear 65 which is rotated by a convenient drive such as for example that shown in Figures 1 and 2, but in such a case it would be desirable to replace the gear 34 by a link belt. An up and down adjustment of the cutter bar 64 as well as a lateral adjustment can be arranged as shown in Figures 1 and 2. By mounting the cutter bar in this manner the operator is enabled to cut slots closer to the curb line.

In Figures 12 through 16 I have shown a modified apparatus for practising my invention. The apparatus includes a frame 66 of inwardly faced channel section, the ends being chamfered and a flat carriage 67 movable therealong on wheels 68, 69 and 70 journalled in the turned down flanges 71 of the carriage 67. The frame has dished cup members 66' fastened to the bottom at suitable places. The wheels 68 and 70 bear against the bottom flange of the side members of the frame and the wheel 69 bears against the top flange. The carriage 67 is moved along the frame by means of a suitable feed screw 72 one end of which is rotatably mounted in the frame bearing 73, but not axially slidable therein. The other end is received in nut 74 secured to the carriage 67. The nut is arranged so that it can be readily disengaged from the screw 72. To move the carriage 67 rapidly, I also provide a rack 75 on the frame and a cooperating pinion 76 on the carriage. Such an arrangement could also be used on the apparatus shown in Figures 1 and 2, or any other type of quick return mechanism could be employed.

Swivelly mounted on the carriage 67 at 77 is

a burner holder plate 78 having one edge curved around the swivel and teeth formed in that edge to form a curved rack 79. The rack cooperates with a pinion 80 whereby the plate 78 may be moved around the swivel 77. The outer edge of the holder plate is recessed as shown at 81.

Mounted below the recess 81 are the burners 82 which are each swivelly and removably suspended from the shaft 83, one end of which is rotatably received in the spaced bearings 84 between which a hand nut 85 is threadedly mounted on the shaft 83 and serves to move it sideways. The other end of the shaft is mounted in spaced gearings 86 between which a worm and gear arrangement 87 is slidably but not rotatably mounted on the shaft. By operation of the worm the shaft is rotated and the burners moved to position them with respect to the surface to be treated.

It is customary to feed the cutting tips with two gases oxygen and acetylene. I provide two manifolds 88 and 89 mounted on the holder plate to contain these gases. Suitable flexible connection 90 and 91 leads from the manifolds 88 and 89 respectively to each of the burner bodies. Gases are fed to the manifolds from suitable cylinders 92 and 93 mounted on the carriage 67.

At the corners of the frame, I provide four retractable wheels 94 (see Figures 15 and 16). Each wheel is supported on an axle 95 secured to a block 96 on the end of a vertical shaft 97 the upper end of which is threaded and is received in a bracket 98 attached to the frame. The shaft is moved up and down by the cooperating threaded wheel nut 99. The block 96 is slidably received in a groove in the bracket 98. The retractable wheels are convenient when it is desired to transport the equipment for any distance. The wheels are vertically adjustable and can serve to bring the track member to level position or a position parallel to the surface to be treated, or again the wheels can be retracted to allow discs 13 to rest immediately upon the surface to be treated. A similar arrangement could well be provided in the apparatus shown in Figures 1 and 2.

At desired points here shown as three, I provide hold down clamps 100, similar to those already described.

In Figure 17 I show a groove cutter which consists of toothed disks 101 of suitable material mounted against rotation on a shaft 102, and spaced the desired distance apart by spacers 103. If desired the discs 101 may be abrasive discs or metal saws; in which cases the cutter will have to be driven at a suitable speed.

In Figure 18 I have shown a plan view of a typical open grid floor. The floor consists of spaced apart bearer bars 103 and crimped bars or reticulated bars 105 joined at the junction point by rivets. Of course the open grid floor may be made from spaced bearer bars and intersecting cross bars. No matter what form the floor takes the top surfaces of the bars can be grooved to give a better traction surface.

In operation the frame is set in desired position on the grating surface and the scarfing tool operated to cut a band of grooves in one operation and for a desired distance. The length of each band of grooves should preferably be such that the wheels of a vehicle will be at all times on bands which are angularly disposed to each other. Various patterns of bands may be used.

The invention has been described in connection with open grid floors, but it is evident that the apparatus and method can be used wherever it is desired to cut grooves in an exposed surface and I contemplate using my apparatus, preferably equipped with abrasive discs for grinding parallel grooves in the surface of an uninterrupted traffic surface such as for example is presented in a concrete or asphalt roadway, or in the surface of a so called "armored" floor such as is often used in bridge floors. The grooves which are thus cut can be left open or may be filled with an abrasive or a material different from that forming the surface. The traffic structure which it is desired to treat may be a bridge or the ordinary hard surfaced roadway laid on the grade or on the level.

While I have described certain preferred embodiments of my invention it is to be understood that changes may be made without departing from the spirit of my invention.

Notice is hereby given of my divisional application Serial No. 576,618, filed February 7, 1945.

I claim as my invention:

1. Apparatus for treating the surface of a traffic structure, comprising in combination a mobile track member, means for releasably anchoring the member to the structure, a carriage mounted on and movable relative to the member and lengthwise thereof, cutting means mounted on the carriage for forming grooves in the surface of the structure and means for positioning the cutting means transversely of the carriage.

2. Apparatus for treating the surface of an open-grid floor, comprising in combination a mobile track member, means for releasably anchoring the member to the floor, a carriage mounted on and movable relative to the member and lengthwise thereof, rotatable means mounted on the carriage for forming grooves in the floor surface and means for rotating said rotatable means, means for adjusting the vertical position of the rotatable means relative to the carriage and means for adjusting the transverse position of the rotatable means.

3. Apparatus for scarfing metallic traffic bearing surfaces of open bridge floors in situ, comprising in combination a mobile frame, means for releasably anchoring the frame over an area of the surface to be scarfed, scarfing means on the frame relatively movable in a horizontal plane at a level to engage and scarf the surface over which the frame is positioned, said scarfing means comprising a carriage with cutters thereon, and means for moving the carriage horizontally in the frame and means for moving the cutters transversely of the carriage.

4. Apparatus for treating the surface of a structure including a frame, a carriage movable along the frame, a holder swivelly connected to the carriage, said holder having surface groove cutting means mounted thereon, means for moving said groove cutting means transversely of the holder, means for moving said groove cutting means at right angles to the plane of the carriage, means for moving the carriage along the frame in one direction, and means for more rapidly moving it in the opposite direction.

5. Apparatus for scarfing metallic traffic bearing surfaces in situ, comprising in combination, a mobile frame, means for releasably anchoring the frame over an area of the surface to be scarfed, scarfing means mounted in the frame and movable lengthwise of the frame and up and down relative to the frame to disengage and engage and scarf the portion of the surface over which the frame is positioned, said scarfing

means including a cutter, means for rotating the cutter, means for moving the cutter into and out of engagement with the surface to be scarfed, and means for moving the scarfing means transversely of the frame.

6. Apparatus for scarfing metallic traffic bearing surfaces of open bridge floors in situ, comprising a frame mounted on retractable wheels, means for releasably anchoring the frame in contact with the floor, a carriage mounted in the frame and movable therealong, scarfing means hingedly connected to the carriage, and movable transversely of the carriage, means for moving the scarfing means up and down, and means for moving the scarfing means transversely of the carriage.

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