May 26, 1942. J. SCHMELLER, SR 2,284,022

REINFORCED METAL PLATE CONSTRUCTION

Filed May 13, 1940 2 Sheets-Sheet 1

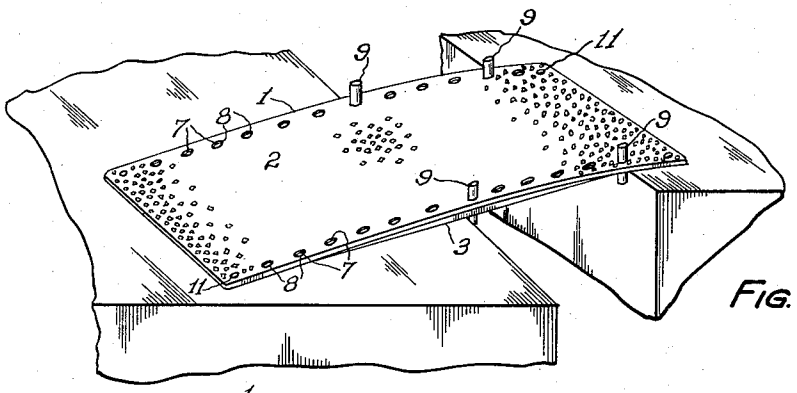

FIG. 1

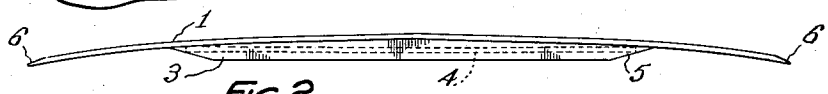

FIG. 2

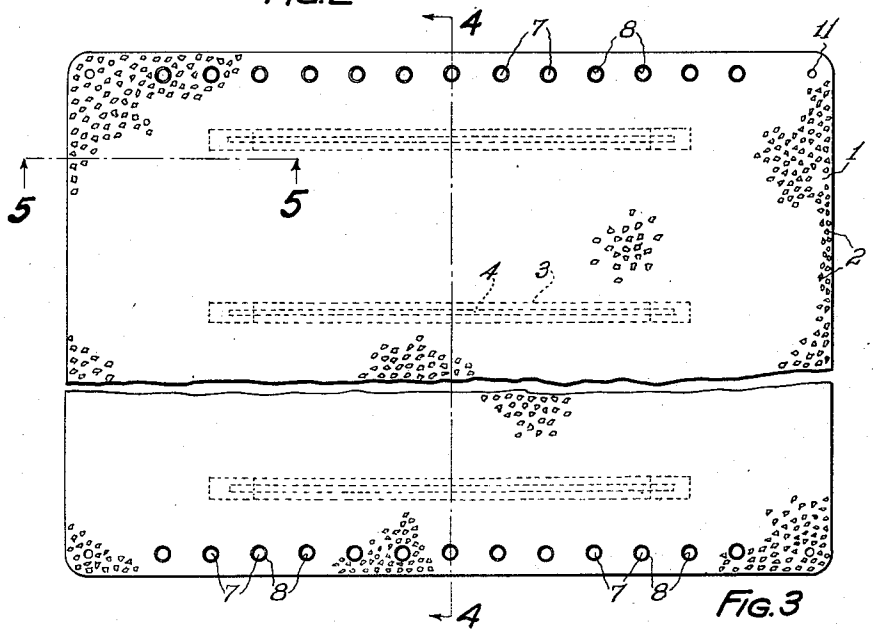

FIG. 3

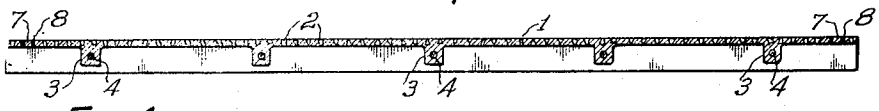

FIG. 4

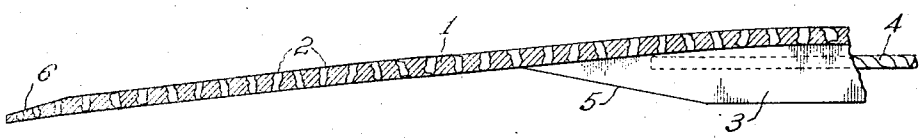

FIG. 5

INVENTOR.
JOHN SCHMELLER, SR.
BY Saywell & Wesseler,
ATTORNEYS.

May 26, 1942. J. SCHMELLER, SR 2,284,022

REINFORCED METAL PLATE CONSTRUCTION

Filed May 13, 1940 2 Sheets-Sheet 2

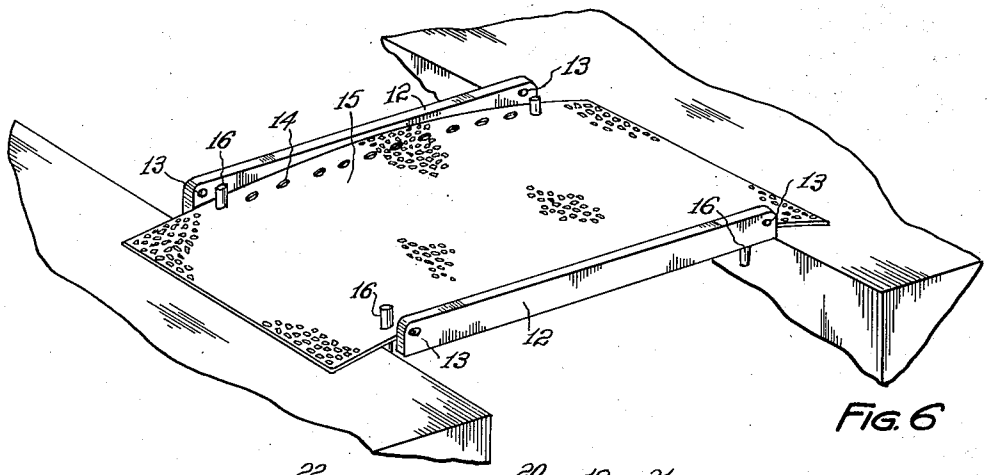

FIG. 6

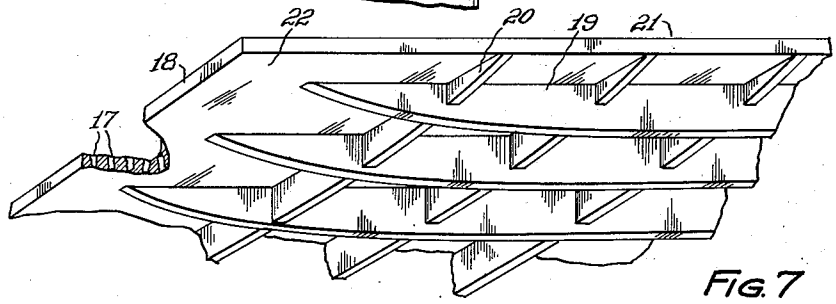

FIG. 7

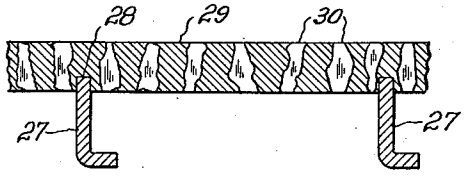

FIG. 8

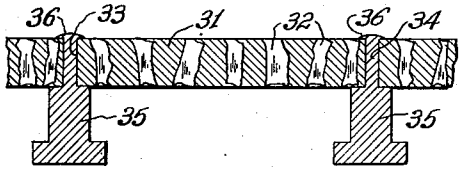

FIG. 9

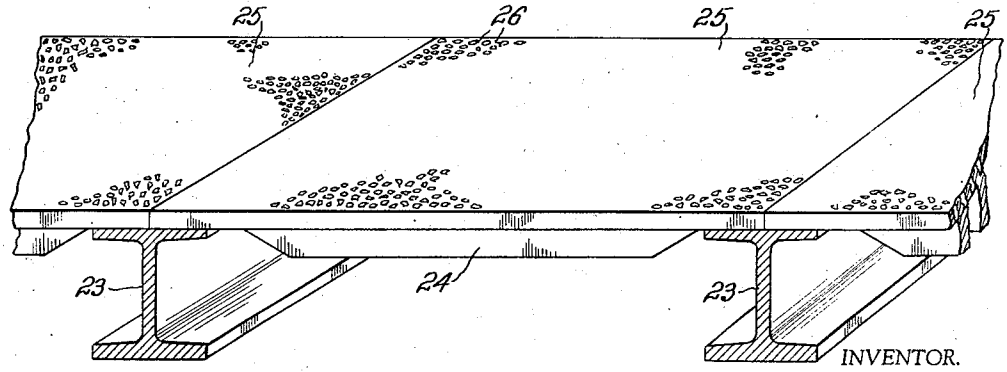

FIG. 10

INVENTOR.
JOHN SCHMELLER, SR.

BY Sayewell & Wesseler,
ATTORNEYS.

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UNITED STATES PATENT OFFICE

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REINFORCED METAL PLATE CONSTRUCTION

John Schmeller, Sr., Lakewood, Ohio

Application May 13, 1940, Serial No. 334,717

4 Claims. (Cl. 94—5)

This invention, as indicated, relates to a reinforced metal plate construction. More particularly, it comprises a reinforced metal plate incorporating a load bearing surface on one side thereof, and an integral reinforcing structure on the opposite side thereof. The load bearing surface is preferably formed of a metal having high shrinkage characteristics enclosing therein a plurality of particles or fragments of abrasive non-slipping material, such as aloxite or the like, such fragments having portions thereof exposed at intervals through such load bearing surface and adapted to prevent slippage or skidding on such surface. A plate of this character forms the subject matter of my patent, No. 2,176,849, granted October 17, 1939. The under surface of the structure may assume various forms adapted to reinforce the load bearing portion of the structure above referred to. Such reinforcement may comprise longitudinal ribs formed of identical metal as the load bearing surface of the plate, or other metal integrally united therewith, and may incorporate reinforcing elements, such as rods and the like. The ribs may extend longitudinally of the structure or transversely thereof, or both longitudinally and transversely.

The preferred form of construction, where the article is to be used as a plate or board for loading trucks, freight cars and the like, comprises an integral cast structure, preferably of aluminum, having embedded in the upper surface thereof fragments of abrasive material slightly projecting therefrom, and having a slightly arcuate curvature throughout as seen in longitudinal cross-section. Such arcuate plate is preferably provided on the under side with longitudinal reinforcing ribs formed of metal similar to that of the plate, such ribs preferably terminating short of the length of the plate, and also having their under surface lying in a plane above the plane connecting the ends of such loading plate. Thus, the ends of such loading plate are free of obstructions, and make close contact with the floors of the platforms or vehicles between which the load is to be transferred.

The particular structure referred to is only one embodiment of the invention which obviously may have various applications.

In addition to the use of the plates as loading boards they may be used as floor or deck boards, or similar structural members, temporarily or permanently secured to other structural elements. Substantially the same form of reinforcement may be used in such instances, the upper surface in every case being provided with exposed areas of abrasive material to present a non-slipping wear tread surface.

When the plates are used for loading purposes with goods and workmen passing over the same all danger of skidding or slipping is avoided, and in addition a surface having a long service life is provided. The load board structure embodies in addition to the reinforcing features a degree of clearance beneath the same and particularly beneath the end portions thereof which permits contact of the edge portions of the board at each end with the supporting surfaces along a curved line tending to merge with the floor surfaces and avoiding an abrupt offset or step which causes jarring action on a truck or dolly. Through the use of a shallow angle of curvature adjacent the ends and providing a non-slipping surface over the active area of the structure the movement of goods or persons over such board or plate may be carried on with greater speed and a maximum of safety. The non-slipping character of the surface is such that it is substantially equal in non-slipping characteristics whether wet or dry and it has been found by actual test that when covered with grease or oil the surface develops a suction effect increasing the non-slipping characteristics thereof.

The principal object of the present invention is to provide a reinforced metal plate incorporating a load bearing surface on one side thereof and an integral reinforcing structure on the opposite side thereof.

Another object of the invention is to provide a reinforced metal plate having exposed on the active upper surface thereof abrasive material providing in connection with the body material of the plate engaged therewith a non-slipping surface and one having long service life.

Another object of the invention is to provide reinforced metal plate preferably formed of aluminum or metal having high shrinkage characteristics holding a plurality of particles or fragments of abrasive non-slipping material in firm engagement with portions thereof exposed at intervals over the active load bearing surface and providing integral means for reinforcing such structure.

Another object of the invention is to provide a plate peculiarly adapted for use as a loading board to transfer freight or passengers between platforms and vehicles, such structure having non-slipping characteristics on its upper surface, and being shaped to present an edge of low height along its line of contact with the floor of said vehicle and said platform.

A further object of the invention is to provide a reinforced metal plate having a surface with non-slipping characteristics and incorporating in its structure a plurality of reinforcing elements providing great strength with a relatively light weight for such structure.

Other and further objects of the invention will appear in the course of the following description.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims, the annexed drawings and the following description setting forth in detail certain structures embodying the invention, such disclosed means constituting however, but several of various forms in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a perspective view showing a loading board embodying the principles of the invention with the ends of such board resting on floor surfaces at different elevations;

Fig. 2 is a longitudinal or side elevation of the structure shown in Fig. 1;

Fig. 3 is a top plan view of a loading board embodying the principles of the invention and indicating the position of longitudinal reinforcing ribs beneath the same;

Fig. 4 is a transverse view of the structure shown in Fig. 3 as seen along the line 4—4 shown in Fig. 3 looking in the direction of the arrows;

Fig. 5 is a fragmentary view partly in section taken along the line 5—5 shown in Fig. 4 looking in the direction of the arrows, and showing the end portion and reinforcement of the loading board;

Fig. 6 is a perspective view of a modified form of structure embodying the principles of the invention wherein lateral reinforcing and guard members are provided;

Fig. 7 is a fragmentary perspective view showing a plate embodying the principles of the invention having integral reinforcing members formed on the under side thereof;

Fig. 8 is a fragmentary sectional view showing the plate embodying the principles of the invention and having angle iron reinforcing elements integrally united therewith;

Fig. 9 is a view similar to Fig. 8 showing a plate having ribs of inverted T-bar cross-section with extension studs engaging through apertures in such plate and having riveted head portions on such studs; and

Fig. 10 is a perspective view showing a floor or deck structure formed of plates embodying the principles of the invention and supported on a frame structure with I-bar supporting members.

As has been stated the invention relates to a number of different forms of structures. As embodied in a loading board as shown more particularly in Figures 1 to 6, inclusive, it presents a slightly curved plate 1 which may be formed of any metal having satisfactory shrinkage characteristics to firmly engage particles of abrasive material 2, and is provided on its under side with reinforcing elements which may assume the form of longitudinal ribs 3. The plate is preferably made of aluminum or aluminum alloy which, because of its high crystallization shrinkage, holds the abrasive particles with a high degree of tenacity, and at the same time has a wear ratio maintaining such abrasive particles in exposed relation under heavy duty service conditions. Where a light aluminum plate is provided the series of longitudinal reinforcing ribs may be increased in number and each of said ribs may have engaged centrally thereof a steel bar, or other suitable reinforcing element 4, such bar being fully enclosed within such rib. Each rib at its ends may be tapered, such tapered portion 5 merging with the under surface of the plate. The plate shown in Figures 1 and 2 particularly has a shallow arc of curvature, and the extreme ends 6 are beveled so as to meet the supporting floor surfaces with an edge of slight thickness.

The longitudinal ribs 3 on the under side of the board, it will be noted, are of shallow depth, and their lower edges are spaced above a plane connecting the extreme end portions of the board. This permits the board to rest above a level floor surface. In order to provide for close contact with the floors of platforms of different elevations the longitudinal ribs 3 do not extend to the extreme ends of the board, but provide a space between their tapered end portions 5 and the ends of the board 6, which is free of reinforcement and may rest in close relation with a supporting floor surface. In order to prevent creeping action of the board under various conditions of service, anchoring means is provided in the shape of marginal apertures 7, preferably having cast-in bushings or ferrules 8, the marginal apertures being closely spaced and providing for the insertion of locking bars or pins 9 which project beneath the under surface of the board in a position to bear against the edges of the platforms, between which said board is supplied. Other apertures 11 may be provided adjacent the ends of the board for the insertion of hooks or the like for moving such board to the desired position.

The cross-section of the longitudinal reinforcing ribs may be varied and likewise the reinforcing members within such ribs may be of different forms. As shown in Figure 5 the reinforcing bar 4 is a twisted steel bar which is straight throughout its length, whereas the rib is curved on its upper edge and straight on its lower edge.

In substitution for the series of parallel longitudinal ribs, or in addition thereto, if desired, combined guide and reinforcing members may be provided at each edge of the loading plate, thus forming side walls 12. The side walls adjacent the ends may be provided with apertures 13 within which hooks or handling implements may be inserted to position the loading board as desired. A series of apertures 14 may be provided in spaced relation along each marginal edge of the curved board member 15, such apertures to receive positioning pins 16 similar to the pins 9 heretofore described.

Where the structure is to be used as a floor or deck plate such plate is preferably formed flat as shown in Figures 7 to 10, inclusive. The abrasive fragments 17 are embedded in a matrix of suitable metal 18, and the under surface of the board is provided with longitudinal ribs 19, and if desired, with transverse ribs 20, each of such series of ribs being curved on its lower edge, and having a flat upper edge merging with the flat under surface of the floor or deck plate 21. The longitudinal ribs, it will be noted, stop short of the end portions of the plate allowing a non-reinforced area 22 at each respective end to be placed upon the supporting member, such as the I-beam 23 shown in Figure 10. Where the structure has only longitudinal ribs the plate will somewhat resemble the loading board heretofore described, the ribs 24, however, having straight upper and lower edges. The upper edges of the ribs of the

structure shown in Figure 10 merge with the under surface of the plate **25**, the upper surface of which is provided with a plurality of abrasive elements **26**. The structure shown in Figure 10 is of particular utility on the decks of ships, or in engine rooms and gun platforms and on the decks of aircraft carriers because of the unusual non-slipping qualities of the plate even when wet or covered with grease. In place of using steel reinforcements embedded in the aluminum or other metal the steel members may be exposed over the greater extent of their surfaces and have only their upper edge portions engaged within the body of the plate. Such structures are shown in Figures 8 and 9 wherein the greater portion of the reinforcing members are exposed. As shown in Figure 8 angle irons **27** have their upper ends **28** engaged within the body of the plate **29** which, preferably, is of aluminum or similar metal. The body of the plate carries fragments **30** of suitable abrasive material, such as aloxite, which may be in small fragments, or in large fragments as shown, which extend completely through the plate structure. In the form of construction shown in Figure 9 the plate **31**, carrying abrasive particles **32**, is provided with apertures **33** through which studs **34** carried on inverted T-bars **35** are received. The studs may have their outer ends **36** riveted down against the plate surface.

In the plate type of structure just described the body of the plate may be made somewhat heavier than the loading board, and the number of ribs reduced, depending upon the character of the load for which such floors or deck is provided. The plates may be secured by suitable fastenings to the frame members supporting the same and may be made removable and readily replaceable. This is of a special advantage in connection with the decks of warcraft, particularly aircraft carriers wherein a non-skid surface from which to take off, or upon which to land, is of primary importance.

The wear surface reinforced plates hereinabove described may be used as the floor, side walls and top coverings of fluid passageways with the wear surfaces having direct contact with the fluid and with the elements of abrasive very closely spaced in order to prevent abrasive action on such surfaces by sand or foreign material carried into such fluids.

Other modes of applying the principle of my invention may be employed instead of those explained, change being made as regards the structure herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. An article of the character described having in combination a metal plate having fragments of non-slipping material embedded so as to project from the active surface thereof, said plate being formed longitudinally on an arc of shallow curvature, a plurality of longitudinal reinforcing elements disposed beneath said plate and conforming at their upper edges to the curvature of said plate and having straight lower edges and reinforcing bars embedded in said members at an intermediate point and terminating short of the end portions of said plate, the extreme ends of said plate being free of reinforcement and adapted to rest on supporting members at a low angle.

2. A loading board formed as an integral structure of cast metal having an upper surface modified to prevent slipping, said loading board presenting an upper cambered surface as seen in longitudinal elevation and providing a top plate of substantially uniform thickness throughout, and a series of longitudinally disposed integrally cast reinforcing ribs on the under surface of said plate, said ribs being of greater depth at the middle than at the ends thereof and providing arch reinforcement for said cambered member, said ribs terminating short of the ends of said board and providing areas adjacent each end free on the under side of reinforcing elements.

3. A loading board formed as an integral structure of cast metal having an upper surface modified to prevent slipping, said loading board presenting an upper cambered surface as seen in longitudinal elevation and providing a top plate of substantially uniform thickness throughout, and a series of longitudinally disposed integrally cast reinforcing ribs on the under surface of said plate, said ribs being of greater depth at the middle than at the ends thereof and providing arch reinforcement for said cambered member, said ribs terminating short of the ends of said board and providing areas adjacent each end free on the under side of reinforcing elements and beveled top edges at each end of said board to provide a substantially smooth surface for traffic over the upper surface of said loading board.

4. A loading board formed as an integral structure of cast metal having an upper surface modified to prevent slipping, said board presenting an upper plate member of substantially uniform thickness throughout, and having at least one series of reinforcing ribs on the under side thereof, each of said ribs being of greater depth centrally than adjacent the end portion thereof and being cast integrally with said upper plate member, and a series of secondary ribs at right angles to said first named ribs, such secondary ribs in each instance being of less depth than the first series of ribs at the middle and end portions of each respective series.

JOHN SCHMELLER, SR.