ABSTRACT OF THE DISCLOSURE

A false flooring includes a plurality of interlocking metal modules, each having a pair of outer legs adapted to be connected to engage existing flooring and a center leg with an existing metal flooring in response to a load being imparted to the upper module surface. Between each of the outer legs and the center legs, there are provided first, second and third arms having upwardly deflected arcs. The third arm is connected to the first and second arms by a pair of channels, having sloping side walls and a downward extent considerably less than the length of the legs.

The present invention relates generally to flooring and, more particularly, to a metal false flooring including a plurality of interlocking modules, each of which includes supporting legs and a channel connecting a pair of arms extending from the legs together, wherein the channel is supported solely by the arms and does not extend to an existing flooring.

While metal false floorings have found extensive application in many environments, the cost thereof, as well as the discomfort to personnel standing thereon, appears to have been a deterrent to their use in retail establishments. In particular, existing metal floorings require an appreciable amount of metal, causing the price thereof to be noncompetitive with rubber and wooden false floorings frequently utilized in supermarkets and bars. A further, apparent, deterrent to metal false floorings in retail establishments has been the discomfort of such floorings to personnel required to stand on them for prolonged time periods. Discomfort to personnel standing on metal floorings has been the result of designs that have not utilized the metal flexural properties. Generally, it has been thought that if the flexural properties of metal were employed, the resulting flooring would not have sufficient strength to withstand loads resulting from persons standing and walking thereon or heavy articles being dropped.

According to the present invention, a false flooring is provided that is able to sustain the load of a person and/or heavy object, while providing comfort to personnel standing thereon because the flexure properties of metals are utilized. In addition, the false flooring of the present invention is relatively economical, having a cost on the same order of magnitude as currently utilized wooden gratings and rubber mats.

The stated economic, load bearing and comfort features are realized by fabricating the flooring as a plurality of interlocking modules, each preferably being a unitary extension. Each interlocking module is provided with downwardly depending leg means connected together by horizontally extending arms which are joined together by a downwardly extending channel. The channel has a downward extent considerably less than the length of the legs to limit the amount of metal and enable the horizontally extending arms to be deflected in response to loading by the weight of a person, while providing strength to the structure. Additional strength is achieved by arcing the arms upwardly and by locating each leg in substantial alignment with an apex of certain of the arcs. The channel includes sloping, vertically extending side walls, as well as a horizontally extending span connecting the walls together, whereby an expansion type joint is effectively formed thereby. A further feature of the sloping vertical walls is that the flooring can be easily cleaned by hosing. To this end and to enable liquids falling on the false flooring to be drained, slotted apertures are provided in each of the channels.

According to another aspect of the invention, additional comfort to personnel standing on the false flooring is provided, including a center leg having an extent slightly less than a pair of outer legs which are connected to engage an existing subflooring when the module is not loaded. The center leg engages the existing flooring only in response to a load being imparted to the particular module thereby enabling the section to be deflected throughout its width, while preventing the elastic limit of the metal comprising the module from being exceeded.

Still another feature of the invention resides in the provision of a further horizontal arm connecting the arms extending from the legs together. The further arm is connected to the arms extending from the legs only by a pair of channels to provide additional deflection and minimize expenses. This feature enables the advantages mentioned supra with regard to strength, flexure and economy to be achieved; they would not be attained if the further arm were supported by a leg, rather than the channels.

According to another feature of the invention, a number of modules having different widths can be assembled to enable a complete flooring to span virtually any predetermined region. In particular, sections can be formed utilizing the principles of the invention as submultiples of the basic flooring described. In accordance with one type of submultiple flooring, a pair of downwardly depending legs is separated merely by a single channel section and a pair of arms, while in another embodiment, a pair of channels spans the distance between two legs and three arms. In accordance with still another embodiment, a three-legged submultiple flooring can be provided wherein one of the arcuate units is removed and a single channel spans the distance between a pair of legs while the configuration between a second pair of legs is the same as subsists in the conventional full width module.

According to another aspect of the invention, a sloping leg can be provided at the end of the flooring. This feature enables hand trucks, for example, to be easily rolled onto the false flooring.

It is, accordingly, an object of the present invention to provide a new and improved false flooring comprising a plurality of interlocking modules.

Another object of the invention is to provide a new and improved false flooring that is particularly adaptable for use wherein personnel are required to stand for prolonged time periods.

Another object of the invention is to provide a false metal flooring adapted to be utilized in retail establishments wherein economic factors and comfort to personnel standing on the flooring must be considered.

Still another object of the invention is to provide a metal false flooring that is deflectable in response to loading by personnel, yet is strong enough to withstand the loading as well as other forces, and is economical.

A further object of the invention is to provide a metal false flooring including a multiplicity of identical modules, having different widths and substantially the same properties regarding comfort to personnel and strength.

Still another object of the invention is to provide a metal false flooring that is adapted to enable hand trucks and the like to be rolled thereon with ease.
The above and still further objects, features and advantages of the present invention will become apparent upon consideration of the following detailed description of several specific embodiments thereof, especially when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a side sectional view of one module of a preferred embodiment of the present invention;

FIG. 2 is a perspective view illustrating a segment of false flooring constructed of a number of interlocked modules of the type illustrated by FIG. 1;

FIG. 3 is a side sectional view of a number of interlocked modules of the type illustrated by FIG. 1, wherein in the manner by which the modular sections are deflected in response to the application of various forces thereto is illustrated;

FIG. 4 is a side sectional view of a module in accordance with an embodiment of the present invention enabling a hand truck or the like to be rolled on the false flooring;

FIG. 5 is a side sectional view of an embodiment of a submultiple width unit employing a pair of legs;

FIG. 6 is a side view of another embodiment of a submultiple unit employing a pair of legs and a pair of channels; and

FIG. 7 is a side view of a submultiple unit embodiment employing three legs.

Reference is now made to FIGS. 1 and 2 of the drawings wherein the elongated, extruded aluminum modules are respectively illustrated in a cross-sectional view at right angles to the direction of elongation and in an assembled perspective view. Typically, each of the modules is fabricated as aluminum extrusion having a thickness of approximately 0.078 inch, a width of approximately six inches, a height of approximately one inch and a length as great as twenty feet. Each module includes a pair of outer legs 11 and 12 at opposite ends of the module and a center leg 13, with each leg having substantially the same length so that they all are connected to engage the floor in response to a load being imparted to a particular module.

Extending from left and right legs 11 and 12 towards the center of the module are horizontal arms 14 and 15, respectively, while arms 16 and 17 extend horizontally from leg 13 towards each of the sides of the module. A second pair of horizontally extending arms 18 and 19 is connected respectively between arms 14 and 16 and arms 15 and 17. Each of supporting arms 14-19, which have substantially coplanar horizontal load receiving upper surfaces and are substantially at right angles to vertically extending legs 11-13, is connected to the adjacent arm by four downwardly extending channels 21 that include vertically extending side walls 22 and a horizontal span 23 between the side walls. Side walls 22 slope from the vertical at an angle of approximately 22½ degrees to form an expansion joint between the arms and enable the metal flooring to be readily cleaned by hosing. Walls 22 extend vertically to an extent considerably less than the length of legs 11-13 so that the upper surface of span 23 is approximately one-quarter inch from the upper surface of the arm segments to which they are connected. Channels 21, in addition to serving as expansion joints for arms 14-19, provide strength to the module by preventing buckling thereof in response to downwardly exerted forces.

Added strength to the module is provided by upwardly arcing each of arms 14-19 so that the arms 14-17 connected to legs 11-13 have apices substantially coincident with the corresponding legs while arms 18 and 19 have apices coincident with their center lines. Typically, each of arms 14-19 has an arc defined by a three inch radius that is swung through an angle of approximately 18 degrees for each of arms 14-17 and through an angle of approximately 36 degrees for arms 18 and 19. Thereby, the assembled modules provide composite arced surfaces covering an angle of substantially 36 degrees.

It is noted that arms 18 and 19 are supported solely by their connection to arms 14-17 by channels 21. This arrangement enables the false flooring of the present invention to be economically constructed and enables each module to be deflected sufficiently in response to loading by a person standing thereon, whereby fatigue to the legs of the person is materially reduced. If arms 18 and 19 were supported by a leg beneath them, deflection of the module would be materially reduced and the price of the unit would be materially increased. In addition, the configuration of channels 21, in combination with the arcing or arms 14-19, enables the false flooring to have sufficient strength to withstand loads due to personnel walking thereon and objects being dropped.

To prevent slippage to objects placed on the false flooring of the present invention and of persons walking on the flooring, each of arms 14-19 includes a multiplicity of longitudinally extending triangular shaped grooves 24.

To enable the floor modules to be cleaned and allow moisture which may be spilled on the module to escape therethrough, each of channels 21 includes a multiplicity of elongated apertures 25. Apertures 25 are punched at suitable intervals along the length of horizontal span 23 in each of channels 21 on center lines defined by grooves 24. It has been found that apertures having a length on the order of three-quarters of an inch and a width of approximately one-quarter of an inch enable liquid to escape from the floor while substantially preventing the passage of coins which may be inadvertently dropped on the flooring.

As shown in FIGS. 2 and 3 the several modules are adapted to be locked together. To this end, each of legs 12 includes a lower extension 26 and a tongue 27 extending from the right side thereof, as illustrated in the figures. At the end of extension 26 is provided upwardly extending locking lug 28 which is adapted to receive straight tail dog 29 extending from the right side of leg 11. Downwardly depending tongue 27 is adapted to engage the upper surface of downwardly depending seat 31, which extends between the upper end of leg 11 and the apex of arm 14. A pair of modules is interlocked by means of a plier-like tool so that the bottom surface of straight tail dog 29 securely engages the upper surface of extension 26 and the tapered end of the dog digs into the upwardly extending portion of lock lug 28 while tongue 27 and seat 31 are in engagement. The intersection point between two adjacent sections is such that the apex of the arced section between arms 14 and 15 is coincident with the intersection point. Thereby, to the casual observer of a completely assembled false floor, the separate modules appear as a unitary construction and it is difficult to perceive the connections between the various modular sections.

To maintain the lower extremities of legs 11 and 12 in a single plane in contact with an existing flooring 32, FIG. 3, leg 11 is approximately 0.058 inch shorter than leg 12, whereby the former leg is connected to the existing flooring through the leg 12 of the adjacent section. Thereby, the outer legs of each module are firmly connected to an existing flooring so that stability of the false flooring subsists. Each of the modular units has sufficient flexural properties so that the outer legs of the modules are connected to the existing flooring even if the flooring is uneven. For the same reason, an end module, such as left section 33 in FIG. 3, has the leg 11 thereof connected to an existing flooring after a short period of use.

To enable each module to be deflected in response to loading by personnel, so that personnel standing on the flooring will not suffer from excessive leg fatigue, center leg 13 is not long enough to be connected to existing flooring 32 unless the module is loaded by a
person. To this end, center leg 13 is approximately 0.078 inch shorter than leg 12, a distance approximately equal to the thickness of the metal extrusion. To prevent leg 13 from digging into the existing flooring 32 and to provide added strength to the bottom of the center leg, outwardly extending foot 34 is provided at the bottom thereof.

To describe the manner in which modules of the present invention are deflected in response to exemplary loads, specific consideration is now given to FIG. 3 of the drawings. In FIG. 3, loads indicated by arrows 35 and 36 are respectively applied to locked modular sections 37 and 38. Load 35 is applied to section 37 at a point aligned with leg 13, while load 36 is applied to section 38 on the center line of arm 19. In response to each of the loads, center legs 13 of sections 37 and 38 are deflected downwardly to engage existing flooring 32.

Arms 18 and 19 of section 37 are deflected downwardly from the left and right sides thereof, as viewed in the figures, while the channels connected to the left and right edges of arms 18 and 19 are not substantially deflected. The deflection of arms 18 and 19 increases substantially to the right and left edges thereof, while the channels 21 connecting arms 18 and 19 with arms 16 and 17 are substantially deflected, as are center arms 16 and 17. The expansion properties of the channels 21 connecting arms 16-19 together are to be noted.

With regard to deflection of module 38 in response to the force 36, it is noted that arm 15 pivots about the left edge of leg 12 and that the channel 21 connecting arms 16 and 18 together is pivoted about the intersection point of the left side of wall 22 with horizontal span 23. From the expansion properties of channel 21 between arms 16 and 18, relative comfort is imparted to the legs of personnel standing on modular section 38 and imparting the force designated by arrow 36. After the forces indicated by arrows 35 and 36 have been released, the modular floor sections have sufficient elasticity to spring back to the same position as indicated by FIG. 1.

In a typical application wherein personnel wearing flat shoes stands on the flooring of the present invention, the foot of the person extends over a pair of the channels onto at least a pair of the arcuate surfaces defined by arms 14-19. This result is achieved by providing a horizontal span to each of the channels of approximately one-quarter of an inch and forming each composite arcuate surface formed by arms 14-19 with a total span of approximately one inch. These dimensions enable personnel standing on the flooring to have relatively significant air spaces between a portion of their shoes, while preventing tripping.

In many instances, it is desirable to provide a sloping side to the end of the false flooring of the present invention. The embodiment of FIG. 4 enables such a result to be attained by providing a pair of legs 41 and 42, separated by a generally horizontal, curving section 43 connecting the legs 41 and 42. Arm 19 is formed in exactly the same manner as described supra with regard to leg 11, while leg 42 is illustrated as being inclined to the horizontal by an angle of 60°. In the alternative, to provide greater ease in enabling hand trucks to be rolled onto the false flooring, leg 42 can be approximately 45°. The alternative construction, however, has the disadvantage of reducing the strength of the extended unit of FIG. 4. Typically, the extended unit of FIG. 4 is merely a slight appendage to the last three-legged unit of the type illustrated by FIG. 1. Thereby, the horizontal extent of arm 19 is generally on the order of one inch and the horizontal projection of leg 42 is approximately 5/8 of an inch.

In certain areas, the three-legged, full width, six inch extrusion of FIG. 1 does not provide the required amount of false flooring. To enable the false flooring of the present invention to be utilized with virtually any sized area, the embodiments of FIGS. 5-7 were developed. In the embodiments of FIGS. 5-7, the same principles as are utilized in the embodiment of FIG. 1 are employed.

In the embodiment of FIG. 5, a pair of downwardly depending legs 44 and 45 is connected to each other by arms 46 and 47 and channel 48. The dimensions of legs 44 and 45 are identical with the dimensions of legs 11 and 12 of the full width unit of FIG. 1, while the dimensions of elements 46, 47 and 48 are respectively the same as the dimensions of elements 14, 15 and 21 in the FIG. 1 embodiment. Thereby, with the embodiment of FIG. 5, an extension of approximately two inches is provided at the end of a full width six inch module.

With the module of FIG. 6, a three inch submodule width span is provided by including a pair of vertically extending legs 51 and 52 between which are provided arms 53-55 and channels 56 and 57. Legs 51 and 52 are constructed and dimensioned identically with legs 11 and 12 of the embodiment of FIG. 1, while arms 53, 54 and 55 are equivalent in dimension with arms 14, 18 and 15, respectively of the full span embodiment. Similarly, channels 56 and 57 are identical with channels 21 in FIG. 1.

A submodule extension having a span of 4½ inches is provided by the embodiment of FIG. 7. In the embodiment of FIG. 7, three downwardly depending legs 61, 62 and 63 are provided, which legs are equivalent with legs 11, 12 and 13 in the previously described full span embodiment of FIG. 1. Between legs 61 and 63, the extrusion is identical with the cross section of the FIG. 1 embodiment between legs 11 and 13, while the false flooring between legs 62 and 63 includes arms 64 and 65, as well as channel 66. Arms 64 and 65 are dimensioned identically with the arms 17 and 15, respectively, of FIG. 1, while channel 66 is equivalent to channel 21.

The various submodule false flooring sections of FIGS. 5-7 provide many of the attributes of the full false flooring of FIG. 1. In particular, the configurations of FIGS. 6 and 7 provide comfort to personnel standing thereon since there is substantial deflection between a pair of legs thereof. While the relatively small sections on the right side of FIG. 7 and in the embodiment of FIG. 5 do not provide the comfort to personnel as is attained with the embodiment of FIG. 1, these sections are of relatively small span and personnel will walk thereon to any great extent. In addition, the sections are of sufficiently narrow span as to preclude an entire foot from being placed thereon.

The sloping section of FIG. 4 can be added to either the full span module of FIG. 1 or any of the submodule span modules of FIGS. 5-7, as specifically illustrated in FIG. 6. Thereby, various combinations of the sloping section and the full and submodule modules can be attained as the requirements of a particular area dictate. While there have been described and illustrated several specific embodiments of the invention, it will be clear that variations in the details of the embodiments specifically illustrated and described may be made without departing from the true spirit and scope of the invention as defined in the appended claims.

I claim:
1. A false flooring adapted to be laid on an existing floor comprising a plurality of elongated metal sections adapted to be interlocked, each of said sections having a cross-sectional shape through a plane at right angles to the direction of elongation in the form of: first and second legs respectively positioned substantially at opposite ends of the section, a center leg, first and second separate, substantially horizontal supporting arms respectively extending at substantially right angles from each of said first and second legs, third and fourth substantially horizontal arms extending in opposite directions from said center leg, each of said arms having substan-
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tially coplanar load receiving surfaces, each of said legs extending in the vertical direction away from each of said arms by substantially the same extent toward the existing floor, and downwardly extending channel means separately connecting said arms together and being suspended between said legs to form an expansion joint in response to a load being applied to an arm.

7. The flooring of claim 1 further including fifth and sixth substantially horizontal arms, said channel means comprising first, second third and fourth channels, said first channel connecting said first and fifth arms together, said second channel connecting said third and fifth arms together, said third channel connecting said fourth and sixth arms together, and said fourth channel connecting said second and sixth arms together, said fifth and sixth arms being supported only by said channels and having load receiving surfaces substantially coplanar with the load receiving surfaces of said other arms.

8. The flooring of claim 2 wherein each of said arms is in the form of an arc having a curvature extending away from the floor.

4. The flooring of claim 3 wherein each of said channels includes a pair of sloping vertical walls.

5. A false flooring adapted to be laid on an existing floor comprising a plurality of elongated metal sections adapted to be interlocked, each of said sections having a cross-sectional shape through a plane at right angles to the direction of elongation in the form of: first and second legs respectively positioned substantially at opposite ends of the section, a center leg, first and second separate, substantially horizontal supporting arms respectively extending at substantially right angles from each of said first and second legs, third and fourth substantially horizontal arms extending in opposite directions from said center leg, each of said arms having substantially coplanar load receiving surfaces, each of said legs extending in the vertical direction away from each of said arms by substantially the same extent toward the existing floor, and downwardly extending channel means separately connecting said arms together, said channel means extending vertically away from said arms by a distance substantially less than the extent of said legs away from said arms, fifth and sixth substantially horizontal arms, said channel means comprising first, second third and fourth channels, said first channel connecting said first and fifth arms together, said second channel connecting said third and fifth arms together, said third channel connecting said fourth and sixth arms together, and said fourth channel connecting said second and sixth arms together, said fifth and sixth arms being supported only by said channels and having load receiving surfaces substantially coplanar with the load receiving surfaces of said other arms.
9 floor, and downwardly extending channel means separately connecting said arms together, said channel means extending vertically away from said arms by a distance substantially less than the extent of said legs away from said arms, each of said arms being in the form of an arc having a curvature extending away from the floor, and wherein each of said arcs has an apex, the apices of the arcs of said first and second arms being substantially aligned with said first and second legs, respectively, the apices of the arcs of said third and fourth arms both being aligned with said center leg.

14. A false flooring adapted to be laid on an existing floor comprising a plurality of elongated metal sections adapted to be interlocked, each of said sections having a cross-sectional shape through a plane at right angles to the direction of elongation in the form of: first and second legs respectively positioned substantially at opposite ends of the section, a center leg, first and second separate, substantially horizontal supporting arms respectively extending at substantially right angles from each of said first and second legs, third and fourth substantially horizontal arms extending in opposite directions from said center leg, each of said arms having substantially coplanar load receiving surfaces, each of said legs extending in the vertical direction away from each of said arms by substantially the same extent toward the existing floor, and downwardly extending channel means separately connecting said arms together, said channel means extending vertically away from said arms by a distance substantially less than the extent of said legs away from said arms and wherein said first and second legs are connected to engage the floor whether the section is loaded or unloaded, said center leg having a length such that it is connected to engage the floor only in response to the section being loaded.

15. A false flooring laid on an existing horizontal floor comprising a plurality of elongated, interlocked metal sections, each of said sections having a cross-sectional shape through a plane at right angles to the direction of elongation in the form of: first and second legs respectively positioned substantially at opposite ends of the section, first and second separate, substantially horizontal supporting arms respectively extending at substantially right angles from each of said first and second legs, each of said arms having substantially coplanar, horizontally extending load receiving surfaces, each of said legs extending in the vertical direction away from each of said arms by substantially the same extent toward the existing floor, one of said legs being in contact with the floor, and downwardly extending channel means separately connecting said arms together and being suspended between said legs to form an expansion joint in response to a load being applied to an arm.

16. The flooring of claim 15 further including another substantially horizontal arm substantially coplanar with said first and second arms, and wherein said channel means connects said first and second arms to said another arm.

17. The flooring of claim 16 wherein each of said arms is in the form of an arc having a curvature extending away from the floor.

18. The flooring of claim 17 wherein said channel means includes a pair of sloping vertical walls.

19. The flooring of claim 16 wherein said channel means includes a pair of sloping vertical walls.

20. The flooring of claim 15 wherein said channel means includes a pair of sloping vertical walls.

21. The flooring of claim 15 wherein there is provided a further section, said further section having a downwardly extending leg having a substantial slope on one side thereof.

22. The flooring of claim 15 wherein said channel means includes a pair of sloping vertical walls and a horizontal span connecting said walls together.

23. The flooring of claim 15 wherein each of said arms is in the form of an arc having a curvature extending away from the floor, each of said arms having an apex, the apices of the arcs of said first and second arms being substantially aligned with the first and second legs, respectively.

24. A false flooring adapted to be laid on an existing floor comprising a plurality of elongated metal sections adapted to be interlocked, each of said sections having a cross-sectional shape through a plane at right angles to the direction of elongation in the form of: first and second legs respectively positioned substantially at opposite ends of the section, a center leg located between said first and second legs, substantially horizontal and coplanar load bearing arm means extending substantially at right angles from each of said legs, and downwardly extending expansion joint means for connecting each of said arm means and legs together and being suspended between said legs, each of said legs extending in the vertical direction away from each of said arm means by substantially the same extent toward the existing floor.

25. The flooring of claim 24 wherein said first and second legs are connected to engage the floor whether the section is loaded or unloaded, said center leg having a length such that it is connected to engage the floor only in response to the section being loaded.

26. A false flooring adapted to be laid on an existing floor comprising a plurality of elongated metal sections adapted to be interlocked, each of said sections having a cross-sectional shape through a plane at right angles to the direction of elongation in the form of: first and second legs respectively positioned substantially at opposite ends of the section, a center leg located between said first and second legs, substantially horizontal and coplanar load bearing arm means extending substantially at right angles from each of said legs, and downwardly extending expansion joint means for connecting each of said arm means and legs together, said first and second legs being connected to engage the floor whether the section is loaded or unloaded, said center leg having a length such that it is connected to engage the floor only in response to the section being loaded.

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