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McGeary et al.

[11] **3,783,471**

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[54] **FOOT GRILLES AND MATS**

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[52] **U.S. Cl.** **15/215,** 52/181, 161/67

[51] **Int. Cl.** **A47l 23/22,** E04f 19/10

[58] **Field of Search** ..... 52/667, 181; 15/215, 15/216, 217, 238, 239, 240; 160/231, 231 A; 161/67

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[57] **ABSTRACT**

A foot grille, grating, mat, or the like comprises parallel, closely spaced bars, each of which has a shallow channel that has overhanging lips and receives and captures a replaceable carpet strip. Each carpet strip has a semi-rigid backing that imparts sufficient stiffness to the carpet to prevent it from pulling out of the bar channel.

10 Claims, 5 Drawing Figures

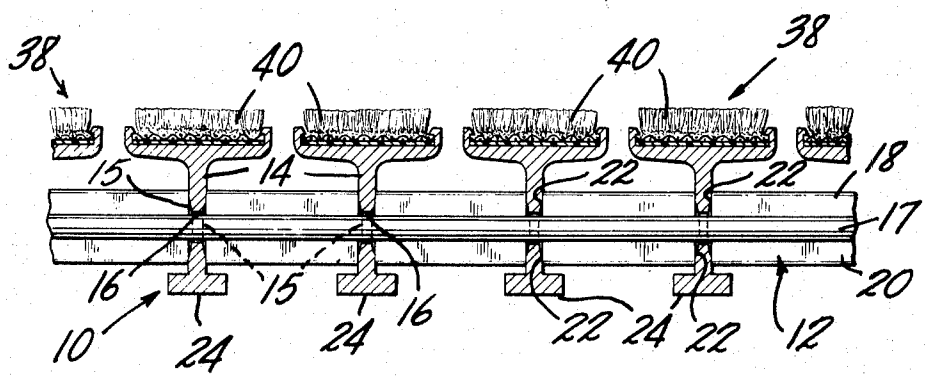


FIG. 1

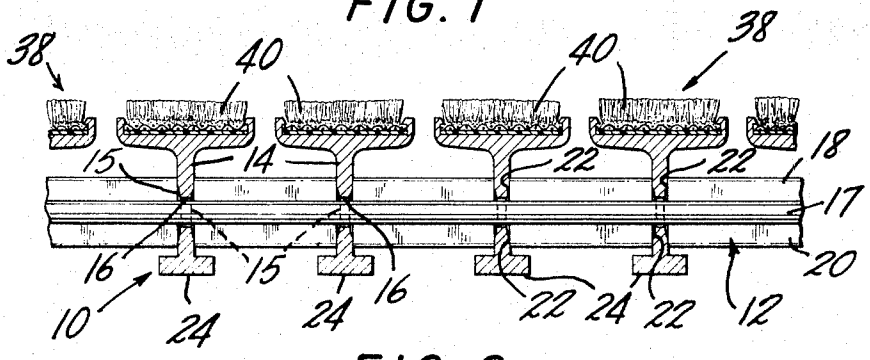


FIG. 2

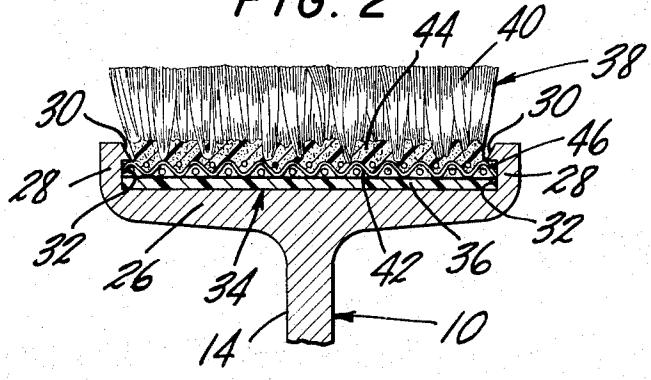


FIG. 3

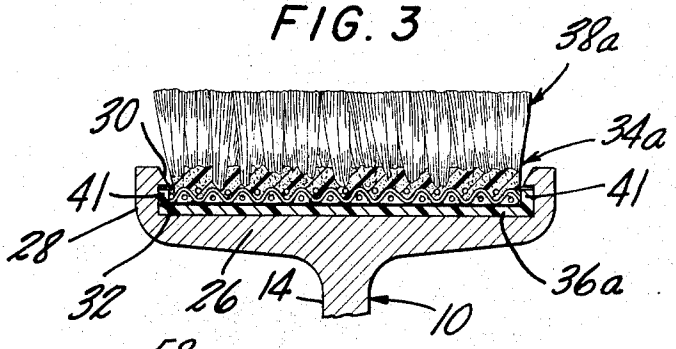


FIG. 4

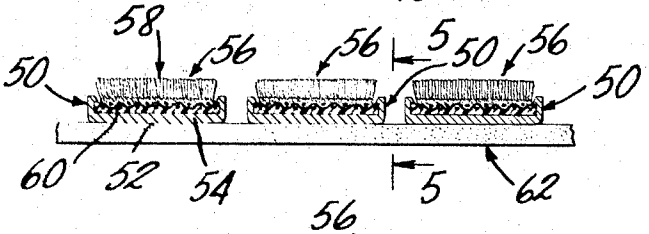
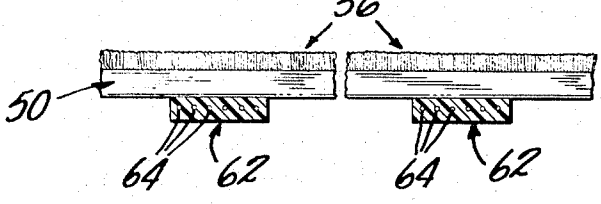


FIG. 5



FOOT GRILLES AND MATS

BACKGROUND OF THE INVENTION

This invention relates to grilles, gratings, mats and the like of the type used, for example, in building entrances for dirt removal from the footwear of persons entering the building.

It is common practice in both residential and commerical buildings to use grilles, gratings or mats either inside or outside the entrances to the building so that persons entering the building can scrape dirt from their footwear. A wide variety of entrance gratings and mats are available for this purpose.

There are several important attributes that any entrance foot grille or mat should have. It should provide a surface that is effective in dislodging dirt from the footwear of persons treading upon it. It should be capable of retaining dirt dislodged from the footwear for subsequent removal. It should be relatively easy to clean, preferably with a self-cleaning action on at least the surface that is walked upon. The materials from which the mats or grilles are made should be capable of withstanding to the greatest degree possible the environmental conditions in which the mats or grilles are used, such as the abrading action of being walked upon, water, materials commonly present with water and dirt that may be carried on the footwear of persons treading upon the grille or mat, sunlight and temperature conditions.

Foot grilles and mats of various types in common use may meet some of the requirements quite well, but often do not meet others. For example, rigid metal grilles are usually durable and resistant to conditions in the environment, and have a self-cleaning action, insofar as dirt removed from footwear falls into the spaces between the grille bars. However, the hard surface of the metal grille bars usually provides only limited cleaning effectiveness. On the other hand, pile fabrics, such as carpets or fiber mats, are usually very effective in cleaning footwear, but tend to be less durable and subject to rapid wear.

The assignee of the present application has for some time manufactured and sold a form of rigid metal foot grille having closely-spaced interconnected metal bars. The tops of the bars are provided with surfaces of various materials and forms that enhance cleaning effectiveness, durability, or attractiveness, such as plastic wearing surfaces, an abrasive material surface, a serrating of the material of the bars and the like. These grilles have been widely accepted and have provided excellent service. Reference may be made to U.S. Pat. No. 3,383,822 for a complete description of such foot grilles.

One form of grille of the type described in the abovementioned patent has surfaces on the tops of the bars constituted by strips of carpet permanently installed in shallow channels by an adhesive. The pile material of the carpet is very effective in cleaning footwear, can be matched for color and carpet material to carpeting within the building in which the grille is used, and has various other advantages. Unfortunately, the carpet materials are subject to wearing out relatively quickly, and inasmuch as the carpet material is permanently glued in place on the bars, the useful life of the grille can be somewhat limited, especially when used in a high traffic area, such as the entrance to a store or an office building.

SUMMARY OF THE INVENTION

There is provided, in accordance with the invention, a novel and improved foot grating, grille, mat or the like that is durable, highly effective in cleaning the footwear of persons treading elements it, is easy to clean and has, in particular, the advantage of embodying replaceable pile surface elements which enable the grille to provide virtually unlimited service life. When a pile elementbecomes undesirably worn, discolored or for any other reason unsatisfactory to the user, the pile fabric element can be quickly and easily removed and replaced by new elements.

More particularly, a foot grille, grating, mator the like, in accordance with the invention, comprises a multiplicity of spaced-apart, elongated bars of uniform cross-section along their length. Each of the bars includes, in cross-section, an essentially flat base portion, a flange portion along each side of and extending upwardly from the base portion to form a shallow channel, and a lip portion extending along and inwardly from the upper edge of each flange portion. The flanges and lips along each side of the flat base of each bar define marginal slots along each side of the bar that receive and capture an elongated strip of pile fabric material. Each pile fabric strip has an essentially flat base strip of semi-rigid material that imparts sufficient stiffness to the pile fabric material to provide a dimensional and geometric stability to the pile fabric that enables the pile fabric strip to be firmly retained and captured within the bar channel, each marginal edge of the pile fabric strip being firmly received and captured in the slots along each side of the bar. The semi-rigid base strip, therefore, prevents the pile fabric from pulling out of the shallow slot and thus allows the strip to be installed and retained in place without the use of any adhesive, fasteners or any other means, apart from the capturing of the marginal portions within the side slots on the bars. Fasteners may, however, be used at the ends of the strips, or a peripheral frame or end frames provided, to prevent the strips from sliding lengthwise.

Although the bars and the pile fabric strips of a foot grille, grating or mat, according to the invention, may be made of various materials, a preferred grating, grille or mat embodies bars formed, such as by extrusion from aluminum or a high-performance, rigid plastic, to the desired cross-section and pile fabrics with piles of synthetic material, such as acrylic, nylon, polypropylene or other polymeric materials known to be appropriate for pile fabrics. Advantageously, the pile fabric strips may be a conventional, commercially available carpet material. Indeed, the same carpet material that is used within the building where the grille or mat is installed can be used for the pile strips of the mat or grille. When carpet materials are used for the pile fabric strips of a grille or mat, the semi-rigid base of each strip may be a pre-formed strip of a semi-rigid material adhered to the back face of the preformed carpet with a suitable adhesive, or a suitable backing layer of a semi-rigid material, such as a polymeric material, may be applied by spraying, extrusion or other suitable coating process to the back face of the pre-formed carpet. The bottom surface of the base strip may have a dimpled or waffle pattern or texture to provide s suction action for improved resistance to pull-out of the carpet strip.

Many commerically available carpets have only limited resistance to pile yarns becoming detached from the backing. This is particularly true of many tufted carpets. Recently, a type of carpet that has a particularly strong connection between the pile and the backing and exhibits virtually no tendency for any fraying or pulling out of the pile along a cut edge has been introduced by Deering Milliken under the trademark "Milstar." In the "Milstar" carpet, a pile is joined to an appropriate backing fabric, such as a conventional jute backing, by a layer of polymeric material. The pile is in the form of generally U-shaped yarn segments; the yarn segments, however, do not punch through the fabric backing as they do in tufted carpet, but are embedded in the layer of a polymeric material and are firmly held in place by it. This type of pile fabric or carpet has, because of its construction, particularly good properties for use as the pile fabric strips in foot grilles and mats of the invention. The strips can readily be cut from a web of the carpet material to precise dimensions with almost no risk of the pile tearing loose from the backing, even along the extreme edges of the cut material. It is also possible to provide a routed edge along the pile face of the carpet in which substantially all of the pile material is cut away, leaving a thin layer of the polymeric material and the fabric backing of the carpet that is captured under or within the marginal slot along each side of the grille or mat bar. The construction of this type of pile fabric also permits the production of a carpet material in which the polymeric material layer by which the pile is joined to a backing is relatively stiff and can be considered as the semi-rigid base member that is important in providing sufficient rigidity in the pile fabric strip to prevent it from pulling out of the bar channel. Very good results are also obtained, however, by adhering a separate, preformed base strip of semi-rigid material on the back of a pre-formed conventional carpet material, either "Milstar" or some other carpet material of similar construction.

A relatively thin grille, grating or mat, according to the invention, is obtained by uniting bars having the replaceable pile fabric strips with connector members in the form of relatively thin strips extending generally transversely of the bars and joined to the bottoms of the bars. Advantageously, the connector strips are formed of a flexible material, such as an elastomeric, polymeric material, for example, a synthetic rubber or flexible plastic, or a fabric. The use of flexible connector members in a thin form of mat permits the mat to be rolled up for storage or for cleaning the floor surface under the mat. A thin form of grille or mat can be mounted in a shallow recess or pit in a floor or can be placed directly on any desired surface. Depending on the materials of the bars and the connector members, various ways can be used to unite the bars to the members. For example, most materials useful for the connector members can be securely united to metal or plastic bars with an epoxy or other high-peel strength adhesive; thermoplastic bars can be united to thermoplastic connector members by ultrasonic welding.

A foot grille, grating or mat, according to the invention, offers numerous advantages. As already mentioned, the most important advantages is that the pile fabric strips can easily be replaced when they become worn or unsightly for one reason or another. The pile fabric material provides very effective cleaning of the footwear of persons entering the building. The grilles, gratings and mats have a self-cleaning action, in that dirt scraped off footwear treading upon them tends to fall down between the bars and onto the floor or into a pit in which the mat or grille is installed. The pile fabric provides a very attractive surface that can be color-matched to suit the environment. The construction permits assembling strips of different colored pile materials or pile materials of different designs into the mat or grille to provide a desired design, emblem, numbering or lettering; in this respect it is very easy to provide a custom installation by appropriate changes in the pile material.

DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention, reference may be made to the following description of exemplary embodiments, taken in conjunction with figures of the accompanying drawings, in which:

FIG. **1** is an end view in section of a portion of an exemplary grille taken generally transversely across the grille bars;

FIG. **2** is an end view in section of a portion of a bar of the grille in FIG. **1**, the view being on a larger scale than FIG. **1**;

FIG. **3** is an end view in cross-section of a bar having a different form of pile fabric strip installed in it, the view being also on a larger scale than FIG. **1**;

FIG. **4** is an end view in cross-section of a portion of an exemplary thin form of mat taken generally transversely across the bars; and

FIG. **5** is a side view in cross-section of a portion of the mat of FIG. **4**, the view being taken generally along the lines **5—5** in FIG. **4** and in the direction of the arrows.

DESCRIPTION OF EXEMPLARY EMBODIMENT

The basic construction of the grille illustrated in the drawing is essentially the same as the grilles described and illustrated in U.S. Pat. No. 3,383,822 for "Grating" granted May 21, 1968 (the patent referred to above). Reference may be made to that patent for a complete description of the basic structure of the grille and the manner in which it is assembled. Briefly, the grille comprises a multiplicity of closely spaced, parallel grille bars joined together into a rigid grille unit by connector rods **12.** The bars **10** are preferably continuous extrusions of uniform cross-section and formed from aluminum, brass, plastic or other suitable material and then cut to the desired length. Each of the grille bars includes, in cross-section, a web portion **14,** the central part of which is of reduced thickness, relative to the upper and lower parts, to provide concavities **15** in each face. The web portion of each bar is formed with a series of spaced-apart, key-like holes **16** that generally match the cross-section shape of the connector rods **12.** Each connector rod (several are used to join the grille into a grille assembly) has, in cross-section, a circular center section (reference numeral **17** in FIG. **1,** as viewed in elevation) and two flanges **18** and **20** extending from diametrically opposite points on the circular center section **17** and aligned on a plane that includes the axis of the center section **17.**

The two flanges **18** and **20** of the connector rod **12** are formed with slots **22** located on centers equal to the desired center-to-center spacing between the grille bars **10.** The grille is assembled by inserting the connector rods **12** through the matching key-like holes **16** in the

grille bars. The holes **16** in the grille bars are oriented so that the rods are inserted through the bars with the flanges of the rods in a horizontal plane. After all of the grille bars **10** are assembled onto the connector rods, each connector rod is rotated about its longitudinal axis to bring the two flanges **18** and **20** on each rod **12** into a generally vertical plane, as illustrated in FIG. **1.** The dimensions of the slots **22** in the lengthwise direction of the connector rods **12** are slightly less than the dimensions at the corresponding locations of the web portions **14** of each grille bar. Accordingly, the web portions of the several grille bars become wedged or clampled between the opposite edges of each slot **22,** and because of the dimensional relationship between the width of the slot and the thickness of the web portion where the slot walls engage the web portion of each grille bar, there is a firm frictional engagement between them which connects the bars into a strong, rigid grille structure.

Each grille bar **10** has, in cross-section, a flange portion **24** at the bottom of the web portion **14** and an upper portion located at the top of the web portion. The upper portion is composed of a substantially flat base portion **26** (see FIG. **2**), a flange portion **28** extending upwardly from each side of the base **26** and forming a shallow channel in the top portion of the bar, and a lip portion **30** at the top of each flange portion and extending inwardly toward the center of the bar. Each flange portion **28,** lip portion **30** and the marginal portion of the base portion **26** define a continuous longitudinal slot **32** at each side of the shallow channel presented by the top portion of each bar, such channel having a top opening of substantial width represented by the distance between the innermost extremities of the lip portions **30.**

The shallow channel of the upper portion of each grille bar **10** receives a pile fabric strip **34** that constitutes the tread surface of the grille. As mentioned above, the pile fabric strip may be of various materials, but preferably is a carpet of synthetic material having a base **36** of semi-rigid material to impart stiffness to the carpet. The pile fabric strip **34** in the embodiment shown in the drawing comprises a strip of carpet **38** of a type having a pile **40** of generally U-shaped loops of yarn adhered to a fabric backing **42** by a layer of a polymeric material **44** that has been formed *in situ* on the faric and into which the loops have been pressed during the process of manufacture. Inasmuch as the construction of this particular type of carpet provides the important advantage of being substantially free of any tendency for tearing away of the pile, in other words, an overall secure bond between the pile and the backing, it is appropriate to consider the carpet construction in some detail.

A carpet of this type is made by coating the backing fabric **42** with a layer of a plastisol of a polymeric material, such as polyvinylchloride, in semi-liquid or paste from and then appropriately forming and pushing the yarn loops into the plastisol coating. The plastisol layer is then fused and then cooled to solidify it, and the result is a layer of plastic material that is firmly adhered to the backing and in which the pile loops are embedded with the base portions encapsulated in the layer of plastic. As mentioned above, carpet materials of this type have recently become available commercially.

The pile fabric strips **34** of the grille illustrated in the drawings are made sufficiently stiff to retain them in the bar channels by laminating to the carpet strip **38** a base strip **36** with an appropriate adhesive. The base strip **36** is made of an appropriate semi-rigid material, advantageously a plastic, such as a medium density polyvinylchloride. In the embodiment of FIG. **2,** the strip **36** is of uniform thickness entirely across its width. The pile fabric strip **34*a*** in the embodiment of FIG. **3** is similar to that of the embodiment of FIG. **2,** except that the base strip **36*a*** has flanges **41** formed along its sides to provide a shallow recess in which the carpet material **38*a*** is received. In the embodiment of FIG. **2,** the strips can be made by laminating a sheet of carpet material to a sheet of the base strip material and then sawing or otherwise appropriately cutting the composite sheet into strips of appropriate widths. In the embodiment of FIG. **3,** the strips of carpet are cut out separately, and the pre-formed base strips **36*a*** are laminated to the individual carpet strips.

In the embodiment of FIG. **2,** the upper side edges of the carpet strips are routed away to remove the pile and part of the plastic layer and thereby to leave a small lateral projection **46** along each edge of the carpet strip **38** constituted by a portion of the layer **44** of plastic material of the carpet, the fabric backing **42,** and the side marginal portions of the base strip **36.** Each of the side projections **46** has a thickness substantially equal to the vertical dimension of the slot **32** at the edges of the top portion of each bar **10,** and the transverse dimension between the extremities of the two projections **46** is substantially equal or just slightly less than that dimension measured horizontally between the inner faces of the flange portions **28,** that is, the bases of the slots **32.** Consequently, the projections **46** of the pile fabric strips **34** are received and captured within the channel at the top portion of each grille bar **10.**

The embodiment of FIG. **3** also involves a similar receiving and capturing of the pile fabric strip **34*a*** in the channel of the bar **10.** In this instance, however, the width of the carpet strip **38*a*** is substantially equal to the dimension of the top opening between the innermost extremities of the lip portions **30** of the bars **10.** The semi-rigid base strip **36*a*** is dimensioned to fit firmly within the channel with the side marginal portions received and captured in the slots **32** at each side of the bar **10.** Consequently, both embodiments achieve the same result, but in a slightly different manner.

FIGS. **4** and **5** of the drawings illustrate a relatively thin mat having bars **50** that are substantially identical in cross-sectional shape to the top portions of the bars **10** of the grille illustrated in FIG. **1** except that the bottom surface **52** of the base portion **54** of each bar **50** is substantially flat. Each bar **50** receives a replaceable pile fabric strip **56** composed of a pre-formed carpet of the type described above and illustrated in FIGS. **2** and **3.** Instead of providing a separate pre-formed base strip of semi-rigid material, however, the pile fabric strip **56** has a coating **60** of a polymeric material applied to the under side of the carpet strip **58.** In particular, an epoxy resin compound is sprayed onto the fabric backing of the carpet strip. Upon setting, the epoxy resin imparts substantial stiffness, that is, geometric and dimensional stability, to the pile fabric strip **56** that prevents the pile fabric strip from pulling out of the shallow channel in the bar **50.** Apart from the above-mentioned differences, the bars **50** and pile fabric strip **56** in the embodiments of FIGS. **4** and **5** are identical to the embodi-

ments of FIG. 1 and therefore need not be described here in detail.

The bars 50 are united into a mat by spaced-apart, relatively thin strips 62 of a flexible material that extend transversely to the bars and across a suitable number of bars to provide a mat of the desired width. In particular, the embodiment employs strips of about, say, one-eighth inch to three-fourths inch thick and from about three-fourths inch to 1½ inches wide of neoprene synthetic rubber reinforced with longitudinally extending cords 64 that impart longitudinal stability to the strips. The thickness of the strips may be varied to provide a mat of the desired thickness. If the mat is to be placed directly on a floor surface, then very thin strips would be used. If a pit or recess is available in the floor, relatively thicker strips may be employed. The strips 62 are joined to the bottom surface of the bars by an epoxy or other appropriate adhesive, and very good bonds between the strips and the bars can be obtained with proper precautions in cleaning the bars. The bottoms of the bars may be roughened or serrated to assist in forming a strong connection, but several high-peel strength adhesives are available that permit the required bond to be achieved without roughening or serration of the bars. The strips may be cast *in situ* across the bottom surfaces of the bars and thereby be united and bonded directly to the bars. The width of the strips and the spacing lengthwise of the bars between the strips can be varied in accordance with the strength requirements. An increase in the width of each strip permits a stronger adhesive bond between the bars and the strips to be achieved; a greater overall strength in the mat is attained by spacing the strips relatively closely, say, on 4 inch centers. The strips can be color-matched to the pile fabric. Rubber or plastic connector strips 62 provide a desirable moderate resiliency and good nonslip properties to the mat.

The above-described embodiments of the invention are intended to be merely exemplary, and those skilled in the art will be able to make numerous variations and modifications of them without departing from the spirit and scope of the invention. All such variations and modifications are intended to be included within the scope of the invention as defined in the appended claims.

We claim:

1. A foot grille, grating, mat or the like comprising a multiplicity of parallel spaced-apart elongated bars of uniform cross-section along their length, each bar including in cross-section a base portion having an essentially flat shallow channel defined by a flange portion along each side of and extending upwardly from the base portion and a lip portion extending inwardly from the upper edge of each flange portion and defining with each flange portion and the adjacent side marginal part of the base portion an inwardly open slot extending along each side of the bar, the inner ends of the lip portions being spaced-apart to define an opening between them, and an elongated strip of a pile fabric material received by each bar, each pile fabric strip having an essentially flat base strip of a semi-rigid material that renders the pile fabric strip sufficiently stiff to prevent the pile fabric strip from being pulled up out of the bar channel, and a pile, each pile fabric strip being received on a bar with the side margins of the base strip firmly received and captured in the slots along each side of the bar, with the base strip resting on the base portion of the bar, and with the pile extending up through and above the opening between the inner edges of the lips, and each pile fabric strip further having a longitudinally continuous lateral projection extending out on each side thereof constituted at least by marginal portions of the semi-rigid base strip, each such lateral projection being of a thickness substantially equal to the corresponding thickness-wise dimension of the corresponding slot receiving it, and at least that part of the pile of the pile fabric material intermediate the lips of the bar being of a width less than the width of the base strip and not greater than the dimension between the inner edges of the lips.

2. A foot grille, grating, mat or the like according to claim 1 wherein the semi-rigid base of each pile fabric strip is a pre-formed strip of a semi-rigid material adhered to the back face of a pre-formed separate pile fabric.

3. A foot grille, grating, mat or the like according to claim 1 wherein the semi-rigid base of each pile fabric strip is a coating of semi-rigid material on a pile fabric.

4. A foot grille, grating, mat or the like according to claim 2 wherein the pile fabric is a carpet.

5. A foot grille, grating, mat or the like according to claim 1 wherein the pile fabric strip includes a pile of U-shaped yarn segments having portions at the bases of the U adhesively bonded *in situ* to a backing material by a layer of a polymeric binder material on the pile side of the backing material.

6. A foot grille, grating, mat or the like according to claim 5 wherein the pile along the side edges of each pile fabric strip is removed to create the said lateral projections and a portion of the binder material and the backing material along each side of the pile fabric strip constitutes said lateral projection and is received in a slot of the bar.

7. A foot grille, grating, mat or the like according to claim 1 and further comprising a multiplicity of connector members joined to the elongated bars to unite them in substantially parallel, closely-spaced relation.

8. A foot grille, grating, mat or the like according to claim 7 wherein the connector members are unitary, elongated elements extending transversely across a group of the bars and disposed substantially parallel to each other in spaced-apart relation.

9. A foot grille, grating, mat or the like according to claim 8 wherein the base portion of each bar has a substantially flat bottom surface and wherein the connector members are thin strips of a flexible material joined to the bottom surfaces of the bars.

10. A foot grille, grating, mat or the like according to claim 9 wherein the connector members are formed of an elastomeric material and are adhesively joined to the bars.

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