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GRILLWORK WITH ORNAMENTAL RELIEF OF FACE

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This application is a continuation-in-part of my co-

pending application Serial No. 157,436, filed December

6, 1961, now abandoned.

This invention, in general, relates to grillwork having a series of spaced bars or vanes in which indentations or recesses are provided in an an edge of the bars or vanes, which recesses have an easily visible contrast with the remaining portions of said edge. The invention also per-
tains to novel procedures and techniques used to produce the grillwork of the type described.

Briefly, the grilles of this invention are made of spaced bars or vanes, which are usually in approximate parallel orientation. One edge of the bars or vanes is provided with alternating raised segments and recessed segments.

In a preferred embodiment of my invention, the bars or vanes are made of metal. The best metal for the pur-
poses of my invention is an extrudable and anodizable metal, e.g., aluminum. One edge of the metal bar or vane is machined at spaced intervals to provide an edge having alternating raised and recessed segments or is provided with a strip or strips along its front edge to give a low relief pattern, design, etc.

The machined bar or vane is thereafter provided with a coating at least along said edge and preferably also over at least the two opposite sides of the bar or vane. While these coatings may be a metal-adherent paint or enamel, or a colored vitreous enamel coating in the case of steel bars or vanes, or other similar coatings, the preferred procedure of my invention for providing coloring on the aforesaid surfaces of the bars or vanes is done by anodizing a bar or vane made of an anodizable metal. For this purpose, aluminum or anodizable aluminum alloys are particularly suitable as an economical, readily anodizable metal.

The machined, aluminum bars or vanes are anodized by techniques well known in the art, after which the anodized surfaces of the bars are dyed with dyestuffs well known in the art. The choice of color of the dyestuffs is a matter of subjective choice. The dye color, how-

ever, should be one having a visible contrast with the silver color of aluminum. At least the machined edge containing the raised and recessed segments is anodized, although it is usually more convenient and is generally preferred to anodize and color by dyeing the entire bar or vane. If desired, the dyeing may be set and sealed by techniques well known in the art.

For purposes of this invention, the anodized and dyed surfaces of the bars or vanes shall be considered a coating. Reference hereinafter to coatings in the description of this invention and in the claims is intended to encompass these surfaces as well as surfaces having other coatings of the type heretofore described.

In the coating operation, the raised segments and the recessed segments of the edge of the bars or vanes both have a machined coating applied thereto. The raised seg-

ments are thereby polished or machined by wire wheels, grinding wheels or machine cutting tools to a depth sufficient to remove the coatings on the edge of the bars or vanes on the raised segments. The coatings on the recessed segments are left undisturbed.

As a result of this operation, the raised segments along this edge become the color of the metal beneath the coating. In the cases of aluminum, steel and the like, these raised portions have a silver appearance which con-
tracts with the coated portions of the bars or vanes.

Many grillwork patterns are attainable by utilizing vari-

ous lengths of the raised portions and various lengths of the recessed portions along the edge of the bars or vanes. Still other variations are attainable by arranging adjacent bars in the grillwork so that the raised segments and recessed segments are in columns, on the one hand, while in other cases, the respective raised segments and recessed segments of adjacent bars or vanes can be staggered. A few patterns out of the many grillwork patterns attain-
able by the following procedures and techniques of this invention are described hereinafter.

Several embodiments of the invention are illustrated in the drawings wherein:

FIG. 1 is a perspective view of one embodiment of the grillwork of my invention mounted in a frame of an air inlet or outlet grille of a heating or ventilating system.

FIG. 2 is a broken view in side elevation cross-section, taken on section 2—2 of FIG. 1.

FIG. 3 is a broken, rear elevation of the grillwork and frame shown in FIG. 1.

FIG. 4 is a fragmentary, detailed view taken on section 4—4 of FIG. 3.

FIGS. 5, 6 and 7 are front elevations of further em-

bodiments of the invention.

FIG. 8 is a perspective view of still another embodi-
mint of a grille, illustrating the application of the prin-
ciples of the invention to provide a grille with pictorial or artistic design in low relief.

FIG. 9 is a front elevation of a still further embodi-
mint, e.g., a low relief representation of a jet airplane in perspective and the letters "TV" representing the initials of a fictional airline.

FIG. 10 is a fragmentary, perspective view of a grille bar of another embodiment of the invention.

The air handling grilles of FIGS. 1—4 comprise a metal frame 1 of generally rectangular configuration in which a pair of opposite sides trapezoidal front face plates 2, 3 and on the other two opposite sides trapezoidal front face plates 4, 5. These face plates make up a frame around a central air passage defined by the four rearwardly-exten-
ting rectangular parts 6, 7, 8 and 9 extending rearward-
ly from the front face plates 2, 3, 4 and 5, respectively.

The rearwardly-extending parts 6, 7, 8 and 9 abut at their ends and form rectangular passageway adapted to be connected with the terminal end of ductwork of an air heating, cooling, and/or ventilating system. The frame 1 is made into a rigid structure by welding, soldering or brazing applied on the rear face of the frame at the corners 10 and also corners 11 of the segments 6, 7, 8 and 9.

Within the passageway formed by the segments 6—9 there is mounted a grillwork made of spaced bars or vanes 12 held in spaced relationship to each other on mounting rods or the like. The bars or vanes 12 may be held in spaced relation on the mounting rods by conventional tech-

niques utilizing welding, spacer-washers, jam-fits, etc., but it is preferred for the sake of simplicity of manufacture to mount the vanes or bars 12 in spaced fixed relation to each other on hollow members having a length approximately equal to the height of the opening of the air passageway.

The hollow members are shown in the illustrated embodi-

ment in the form of hollow tubes 13. These tubes ex-
tend through aligned holes in the bars or vanes 12 in close fitting relationship with said holes. A tight friction fit be-

tween the bars or vanes 12 and tube 13 is achieved by distorting at spaced points the outer surface of the hollow tubes 13 so as to form longitudinally extending ribs 14.
In the case of soft metals such as aluminum, the walls of the holes may be slightly depressed in the distortion of the hollow tube. The grillwork is formed by placing the bars or vanes 12 in a jig and inserting the tubes 13 through aligned holes predrilled in the bars or vanes 12. A mandrel having a plurality of spaced ribs of a radius slightly larger than the radius of the tubes is forced through the tubular members in a longitudinal direction. This procedure results in the formation of flutes or grooves 17 at spaced points in the inner walls of the tubes 13 and simultaneously results in the formation of longitudinal ribs 14 on the exterior walls of the tubes. These ribs are minor distortions in the walls, of the circumferential surface of the tube and cause the outer walls of the tubular member 13 to expand tightly against the inner walls of the holes of the bars or vanes 12. The amount by which the outer walls are thus expanded at spaced intervals is sufficient to tightly hold the bars or vanes 12 on the tubular members 13. This gives a rigid assembly of spaced bars or vanes mounted on the tubular supporting members 13.

As a specific example of one relationship between the mandrel and the tubular member 13, a tube having a 1/4" internal diameter and 9/16" outside diameter is inserted through holes in the bars or vanes 12 of slightly more than the 1/4" internal diameter. The body of the mandrel is 0.015-0.016" smaller in diameter than the 3/16" internal diameter of the tube 13. The mandrel has ribs which are 0.028" larger than the 3/16" internal diameter. Thereafter, the grillwork thus formed is assembled in the frame 1 by driving four pins 15 through holes in segments 6 and 7 into the four open ends of the two tubes 13 with a tight, friction fit between the pins and tubes. The assembled air distributing device is a rigid structure whose parts are not subject to vibration by air passing therethrough. As an alternate method of manufacture, the frame in which the grill is supported may be provided with holes aligned with the holes of the spaced bars or vanes and the hollow supporting members may extend through the holes in the frame. Then the mandrel can be pushed through the hollow member to cause it to expand at spaced points in the form of longitudinal ribs so that the outer side of the hollow member expands against the inside wall of the holes of the bars or vanes and also the inside wall of the frame member itself. The invention is not limited to the foregoing embodiments. There are various modifications to which my invention is equally applicable. For example, instead of a rectangular, square or round frame and corresponding opening, the frame may be circular, oval, triangular or other desired shape. Similarly, the passageway for the air formed by the rearwardly-extended portions may be of the same shape. It is further not required that the hollow members 13 be round. They may be hollow members having a flattened tubular form, or they may be rectangular, e.g., square, hollow members, triangular hollow members or oval hollow members. Also, especially in large grilles, a reinforcing bar can be inserted into the hollow supporting members after formation of the longitudinal ribs to give the supporting members additional rigidity. Also, the bars or vanes 13 may have other shapes and may be positioned at an angle with relation to the direction of air flow for deflecting the air in a desired direction.

The front edges of the bars or vanes 13 in the embodiment of FIG. 1 have rectangular recesses 16 cut in the front edge of these bars at regular, spaced intervals. The width of these recesses are colored by a coating that visibly contrasts with the metallic colored front faces on the raised portions 17 of the bars 12. In the preferred practice of the invention, the walls of the recesses 16 are dyed after anodizing the bars 12. The dye is markedly contrasting in color with the silver, metallic color of the base material, e.g., aluminum. Almost any color may be used for dyeing the walls of the recesses 16, but for the best contrasting effect it is preferred to use a dark color such as black, brown, dark green, dark blue or the like. It is also preferred that the upper and lower walls 18 and 19, respectively, of the bars 12 be colored in a similar manner to the recesses 16 with a coating contrasting with the silver color of the raised portions 17 so that the grillwork is made up of bars wherein the front faces of the raised sections are the only visible part of the bar and vane which are the silver color, the remainder of the bar or vane being a color contrasting with the natural metallic color of the raised edge portions 17.

The embodiments of FIGS. 5-7 show three additional designs on the grille face which may be achieved utilizing the recesses 16 and grooves 17 of the tubes and bars of the embodiment of FIG. 5. In the embodiment of FIG. 5, the raised portions 20 on the aluminum spaced bars or vanes are staggered in successive bars or vanes. The silver colored raised portions 20 have a length which is about twice the length of the recesses 21, the latter having an anodized and dyed coating which is a dark color, e.g., black, contrasting with the silver color of the raised portions 20.

In the embodiment of FIG. 6, the grille is of the same general character of the grille of FIG. 5 except that the length of the raised portions 22 of the bars or vanes is about double the length of the raised portions 20, and the length of the recesses 23 of the bars or vanes is about double the length of the recesses 21—giving a grille face design having a different appearance from that of FIG. 5.

In the embodiment of FIG. 6, the silver colored raised portions 24 and the contrastingly dyed, anodized recesses 25 are of the same length. This arrangement gives a design of a still further different over-all appearance.

The foregoing embodiments are illustrative of the literally hundreds of designs which are attainable in the practice of the invention. There are many other designs which may be provided by altering the length of the raised portions and/or the contrasting recesses and also by altering the relative positioning of the recesses and raised portions of a bar or vane in relation to the recesses and raised portions of adjacent bars or vanes. Furthermore, it is not essential to the practice of this invention that the design provided by the raised portions and contrasting recesses be a regular pattern of repeating units as is the case in the illustrated embodiments. The over-all design pattern provided by the raised portions and contrasting recesses may be an irregular pattern provided by random positioning of the raised portions and contrasting recesses in adjacent bars or vanes. Still further, the position of the raised portions on the recesses in adjacent rows may be, by predesign, positioned so that the recesses or raised portions form a geometric outline, a monogram, a figure, or other idioms on the grille face, e.g., a circle or series of circles, letters, a bird, or any other item.

As examples of the latter, FIGS. 8 and 9 show artistic or pictorial representations in low relief. The grille 26 of FIG. 8 comprises a vertical series of horizontal, parallel, grille bars 27 supported on three vertical tubes 28, 29, 30 in the manner aforedefined. The tubes are mounted in the grille frame 31. The raised portions (shown in white) 32 of the grille depict in low relief a male mandolin player 33 and a dancing woman 34. The raised portions 32 of the bars set off the over-all figures in basic outline while small recesses or notches 35 in the raised segments set off the hats, the legs, the skirt and the mandolin in the basic outline of the figures themselves. The raised segments 32 of the grille bars are contrasted from the darker, recessed ground 36 by one of the techniques heretofore described.

The grille of the embodiment of FIG. 9 is constructed like that of FIG. 8 but shows a grille with idioms symbolic of a company or other business enterprise, e.g., the letters "TV," formed by raised portions 37 of the grille bars 38. The grille may also have in solid form or in
phantom outline other symbols, figures, etc., representative of the business activity of the company or enterprise. Assuming the actual existence of TV Airlines, the grill may also show in low relief provided by raised portions 39 on the grill a symbol or figure representative of the airline business, e.g., a perspective view of a jet airplane 40. The foregoing embodiments are exemplary of the innumerable varieties of grilles which may be made in accordance with the invention. It will be appreciated that actual design, Indicia, etc., of the grill face may take many forms without departing from the spirit and scope of the invention. Furthermore, it is within the contemplation of the invention that the Indicia, design, figure(s), etc., on the grill may be recessed in the face of the grille instead of in low relief, by making the recessed, darker background in FIGS. 8 or 9 the raised portion of the grille bars and by making the bar portions defining the man 33, woman 34, letters "TV" and/or airplane 40 the recessed portions. The color contrast between raised and recessed portions on the grille face edges of the grille bars may be provided by any of the foregoing techniques. The embodiment of FIG. 10 employs another technique of providing the figure corresponding to those of the design for grilles of the type described. The graphic or pictorial designs, indicia, figures, etc., on the grille face. In this embodiment, the front edges of the grille bars need not be notched or cut to provide the design, Indicia, etc. Rather, each of the grille bars 41 have mounted on their front edges 42 one or more U-channel strips 43 cut to the length required and positioned on the grille bar in a manner so as to provide any one of the designs, Indicia, figures, etc., on the overall grille. Taking the grille of FIG. 8 as an example, the strips 43 would be mounted on the grille bars in lengths and positions corresponding to the positions of the raised segments corresponding to those of FIG. 8. The strips 43 thus arranged on the face of the grille provide in low relief the graphic representation of a male mandolin player and a dancing woman. The side walls 44 of the U-channel strips 43 may overlap the side walls 45 of the grille any desired depth or may be omitted. The side walls 44, however, are preferred because they provide additional gripping surface between the grille bars 41 and the strips 43. The U-channel strips 43 can be mounted by friction or snap fit only on the grille bars 41, but it is usually best to cement the strips on the bars 41 by means of epoxy cement or other adhesive means to prevent their working loose. The strips 43 may be metal extrusions, e.g., natural color or anodized and dyed aluminum, strips of a colored thermoplastic or thermosetting resin, metal strips, e.g., copper, brass, steel, stainless steel, vitreous enamelled steel, etc., bent into the desired shape in cross-section, and the like. The strips 43 should be a color or color shade which contrasts with the color or color shade of the front edge 42 of the grille bars 41 so that the low relief design, Indicia, figures, etc., are readily recognized on the grille face. As a specific illustration in the case of FIG. 10, the grille bar 41 may be an anodized aluminum bar with the front edge 42 dyed a dark color. The sides 45 preferably are also anodized and dyed in the same color. The strip 43, on the other hand, may be an aluminum strip which has the silvery color of metallic aluminum or which is anodized and dyed in a lighter shade of the same color or a different, lighter color contrasting with the darker color of the anodized and dyed surfaces of the grille bar 41. It will be appreciated that the shades or colors could be reversed, if desired.

It will be apparent, therefore, that the invention has many design adaptations as well as use adaptations for grillwork in wall or ceiling outlets or inlets for heating, ventilating and/or cooling systems, grillwork for heating or air-conditioning units, floor grilles, ornamental grillwork for space dividers in homes or commercial buildings, ornamental floor or sidewalk grating, foot treads for escalators and the like, and other similar or related uses for grillwork units.

The invention is hereby claimed as follows:

1. A grillwork structure comprising a series of spaced, aluminum bars, an edge of said bars having alternating recesses and raised portions thereon, said alternating said bars being anodized and dyed with a dye which contrasts with the silver color of the aluminum metal, and the raised portions of said edge being exposed aluminum to provide raised surfaces along said edge having the color of the aluminum metal alternating with recesses along said edge having the color of said dye.

2. The grillwork of claim 1 wherein said recesses and raised portions are spaced along the edges of said bars at regular intervals.

3. The grillwork of claim 1 wherein said bars are mounted in spaced, parallel relationship on rods extending through holes in said bars.

4. A grillwork structure comprising a series of spaced, aluminum bars having raised portions on the front edges of said bars, said bars being anodized and dyed with a dye which contrasts with the silver color of the aluminum metal, said raised portions forming in low relief a predetermined pattern on the face of said grillwork structure formed by said front edges of said bars, and said raised portions being exposed aluminum having said silver color of aluminum metal and contrasting with the color or shade of the remainder of said front edges of said bars.

5. A grillwork structure as claimed in claim 4 wherein said raised portions are strips secured to said front edges of said bars.

6. A grillwork structure comprising a series of spaced, aluminum metal bars having raised portions on the front edges of said bars, said bars being anodized and dyed with a dye which contrasts with the silver color of aluminum metal, said raised portions as a group defining a graphic representation on the front face of the grillwork structure in low relief, the front edges of said raised portions being exposed aluminum metal having the color of said metal of said metal bars, and the remainder of said front edges and the upper and lower surfaces of said bars having color which contrasts with said color of said aluminum metal whereby said graphic representation in said low relief stands out relative to the remainder of the front face of said grillwork structure.

7. A grillwork structure as claimed in claim 6 wherein said graphic representation is a pictorial design.

8. A grillwork structure comprising a series of spaced, elongated, aluminum bars, means holding said bars in spaced relation in the form of a grille, the front edges of said bars being notched by spaced notches extending transversely across said bars from the respective upper surfaces to the respective lower surfaces of said bars, the notches forming spaced recesses alternating with the unnotched higher portions along said front edges, said front edge and said upper and lower surfaces being anodized and dyed with a dye which contrasts with the silver color of aluminum metal, and said higher portions of said front edge being exposed aluminum metal having the silver color of aluminum metal, whereby said higher portions color-contrast with said anodized and dyed notches and said upper and lower surfaces.

9. A grillwork structure comprising a series of spaced, elongated bars, means holding said bars in spaced relationship in the form of a grille, a plurality of U-channel strips mounted over portions of front edges of said bars and portions of the sides of said bars at predetermined places thereon and providing on the front face of said grille raised portions forming in low relief a predetermined pattern on said face, and said strips being of a color or shade contrasting with the color or shade of said front edges of said bars, whereby said raised portions and the remaining portions of said front edges of said bars contrast from each other in color or shade.

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