

Jan. 24, 1939.

G. F. DRAKE

2,145,073

GRILLE AND METHOD OF MAKING THE SAME

Filed Dec. 19, 1936

2 Sheets-Sheet 1

Fig. 1.

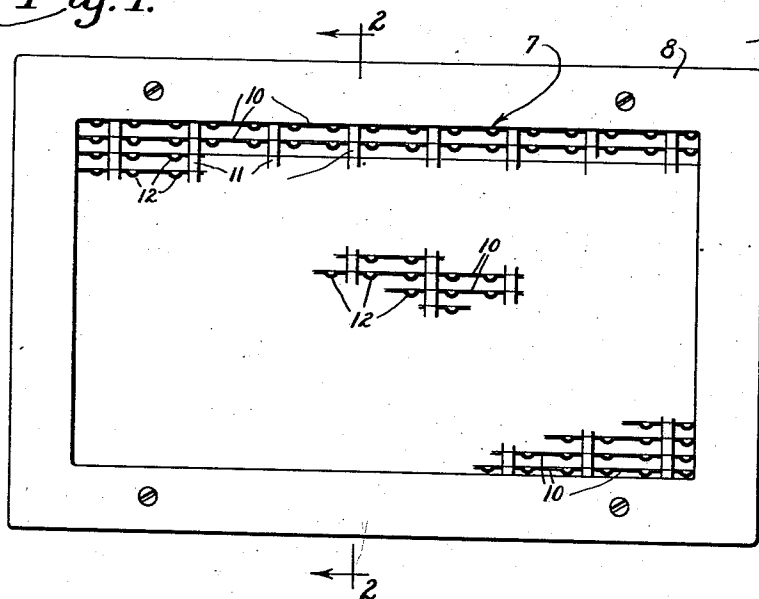


Fig. 2.

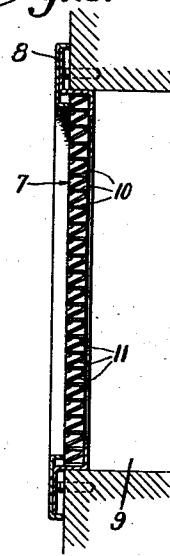
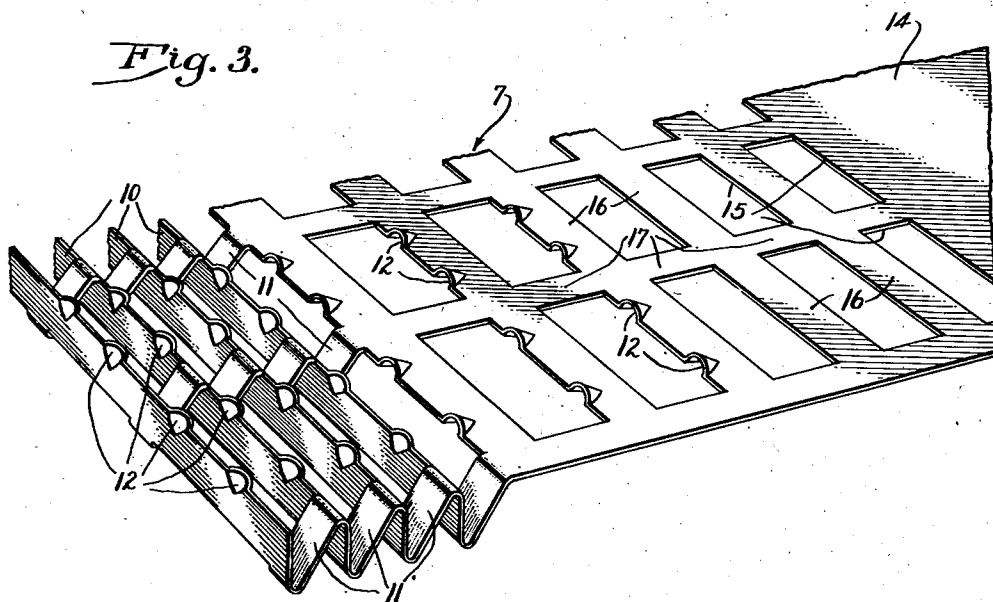


Fig. 3.



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2 Sheets-Sheet 2

Fig. 4.

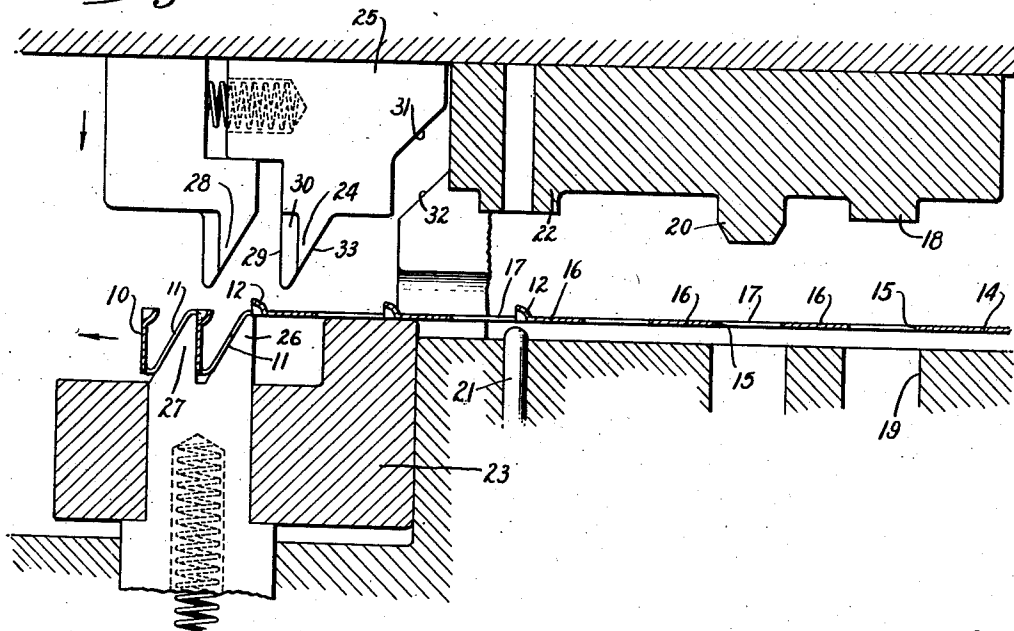


Fig. 5.

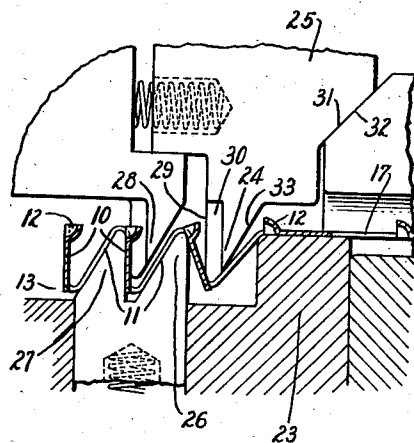
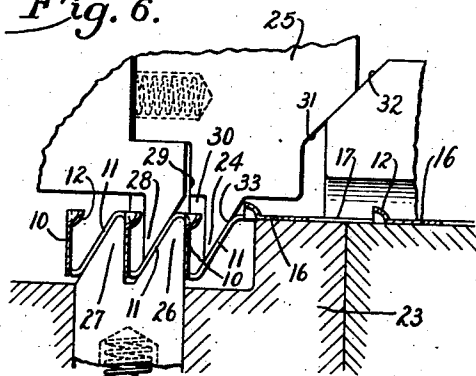


Fig. 6.



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GRILLE AND METHOD OF MAKING THE SAME

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Application December 19, 1936, Serial No. 116,688

4 Claims. (Cl. 29—160)

This invention relates to grilles for covering the open ends of air ducts and the like and has more particular reference to the construction of the so-called core of the grille.

5 The primary object of the invention is to provide a novel grille construction which may be formed by perforating and folding a single sheet of metal and which has fins of any desired width and lateral spacing, each comprising a single
10 thickness of the metal sheet.

A more detailed object is to provide a folded sheet metal grille core of the above character having its fins held in spaced relation by connecting elements integrally joined at opposite ends to
15 opposite sides of the adjacent fins.

The invention also resides in the novel construction of the grille which permits the formation of deflecting or diffusing elements along edge portions of the grille fins.

20 Another object is to provide a novel method of forming a grille of the above character from a sheet of metal.

Other objects and advantages of invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

25 Figure 1 is a front elevational view of a grille embodying the present invention.

Fig. 2 is a fragmentary sectional view taken
30 along the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary perspective view of the improved grille core in the process of construction.

35 Fig. 4 is a cross sectional view taken through the core shown in Fig. 3 and the cooperating die members by which the core is formed.

Figs. 5 and 6 are fragmentary views of a portion of Fig. 4 illustrating different steps in the folding process.

40 While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form or method disclosed, but intend to cover all modifications and alternative constructions and methods falling within the spirit and scope of the invention as expressed in the appended claims.

45 The grille shown in the drawings for purposes of illustration is of the type generally used for covering the discharge outlets in air distributing systems and comprises a core 7 mounted in a frame 8 adapted to be supported in the open end of an air duct 9. The core comprises a plurality
50 of thin fins 10 supported in spaced parallel planes

and disposed edgewise to the direction of air flow from the duct, each fin comprising in the present instance a single thickness of thin sheet metal.

If the grille is to be used for imparting directional control to the air stream discharged from the grille face, the fins are made substantially wider than the spaces between them. Parallel relation of the fins is maintained by spacing or connecting elements 11 spaced longitudinally of the fins and each integrally joined at its opposite ends to the adjacent fins. Herein, the elements 11 are substantially straight intermediate their ends and extend generally diagonally of the space between the adjacent fins with their opposite ends rounded slightly at the points of merge with the fins. A substantially rigid connection is thus formed between the front side edge of one fin and the rear edge of the adjacent fin.

It will be observed that the spaced parallel fins define between them narrow air passages for the flow of air through the grille, the opposing faces of the fins constituting parallel walls which are continuous throughout the length of the fins. The connecting elements extend diagonally across the air passages thus formed at longitudinally spaced points, and since their only function is that of maintaining the fins in properly spaced relation, they are spaced a substantial distance apart and made as narrow as possible consistent with the performance of this function, thereby reducing the resistance interposed by the connecting elements to the flow of air through the grille. Thus, the length of the air passages longitudinally of the fins is a multiple of, that is, several times, the width of the connecting element and the latter width is a small fraction of the distance between the adjacent elements connecting adjacent fins.

In the present instance, spaced deflecting or diffusing elements 12 are positioned along the edge portions of the grille fins and comprise short projections depressed in or bent from the edge portions of the fins without severing the metal at such edges. Of course, these projections may be in various shapes according to the desired inclination and effective area of the deflecting surfaces defined by the projections. By forming the projections along one side edge only of the fins, the grille may be mounted as shown with the deformed edges on the face or discharge side of the grille or, by reversing the grille in its mounting, the plain edges may be exposed. Extension of the connecting elements diagonally of the adjacent fins permits of such reversal, the elements

presenting the same general appearance when viewed from either side of the grille.

By deforming the individual fins to form the projections 12 and utilizing the diagonal connecting elements 11 spaced relatively close together along the fins, a truss-like structure is provided which possesses a substantial degree of rigidity as is desired in grilles of the present character.

The grille above described lends itself to manufacture at low cost by a novel method of punching and folding a single sheet 14 of thin metal. As illustrated herein, the method comprises punching parallel rows of elongated apertures 15 in the sheet to leave strips 16 of metal intervening between the adjacent rows and having parallel side edges, deforming the edge portions of the strips 16 to form the projections 12, and finally, while maintaining each strip in flattened condition, folding or corrugating the perforated and deformed sheet by relatively bending the cross-pieces 17 and the strips 16 along lines substantially coincident with the side edges of the strips so as to bring the strips 16 into parallelism throughout their lengths and widths with the cross pieces 17 of metal intervening between the adjacent apertures of each row connecting the adjacent strips. The rows of apertures 15 are spaced apart so that the strips 16 which when bent into parallel relation constitute the fins 10 in the finished grille will be of the desired width. Similarly, the width of the apertures is proportioned according to the desired spacing of the fins in the complete grille. The lengths of the apertures 15 determine the lateral spacing of the connecting elements 11 in the finished grille and each length is a multiple of the width of an individual connecting element.

Referring now to Figs. 4 and 5, the steps in the method above described are preferably performed upon the metal sheet as it is advanced step-by-step through sets of dies arranged in spaced relation. In the embodiment shown, the apertures 15 are punched by cooperating male and female dies 18 and 19 which operate while the sheet is being held in proper position by suitable locating punches 20 which are projected through previously punched apertures. A die having properly shaped projections 21 cooperates with a female die member 22 to deform the opposite side edges of the strips 16 and thereby form the projections 12 and 13 during the operation of the punch 18. While the dies 18 and 22 are retracted, the perforated sheet is held raised above the dies 21 by a block 23 normally urged upwardly to the position shown in Fig. 4 thereby permitting the sheet to advance.

Folding of the perforated sheet so that each strip 16 forms a fin 10 is preferably effected in two stages, the first occurring in the initial downward movement of a projection 24 on a vertically movable block 25 into the space between the block 23 and an upstanding but downwardly retractible projection 26. In such movement, the preceding fold is held against retraction by a projection 28 movable downwardly with the projection 24 so that the portion of the sheet between the projection 26 and the block 23 is bent downwardly as illustrated in Fig. 5, the unbent portion of the sheet being advanced along the block 23 to permit of such bending. The vertical forward wall 29 of the projection 24 has spaced recesses 30 therein to receive the diffusing projections 12.

The die block 25 is mounted to slide horizontally on its support and in the continued downward movement of the latter, a cam surface 31 on the block 25 cooperates with a stationary cam 32 to

shift the projection 24 toward the vertical wall of the projection 26 thereby bringing the engaged strip 16 into parallelism with the previously formed fins as shown in Fig. 6. Final shaping of the connecting element 11 engaged by the inclined surface 33 of the projection 24 occurs in the next stroke of the dies when this element is pressed between the inclined surfaces of the projections 26 and 28 and the fin is straightened between the vertical surface of the projection 28 and the opposed surface of an upstanding projection 27 paralleling the projection 26. In the final movement of the forming dies to the positions shown in Fig. 6, the locating pins 20 engage the strip after which the perforating punches 18 operate. Then, after retraction of the dies 18, 20, 22, 24 and 28, the metal sheet is raised by the block 23 and the projections 26 and 27 are retracted to permit the sheet to be advanced for the next cycle.

With the method above described, grilles composed of any number of fins and having any selected length less than the width of the dies may be constructed simply by passing a sheet of metal of the proper size through the dies. Thus, the present invention enables grille cores of widely varying sizes to be constructed quickly and at a low cost comparable to perforated plate grilles. In addition, the present grille is characterized by a large free air area and an artistic frontal appearance more nearly comparable to the more expensive fabricated sheet metal grilles now in common use. The fins may be made of any desired width relative to the spacing therebetween for the purpose of obstructing vision to the desired degree or obtaining directional control of the discharged air stream. Also, by varying the shape of the coating folding dies, the fins 10 may be disposed relative to the face of the grille at any angle other than the right angle shown.

I claim as my invention:

1. A grille through which air is to be blown, having a core made from a single sheet of metal and comprising a multiplicity of thin parallel fins each comprising a single layer of metal, said fins being spaced apart to define between them narrow air passages having opposed parallel walls continuous throughout the length of the fins, and narrow connecting elements integrally joined at opposite ends to opposite side edges of adjacent fins and extending diagonally across said passages at points spaced apart longitudinally of the passages, the length of the individual air passages between adjacent connecting elements being a multiple of the width of each connecting element so that said elements, while maintaining the spacing of said fins, offer comparatively small resistance to the flow of air through the grille.

2. A grille through which air is to be blown, having a core made from a single sheet of metal and comprising a multiplicity of thin parallel fins each comprising a single layer of metal disposed substantially perpendicular to the face of the grille, said fins being spaced apart to define between them narrow air passages each having opposed walls which are continuous and parallel to each other throughout the length and width of the fins, and narrow connecting elements integrally joined at opposite ends to opposite side edges of adjacent fins and extending diagonally across said passages at points spaced apart longitudinally of the passages, the length of the individual air passages between adjacent connecting elements being a multiple of the width of each connecting element so that said elements, while maintaining the spacing of said fins, offer com-

paratively small resistance to the flow of air through the grille.

3. The method of forming a parallel fin grille from a sheet of metal which comprises first punching out metal from said sheet to form parallel rows of apertures with the adjacent rows separated by continuous metal strips each having parallel side edges and a width equal to that of one grille fin to be formed, the length of each aperture measured longitudinally of its row being a multiple of the width of the element which connects the adjacent strips and which separates the adjacent ends of adjacent apertures in the row, then deforming the edge portion of each of said strips at points spaced along at least one side thereof and disposed between said connecting elements, and finally relatively bending said connecting elements and said strips along bending lines substantially coincident with said side edges to bring the strips into spaced parallel planes

while maintaining the strips substantially flat and the edges thereof deformed.

4. The method of forming a parallel fin grille from a sheet of metal which comprises first punching out metal from said sheet to form apertures arranged end to end in spaced parallel rows with the adjacent rows separated by continuous metal strips having parallel side edges and integrally joined by narrow connecting elements separating the adjacent apertures in the individual rows, each element having a width which is a small fraction of the length of an individual aperture, and relatively bending said strips and connecting elements along lines substantially coincident with the longitudinal side edges of said strips to bring said strips into parallelism throughout their lengths and widths and to extend said elements diagonally of the spaces between the adjacent strips.

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