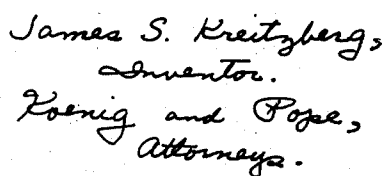


**J. S. KREITZBERG**

REFLECTOR

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J. S. KREITZBERG

2,968,033

REFLECTOR

Filed April 22, 1957

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FIG. 3.

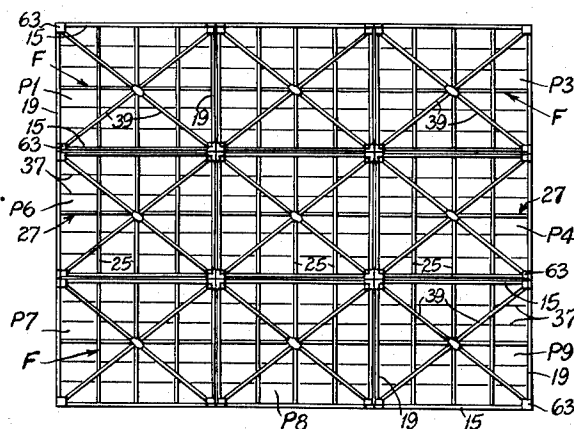
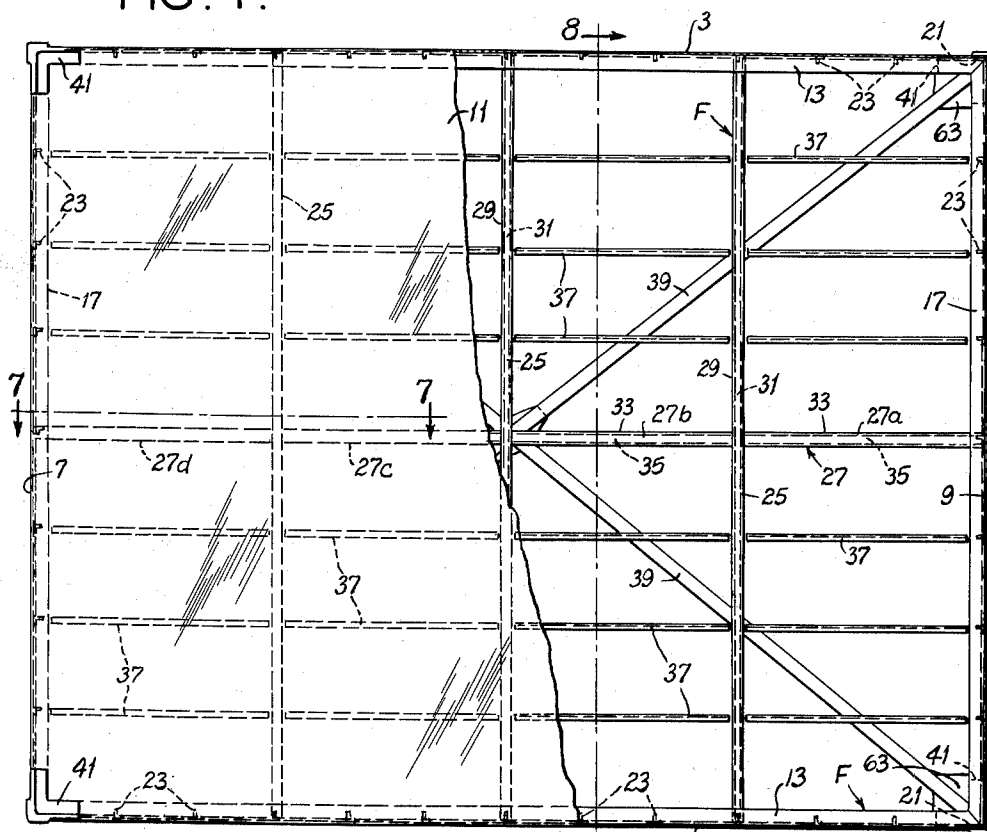


FIG. 4.



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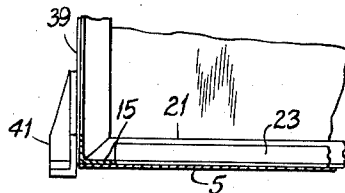
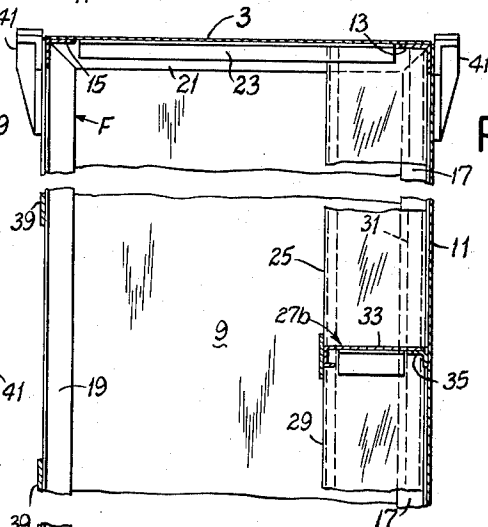
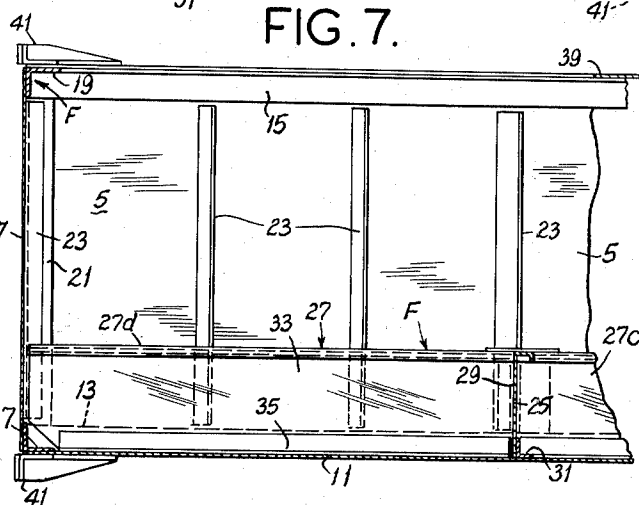
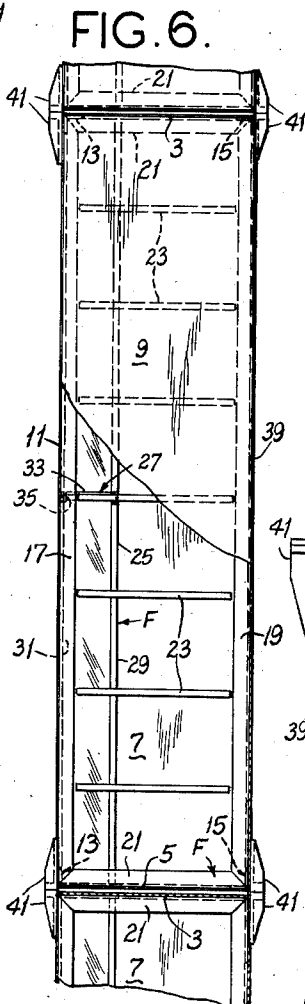
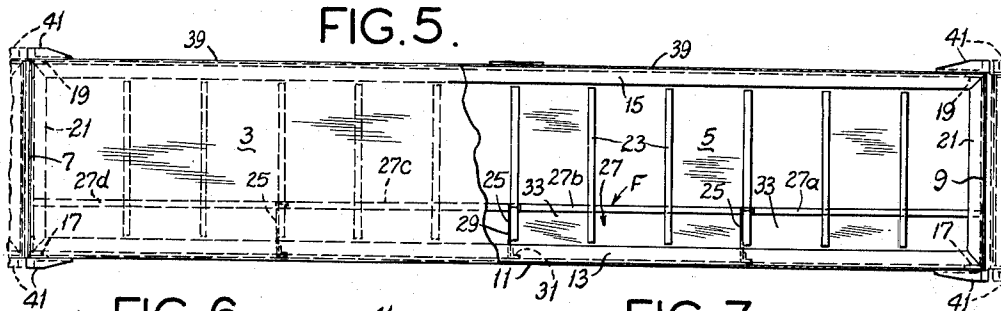
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Filed April 22, 1957

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FIG. 9.

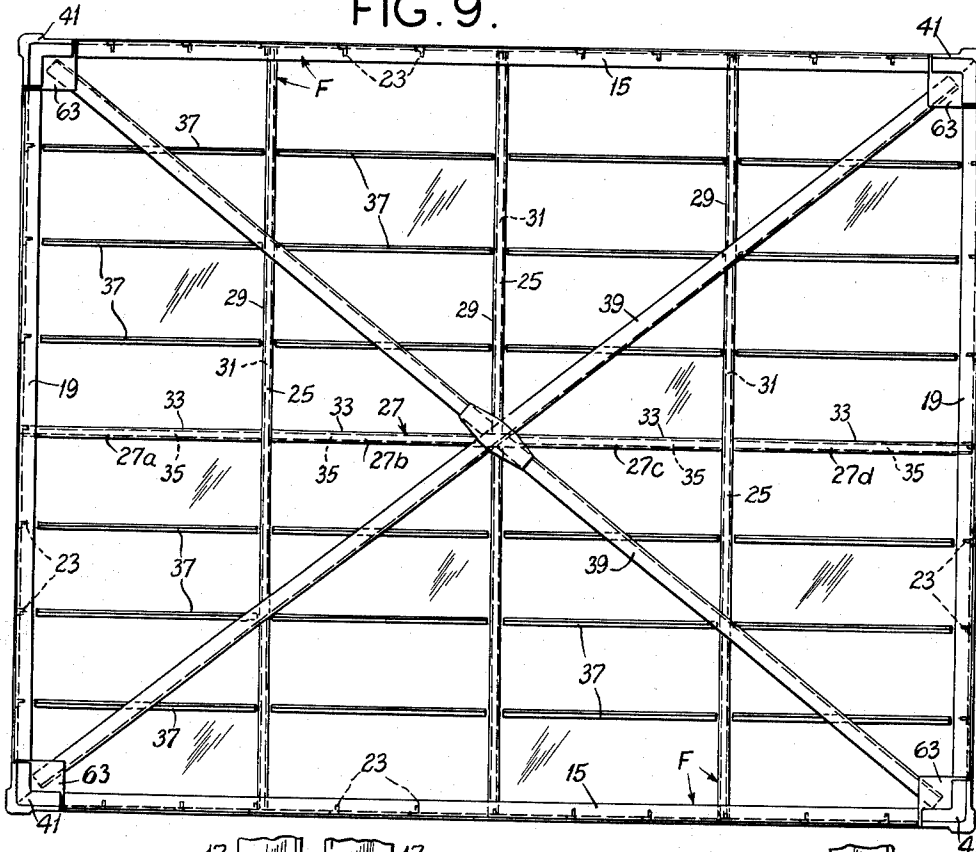


FIG. 10.

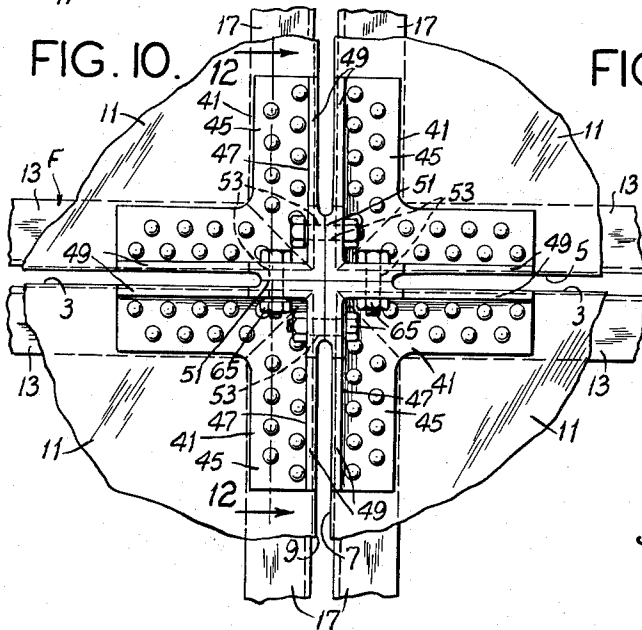
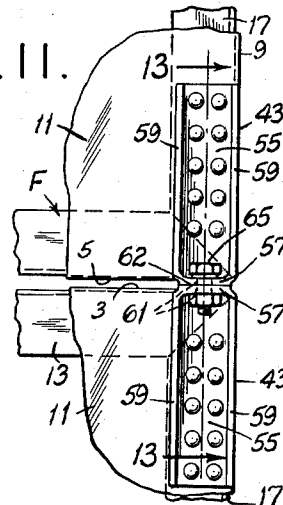


FIG. 11.



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REFLECTOR

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Filed Apr. 22, 1957, Ser. No. 654,177

9 Claims. (Cl. 343-18)

This invention relates to reflectors, and more particularly to a reflector for microwaves, also known as a "passive repeater."

Among the several objects of the invention may be noted the provision of a reflector of the class described which is of modular construction for simplicity of erection in the field, noting that such reflectors are often installed in remote locations at high altitudes; the provision of a reflector of this class the modules of which are easily assembled to provide a perfectly flat reflecting surface which remains perfectly flat and in proper position even under the most severe weather conditions; and the provision of a reflector of this class which is economical to manufacture. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

Fig. 1 is a front elevation of a reflector of this invention;

Fig. 2 is an enlarged end elevation of Fig. 1, showing a supporting structure for the reflector;

Fig. 3 is a rear elevation of the reflector per se, on the same scale as Fig. 1;

Fig. 4 is a front elevation of one module or panel of the reflector, on a larger scale than Fig. 1, and with a front skin plate of the panel partly broken away to reveal interior details;

Fig. 5 is a view in plan of Fig. 4, with a top skin plate of the panel partly broken away;

Fig. 6 is a right end view of Fig. 4, with a side skin plate of the panel partly broken away;

Fig. 7 is an enlarged horizontal section taken on line 7-7 of Fig. 4;

Fig. 8 is an enlarged vertical section, with parts broken away, taken on line 8-8 of Fig. 4;

Fig. 9 is a rear elevation of Fig. 4;

Fig. 10 is an enlarged detail of a panel connection at an inside meeting corner;

Fig. 11 is an enlarged detail of a panel connection at an outside meeting corner;

Fig. 12 is a section taken on line 12-12 of Fig. 10; and

Fig. 13 is a section taken on line 13-13 of Fig. 11. Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, a microwave reflector of this invention, designated in its entirety by the reference character 1, is shown to comprise an assembly of individual modular reflector units or panels, each generally identified by the reference character P. Nine such panels are shown and specifically designated P1 to P9. Each panel is of rectangular shape in elevation. The panels are arranged in horizontal rows and vertical tiers of three panels each. Thus, as shown in Fig. 1, the top

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row comprises panels P1-P3 (from right to left), the middle row comprises panels P4-P6 (from left to right), the bottom row comprises panels P7-P9 (from right to left), the left tier comprises panels P3, P4 and P9, the middle tier comprises panels P2, P5 and P8 and the right tier comprises panels P1, P6 and P7.

Each unit or panel P is of rectangular box-like form having a top skin plate 3, a bottom skin plate 5, left and right side skin plates 7 and 9, and a front skin plate 11, and being open at the rear. A typical panel is eight feet high, ten feet wide and two feet deep. In such a panel, the skin plates may, for example, be 0.064 inch thick duralumin coated with aluminum.

Each unit of panel P comprises an internal frame work generally designated F to which the skin plates are secured as by riveting. As shown best in Figs. 4-9, this framework comprises horizontal top and bottom front angle-section bars which, being identical, are each designated 13, and horizontal top and bottom rear angle-section bars which, being identical, are each designated 15. It further comprises vertical left and right side front angle-section bars which, being identical, are each designated 17, and vertical left and right side rear angle-section bars which, being identical, are each designated 19. It further comprises horizontal front-to-rear angle-section bars, each designated 21, at the four corners of the unit. The top and bottom skin plates are secured on the horizontal legs of bars 13, 15 and 21. The side skin plates are secured on the vertical side legs of bars 17, 19 and 21. The front skin plate is secured on the vertical front legs of bars 13 and 17.

Angle-section stiffener bars such as indicated at 23 are secured, as by riveting, to the inside of the top, bottom and side skin plates 3, 5, 7 and 9 for stiffening these plates. These bars 23 extend from front-to-rear between the bars 13 and 15 and between the bars 17 and 19. Three vertical spars, each designated 25, and a central horizontal spar 27 are secured to the inside of the front skin plate 11, as by riveting, for stiffening this plate. Each spar 25 consists of a J-shaped sheet stock section 29 extending between the top and bottom front bars 13 and an angle-section bar 31 (see Figs. 7 and 8). The spar 27 comprises four sections 27a, 27b, 27c and 27d, each consisting of a J-shaped sheet stock section 33 and an angle-section bar 35. Additional horizontal front skin plate stiffeners are indicated at 37. Each of these consists of an angle-section bar. The framework F further comprises diagonal brace members 39 extending across the open rear of the panel P.

It is preferred that the above-described members making up the framework F be duralumin members. It will be understood that rivets (preferably aluminum rivets) are used for securing the members of the framework together and for securing the skin plates thereto, the riveting being conventional and hence not illustrated in detail.

The units or panels P are held in assembly with the front skin plates 11 of the panels coplanar by means comprising holding members or lugs secured to the front and rear of the panels at the meeting corners thereof with fasteners extending through adjacent ones of the holding members. Two different types of these corner holding members or lugs are used, one type designated 41 being used at the inside meeting panel corners, the other type designated 43 being used at the outside meeting panel corners. The inside corner holding member or lug 41 (which is illustrated in detail in Figs. 10 and 12) is a metal casting (preferably aluminum) having a flat L-shaped base portion 45 and an outstanding L-shaped flange 47. This flange may be tapered at its ends as indicated at 49. The corner portion of the L-shaped flange is made thicker than the remainder to provide

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outwardly offset faces 51, which are preferably machined flat. Bolt holes 53 are provided in each wing of this thickened corner portion. The outside corner holding member or lug 43 (which is illustrated in detail in Figs. 11 and 13) is a metal casting (preferably aluminum) having a flat base portion 55, a flange 57 at one end, and triangular side flange portions 59. A bolt hole 61 is provided in the flange 57. The outside face 62 of flange 57 is preferably machined flat.

Panel P5 (the center panel) has inside type corner lugs 41 at both front and rear at all four corners. Panel P2 has lugs 41 at both front and rear at its two lower corners and outside type corner lugs 43 arranged with their flanges 57 vertical at both front and rear at its two upper corners. Panel P8 has lugs 41 at both front and rear at its two upper corners and lugs 43 arranged with their flanges 57 vertical at both front and rear at its two lower corners. Panels P1 and P3 have lugs 41 at both front and rear at their lower inside corners, lugs 43 arranged with their flanges 57 vertical at both front and rear at their upper corners which meet panel P2, and lugs 43 arranged with their flanges 57 horizontal at both front and rear at their side corners which meet panels P4 and P6. Panels P7 and P9 have lugs 41 at both front and rear at their upper inside corners, lugs 43 arranged with their flanges 57 vertical at both front and rear at their lower corners which meet panel P8, and lugs 43 arranged with their flanges 57 horizontal at both front and rear at their side corners which meet panels P4 and P6. Panels P4 and P6 have lugs 41 at both front and rear at their inside corners, and lugs 43 arranged with their flanges 57 horizontal at both front and rear at their outside corners.

The lugs 41 at the front of a panel have their base portions 45 secured over the front skin plate 11, with their flanges 47 angling around the respective corner and projecting forward from the panel, and with faces 51 offset outward from the corner. The lugs 41 at the rear of a panel have their base portions 45 secured over gusset plates 63 for the diagonal braces 39, with their flanges 47 angling around the respective corner and projecting rearward from the panel, and with faces 51 offset outward from the corner. At the inside meeting corners at both front and rear, the L-shaped flanges 47 of the lugs 41 are arranged in a cruciform manner (see Figs. 1 and 13). The lugs 43 at the front of a panel have their base portions 55 secured over the front skin plate 11 with their flanges 57 and 59 projecting forward and with their faces 62 offset outward. The lugs 43 at the rear of a panel have their base portions secured over the gusset plates 63 with their flanges 57 and 59 projecting rearward and their faces 62 offset outward. At the meeting corners, suitable fasteners such as bolts 65 extend through the bolt holes 53 and 61 of the adjacent lugs 41 and 43, as the case may be, to fasten the panels together with the front skin plates of the panels coplanar. At the inside meeting corners, faces 51 of adjacent lugs 41 abut one another. At the outside corners, faces 62 of adjacent lugs 43 abut one another. Since these faces are offset outward from the corners, there is some space between adjacent panels.

The reflector 1 (consisting of the assembly of panels P1 to P9) is carried by a steel supporting frame generally designated 67. As shown in Figs. 1 and 2, this frame comprises a pair of uprights 69 mounted on concrete footings 71. These uprights are located in the rear of the reflector and extend generally centrally of the left and right tiers of panels. A truss such as indicated at 73 extends rearward from each upright to a concrete footing 75. Upper and lower triangular frames such as indicated at 77 and 79 are secured to the rear of the reflector, and connections indicated generally at 81 and 83 are made between the uprights and these frames. These connections may be of such nature as to allow for adjustment of the reflector relative to the supporting

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frame 67 for accurate angling of the front face of the reflector.

The panels P are fabricated in the shop. Nine panels (in the case of the nine-panel reflector 1 shown) are preassembled in the shop with their front skin plates coplanar. The corner lugs 41 and 43 are applied, drilled and bolted together in making the preassembly. Then the panels are marked and disassembled (disassembly being easy because of the simple bolted connections) for shipment to the field. Reassembly in the field simply involves assembling the marked panels and bolting them together, and may be quickly and efficiently carried out, with assurance of alignment because of the preassembly.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A microwave reflector comprising an assembly of individual modular reflector units each of rectangular shape in elevation, said units being arranged in horizontal rows and vertical tiers, each unit being of rectangular box-like form having a flat front skin plate, each unit having an internal framework to which the front skin plate is secured, and means for holding the units in assembly with the front skin plates thereof coplanar comprising holding members secured to the front and rear of the units at the meeting corners thereof, the holding members which are secured to the front of the units projecting forward from the front skin plates and the holding members which are secured to the rear of the units projecting rearward therefrom, and fasteners extending through adjacent ones of said holding members in planes parallel to the plane of the front skin plates spaced forward and rearward of the units.

2. A microwave reflector comprising an assembly of individual modular reflector units each of rectangular shape in elevation, said units being arranged in horizontal rows and vertical tiers, each unit being of rectangular box-like form having flat top, bottom, side and front skin plates, each unit having an internal framework to which the skin plates are secured, and means for holding the units in assembly with the front skin plates thereof coplanar comprising holding members secured to the front and rear of the units at the meeting corners thereof, the holding members which are secured to the front of the units projecting forward from the front skin plates and the holding members which are secured to the rear of the units projecting rearward therefrom, and fasteners extending through adjacent ones of said holding members in planes parallel to the plane of the front skin plates spaced forward and rearward of the units.

3. A microwave reflector as set forth in claim 2 wherein the holding members are lugs which project out forward and rearward from the units, and wherein each lug at each inside meeting corner is formed for attachment of the lugs of two adjacent units.

4. A microwave reflector comprising an assembly of individual modular reflector units each of rectangular shape in elevation, said units being arranged in horizontal rows and vertical tiers, each unit being of rectangular box-like form having flat top, bottom, side and front skin plates and being open at the rear, each unit having an internal framework comprising top, bottom, side and front frame members to which the top, bottom, side and front skin plates are secured, and brace members extending across the open rear of the unit, and means for holding the units in assembly with the front skin plates coplanar comprising holding members secured to the front and rear of the units at the meeting corners thereof, the

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holding members which are secured to the front of the units projecting forward from the front skin plates and the holding members which are secured to the rear of the units projecting rearward therefrom, and fasteners extending through adjacent ones of said holding members in planes parallel to the plane of the front skin plates spaced forward and rearward of the units.

5. A microwave reflector as set forth in claim 4 wherein the holding members are lugs having engaging faces spaced outward from the units so that the units are spaced from one another.

6. A microwave reflector comprising an assembly of individual modular reflector units each of rectangular shape in elevation, said units being arranged in horizontal rows and vertical tiers, each unit being of rectangular box-like form having flat top, bottom, side and front skin plates and being open at the rear, each unit having an internal framework comprising top, bottom, side and front frame members to which the top, bottom, side and front skin plates are secured, and rear frame members extending across the open rear of the unit, and means for holding the units in assembly with the front skin plates coplanar comprising lugs secured to the front and rear of the units at the meeting corners thereof, the lugs secured to the front of the units projecting forward from the front skin plates and the lugs secured to the rear of the units projecting rearward therefrom, and fasteners parallel to the plane of the front skin plates spaced forward and rearward of the units, the lugs at the inside meeting corners having outstanding L-shaped portions

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and the four lugs at each inside meeting corner having their L-shaped portions arranged in a cruciform manner.

7. A microwave reflector as set forth in claim 6 wherein the lugs have engaging faces spaced outward from the units so that the units are spaced from one another.

8. A microwave reflector as set forth in claim 6 wherein each unit has stiffening means secured to the inside of the skin plates.

9. A microwave reflector as set forth in claim 8 wherein the stiffening means includes a central horizontal spar and vertical spars.

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## UNITED STATES PATENT OFFICE CERTIFICATION OF CORRECTION

Patent No. 2,968,033

January 10, 1961

James S. Kreitzberg

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, lines 27 and 28, for "the units projecting rearward therefrom, and fasteners paralalled to the plane of the front skin plates spaced for-" read -- the units projecting rearward therefrom, and fasteners extending through adjacent ones of said lugs in planes paralalled to the plane of the frontskin plates spaced for- --.

Signed and sealed this 6th day of June 1961.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

DAVID L. LADD

Commissioner of Patents

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UNITED STATES PATENT OFFICE  
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This certificate supersedes Certificate of Correction issued June 6th 1961.

Signed and sealed this 31st day of October 1961.

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