The present invention relates to construction features of a door for a panel screen room adapted to suppress or attenuate radio waves, and is a continuation-in-part of my Patent 2,765,362 issued October 2, 1956.

The invention concerns itself more particularly with the problem of providing a wave attenuating door in a screen room having double layers of shielding material which will preserve electrical continuity between corresponding shielding layers of the screen room and on the door, while maintaining the electrical isolation of the inner and outer shielding layers of both the room and the door.

Various materials are recognized to possess shielding characteristics which will serve the purpose of isolating space units against electromagnetic as well as electrostatic wave penetrations. These materials are usually metallic and planar in form, and their shielding efficiency is related to their conductivity and nonpermeability as well as to the preservation of continuous electrical conductivity between contiguous parts. By utilizing multiple mutually spaced shielding enclosures formed of appropriate materials, the quality of wave attenuation may be improved and extended over a wide range of frequencies.

The effectiveness of attenuation has also been recognized as factorially dependent upon the establishment of sufficient impedance in respect to double shield screens and for this purpose each screen is required to be maintained electrically insulated from the other. Since each screen is required to completely encompass the enclosure, one lying entirely within the other, there is thus presented the unique problem of conductivity coupling as between consecutive sections of the same screen and between the door and at the same time of securing isolation as between different screens both in the screen room and the door.

The screen should be made of highly conductive metal which possesses adequate tensile strength to withstand outline suspension, preferably 22 mesh copper screen wire or tinned ferrous wire to secure an effective barrier against emanation or invasion by radio waves within the bands subject to examination. The attenuation in logarithmic units through a shield layer has been evaluated as proportional to the first power of its thickness and to the square root of its conductivity, permeability and the wave frequency.

It is, therefore, a principal object of the present invention to provide a prefabricated screen room construction utilizing double shield shields having the inner and outer layers electrically insulated from each other throughout the screen room and in the door as well.

It is a further object of the invention to provide means to effect positive edge to edge contactal engagement between the door and screen room for corresponding shield elements to maintain continuous conductivity for the inner and outer shielding layers respectively.

Another object of the invention is to provide positively actuated means adapted to insure the aforementioned connections.

Yet another object of the invention is to provide means for use on a door frame to effect electrical connection between corresponding shielding elements on the door and the screen room and electrical isolation of the inner and outer layers.

For a better understanding thereof and for an explanation thereof in reference to particular structural elements, attention will now be directed to the accompanying illustrations in which corresponding parts are designated by like reference numerals throughout, and in which:

Fig. 1 is a side elevation of a screen door according to the present invention secured in a screen room, shown in fragmentary form;

Fig. 2 is a vertical section taken through the lines 2—2 of Fig. 1 showing the construction of the dual screen door, partly broken away;

Fig. 3 is a horizontal sectional view taken through the line 3—3 of Fig. 1 and Fig. 2 showing the dual construction of the door, being partly broken away.

Referring now to Fig. 1, a screen door 10 is disclosed having a rectangular frame 11 and front and back metallic shields which are formed preferably of 22 mesh copper screening used for the screen room, is pivotally secured by hinges 18 to a door frame 14 mounted in the screen room 16 and preferably extends substantially from top to bottom of the screen room. The door may also be provided with three pivotal handles 20 adapted to be removably engaged in the brackets 22 for maintaining it in shielding relation with the screen room.

As seen in Fig. 2, the construction of the screen room adjacent to the door frame 11 is substantially similar to that disclosed in my earlier filed application No. U. S. Patent No. 2,765,362 issued October 2, 1956. The outer bottom shielding layer 28 of the screen room is brought around the corner of the threshold member 24 and then is turned across the land 30 and set edgewise into the groove 32 cut into the edge of the panel in the manner described in the aforementioned pending application.

Thereupon a strip 34 is inserted to engage the screen tightly within the aforementioned groove 32.

The threshold member 24 is inset along the front edge thereof to provide a relatively narrow portion 35 and relatively wide portion 36 adapted to provide a seat for the bottom door frame piece 26. Thus the frame member 36 extends across the bottom of the entry way in abutting relation to the threshold 24 and is seated in sealing contact with the screen 28. At the same time the inner screen 38 extends downwardly between the threshold member 24 and frame member 36 and thence into the groove 40 where it is secured by strip 42 corresponding to strip 34. Preferably the channels 32 and 40 are narrow saw cuts, located at a predetermined distance from the adjacent panel face, to define the width of the land 30 and seating ledge 31. Also the grooves are preferably of such depth that when each edge of the screen is bottomed in its respective channel, after the screen has been stretched taut across the respective panel face and secured, for example, by staples, a slight amount of surplus screen material will exist so as to cause the marginal portions adjacent the land 30 and seating ledge 37 to bow outwardly from the surfaces of the said land and seating ledge to provide a resilient contact surface which will insure continuous conductive engagement with copper facings on the frame member 11, as will hereinafter be described.

The frame member 36 is provided with a double copper facing, each facing 37 and 39 extending along a lateral face of the frame and forming a flap over a marginal portion of the adjacent sides thereof. Accordingly the bottom folds contact the screens 28 and 38, respec...
tively, and conduct the electrical current from the screens in spaced relation to the top of the frame 36.

The construction at the top of the door is substantially similar to that at the bottom, and the threshold 24 and lintel 43 constitute horizontal members of a frame secured peripherally to the door frame 14, as will be hereinafter described.

The screen door itself is provided with a bottom beam 44 to which are secured external screen 46 and internal screen 48. The inner screen 48 is provided with a finger contact 50 secured to the lower end thereof and preferably extending over the elongated beveled block 52 and into the beveled groove 54 to be secured therein by screw means 56, the said screw means having the head set down below the level of the door edge to maintain the finger contact in arched condition and to avoid interference in opening and closing the door. The contact 50 is preferably formed of copper or copper alloy, and has closely spaced and curved fingers therealong. As shown in Fig. 2, the finger contact 50 is thereby disposed in an electrically connected relation with the copper facing on the beam 36 when the door is in closed position in the frame 11, so that the inner screen 48 of the door is grounded to the inner screen 38 of the screen room. A similar construction is provided for other portions of the door, as will be hereinafter described.

The construction of the upper portion of the door is identical with that of the lower portion and accordingly electrical continuity for the inner screen of the dual screen room is provided from the screen 38 through the facing 37 through the electrical contact 50 and along the screen 48 corresponding to the upper portions of the screen 38 to produce an effective inner shield across the entire door area.

The outer screen 46 for the door 10 has formed around the three sides thereof a contact finger element 58 which is protected by a brass backing plate 60 secured to the frame 11 by screws 61. Thus the lower edge of the element 58 is adapted to contact facing 39 when the door is shut to ground the screen 46 of the door to the screen 28 of the room. The same construction prevails at the upper portion of the screen door and accordingly continuous electrical contact for the outer screen is provided as is also shown in Fig. 2.

Now to Fig. 3, vertical frame members 62 and 64 for the door maintain the separation of the dual screens 46 and 48 transversely of the door. A door post 66 is provided having copper facings 67 and 69 at the front and rear thereof. The outer screen 28 is brought into electrical contact with the outer facing 69 by passing it between the vertical screen room frame member 68 and a post 70 secured thereto and within the groove of the rabbed portion 72 of the post 70 to be secured therein by fillet strip 74 after the method previously described.

The vertical posts 68, together with the threshold member 24 and the lintel 43, form a peripheral framework secured to the door frame 14 and adapted to maintain the outer and inner shielding layers of the shielding room 28 and 38 in spaced-apart, electrically isolated relationship. The vertical members 68 have the outer surfaces thereof spaced inwardly with respect to the screen 46 in a preferred embodiment in order that the slit 70 may have the land 76 thereof disposed in substantial registration with inset fold 78 of the outer facing 69.

A transverse bowed portion 79 is formed over the land 76 to contact firmly the fold 78; and inner screen 38 is brought into firm engagement with the inner facing 67 by similar means. Thus the screen is anchored in the groove 80 of vertical frame member 66 by strip 82, and the portion 84 passing over the land 86 is bowed to press against the copper facing 67 for reliable electrical connection therebetween.

The outer facing 69 provides a connection between outer screen 28 of the screen room and outer screen 46 of the screen door, through the said finger contact element 58 secured to the vertical marginal edge of screen 46 and having a backing plate 60 secured to post 66 to assure that element 58 will be held in proper position to establish contact with facing 69.

A brass plate 88 is screwed to the inner face of the post 66 to afford a similar backing for a finger contact 90 for electrical connection between the inner facing 67 and the internal screen 48 of the door, the brass bearing plate 92 providing a contact margin for screen 48. The post 94 likewise has a contact finger 95 with brass backing plate 96 secured thereto, adapted to contact brass bearing plate 98 at the other side of the door, and in fact, this construction may be used around the outer inner door if desired as an alternate construction to the outwardly turned fingers 50. In order to assure good contact between finger elements 90 and 95 and marginal plates 92 and 98, a plurality of coil springs 100 are set in the door frame 11 in back of the marginal plates to push these plates against the contact fingers when the door is shut. To this end, the contact frame 11 by screws or the like (not shown) set inwardly of the said marginal plates, 92 and 98.

The plate 96 is secured to a facing 102 corresponding to facing 67, and while the finger contact 95 and backing plate 98 therefor extend around three sides of the outside of the door, it is preferred to utilize an inwardly turned finger contact 104 along the hinged side of the door, in order to contact the facing 106. Facings 102 and 106 are adapted to establish electrical contact with screens 38 and 28 respectively, just as the other facings provided around the entire periphery of the frame or joint 14 insure contact at their respective junctures.

It will thus be seen that applicant's invention affords a reliable electrical connection between the inner shielding layer of the door and the inner shielding layer of the room and between the outer shielding layer of the door and the outer shielding layer of the room whenever the door is closed, since finger contact elements are provided which will always be disposed in appropriate position for contact between the respective elements without any danger of electrical contact between the inner and outer layers of the room.

Although I have provided means for effecting continuous electrical connection between the door frame and between the door frame and the screen room, and also means for maintaining continuous inner and outer shields in spaced electrically isolated relation both as regards the screen room and the door, I do not wish to be limited to the exact details described and it will be appreciated that details may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

What is claimed is:

1. A door construction for a radio wave attenuation room comprising a rectangular panel having a sheet of metallic shielding material covering each face, a door frame adapted to hingedly support said sheets for swinging contact fingers are disposed in substantially parallel relation to said door shielding, at least the inner
vertical fingers being secured to the inner facings of the vertical portion of the door frame whereby to afford electrical contact between the inner shielding on said door and the inner facings on said frame and the outer contact fingers being secured to said outer shielding, and a plurality of spring mounted electrically conductive bearing plates adapted to press upon at least the vertical inner contact fingers to secure electrical contact with adjacent shieldings and facings, said bearing plates being secured to the marginal edges of said inner screen and said inner screen being secured to said door panel inwardly of said bearing plates.

3. In the device according to claim 2, a metallic backing plate for each finger contact element secured to an inner facing on said frame and a metallic backing for each finger contact element secured to the sheet of metallic shielding material covering the outer face of the door whereby to maintain the said contact fingers in appropriate contacting position, said backing plates being secured to the inner frame elements and the outer face of the rectangular panel respectively.

4. The construction according to claim 2 wherein contact finger elements are secured to the top and bottom margins of the inner sheet of said door, and are bowed into overlying relation with the top and bottom door edges and set into said edges whereby to establish electrical contact with the inner facings disposed on the top and bottom portions of said frame when said door is in closed position.

5. In combination with the construction according to claim 3, a second frame secured peripherally to said first named frame, the top and bottom members of said second named frame each having an edge portion of reduced thickness whereby to seat the top and bottom members of said first named frame, said portions of reduced thickness having formed therein a pair of spaced-apart lands whereby inner and outer shielding layers of a screen room may be disposed thereover in contact with the inner and outer facings on said first named frame members in electrical isolation from each other, and the vertical members of said second named frame having formed along at least one edge thereof a marginal land extending inwardly from the frame face adjacent thereto, whereby the margin of the shielding layer adjacent said land may be turned over said land for electrical contact with a facing on said first named frame.

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