May 21, 1957 W. M. DUNN 2,793,245

RADIO SHIELDED ENCLOSURES

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FIG. 1

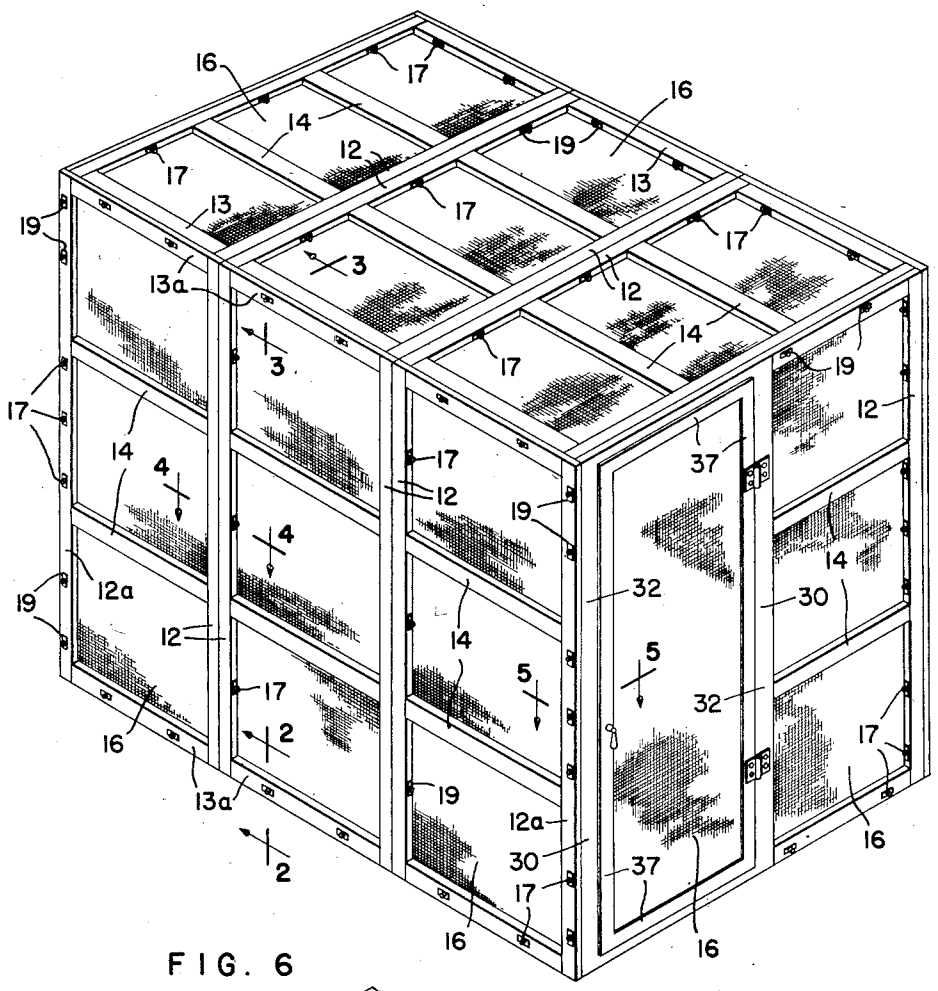
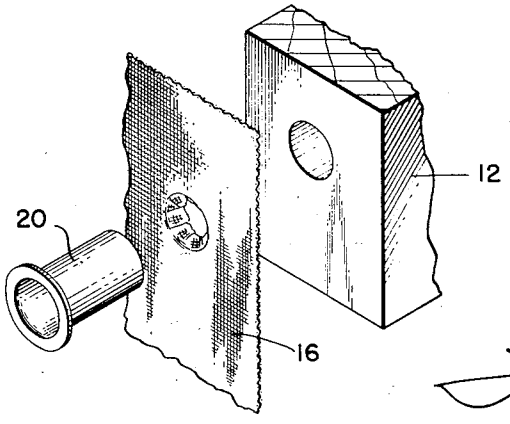


FIG. 6



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FIG. 2

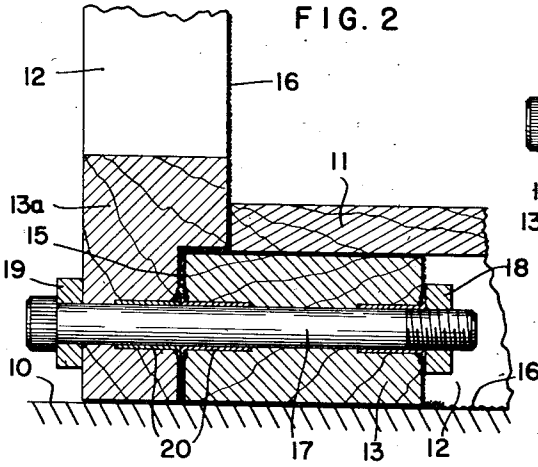


FIG. 3

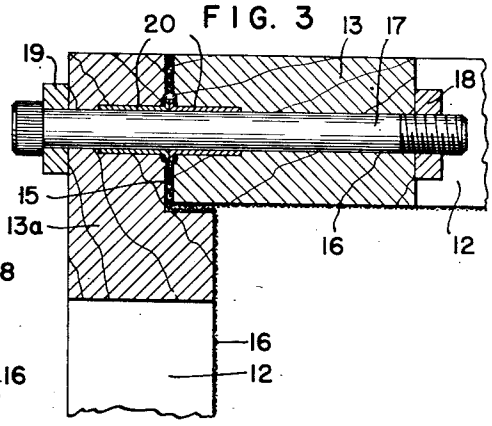


FIG. 4

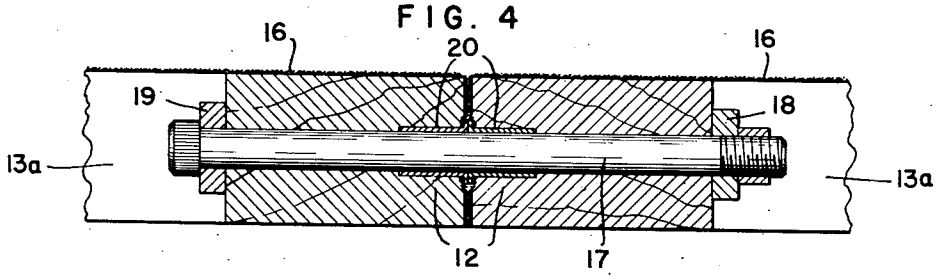
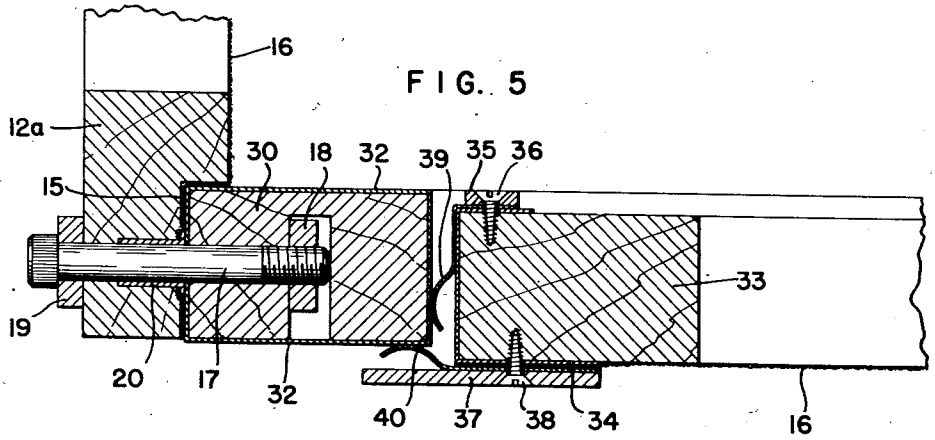


FIG. 5



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RADIO SHIELDED ENCLOSURES

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Application January 21, 1953, Serial No. 332,349

5 Claims. (Cl. 174—35)

This invention relates to radio shielded enclosures and it relates more particularly to such enclosures made of separable panels which may be shipped in "knocked down" form, and secured to each other at the desired locations to provide enclosures, the interior of which will be shielded against stray radio waves, and in which testing of various electrical instruments may be done without interference from such waves which otherwise would seriously affect the accuracy of the measurements and the success of the tests. Shielded enclosures of the character aforesaid are used in laboratories and in other places where various types of tests are performed such, for example, as radio interference measurements, radio frequency calibrations, radio inspection tests, testing equipment for measuring minute voltages and testing various other devices and appliances. The purpose of such enclosures is to intercept and dissipate stray radio waves which would otherwise be the cause of serious and annoying disturbances.

Heretofore, considerable difficulty has been experienced, in the construction of such radio shielded enclosures, in maintaining the proper electrical connections between the screening sheets of the various panels, and in preventing the bolts used for securing the panels to each other from acting as antennae which pick up and transmit undesired radio waves to and from the interior of the enclosure.

The principal object of the present invention is to provide a novel form of radio shielded enclosure made of separate screening panels adapted to be assembled and bolted together at the desired locations.

A further object of the invention is to provide an enclosure of the character aforesaid which will be relatively inexpensive yet quite efficient for its intended purpose.

A further object of the invention is to provide an enclosure of the character aforesaid in which any possibility of the connecting bolts acting as antennae will be eliminated without undue complication of the structure.

A further object of the invention is to provide an enclosure of the character aforesaid in which proper electrical connection of the shielding screens or plates of the various parts will be effected inexpensively yet effectively.

The nature and characteristic features of the present invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming a part hereof, in which:

Figure 1 is a perspective view of a radio shielded room embodying the main features of the present invention;

Fig. 2 is a fragmentary vertical sectional view of a portion of the structure illustrating the manner of securing the vertical wall panels to the floor shielding panels, the section being taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary vertical sectional view of a portion of the structure illustrating the manner of securing the top or ceiling panels to the sidewall panels, the section being taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary horizontal sectional view taken on the line 4—4 of Fig. 1 illustrating the manner of securing the side panels to each other at intermediate points;

Fig. 5 is a horizontal sectional view, taken on the line 5—5 of Fig. 1, illustrating the manner of securing the door jam to the adjacent panels and for establishing the necessary electrical connection of the metallic door parts when the door is closed; and

Fig. 6 is a perspective view of certain of the parts shown in separated relationship preparatory to the assembly thereof.

It should, of course, be understood that the description and drawings herein are illustrative merely and that various modifications and changes may be made in the structure disclosed without departing from the spirit of the invention.

Referring to the drawings, in the particular embodiment of the invention therein shown, the sidewalls of the enclosure are made up of a series of vertical screened panels secured to each other in a manner to be presently explained.

Likewise, the ceiling is made up of a series of horizontally disposed screened panels resting on and secured, in a manner to be presently explained, to the panels which make up the sidewalls.

Also, the floor is made up of a series of screened panels which are placed on the primary floor **10** of the building in which the shielded enclosure is to be erected. The screened floor panels have superposed thereon a series of panels **11** preferably made of plywood which rest upon the screened floor panels and provide the floor proper of the enclosure.

Each of the screened panels, whether the same is used for the sidewalls, ceiling or the screening floor panels, consists primarily of a rectangular frame work comprising side strips **12**, running lengthwise of the panels, connected at their ends by strips **13**, running transversely of the panels, and intermediate strips **14**, also running transversely of the panels.

All the strips **12**, **13** and **14**, above described, are preferably rectangular in cross-section with the exception of certain of the strips, 12^a or 13^a, as the case may be, which are to be joined to the others of adjoining panels at the vertical corners of the sidewalls, around the horizontal edges of the ceiling, and around the outer edges of the floor at which places one of the abutting strips is recessed, as at **15**, to receive the end or edge of the abutting panel.

The frame work of each of the panels, in each instance, is provided on one face thereof with screening material **16**, which preferably consists of woven wire cloth of relatively fine mesh, although sheet material may in some instances be used, for preventing the passage of radio waves to the interior of the enclosure.

The screening material **16** is carried around outer edges of the strips at the sides and ends of the respective panels, and into and across the recesses **15** where the same are employed.

The respective panels are secured to each other by means of bolts **17**, the threaded ends of which engage complementally threaded pressure plates **18**. Somewhat similar pressure plates **19** are also employed under the heads of the bolts **17**, but these pressure plates **19** are not threaded as are the plates **18** used at the threaded ends of the bolts.

The bolts **17** employed for securing the side strips **12** of the panels to each other, as shown more particularly in Fig. 2 of the drawings, extend through said strips on the outside of the screening material **16** as shown.

Likewise, the bolts **17**, which are used at the corner edges, that is to say, where the top horizontal strips of the sidewall panels join the marginal edge strips of the ceiling, and where the vertical edge strips of the end panel of one sidewall is joined to the vertical edge strip

of the end panel of the adjacent sidewall, as shown in detail in Fig. 5 of the drawing, are located, in each instance, outside of the respective planes of the main screening cloth on the inner faces of the various panels.

As hereinbefore pointed out, considerable difficulty has been experienced in structures of this character to insure the proper electrical connections between the screening material of the various panels, which is essential for the proper prevention of the passage and reradiation of radio waves, and in many instances it was necessary to resort to soldering which was objectionable by reason of the annoyance and difficulties encountered in soldering done at the place of erection, but this difficulty has been effectually overcome in the present structure by the tension of the bolts causing the abutting surfaces of the screen cloth **16** which is carried around on the outside of each of the members at the sides and ends of the panels, and also in the recesses **15** in certain of the members of the panel frame, to contact each other efficiently.

It is also essential that the bolt members, even where the same are on the outside of the screening cloth **16**, be in electrical connection therewith, and this is insured by the use of the flanged bushings **20**, shown more particularly in perspective in Fig. 6 of the drawings. These bushings **20** are forced through the screen cloth and into the holes provided for the passage of the fastening bolts by means of a suitable punch or mandrel (not shown), and when thus mounted, these bushings **20** not only serve to prevent fraying of the screen cloth at the places where the bolts pass through the strips of the panel frames and other parts, but will also serve to prevent the bolts from acting as antennae to carry radio waves into the interior of the enclosure.

However, in the erection of structures of this character, it is advisable that the screening material of the screening panels of the floor structure be so disposed that the screening material **16** is on the bottom surface adjacent the upper surface of the primary floor **10** of the building in which the radio shielded enclosure is erected, as when so disposed said screening material is better protected against damage and wear.

In this instance, the screening material **16** is carried entirely around the end and edge strips of the screening floor panels, and one of the bushings **20** is also employed at the inner or threaded end of the bolt (see Fig. 2), whereby said bolts will be prevented from serving as antennae carrying any undesired waves into the enclosure notwithstanding said bolts extend entirely through from the outside to the inside of the screening material.

The floor proper is provided by the use of plywood panels **11** disposed over the bottom screening panels of the structure as indicated in Fig. 2 of the drawings.

The door structure is shown in perspective in Fig. 1, and in detail, in horizontal section, in Fig. 5 of the drawings. At the place where the door is provided, in lieu of a screening panel at that point there are provided side stiles **30** secured to the adjacent panels by bolts **17**, the inner ends of which are threaded into pressure plates **18** which are, in this instance, located in suitable recesses **31** provided in the members **30** at the places where the bolts **17** are located.

The side stiles **30** as well as the top and bottom members of the door frame are preferably covered by sheet metal **32** which is pressed into good electrical contact with the screening material of the adjacent panels by the tension of the bolts **17**.

The door proper comprises a suitable frame work provided on one face thereof, with screening cloth **16** which may be disposed on either the inner or outer face, as preferred, and, here again, sheet metal may be used in lieu of the screening cloth if desired.

The members **33** of the frame work of the door proper are at least partially encased in sheet metal **34**, extending over the screening cloth **16**, around the outer edge of the frame work of the door and partially on the inner face of the frame work of the door. The sheet metal **34** may be secured on the inner face by means of metallic strips **35** which are secured to the frame work of the door by screws **36**, and likewise, the sheet metal **34** may be secured on the outer face of the door frame by metal strips **37** and screws **38**. The strips **37** are preferably of sufficient width to overlap the opening between the edge of the door and the adjacent door frame member **30**.

The frame members **33** of the door proper are also each provided with contact strips **39** and **40** respectively secured to the door by having portions thereof extending under the strips **35** and **37**. These contact strips **39** and **40** are adapted to contact with the metallic casing **32** which partially surrounds the door frame members **30**, and thereby establish an electrical connection between said casing **32** and the metal parts of the door proper.

The use of the metallic strips **39** and **40** in this manner will effectively prevent the passage of any radio waves through the crevices or openings which extend around the outer edges of the door.

By the foregoing arrangement there is provided a radio shielded enclosure of the knock down type which may be quickly assembled at the desired place and which is so constructed and arranged as to effectively prevent the passage of stray radio waves to the interior thereof, and which is also so constructed and arranged that none of the parts thereof will act as antenna to pick up and transmit undesired radio waves from the exterior to the interior of the structure.

Furthermore, the device is so constructed and arranged that the same may be readily dismantled and moved from place to place without loss of any of the protective properties thereof. The use of the bushings **20** will also serve to prevent fraying and displacement of the screening material when the bolts are removed for any purpose.

I claim:

1. In a radio shielded enclosure including a plurality of separately constructed panel frames each including lengthwise extending side strips and transversely extending end strips, said side strips and end strips constituting marginal members, said panel frames each having radio wave screening material on the inner face thereof, means for securing the panels to each other and for electrically connecting the screening material of panels adjacent each other comprising the provision of an extending portion of the screening material for each panel on the portions thereof abutting the adjacent panels, bolts extending through openings in the marginal members of said panels and metallic bushings engaging said screening material and extending into the holes through which said bolts extend, said bushings each having a flanged portion extending over a portion of the screening material which it engages.

2. In a radio shielded enclosure comprising a plurality of separately constructed panel frames each including lengthwise extending side strips and transversely extending end strips, said side strips and end strips constituting marginal members, said panel frames each having radio wave screening material on the inner face thereof, means for securing the panels to each other and for electrically connecting the screening material of panels adjacent each other along corner edges of the enclosure comprising the provision at such locations of a recess in one of the marginal members of one of said panels into which a marginal portion of another of said panels extends, the screening material of each panel having such recess being continued into said recess, and the screening material of each of the other panels being continued around and over the abutting edge of said panel, bolts extending through openings in said marginal members, and metallic bushings engaging such screening material and extending

into the holes through which said bolts extend, said bushings each having a flanged portion extending over a portion of the screening material which it engages.

3. In a radio shielded enclosure including a plurality of separately constructed panel frames each including lengthwise extending side strips and transversely extending end strips, said side strips and end strips constituting marginal members, said vertical wall panel frames each having radio wave screening material on the inner face thereof, and a plurality of similarly constructed panel frames forming part of the floor structure each having radio wave screening material on the lower face thereof, the means for securing the floor panels to the vertical wall panels and for electrically connecting the screening material of said panels to each other along the lower corner edges of the enclosure comprising the provision of a recess in the lower marginal member of each of said vertical wall panels into which a marginal portion of one of the floor panels extends, the screening material of each wall panel having such recess being continued into said recess, the screening material of the adjacent floor panel extending entirely around the marginal member thereof which is positioned within the recess of the wall panel, bolts extending through openings in said marginal members of the wall and floor panels, said bolts being in electrical connection with the portions of the screening material which extend around the marginal members of the floor panels, and metallic bushings engaging said screening material and extending into the holes through which said bolts extend, said bushings each having a flange portion extending over a portion of the screening material which it engages.

4. The shielded enclosure of claim 1 further characterized by a plurality of panel frames forming part of the floor structure each having radio wave screening material affixed to said frame, and means for securing the floor panels to the vertical wall panels and for electrically connecting the screening material of said panels to each other along the lower corner portions of the enclosure, said means comprising the provision of screening material of the floor panels extending entirely around the marginal members thereof and engaging portions of the screening material of the vertical wall panels.

5. The shielded enclosure of claim 1 further characterized by floor panels secured to vertical wall panels and in which said bolts pass from outside the shielded enclosure to the inside thereof and are maintained in electrical contact with portions of the screening material which extend around the marginal members of said panels.

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