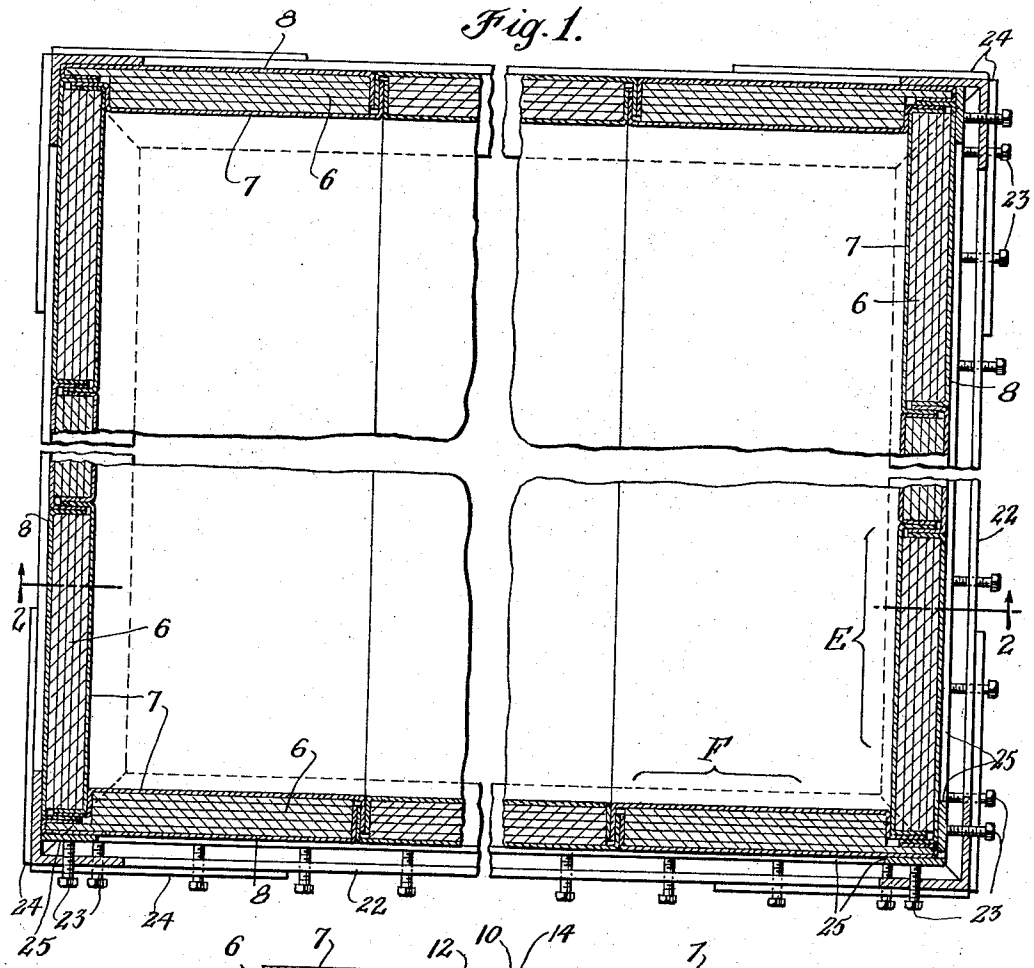
March 3, 1959 R. B. SCHULZ 2,876,275

SHIELDING PANEL AND JOINT CONSTRUCTION

Filed Aug. 12, 1953

2 Sheets-Sheet 1

Fig. 1.



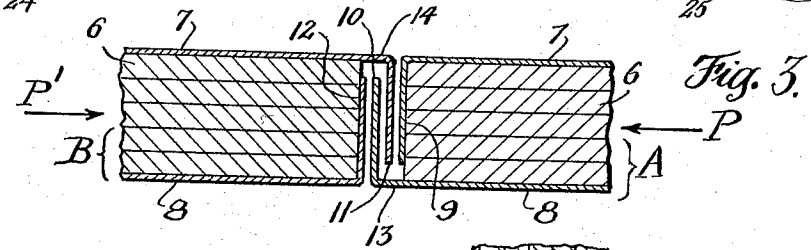


Fig. 3.

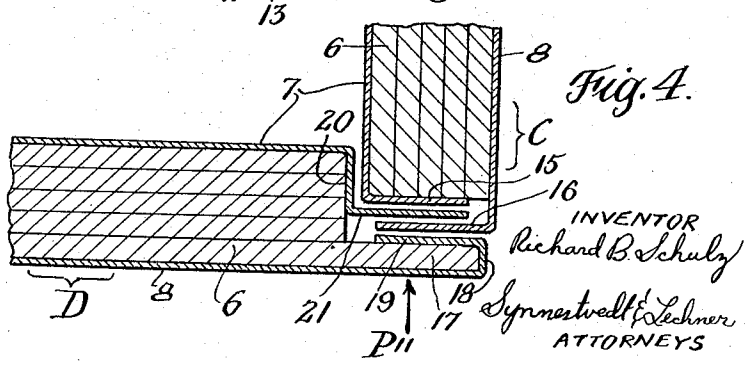


Fig. 4.

INVENTOR
Richard B. Schulz
Synnestvedt & Lechner
ATTORNEYS

March 3, 1959 R. B. SCHULZ 2,876,275

SHIELDING PANEL AND JOINT CONSTRUCTION

Filed Aug. 12, 1953

2 Sheets-Sheet 2

Fig. 2.

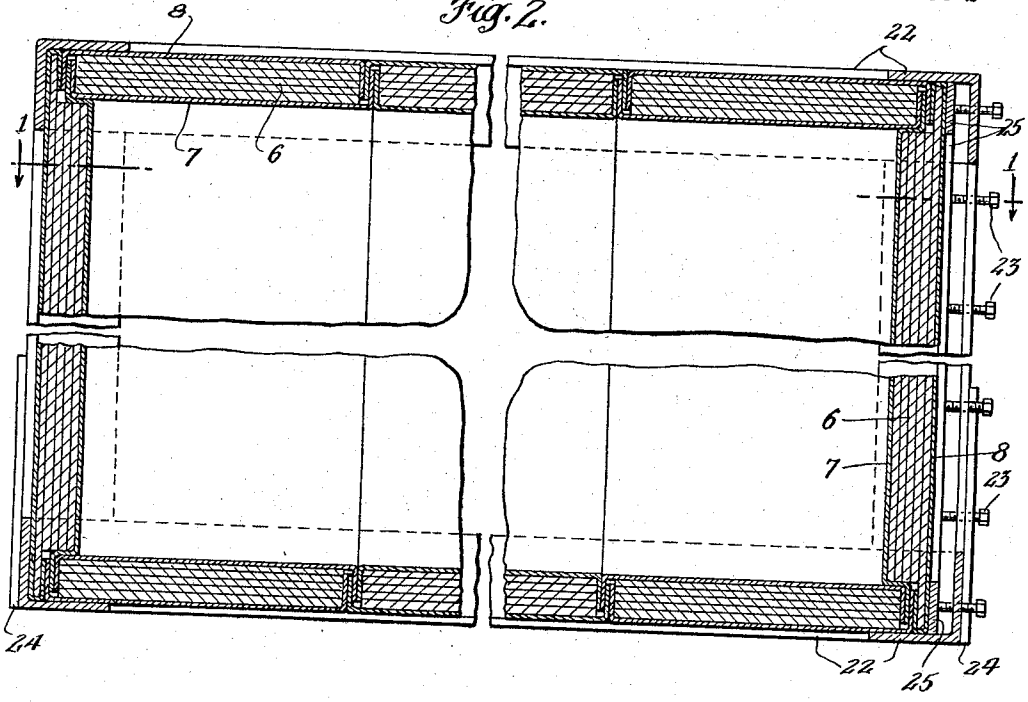
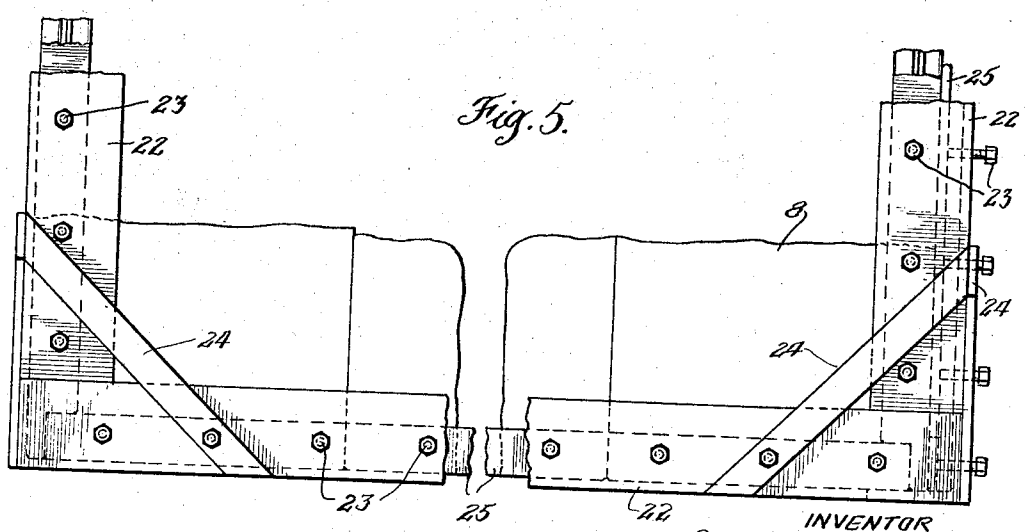


Fig. 5.



INVENTOR

Richard B. Schulz

Synnestvedt & Lechner

ATTORNEYS

United States Patent Office 2,876,275 Patented Mar. 3, 1959

2,876,275

SHIELDING PANEL AND JOINT CONSTRUCTION

Richard B. Schulz, Philadelphia, Pa.

Application August 12, 1953, Serial No. 373,876

3 Claims. (Cl. 174—35)

This invention relates to the art of shielding a room or other enclosure against the passage of electromagnetic waves and it may be used either to protect sensitive radio or electronic equipment located within the room against interference from sources of electromagnetic energy from outside the room or to confine within the room electromagnetic radiation from some internal source so as to render the region without the room relatively free of such radiation.

The principal objects of the invention are to provide standard, metal-surfaced panels by means of which a room or enclosure of any desired size can be readily fabricated by the simple expedient of building up the wall from a plurality of panel units; to provide such a built-up structure in which the abutting edges of the panels are provided with means for insuring good conductivity from panel to panel so that the shielding currents which are set up by the radiation which it is desired to control may flow freely in whatever paths are necessary to oppose the waves against which it is desired to construct the shield; to provide a contact between panel edges which will tend to maintain the conductivity throughout the life of the shielded room; to provide a rugged panel construction which is capable of rapid and easy erection; to provide individual panel components which are readily manufactured by mass production techniques; to provide a construction in which it is possible to greatly reduce the space required in shipping the equipment; and, in general, to improve the effectiveness of shielding walls.

The invention, probably, will be better understood if the following theoretical considerations are kept in mind. An electromagnetic wave impinging upon a metallic surface will be largely reflected from that surface somewhat in the manner that light waves are reflected from a mirror. Nevertheless, a small portion of the wave will be transmitted across the interface formed between the air and the metal surface, which wave will be attenuated in passing through the thickness of the metal layer and will again undergo reflection as it emerges from the metal to the second region of air. In this way the portion that is transmitted is made extremely low in comparison to the level of the original signal. The wave against which the shield is erected tends to induce eddy currents in the metal which circulate in such a manner as to set up a field in opposition to the initial field. The degree of field cancellation is essentially dependent upon the conductance of the paths in which the shielding currents flow which makes it necessary to use shielding materials having excellent conductivity characteristics. My invention is designed to provide continuous surfaces so that the shielding currents may flow freely in whatever paths are necessary to oppose the field set up by the waves against which the shield is erected.

How the objects of my invention are attained is illustrated in preferred form in the accompanying drawings wherein

Figure 1 is a sectional plan view, taken along the line 1—1 in Figure 2, of a shielded room built-up from individual panels in accordance with the present invention;

Figure 2 is a sectional side view taken along the line 2—2 in Figure 1;

Figure 3 is a fragmentary sectional view, on a larger scale than the previous figures showing a portion of a pair of panels arranged in interlocked in-line edge-to-edge relation;

Figure 4 is a fragmentary sectional view similar to Figure 3 but showing a pair of panels in interlocked right-angle edge-to-edge relation;

Figure 5 is a fragmentary side elevation on the scale of Figures 1 and 2 showing the arrangement of certain of the structural elements used to maintain the panels in proper position.

Inspection of the drawings will show that my improved panel units may be composed of an inner plywood member 6 around which is placed a relatively thin sheathing of some suitable metal such as copper. This sheathing may be formed from two sheets of metal 7 and 8 which are bent to form contact portions 9 and 10 which overlay the edge surfaces of the plywood member 6.

As best shown in Figure 3, the contact portions 9 and 10 of a panel, generally indicated at A, are not initially pressed into tight surface engagement with each other. This is done to allow space for the insertion of contact portion 11 of an adjoining panel, generally indicated at B. The contact portions 11 and 12 of panel B are spaced apart, in a manner similar to that described with reference to contacts 9 and 10 of panel A, sufficiently to permit the insertion of contact portion 10 of panel A. This interleaving construction provides for surface contact between the sheets of sheathing of adjacent panels in a manner to be described below.

While a variety of sizes and shapes of panels may be conveniently employed in the construction of a shielded room in accordance with the present invention, it is preferred to utilize panels of a size, for instance about 2½′ x 7½′, which are easy to manufacture, handle, transport and assemble.

Still with reference to Figure 3, pressure means (described in detail herebelow) may be employed as indicated by arrows P—P′ to urge the panels A and B into tight edge-to-edge, in-line engagement. When such pressure is applied, the surfaces of the contacts 9, 10, 11 and 12 will be brought into intimate interengagement one with another. It will be evident that a certain amount of deformation or buckling will necessarily take place, probably near the portions of the sheathing marked 13 and 14. However, this distortion is not of great magnitude and therefore does not interfere with tight contact of the contact surfaces.

With reference to Figure 4, it is seen that at the corner joints a somewhat different arrangement of the bent over portions is contemplated. Right-angle joints are necessary, when the room is to be in the form of a rectangular parallelepiped, to interchange the panels at the corners and also to interengage the wall panels with the ceiling and floor panels.

One of the panels C of the right-angle edge-to-edge joint illustrated in Figure 4 has contact portions 15 and 16 similar to those of panels A and B described above. The other panel, D, which is joined to panel C is arranged in a somewhat different fashion. The plywood interior 6 of panel D has a flange 17 extending in a direction parallel to a face of the panel a sufficient length to substantially overlap the edge surface of panel C. The outer sheet of sheathing is bent around the flange 17 as indicated at 18. This results in a contact portion 19 which will be parallel to the contact portions 15 and 16 of panel C when panel C is assembled with panel D. The inner sheet of sheathing 7 of panel D is bent over the edge of the plywood 6 of panel D as indicated at 20, and

is also bent to provide a portion **21** which is spaced apart from and parallel to portion **19**. With this arrangement, when panels C and D are brought into assembled relation, contact **16** of panel C may be inserted between contacts **19** and **21** of panel D and, in turn, contact **21** of panel D may be inserted between contacts **15** and **16** of panel C.

Pressure may be applied in the direction of arrow P'' by pressure means to be described below. Such pressure will result in forcing the surfaces of the portions **15, 16, 19** and **21** into intimate contact one with another in a manner similar to that described in connection with Figure 3. Again some inconsequential degree of distortion will occur.

As seen in Figures 1, 2 and 5, frame members **22** are provided which act as the basic structural elements of the assembled shielding room. These frame members **22** may be conveniently made from angle irons and are provided with a series of spaced threaded holes to receive compression screws **23**.

When constructing a shielded room according to the present invention, the first step is to frame, by means of frame members **22**, a mounting structure in which a plurality of the panels may be supported, for instance, in the form of a rectangular parallelepiped. For rigidity and ease of construction, corner braces such as **24** (see Figure 5) may be secured to the frame members at the corner intersections.

Pressure bars **25** are provided between those frame members through which compression screws protrude and the panels adjacent thereto. It is contemplated that pressure bars and compression screws will frame two adjoining sides of the room. Since the compression screws impinge on the pressure bars which contact the panels, the compressive force set up by advancing the screws will be transmitted to the panel assembly mounted within the structural framework.

The top of Figure 2 may be considered to be the ceiling and the bottom the floor of a typical shielded room constructed according to the present invention. The side walls of the room are composed of a number of panels arranged with adjacent contact portions interengaged. It is contemplated that the length of a single panel will be sufficient to span the full distance from floor to ceiling of the shielded room. Additionally, it is contemplated that the length of a single panel will be equal to the width of a specific number of panels, for instance three, which will provide for convenient construction of a shielded room, one panel high, three panels wide and as long as is convenient. With this arrangement, the floor and ceiling of the assembled room will be composed of a series of panels arranged side-by-side in edge-to-edge relationship down the length of the room and spanning the full width of the room.

A door for ingress and egress may conveniently be provided in any desired manner.

By reference to Figure 2, it will be seen that the vertical panels forming the walls of the assembled room are provided with the flanged edges **17** described in connection with Figure 4. Thus the floor and ceiling are lapped all the way around by the downward and upward flanges of the side and end panels. With this arrangement, it is possible to insure tight engagement of the contacts of the floor and ceiling panels with the contacts of the side and end panels by application of horizontal compressive forces alone.

By utilizing the arrangement of panels described above, it is possible to provide all the compressive force needed for tight contact in every direction around the assemblage by framing only two adjoining sides of the room with pressure bars and compression screws. This is illustrated in Figure 1 wherein end E and side F are the two adjoining sides utilized for application of the compressive forces.

When assembling a complete room according to the present invention, the following sequence of steps is preferably carried out:

(*a*) Frame members of proper length and corner braces are assembled to frame the floor of the room and frame members of full room height are mounted vertically at the four corners of the floor frame;

(*b*) Compression screws are started in the spaced holes along the frame members of two adjoining sides;

(*c*) The floor panels are dropped into position with their adjoining edges interengaged;

(*d*) Wall panels are mounted inside the frame with their adjoining edges interengaged and with their bottom edges interengaged with the floor panels;

(*e*) Ceiling panels are placed in position on top of the wall panels with their adjoining edges interengaged and with the edges of the ceiling assembly interengaged with the wall panels;

(*f*) Pressure bars are inserted between the frame members carrying compression screws and the adjacent panels; and

(*g*) The compression screws are tightened to insure tight contact of all of the contact portions of all of the panels.

I claim:

1. A structure for shielding against electromagnetic waves comprising a plurality of panels, frame means adapted to support said panels in edge to edge relation in the form of a parallelepiped, each panel including an inner and an outer metal sheathing having extensions bent to overlay the edges of said panel to provide contact surfaces interengageable with complementary contact surfaces of an adjacent panel, and clamp means reacting against said frame means and adapted to apply pressure to a plurality of assembled panels in a direction to increase the pressure on said contact surfaces and of magnitude sufficient to insure thorough electro-conductivity from panel to panel throughout the assemblage.

2. A construction according to claim 1 in which the frame means comprises frame members secured to one another to provide for the mounting of the panels and in which the clamp means comprises pressure bars mounted between said frame members and panels, said pressure bars framing each of two adjoining sides of said structure, and compression screws in spaced threaded holes in said frame members adapted to apply said pressure.

3. Shielding construction for electromagnetic waves comprising at least a pair of adjacent panels assembled in edge-to-edge relationship, each of said panels being composed of an interior structural non-conducting material of relatively light weight faced on both sides with a sheet of electro-conductive metal having contact portions bent over and interleaving with complementary contact portions on the adjacent panel, together with means exerting pressure on the panels to cause inter-engagement of the contact portions so that all of the sheets are electrically interconnected through the contact portions.

References Cited in the file of this patent

UNITED STATES PATENTS

1,268,707	Gehnrich	June 4, 1918
2,753,390	Feketics	July 3, 1956
2,765,362	Lindgren	Oct. 2, 1956