(12) UK Patent Application (19) GB (11) 2 171 392 A

(43) Application published 28 Aug 1986

(21) Application No 8505027

(22) Date of filing 27 Feb 1985

(51) INT CL[4]
B65D 81/24

(52) Domestic classification (Edition H):
B8P K8
U1S 2087 B8P

(56) Documents cited
None

(58) Field of search
B8P
B4Q
Selected US specifications from IPC sub-class B65D

(71) Applicant
Smith Sample Cases Limited (United Kingdom),
18 Betts Avenue, Martlesham Heath Industrial Estate,
Ipswich, Suffolk IP5 7RH

(72) Inventor
Robert Charles Parker,
Malcolm David Girling

(74) Agent and/or Address for Service
Copp and Co., Lloyds Chambers, Lloyds Avenue, Ipswich,
Suffolk IP1 3HE

ERRATUM

SPECIFICATION NO 2171392A

Page No 1 Line No 9 after These insert pulses interfere with electronic equipment and magnetic

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10 October 1986

against the low-frequency component of the pulses.

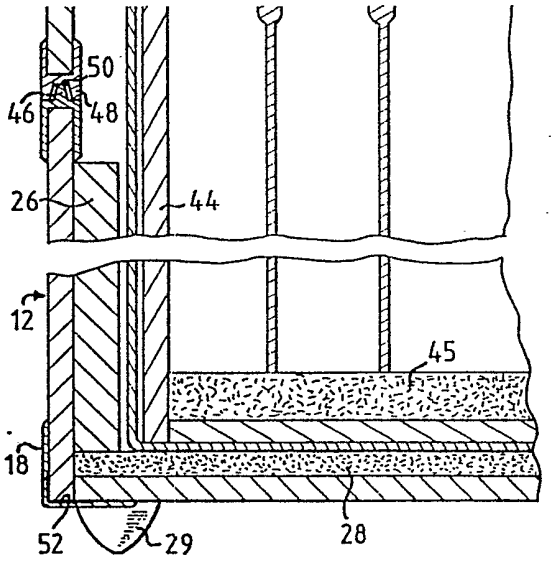

Fig.4

GB 2 171 392 A

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Copp and Co., Lloyds Chambers, Lloyds Avenue, Ipswich,
Suffolk IP1 3HE

(54) A portable case

(57) A portable case for containing components to be shielded from electromagnetic pulses which occur in a thermonuclear explosion has an outer container 10 and an inner container 30,32. One of the containers (preferably the outer one) is of a material such as aluminium or an alloy which is effective in shielding against the high-frequency component of the pulses, and the other container is of a material such as nickel-coated steel which is effective against the low-frequency component of the pulses.

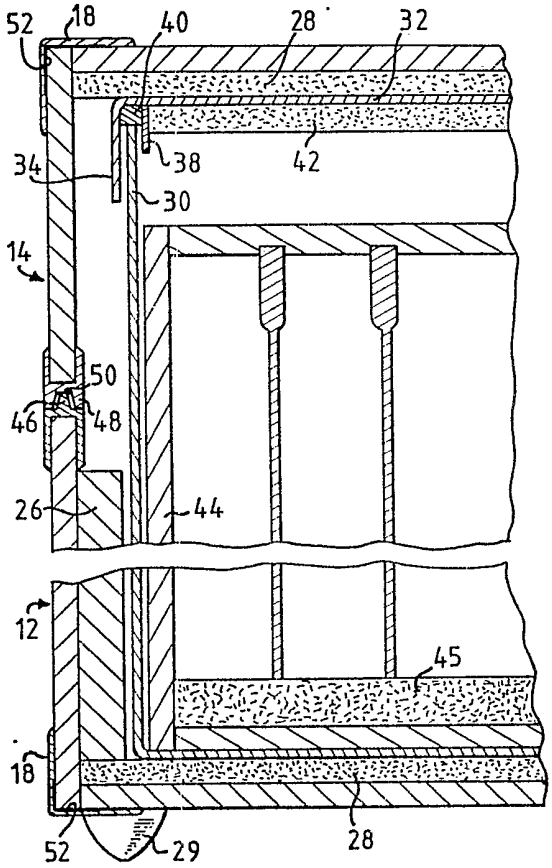

Fig. 4

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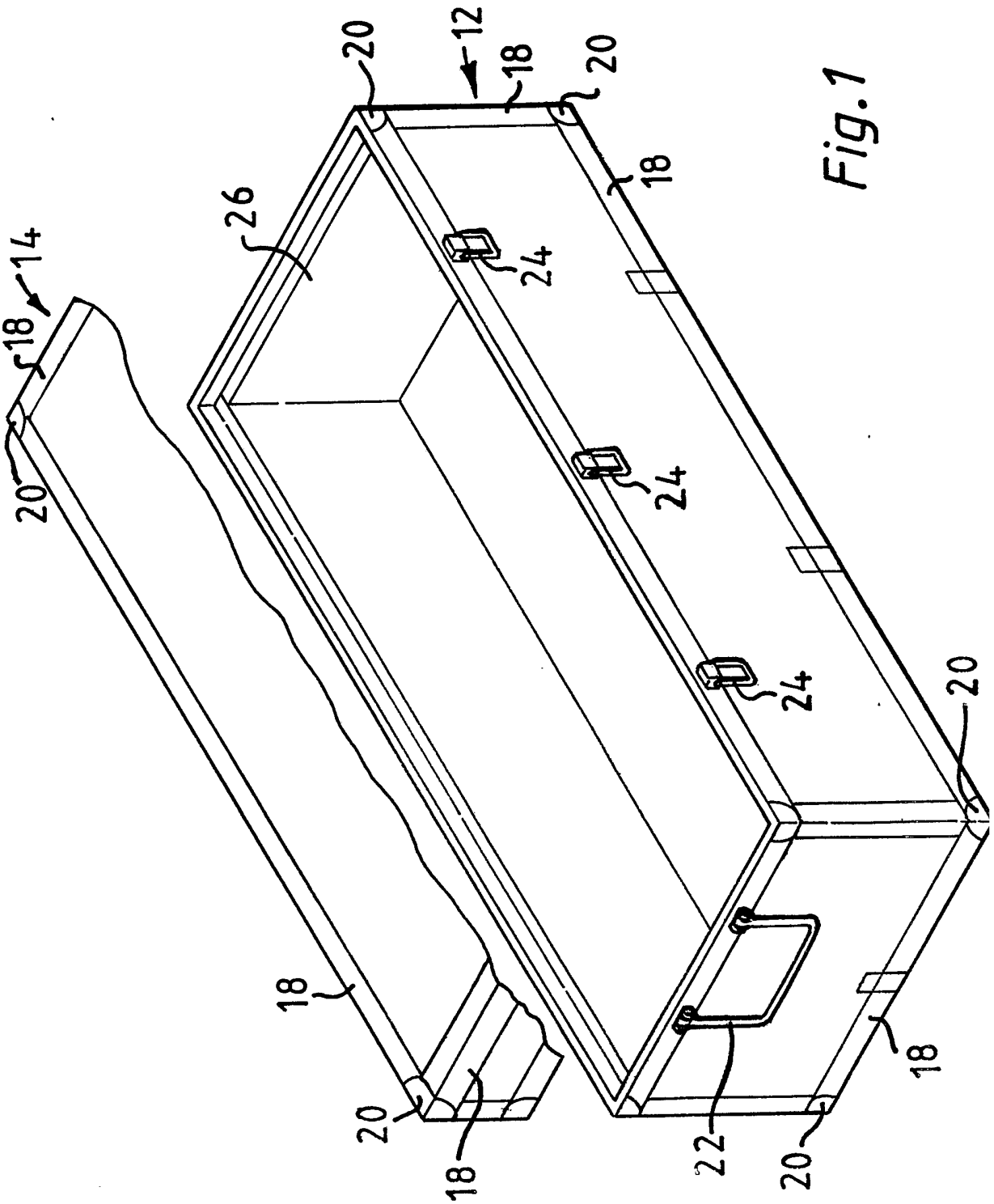

Fig.1

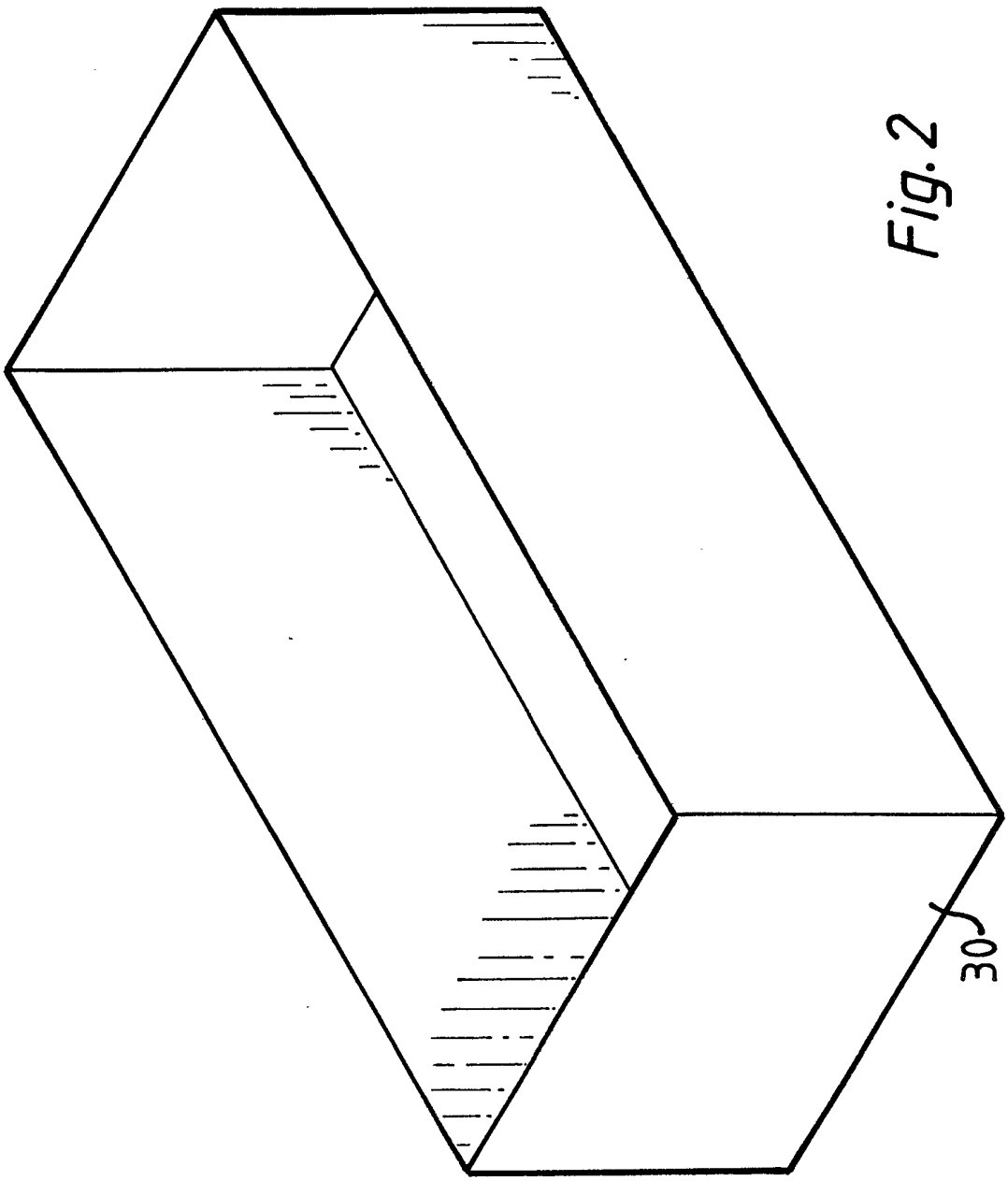

Fig. 2

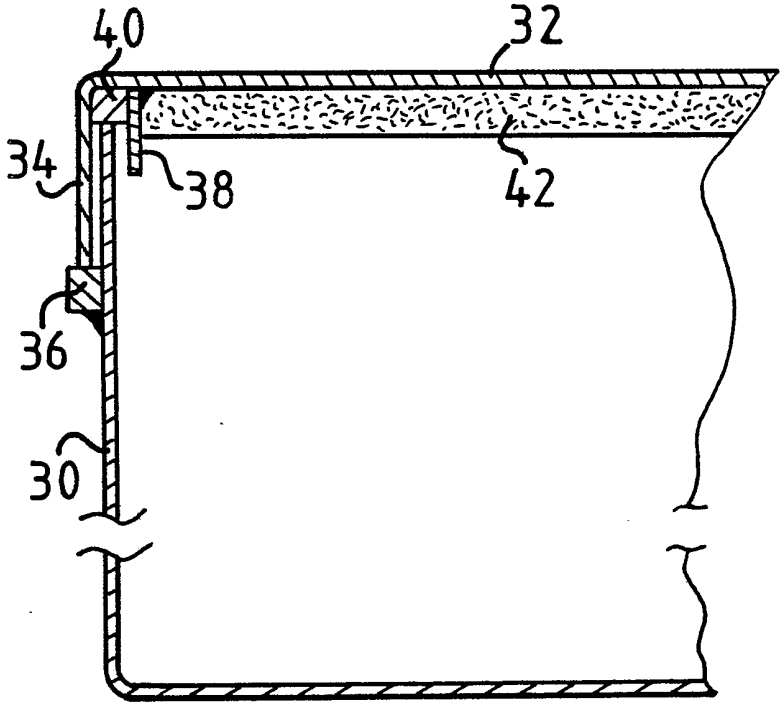

Fig.3

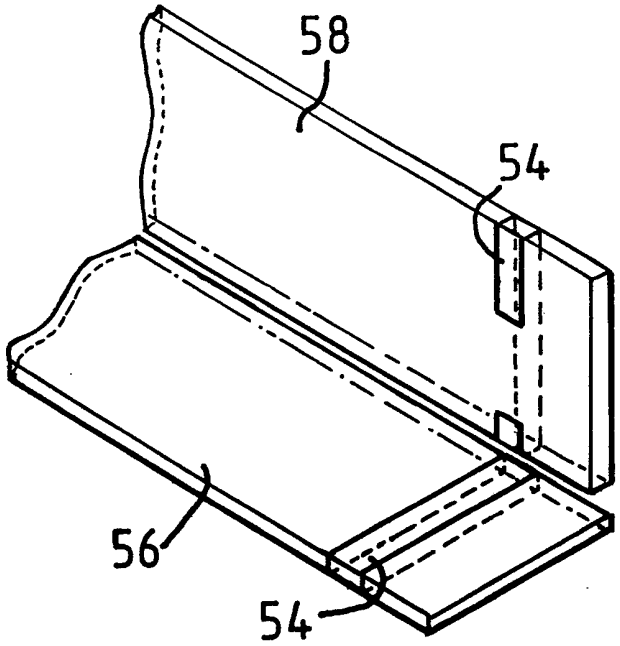

Fig.5

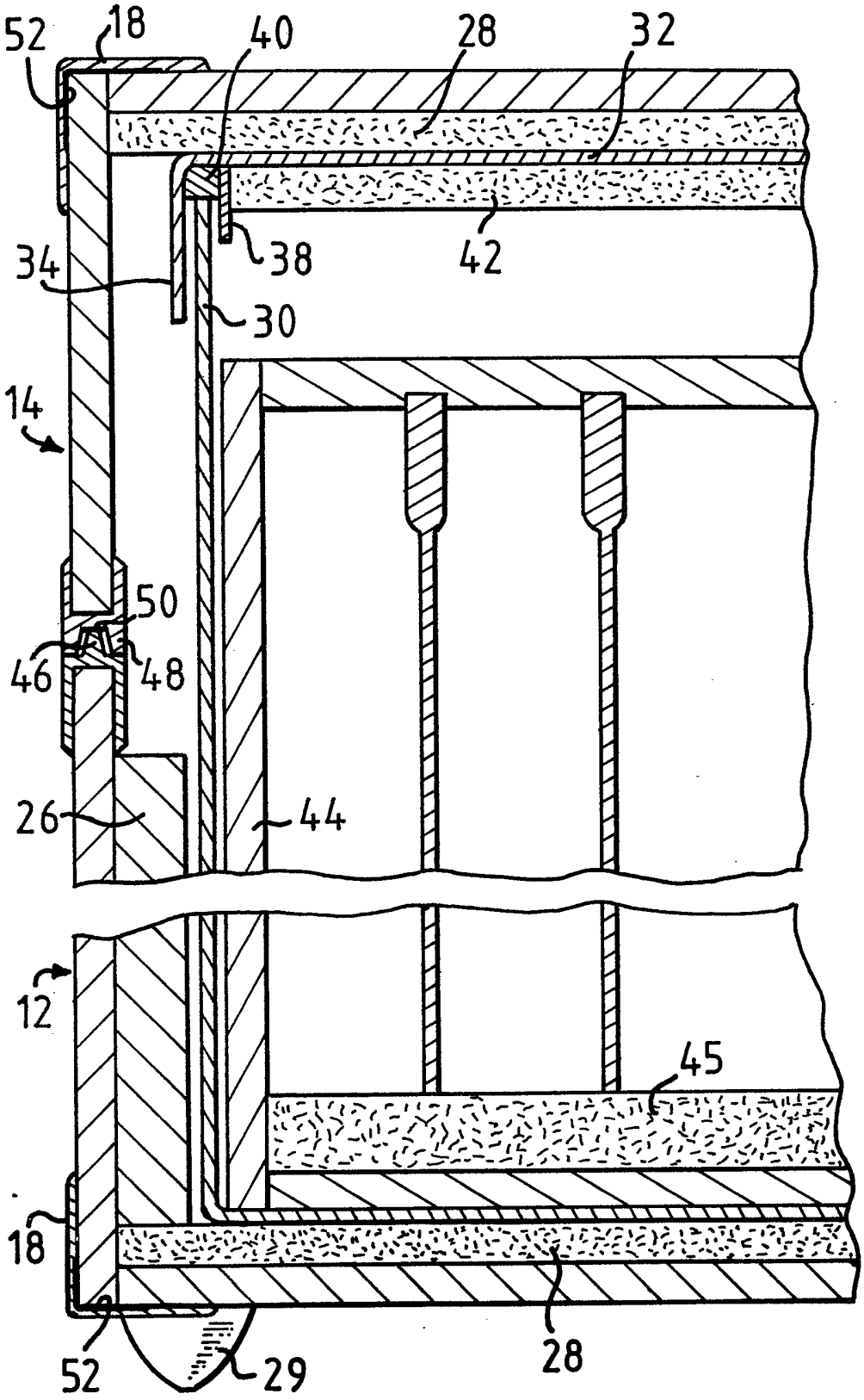

Fig. 4

SPECIFICATION

A portable case

This invention relates to a portable case which provides shielding for its contents against electromagnetic pulses (EMP). Electromagnetic pulses are emitted over a short period when a thermonuclear explosion occurs. These information storage media, and it is therefore desirable to be able to protect particular items of equipment such as critical printed circuit boards or magnetic media against such interference. In practical terms, it is more appropriate to keep back-up circuits or data in portable safe storage for use in the event of such an explosion, rather than attempting to encapsulate, for example, an entire computer installation or an entire switchboard, in a shielded enclosure.

According to the invention, there is provided a portable case for containing objects to be shielded from pulses of electromagnetic radiation occurring as a result of a thermonuclear explosion, the case comprising a metal inner container within a metal outer container, one of the containers being adapted, when closed, to shield the interior of the container against the electric (E) field of the radiation, and the other of the containers being adapted, when closed, to shield the interior of the container against the magnetic (H) field of the radiation.

Suitable shielding materials, and appropriate thicknesses, can be derived from published details of shielding materials and their characteristics.

In a preferred form of the invention, one of the containers is of aluminium or an aluminium alloy of 24 gauge thickness which is effective in shielding against high frequency pulses (in the range 50kHz to 110 MHz) encountered in the-field component of the electromagnetic waves. The other container can be of mild steel, preferably with a plated coating of copper or nickel which is effective in shielding against low frequency pulses (in the range 50kHz to 10 MHz) encountered in the H-field component of the electromagnetic waves. A suitable steel thickness is 2mm. The other container could alternatively be of copper.

The outer container is preferably of aluminium with the inner container being of steel.

The case is preferably constructed as a Faraday cage, i.e. there is an electrically conductive path from the interior of the inner container to the exterior of the outer container.

The outer container can be built up, in a manner known for making portable cases, of laminated panels having an outer cladding of aluminium sheet on a plywood backing. Flat panels are butt-jointed and fastened together at their edges to form a rectilinear case, and the edges of the case are sealed with tape which has the requisite shielding properties. This sealing is required over the exposed plywood edges and also over the actual butt joins between panels. A copper tape with a conductive self-adhesive backing is suitable.

Subsequent to the placing of the sealing tape, the edges of the case are preferably protected by angle sections and corner brackets riveted in place. Each rivet is sealed with a piece of self-adhesive copper tape.

For access to the interior of the case, both the inner and outer containers preferably have openable lids. It is important to seal around the openings of both containers. A compressible, conductive bead is preferably placed between the respective mating surface of each container and its lids. A suitable sealing bead is formed by a knitted Monel wire sleeve around a neoprene core. The fit of the lid of each container onto its respective container base must be effective to provide the required degree of compression in the sealing bead.

Furthermore, for optimum shielding, the containers should be designed so that the lid/base seal of the inner container is spaced a distance of at least $4a$ to one side of the plane of the lid/base seal of the outer container, where a is the overall thickness of the outer container wall.

Shock absorbing padding may be placed inside the inner container, and between the inner and outer containers.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of an outer container of a case according to the invention, with the lid raised and partly cut away.

Figure 2 is a perspective view of the base of an inner container;

Figure 3 is a section through one wall of the inner container, showing the lid in place;

Figure 4 is a section through the complete case, in the closed condition; and

Figure 5 is a detail of an internal feature.

Figure 1 shows an outer container 10 which has a base 12 and a lid 14. Both the base and the lid are made up from a number of flat plywood panels 16 with an outer cladding of aluminium sheet. The panels are held together by angle sections 18 and corner brackets 20 which are riveted in place. The base has a carrying handle 22 at each end and fastening clips 24 are provided along each side. The lid is not hinged, but is completely removable from the base. Details of the joint between the lid and the base will be described later with reference to Figure 4.

The walls of the container base are lined internally with foam 26, which is suitably 18mm in thickness. The floor and the underside of the lid are lined with foam 28 which is conductive to static electricity and may be 6mm in thickness. The conductive foam on the floor is electrically connected to four external feet 29 of the case using aluminium foil tape.

Figure 2 shows the base 30 of the inner container which is of 2mm mild steel sheet welded into a box shape as shown. The steel may be copper or nickel plated. The lid 32 of the box is shown in Figure 3 and has an external flange 34. The flange sits on a bead 36 welded all the way round the base. An additional internal flange 38 is welded into the lid 32 to define a channel which receives a sealing strip 40 which is a Monel mesh strip, as sold by Chomerics (UK) Ltd under reference 01-0401-1564, of cross-sectional dimensions 6mm × 6mm. The abutment of the

external flange 34 on the bead 36 provides a constant 4mm gap between the top of the wall of the base 30 and the underside of the lid, to ensure the proper degree of compression of the strip 40 under the weight of the lid, and the downward force imposed when the lid 14 of the outer container is closed.

A layer 42 of 6mm conductive foam is placed inside the lid 32.

Figure 4 shows the complete case closed. An internal tray 44 for supporting printed circuit boards is shown inside the case. This tray is of plywood and has a layer 45 of conductive foam at its bottom. The tray is a snug fit inside the inner container 30, and the inner container is itself a snug fit inside the base 12 of the outer container 10.

The sealing of the outer container closure, between the base 12 and the lid 14, is accomplished by a valance joint with a rised rib 46 on the upper edge of the base and a mating channel 48 on the lower edge of the lid. A Monel mesh strip 50, as sold by Chomerics (UK) Ltd under reference 01-0101-0006, of dimensions 3mm × 3mm is glued into the base of the channel 48. The dimensions of the channel 48 and of the rib 46 are such as to ensure the proper degree of compression of the strip 50, when the lid is closed and the clips 24 are fastened.

To ensure satisfactory sealing of the outer container, all the butt joints between the panels 16 are sealed by copper tape 52 applied to the joints before the angles 18 or corner brackets 20 are fitted. More copper tape is used to seal each of the rivets which penetrate through the walls of the outer container.

To enable the case to have the characteristics of a Faraday cage, it is important that there be a conductive path from the interior of the case to the exterior. To make this connection between the conductive foam 45 in the tray 44 and the foam 28 on the floor of the outer container, Conductive aluminium tape 54 is applied to the base 56 and to the walls 58 of the tray (see Figure 5). Either the lower edges of the walls 58, or the underneath of the base 56, or both, will be in direct contact with the steel inner container, and the steel container will be in direct contact with the foam 28. As already mentioned, a strip of aluminium tape will make a conductive connection between the foam 28 and each foot 29 of the case.

Tests of a case constructed in the manner described have shown that the case is an adequate shield, for both magnetic and electrical fields occurring in EMP, and is able to demonstrate results well in excess of the NATO standards of 50 - 60 dB at 100 kHz required for such shielding.

CLAIMS

1. A portable case for containing objects to be shielded from pulses of electromagnetic radiation occurring as a result of a thermonuclear explosion, the case comprising a metal inner container within a metal outer container, one of the containers being adapted, when closed, to shield the interior of the container against the electric (E) field of the radiation, and the other of the containers being adapted, when closed, to shield the interior of the container against the magnetic (H) field of the radiation.

2. A portable case as claimed in Claim 1, wherein one of the containers is of aluminium or an aluminium alloy of 24 gauge thickness which is effective in shielding against high frequency pulses (in the range 50kHz to 110 MHz) encountered in the E-field component of electromagnetic waves.

3. A portable case as claimed in Claim 2, wherein the other container is of mild steel.

4. A portable case as claimed in Claim 3, wherein the mild steel has a plated coating of copper or nickel which is effective in shielding against low frequency pulses (in the range 50kHz to 10MHz) encountered in the H-field component of electromagnetic waves.

5. A portable case as claimed in Claim 4, wherein the steel has a thickness of 2 mm.

6. A portable case as claimed in Claim 1 or Claim 2 wherein the other container is of copper.

7. A portable case as claimed in any one of claims 1 to 5, wherein the outer container is of aluminium and the inner container is of steel.

8. A portable case as claimed in any preceding claim and constructed as a Faraday cage.

9. A portable case as claimed in any preceding claim, wherein the outer container is built up of laminated panels having an outer cladding of aluminium sheet on a plywood backing.

10. A portable case as claimed in Claim 9, whrein the panels are butt-jointed and fastened together at their edges to form a rectilinear case, and the edges of the case are sealed with tape which has the requisite shielding properties.

11. A portable case as claimed in Claim 10, wherein the sealing tape is a copper tape with a conductive self-adhesive backing.

12. A portable case as claimed in Claim 10, or Claim 11, wherein the edges of the case are protected by angle sections and corner brackets riveted in place, and each rivet is sealed with a piece of self-adhesive copper tape.

13. A portable case as claimed in any preceding claim, wherein both the inner and the outer containers have openable lids.

14. A portable case as claimed in Claim 13, wherein a compressible, conductive bead is placed between the respective mating surfaces of each container and its lid.

15. A portable case as claimed in Claim 14, wherein the compressible, conductive bead is formed by a knitted Monel wire sleeve around a neoprene core.

16. A portable case as claimed in any preceding claim, wherein the containers are designed so that the lid/base seal of the inner container is spaced a distance of at least $4a$ to one side of the plane of the lid/base seal of the outer container, where a is the overall thickness of the outer container wall.

17. A portable case as claimed in any preceding claim, wherein shock absorbing padding is placed inside the inner container, and between the inner and outer containers.

18. A portable case substantially as herein described with reference to the accompanying drawings.

Printed in the UK for HMSO, D8818935, 7/86, 7102.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.