Sept. 12, 1950 S. TIERNEY, JR 2,522,072

ELECTRICAL SHIELD WITH SLIDE FASTENER

Filed July 24, 1945 2 Sheets-Sheet 1

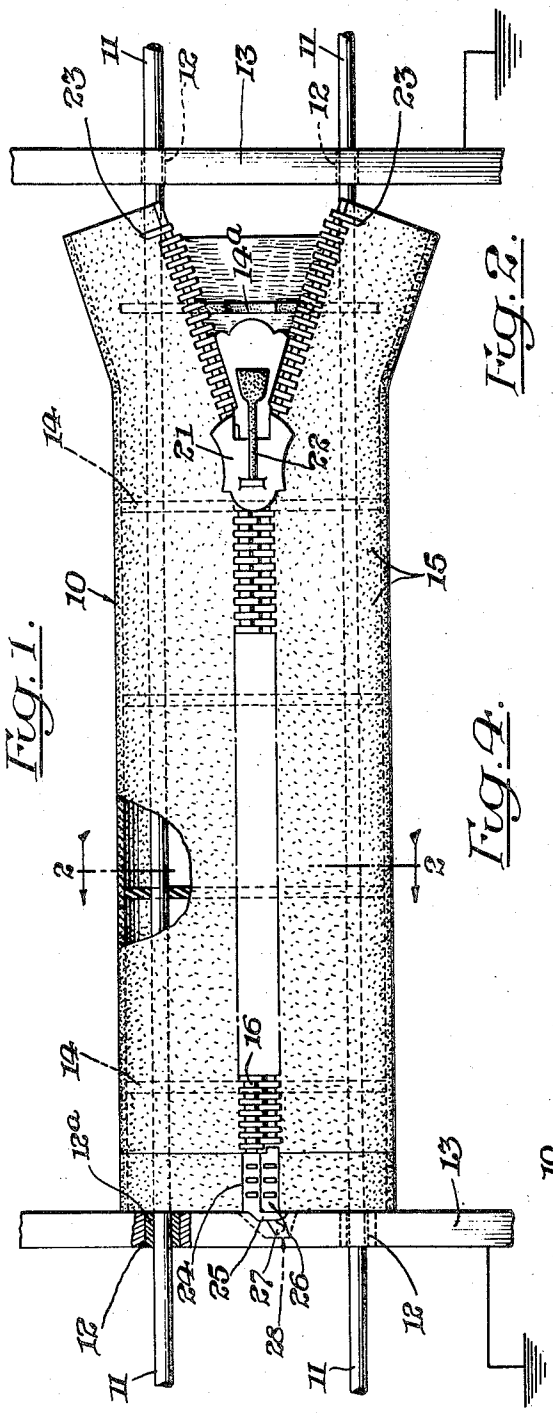


Fig. 1.

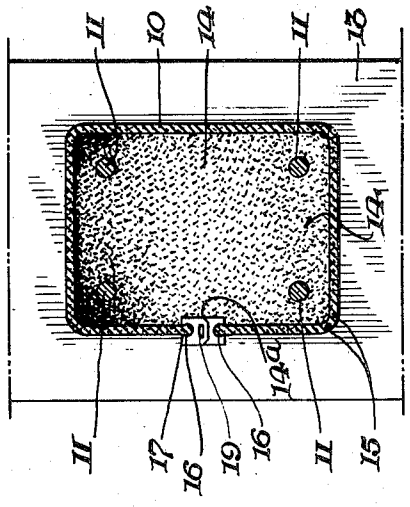


Fig. 2.

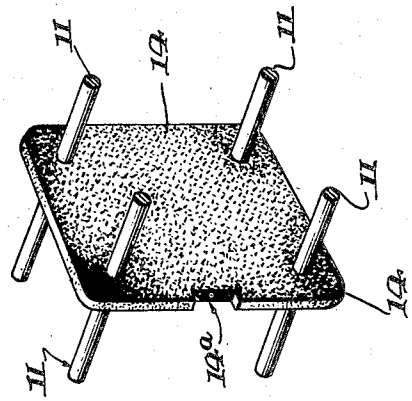


Fig. 4.

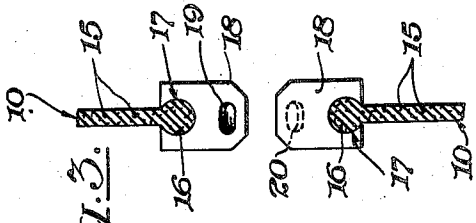


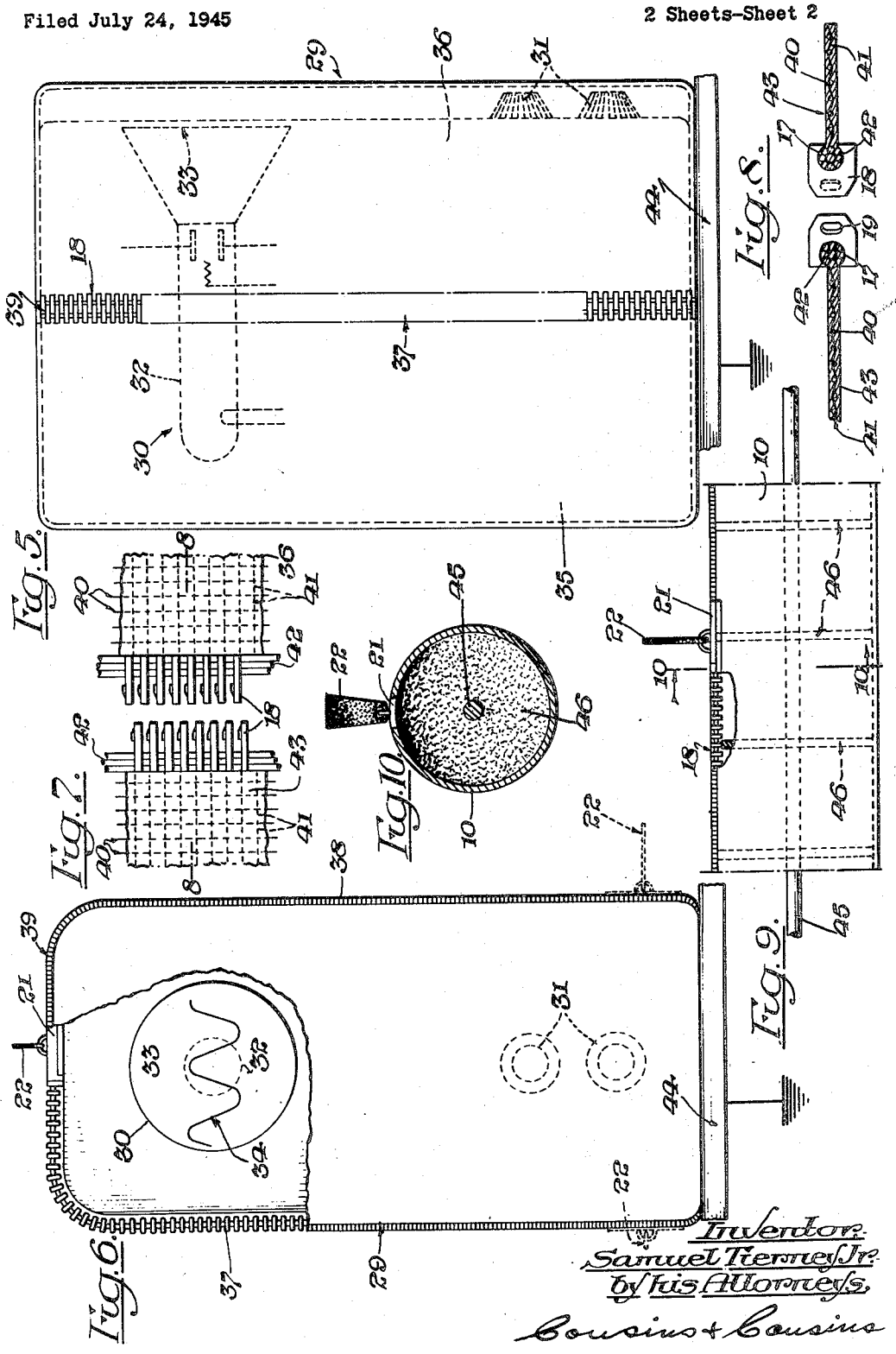
Fig. 3.

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ELECTRICAL SHIELD WITH SLIDE FASTENER

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2,522,072

ELECTRICAL SHIELD WITH SLIDE FASTENER

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5 Claims. (Cl. 174—35)

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This invention relates to the provision of means to electrically connect two electrically conductive elements through the medium of an interlocking slide fastener, commonly known as a "zipper."

Where electrical equipment is used it is frequently necessary to surround the active parts thereof with a grounded metallic casing so as to absorb and ground any electrical emanations which might flow therefrom lest they adversely affect other electrical equipment used in proximity thereto. A typical example of this is the necessity of shielding the ignition systems of airplanes, lest they adversely affect the radio equipment used in said planes. Conversely, where delicate electrical instruments are used, it is frequently desirable or necessary to surround the same in a grounded electrically conductive casing which can absorb and ground any extraneous electrical emanations before the same can affect the operation of such instrument.

Accordingly, the primary object of the invention is to provide a sheet electrically conductive and preferably flexible, but at least bendable, to be applied around any parts needing protection wherein the adjacent edges of the sheet may be held in electrical contact through the medium of a conventional slide fastener, or "zipper."

A further object of the invention is to provide such a protective covering which may be applied or removed quickly and easily by hand, without the use of any tools.

A further, more specific object of the invention is the provision of such a protective covering that may be used as the outer sheet of a co-axial cable for radio transmission.

A further object is to provide such a covering which may be produced with a minimum of machine operations, at low cost, and by relatively unskilled labor.

The invention consists of the construction, combination and arrangement of parts, as herein illustrated, described and claimed. It will be understood that the conventional "zipper" disclosed herein is not the invention, but the invention resides in the combination therewith of a flexible, electrically conductive sheet, and the application of said combination to such installations where the same is desirable or necessary.

In the accompanying drawings, forming a part hereof, are illustrated various applications of the invention, but it will be understood that the invention may be applied in unlimited ways wherever a protective, electrically conductive housing is called for. In the drawings similar reference characters designate corresponding parts, and in which:

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Figure 1 is a schematic plan view, partly broken away, showing the application of the invention to a plurality of electrical conductors.

Figure 2 is a vertical section, taken on line 2—2 of Figure 1.

Figure 3 is a composite, enlarged fragmentary detail of the fastening element.

Figure 4 is a fragmentary perspective, illustrating the insulating spacing means.

Figure 5 is a front elevation of a two part casing for an electrical instrument.

Figure 6 is a side elevation of the casing shown in Figure 5, partly broken away.

Figure 7 is a composite, fragmentary view in plan, showing, on an enlarged scale, a modified form of material.

Figure 8 is a fragmentary section, taken on line 8—8 of Figure 7.

Figure 9 is a plan view, partly broken away, showing the application of the invention to a co-axial cable.

Figure 10 is a vertical section, taken on line 10—10 of Figure 9.

Referring to the drawings, and particularly Figures 1 to 4, 10 designates a flexible sheet which which may be made of natural or synthetic rubber, or a bendable plastic, and which has incorporated therein metallic particles 15. The particles 15 may be of copper, aluminum, brass, graphite or any other suitable electrical conductor. The particles 15 are present in such density as to be in contact one with another so as to make the normal dielectric sheet 10 electrically conductive.

The sheet 10 is adapted to enclose electrical conductors 11, which pass through bores 12 of metal end plates 13 which are grounded. The ends of the sheet 10 are grounded by contact against the walls 13. In order to space the sheet 10 from the conductors 11, there is provided a plurality of spacers 14 supported by the conductors 11, such spacers having recesses 14a to receive the slide fastener hereinafter described. Where the conductors 11 are not insulated, the bores 12 are provided with insulating sleeves or grommets 12a.

The sheet 10 is folded around the spacers 14 and the contiguous edges are joined by a conventional slide fastener such as is shown, for example, in U. S. Patent No. 2,054,880, dated Sept. 22, 1936, to Legat. As best shown in Figure 3, the edges of the sheet 10 are provided with beads 16 which are engaged in slots 17 of metallic fasten-

ers 18, one of which is provided with a projecting lip 19, and the opposite being provided with a mating opening 20. The series of fasteners 18 are engaged or disengaged by slider 21, provided with an insulated portion 22 to prevent communication to the operator of any electrical potential on sheet 10.

At one end of the twin rows of fasteners 18 are located stops 23 to prevent the total removal of the slide 21. At the opposite end one side has an end member 24 provided with an eye portion 25, and the other side has a member 26 having a hook 27 to enter the eye 25, all as illustrated and described in Patent 2,054,880. The wall 13 is provided with a recess 28 to receive the hook 27 and eye 25. The sheet 10 is so dimensioned that it will fit snugly around the spacers 14 and will be under a slight tension when the edges are joined together, so as to provide an effective electrical conductor around the conductors 11, and at the same time be readily removable. If desired, the entire sheet might be removed or merely partially opened for the purpose of inspection or repair of the conductors 11 encased therein. The conductors 11 need not be continuous as shown, but the space between the arbitrary walls 13 might well constitute a junction box in which the conductors 11 are separable and which might require inspection from time to time, which is easily accomplished with the present construction.

In Figures 5 and 6 is shown the application of the invention to an instrument which must be protected both from the influence of extraneous electrical waves and also seal it from emanating any waves of its own. In this case the housing 29, formed of sheet material, to be later described, is used to enclose an oscilloscope which is conventionally shown as 30 having the usual control knobs 31 for adjusting a cathode ray tube 32 having a fluorescent screen 33 on which the wave form 34 appears. In the application of the invention to this type of structure, it may be desired to form the enclosing housing of two parts 35—36, each in the form of complementary rectangular containers with the slide fastener applied to their contiguous edges. The slider 21 is moved up the front face 37, across top face 39 and down the rear face 38 to interengage the rows of fasteners and in the opposite direction to release them. When released, the casing members 35—36 may be readily sprung apart to permit the instrument 30 to be removed from the open top.

If further desired, the lower edges of the complementary sections may be carried by a grounded base 44, so that the two sections of the cover will be retained in place for rejoining when desired.

In Figures 7 and 8 is shown a modified form of flexible sheet as used in housing 29, and composed of wire mesh having the usual warp and woof wires 40—41, respectively. At the edges are provided a plurality of wires 42 which engage in the slot 17 of the fasteners 18, in the manner heretofore described, and for the same purpose. The wires 42 are of soft metal, such as copper, soft brass, fine aluminum, so as to be sufficiently flexible to permit the necessary movement of the fasteners 18 in order to engage the lip 19 with the detent 20. The wire mesh formed by the wires 40 and 41 is preferably covered with a flexible transparent plastic coating 43, as for example, cellulose acetate or a suitable fabric.

The use of a transparent sheet is highly desirable where it is necessary to view the action of an instrument such as the oscilloscope shown in Figures 5 and 6. It will be understood that the wire mesh is sufficiently fine to act as a complete electrical shield.

In Figures 9 and 10 is shown the application of the invention to a co-axial cable in which the inner cable 45 is surrounded by spaced dielectric washers 46, and the outer conducting sheet 10 is wrapped around the washers 46 and has its ends joined with the slide fastener, as heretofore disclosed. The said conducting sheet 10 being similar in construction to that described above in connection with Figures 1 and 2.

From the foregoing it will be seen that this invention provides a flexible electrically conductive sheet which may be applied to various instrumentalities and joined together by conventional slide fasteners to form a complete electrical shield which may be readily applied or removed for the purpose of inspection or repair.

Where the sheet is cut to proper dimensions, the fastening members 18 will be kept under slight tension to maintain them in firm contact, even under the influence of vibrations, to keep the electrical resistance of the joint constant with that of the remainder of the sheet.

Having thus fully described the invention, what is claimed as new and desired to be secured by Letters Patent of the United States, is:

1. An electrical shield comprising a sheet of conductive material adapted to be placed around a part to be shielded and electrically conductive slide fastening means on the contiguous edges of the sheet, in electrical contact with said sheet, to permit easy engagement or disengagement of said edges.

2. An electrical shield comprising a sheet of flexible, conductive material adapted to be placed around a part to be shielded and electrically conductive slide fastening means on the continguous edges of the sheet, in electrical contact with said sheet, to permit easy engagement or disengagement of said edges.

3. An electrical shield comprising a sheet of flexible, normally dielectric material impregnated with conductive particles to render the same electrically conductive and adapted to be placed around a part to be shielded, and electrically conductive slide fastening means on the contiguous edges of the sheet, in electrical contact with said sheet, to permit easy engagement or disengagement of said edges.

4. In a device of the class described, in combination, a flexible member or members having electrically conductive material disposed throughout the body thereof and having a pair of long, oppositely disposed edges adapted to be separated to form an opening, rows of co-operating electrically conductive metallic fasteners conductively secured along said edges and a reciprocable slider arranged to move said fasteners into engagement whereby to provide a plurality of closely spaced electrical paths across said edges.

5. In a device of the class described, in combination, an electrical conductor terminating in a pair of long, oppositely disposed ends adapted to be separated to form an opening, said ends being formed of flexible insulative material having electrically conductive particles distributed therein, rows of co-operating metallic fasteners conductively secured along said ends and a reciprocable slider arranged to move said fas-

teners into engagement whereby to provide a plurality of closely spaced electrical paths across said ends.

SAMUEL TIERNEY, JR.

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