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W. S. MARKS

2,741,181

SUPPORTING SPIDER FOR USE IN PROXIMITY FUZE

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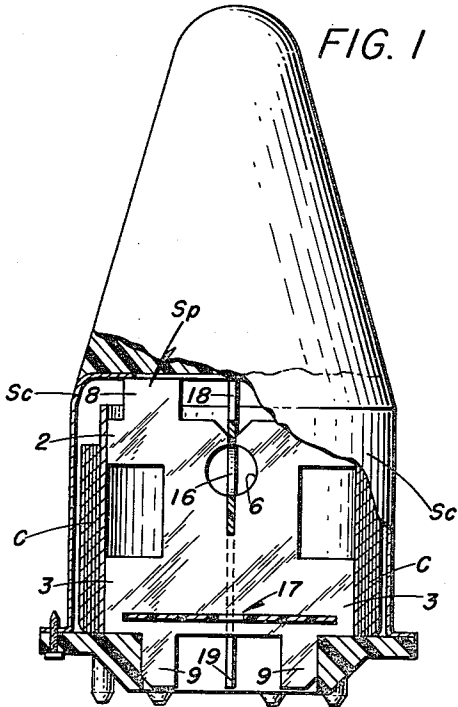


FIG. 1

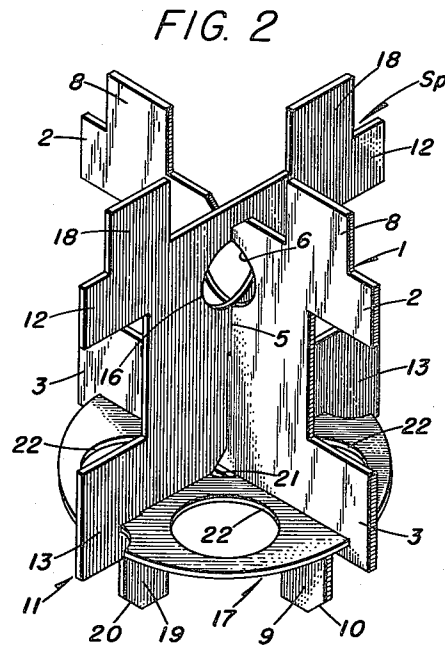


FIG. 2

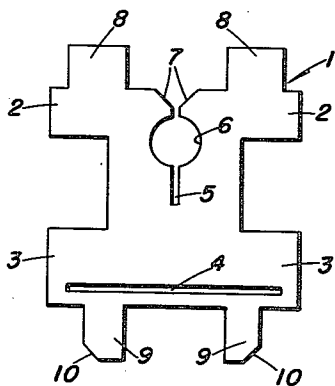


FIG. 3

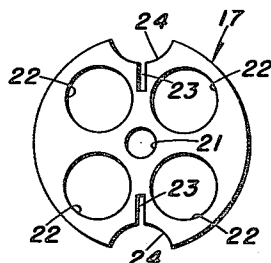


FIG. 5

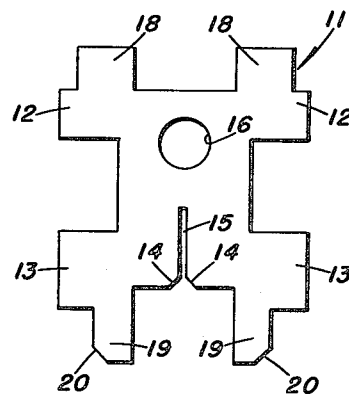


FIG. 4

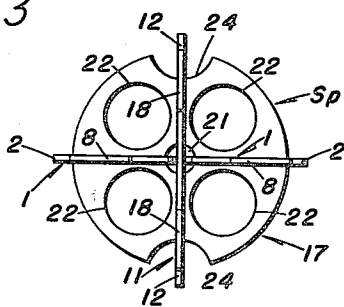


FIG. 6

INVENTOR.
WILLIAM S. MARKS
BY *A. H. O'Brien*

ATTORNEY

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SUPPORTING SPIDER FOR USE IN PROXIMITY FUZE

William S. Marks, Silver Spring, Md., assignor to the United States of America as represented by the Secretary of the Navy

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2 Claims. (Cl. 102—70.2)

The present invention relates in general to proximity fuzes, and more particularly to a spider for positioning and holding thermionic tubes and other elements in a proximity fuze.

Heretofore, it was customary to protect the fragile tubes by covering them with close-fitting elastic socks made of rubber or similar material drawn over the individual tubes that form parts of the amplifier and oscillator of the fuze. These components were further protected against the mechanical forces set up in firing the fuze by potting them, that is, embedding them in a suitable initially liquid composition that fills all the interstices, so that when said composition solidifies this unit of the fuze becomes substantially a hard, solid, non-compressible mass, well fitted to resist powerful mechanical forces such as setback and the like.

Such fuze units, as conventionally constructed, include a number of thermionic tubes, resistors, capacitors and other radio components, compactly mounted in a metal shell known as the shield can, which also snugly houses an annular capacitor likewise forming part of the unit.

An object of the invention is to provide a spider consisting of three pieces of suitable sheet-dielectric material, specifically vinylidene chloride, a certain type of polyethylene, or other plastic, these pieces being interlocked to provide a support that is sufficiently yieldable, yet has adequate rigidity to serve the several purposes listed hereinafter.

These purposes are: to provide a seat for, and position, the amplifier tubes without requiring a rubber or other shock-absorbing covering for the tubes; to provide a support for, and to center correctly, the contents of the shield can by bearing against the annular capacitor housed in said can; to provide nearer approach to uniformity in the positioning of certain components; to provide a support for the more fragile parts; to allow fixed channeling of leads which are critical as to position, with regard to coupling or the possibility of short-circuiting; to offer less resistance to the flow of the material used for potting; and to provide a spider for the above purposes, that is simple and cheap to manufacture, and may be assembled entirely from punchings made of flat sheet material.

Other objects and many of the attendant advantages of this invention will be appreciated readily as the same becomes understood by reference to the following detailed description, when considered in connection with the accompanying drawings, wherein:

Fig. 1 is an axial section through a proximity fuze shield can and contents, showing the invention applied thereto, a portion of the fuze being shown in elevation;

Fig. 2 is a perspective view, on a somewhat larger scale, of the spider constituting the invention;

Fig. 3 is a front elevation of one of the pieces of dielectric sheet material of which the spider is constructed;

Fig. 4 is a similar view of a companion piece, for assembly at right angles to the first piece;

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Fig. 5 is a front elevation of a disk likewise made of dielectric sheet material, interfitting the two above named pieces, and holding them properly assembled; and

Fig. 6 is a plan of the complete spider.

Referring first to Fig. 1, there is shown a shield can *Sc* with an annular capacitor *C* assembled therein, and the spider which constitutes the present invention, shown at *Sp*, within said capacitor. It will be understood that a proximity fuze includes also a multitude of other component elements, but such are not illustrated or discussed here, as they form no part of the present invention.

Referring next to Fig. 2, the general appearance and structure of the spider *Sp* are evident. Briefly, it consists of three pieces of sheet material, mutually at right angles. All the pieces preferably are punchings from a relatively thin sheet of dielectric material of a type that possesses suitable mechanical properties.

While the electrical requirements of the material of which the spider *Sp* is made are not exacting, the mechanical characteristics thereof, on the contrary, are highly important. This material must not be too soft, nor too brittle, and additionally it must be capable of withstanding temperatures higher than those heretofore common in the "normal" potting of proximity fuzes.

As an indication of what is meant, ordinary Lucite and polystyrene are too low-melting to be suitable. While it is difficult to define exactly the characteristics that are essential, it may be helpful to enumerate certain materials that have been found satisfactory. Among the typical materials that have proved to be usable are a special variety of polyethylene of higher melting point than the most common commercially available type, fibre, linen-Bakelite, and especially a plastic marketed under the trade name Saran, which is said to consist of vinylidene chloride. Without excluding other thicknesses, it may be stated that sheet material about $\frac{1}{32}$ inch thick has proved very satisfactory.

The shape of the punching 1 shown in Fig. 3 has the following significant characteristics: Lugs 2 and 3 project laterally from the body of the punching 1 near its top and bottom, as shown. The distance between the outer edges of 2 and 2, or 3 and 3, is substantially the same as the inner diameter of the annular capacitor, so that the spider may fit tightly within said capacitor, which assists in aiming and centering the spider.

A slot 4 extends across the punching 1 near its lower end, and is of a width sufficient to receive the disk shown in Fig. 5, which is described later. Another slot 5, extending at right angles to slot 4, is located centrally of the punching and in its upper half, and has an opening 6 therein as shown. Chamfered portions are provided at 7. Lugs 8, 8 extend upward and lugs 9, 9 downward, the latter having chamfered portions at 10, 10.

The companion punching 11, shown in Fig. 4, is of the same general shape and size as punching 1, but differs in certain details. Lugs 12, 12, 13, 13, 18, 18 and 19, 19 correspond respectively to lugs 2, 2, 3, 3, 8, 8, and 9, 9 of Fig. 3 and lugs 19, 19 are chamfered at 20, 20. While there is a hole 16 corresponding in size and location to hole 6 of Fig. 3, there is no slot through said hole 16, but instead there is a central slot at 15, chamfered at its lower end at 14, 14. There is no slot corresponding to slot 4 of Fig. 3.

In order to complete the assembly and to hold punchings 1 and 11 together rigidly, use is made of the disk-shaped punching 17, shown in Fig. 5. This has a small central hole 21, and four larger holes 22 surrounding it as shown. Two short slots 23, 23 extend in opposite radial directions, between the holes 22 as shown, and these slots terminate in the substantially semi-circular notches 24, 24.

In assembling the spider, the first step is to insert disk 17 into slot 4 of punching 1, in such position that the slots 23 extend at right angles to the plane of punching 1. After the disk 17 has been pushed halfway through the slot 4, the punching 11 is pushed over punching 1, by placing the slot 15 in line with the slot 5, and keeping the lateral planes of the two punchings at right angles to each other.

By pushing part 11 as far as possible, the lugs 19, 19 usually will first abut against the disk 17, and must be slid into the slots 23, 23, which are spaced properly to receive them. Further pushing of member 11 will bring the ends of lugs 8, 8 and 18, 18 into one plane, and likewise will align the lower ends of lugs 9, 9 and 19, 19 into a plane, parallel to the first-mentioned one. This completes the assembly, which is shown in plan in Fig. 6 and in perspective in Fig. 2.

In use, the spider itself is positioned properly in the fuze by causing the upper ends of lugs 8 and 18 to abut against the inside surface of the upper end of the shield 17 while the bottoms of the lugs 3 and 13 abut against the base plate on which said shield can rest. Thus the opposite ends of the spider are held against axial motion with respect to the remainder of the fuze assembly. The annular capacitor C fits around the lateral lugs 2 and 2 at one end and around lugs 3 and 13 at the other, the capacitor itself fitting within the shield can.

It will be seen that the spider divides the substantially cylindrical space within the capacitor C into quadrants. The disk 11 is divided into quadrants also, and each quadrant of the disk is provided with a hole 22.

Preferably the amplifier tubes of the fuze have their bases inserted into the holes 22 and are thus disposed in these four quadrant-shaped compartments. All the wires coming from these tubes are thus accessible from below the disk 17, so that it is relatively easy to make the connections required. This is an improvement over the previously used assembly, wherein the tubes were base-end up and it was relatively more difficult to make the connections.

When an assembly comprising four tubes or less is to be accommodated, each tube will have one of these quadrants to itself. This facilitates mounting and supporting the tubes properly, prior to the potting operation. It also facilitates wiring the tubes and other components of the circuit, as certain elements, such as resistors, sockets, capacitors and the like, may be placed in the same quadrant with the tube to which they appertain, thus simplifying and shortening the connecting wires and also assisting in identification of closely correlated parts of the fuze circuit.

The potting compound is heated sufficiently to become extremely mobile, and is then introduced into the assembly and allowed to harden by cooling. The lugs 2, 8, 10, etc., keep the spider centered, as already stated, and also provide passageways through which the potting compound may flow readily. It will be noted that the disk 17 is of smaller diameter than the bore of the capacitor C, and thus an annular channel is provided for the

potting compound. The holes 6 and 16 likewise afford openings through which the compound may flow easily, as do the hole 21 and the semicircular notches 24. All these channels, passages and other openings thus assist in providing a multiplicity of paths through which the potting compound may flow quickly and freely to positively fill all the voids in the assembled unit.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In combination with a fuze for a rotating type of projectile having a hollow nose, a housing mounted in said hollow nose, means in said housing for supporting fuze components, said means comprising a pair of upright punchings interlocked at an angle to each other, a plurality of lugs spaced about the periphery of each of said punchings, and a disk shaped punching interfitted with said upright punchings and cooperating therewith to define a spider, said disk shaped punching being provided with apertures to receive components of said fuze, said lugs being arranged to abut the surface of said housing whereby said spider is adapted to support fuze components in spaced relationship in said housing.

2. In combination with a fuze for a rotating type of projectile having a hollow nose, a shield can in said nose, a spider formed of dielectric material adapted to fit into said can for supporting fuze components, said spider comprising a first substantially plane upright punching provided with lugs spaced about its periphery, said first punching having a vertically extending slot and a horizontally extending slot, a second substantially plane upright punching provided with lugs spaced about its periphery, said second punching having a vertically extending slot, said punchings being interfitted at an angle to each other by means of said vertical slots, and a horizontally extending punching received in the aforesaid horizontal slot in said first punching and engaging portions of said second upright punching to retain said punchings in interlocked relationship, said horizontally extending punching having apertures therein adapted to receive fuze components, said peripheral lugs being arranged to abut the inside surface of said can, whereby said spider is adapted to support fuze components in spaced relationship in said can.

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