

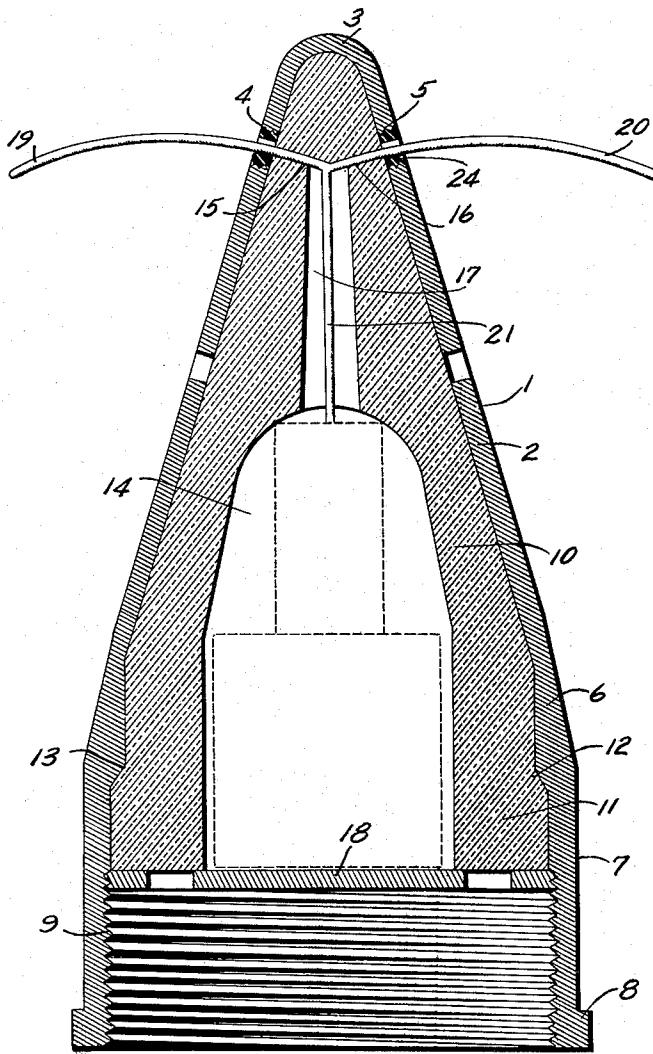
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J. A. VAN ALLEN ET AL

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PROJECTILE NOSE STRUCTURE

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INVENTORS

JAMES A. VAN ALLEN  
ROBERT G. FERRIS

BY

*William Jones*

ATTORNEY

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## PROJECTILE NOSE STRUCTURE

James A. Van Allen, Mount Pleasant, Iowa, and Robert G. Ferris, Harvard, Ill., assignors to the United States of America as represented by the Secretary of the Navy  
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The present invention relates generally to electrically detonated projectiles and more particularly to improvements in the nose structure and antenna means employed in such projectiles.

Considerable trouble has been experienced during the firing of electrically operated projectiles due to the failure of the noses of said projectiles, which noses are ordinarily formed of plastic material carrying a thin sheet metal antenna upon the surface thereof, to withstand the forces present in the gun barrel during acceleration. The forces on the projectile during firing may evidence themselves as sideslap and reverse setback. Breakage of the noses of such projectiles has also resulted from the shocks and jars incident to the handling and transporting of the projectiles prior to firing.

One of the objects of the present invention, therefore, is to provide an improved nose structure for such projectiles which will be capable of withstanding the forces present in the gun barrel and the forces imposed by rough handling of the projectile previous to firing.

Another object of the invention is to provide a projectile nose structure employing an antenna of improved properties and construction.

Still another object of the invention is to provide a projectile nose structure which will protect the components within the same against heat.

A further object of the invention is to provide a structure of this character wherein, by the use of a rigid but relatively thin metal wall, additional space within the nose is made available so that a larger number of components may be accommodated therein.

Further objects of the invention, not specifically mentioned hereinabove, will become evident as the description proceeds.

In the drawing, the single figure is an axial sectional view of our improved projectile nose structure.

Referring now to the drawing, the numeral 1 indicates generally the metallic shell of our improved projectile nose structure. The conical forward end of the nose is closed and rounded as indicated at 3. Formed in the wall of the nose near the closed end 3 are properly located openings 4 and 5 for the antenna elements 19, 20, which will be described in detail hereinafter.

The tapered forward section 2 of the nose shell 1 is joined at its rear end to a thickened section 6 and a generally cylindrical section 7, open at its rear end and provided with a radial, relatively thick coupling flange 8. Formed in the rear end of the section 7 is an internal thread course 9.

Fitted and firmly held in the tapered forward section 2 of the nose shell structure, and extending into the rear section 7 thereof, is a thick, massive liner 10, formed of a block of insulating material and provided with an enlarged lower end section 11 which defines a shoulder 12 adapted to abut the shoulder 13 which is formed at the junction of the thickened wall 6 and the generally cylindrical section 7. The liner 10 is provided with a centrally located chamber 14 for the components of an oscillator or a combined oscillator and amplifier unit. Formed in the forward end of the liner and aligned with the axes of the openings 4 and 5 are bores 15 and 16, which are substantially normal to the outer surface of liner 10, that is, they are radial but forwardly inclined. Extend-

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ing between the meeting inner ends of said bores and the upper end of the chamber 14 is an axial bore 17.

Locking the liner 10 in operative position within the nose structure 1, and closing the rear end of the recess 5 14, is a bottom plate 18 which is preferably formed of metal and is screwed into the thread course 9. The bottom plate 18 retains the components of the oscillator unit, or the oscillator amplifier unit shown in dotted lines, in place in the recess 14. A suitable potting compound 10 may of course be used to retain said components against displacement in the recess itself.

Mounted in the bores 15 and 16 are antenna elements 19 and 20 which are preferably in the form of flexible wires, although it will be understood that the antenna elements 15 might be in the form of blades, as in the disclosure of the patent application of M. A. Tuve and J. A. Van Allen, Serial No. 498,084, now Patent No. 2,360,685, filed August 10, 1943, for Radio Sonde. The antenna elements 19 and 20 are connected to each other at 20 their inner ends, which ends lie at the forward end of opening 17. They emanate from the shell at diametrically opposite points near the vertex and, being flexible, they normally lie dormant against the sides of the shell where they are safe from being broken off and from causing 25 casual injuries to passing personnel. They are also of appreciable lengths when proportioned to the slope of the shell, therefore extending well beyond the plane of the cylindrical section 7 under the influence of centrifugal force when the projectile is in flight. Transmission conductor 21 connects said inner ends of the antenna elements 19 and 20 with the oscillator within the recess 14. It will be understood that the other output terminal of the oscillator is connected to the metallic portions of the projectile, which include the nose cap or shell 1. 30 Suitable grommets 24 are provided to insulate the inner end portions of the antenna elements 19 and 20 from the nose shell 1.

After the oscillator and related components are mounted within the chamber 14 and connected with the 40 conductor 21, potting compound is poured into the chamber to secure the parts in position, and the plate 18 is screwed into place. If desired, the antenna elements may be fastened to the side wall of the section 2 by some suitable means releasable by centrifugal force and/or setback. However, the elements being flexible, there is little likelihood of their becoming broken, so that they may be allowed to project freely, and will extend almost perpendicularly to the axis of the projectile while the latter 45 is in flight, under the effect of centrifugal force.

When an electrically operable projectile equipped with our improved nose is fired and the unit within the recess becomes operative, the elements 19 and 20 will become energized and will radiate electromagnetic energy in the manner described in the copending application of M. A. Tuve and R. B. Roberts for Radio Proximity Fuze, Serial No. 471,388, filed January 6, 1943. The effect of the radiating system is substantially that of a dipole, and the emitted pattern is accordingly essentially symmetrical 55 with respect to the axis of the projectile.

Experiments have proven that the ballistic effect of the elements 19 and 20 is negligible. Therefore, the antenna will not interfere to any material extent with the flight or other operational characteristics of the projectile. All 60 portions of the nose housing and antenna structure are virtually indestructible under conditions prevailing in handling, shipment and loading, so that danger of injury thereto prior to firing is practically eliminated.

What is claimed is:

1. A projectile nose including a hollow metal shell having a cylindrical section merging into a conic section, said shell having two apertures on diametrically opposite

sides of the cone near to and equidistant from its vertex, a bifilar antenna having a branch passing through each aperture, said antenna branches being of equal and appreciable lengths in proportion to the slope of the conic shell, therefore reaching well beyond the plane of the cylindrical section when rigidly extended outwardly by action of centrifugal force, and a single lead-in conductor extending axially within the cone and connected to the inner ends of both antenna branches.

2. The structure defined in claim 1 with the additional characteristics that the antenna branches are flexible and that the projectile is of the spinning type, whereby the centrifugal force will erect the antenna branches rigidly perpendicular to the axis of the shell when the projectile is spun in flight.

3. A projectile nose including a shell having a conic form terminating in a vertex, and a bifilar antenna car-

ried by the shell, said antenna consisting of supinely flexible wires emanating from the interior of the shell at diametrically opposite points near the vertex and adapted at times to lie dormant against the sides of the shell during the inertness of the projectile nose.

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