3,048,110
FRANGIBLE NOSE CONE
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This invention may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates generally to the field of ordnance and is more particularly concerned with an improved frangible nose for a rocket, bomb or missile designed to enter a body of water and sink to a predetermined depth before detonation.

In order to prevent broaching orricocheting of air laid mines, depth charges, or anti-submarine missiles which are projected through the air and enter the water, it is desirable that a portion of the nose piece be flattened. A flattened nose tends to make the missile enter the water cleanly and fall more or less directly along the path of its trajectory extended underwater thereby reducing errors caused when the missile skips along the water surface. However, such a flattened nose is not desirable during the airborne phase of its trajectory because it tends to decrease the aerodynamic stability of the missile so that it rolls or tumbles. In the past it has been the practice to cover the nose flat of a missile with a sheet metal ogive which is wrapped loose on water entry. This technique is especially useful for bombs or depth charges which are dropped from airplanes flying at relatively low speeds. A sheet metal nose, while it may function satisfactorily on missiles traveling at speeds up to the transonic and supersonic range, has undesirable breakup characteristics upon water entry at these higher speeds and causes the missile to follow an unpredictable and erratic course during and subsequent to water entry because of the non-uniform breakup of the false "skin" nose. Furthermore the false "skin" nose may be torn loose during high speed flight.

It is therefore an object of this invention to provide an improved frangible nose which fits over the flattened end of a water entry supersonic missile and which breaks up evenly upon water entry so as not to introduce side components to the forces acting longitudinally of the missile body at water entry.

Another object of the invention is to provide a new and improved frangible nose cap which is sufficiently strong to withstand high temperature and forces generated during supersonic flight through the atmosphere.

Another object is to provide a new and improved frangible nose covering a flat on a missile body to produce an aerodynamically clean body when the missile is moving through the air and which resists pressures generated when the missile is launched but is uniformly broken up upon entry.

These and many other objects will become more readily apparent upon reading and considering the following specification and the appended drawings wherein like numerals designate like or similar parts throughout the various views and in which:

FIG. 1 is a section of the forward portion of a typical missile having a frangible nose cap illustrative of the principles of this invention; and

FIG. 2 is a view in perspective which shows the metal nose insert in greater detail.

Reference will be made with greater particularity to FIG. 1, the forward portion 11 of the missile includes a flat 10 having a threaded hole 12 formed therein to receive the threaded end 20 of the frangible nose insert indicated at 13. It should be noted that hole 12 is considerably deeper than the threaded length of member 13 thereby insuring that the member 13 will be threaded completely into the hole without bottoming in the hole. The outer nose shell 14 is formed preferably of a heat resistant material such, for example, as the asbestos filled plastic molding compound X-1570 manufactured by the Fiberite Corp. This prevents excessive heating interiorly of the ogival outer shell 14. As is apparent from the drawing, shell 14 includes a pair of interiorly projecting shoulders 16 and 17; the first of these receives the plate-like portion 18 of the frangible nose insert 13 and is threaded in order that this plate-like portion may be secured thereto by screws 19. The edge of plate 18 abuts against one surface of shoulder 17, which shoulder also provides a gripping surface to retain a molded foam insert 21 formed securely in place within nose shell 14. This plastic foam piece is preferably premolded to the desired shape and coated with an adhesive (for example an epoxy resin) around its peripheral edge and secured to the inside of shell 14. The foam serves to distribute the water entry shock. The plastic foam, however, does not completely fill the interior space of shell 14 but terminates below the edge 22 of the shell which edge abuts flat 10 on the forward portion of missile 11. Since the foam does not completely fill the shell, a portion of the threads on 13 are exposed between surfaces 11 and the adjacent surface of plastic foam 21. This distance is rather small, in actual practice it need not exceed 7/8 of an inch, however it is important that there be some space between the foam 21 and surface 11 to provide a line at the root of the threads where the stress is concentrated. This serves to break off member 13 from the missile body cleanly along surface 10 at water entry.

It will also be noted that the plate 18 has a plurality of radially extending, circumferentially spaced slots 24 (FIG. 2) which extend into the cylindrical portion 20 and serve to weaken the plate sufficiently so that upon water entry it breaks up uniformly. The shell 14 is made of a plastic material of relatively low tensile strength and disintegrates on water entry and the foam 21 has little compressive or tensile strength and disintegrates upon water entry thereby exposing flat 11 on the missile so that the missile upon water entry behaves as if the frangible nose cap were not present. This cap does, however, improve the aerodynamic characteristics of the missiles since it is formed smoothly on the outer surface and is abutted against the flat 10 at edge 22. The abutment is insured by the above mentioned fact that hole 12 is rather deep in comparison with the threaded portion of member 13. The thermal insulating properties of the shell 14 and foam 21 both serve to prevent rapid heating of the member 13 thereby preventing distortion of either the plate-like portion of this number or the threaded cylindrical portion thereof. This prevents warping of this member which could adversely affect the mode of break up of the shell upon water entry.

Having thus fully described this invention with reference to one preferred embodiment thereof it is by no means so limited as it should be apparent to those skilled in the art that this invention is susceptible of many alterations and modifications without departing from the spirit and scope thereof. Accordingly, it is not to be construed as limited in any manner by the hereinabove described illustrative example but is to be defined by the scope of the appended claims.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A frangible nose assembly in combination with a water entry body having an aerodynamic configuration
3,048,110

and a flat surface and an interiorly threaded hole at said surface, which nose assembly comprises: a hollow frangible shell forming a smooth continuation of said body and abutting said flat surface, said shell being composed of a heat insulating material and having an internal shoulder formed therein, a nose insert having a plate portion mounted on said shoulder, a cylindrical portion integral with said plate portion and having a threaded end disposed within said internally threaded hole and projecting slightly from said flat surface, a plastic foam material disposed within said nose shell between the plate portion of said nose insert and the flat surface on said body, said foam being displaced slightly from said flat surface to expose at least a portion of the projecting threaded end on the cylindrical portion of said nose insert, whereby the water entry shock encountered by said nose assembly is concentrated at the exposed root of the threaded end to break said insert cleanly at the flat surface of said body.

2. The frangible nose assembly of claim 1 wherein said plate portion of said metal nose insert has a plurality of radially extending circumferentially-spaced slots therein to weaken said plate portion and thereby promote uniform and rapid breakup of the plate portion upon water entry.

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