Oct. 29, 1963 R. F. FLETCHER 3,108,540

MISSILES

Filed April 26, 1961

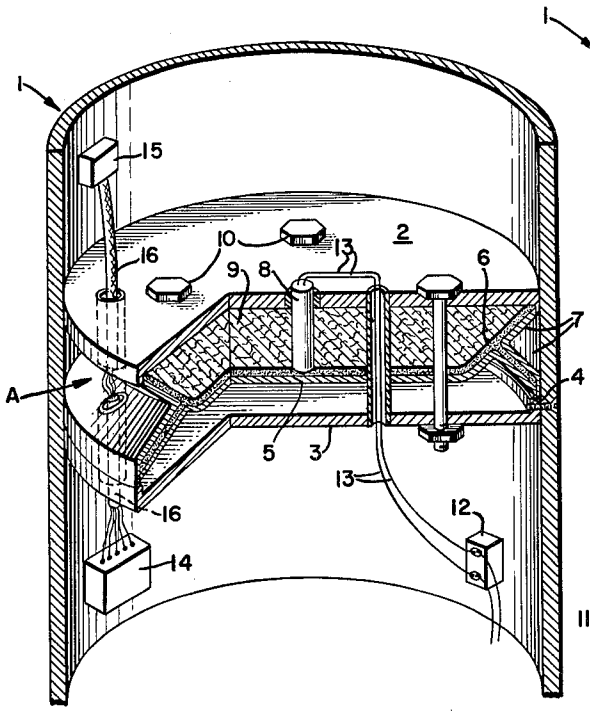


FIG. 1.

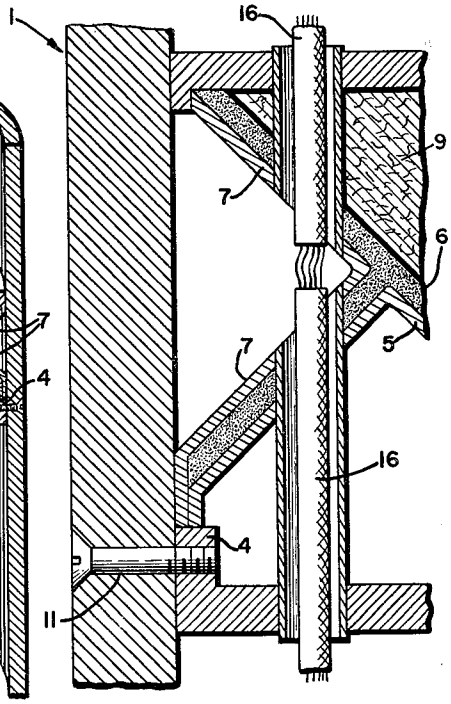


FIG. 2.

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MISSILES

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The invention relates to missiles, and more particularly to the provision of means whereby a casing severing explosive charge effects axial separation of the severed sections of said missile and/or may perform other functions in addition to the casing severing action.

The present specification and drawing include the disclosure of patent application Serial No. 26,772 filed May 4, 1960, now abandoned, of which the present application forms in part a continuation.

The invention consists in the novel construction and combination of parts, as set forth in the appended claims.

In the accompanying drawing, illustrating the invention, FIG. 1 shows a perspective view, partly broken into section, of a cartridge constructed in accordance with the invention, together with a portion of the casing of a missile.

FIG. 2 is a fragmentary enlarged section, taken at arrow A of FIG. 1.

In this drawing the numeral **1** designates the outer casing of a rocket or other missile, within which is secured a cartridge having spaced upper and lower plates **2** and **3**, located intermediately of the missile in peripheral contact with the wall thereof and separating the same into sections. Said plates are connected by bolts **10** or other blast resistant connections designed together with such plates to withstand dismemberment or distortion by the explosion of the charge to be described. The lower plate is formed with an upstanding marginal rim **4**, secured to the casing **1** at **11**. A diaphragm **5** is supported upon the rim **4** and lies midway of the interval between the plates **2** and **3**.

In the preferred form of the invention a relatively thin sheet of explosive material forms a disk **6**, which is supported upon diaphragm **5** and presents a substantially unbroken surface from its center to a periphery adjacent to the casing of the missile. Around this periphery, disk **6** is formed with two outwardly diverging walls, faced with an outer band **7** of highly fusible material such as copper. Each of these walls is of approximately the same thickness as that of the central portion of the disk, giving a preponderance of explosive material adjacent the casing. Diaphragm **5** lies in supporting contact with the plane central portion of explosive disk **6** and has an angularly disposed peripheral portion in contact with the lower of the diverging walls of such disk.

An ignition initiator **8** is mounted on the upper cartridge plate and contacts the sheet explosive disk at its center. This initiator may be of the self-contained type, with delayed action, or it may be actuated by a separate timer, both arrangements being well known in the art. As shown a timer or arming bar, indicated at **12**, is mounted in the section of the casing which is to be severed and is connected to ignition initiator **8** by a lead **13** which passes through a tube in the cartridge.

The space between the upper cartridge plate and the sheet explosive is filled by a layer of cushioning material **9**, which, together with the resistant nature of such upper plate, will protect the assemblies of the upper missile section against damage by the severing explosion.

It will frequently be necessary to connect installations in missile sections which are to be severed from each other, by suitable conductors of energy, in which case such conductors must also be severed. These installations may have any one of a number of functions and may be designated as regulators **14**, and activators **15**, connected by a conductor of energy **16**.

Conductor **16** passes through the cartridge, intersecting the diverging walls of the sheet explosive disk **6** and thus being subject to the lateral casing severing blast.

In operation, the central portion of the sheet explosive disk, being ignited, will exert thrust upon diaphragm **5** and will also act as a fuse to ignite the material of the diverging peripheral walls of the disk. The band **7** is fused by the resulting explosion and a concentrated blast of gases and molten metal is directed against the wall of the casing **1**, severing said wall. Meanwhile the explosion of the central portion of the sheet, having compressed the cushioning material **9** and overcome the resistance of the diaphragm **5**, will buckle said diaphragm and drive it violently against the lower cartridge plate, the open space between diaphragm **5** and plate **3** serving as an expansion chamber. This impact will occur substantially at the moment of the fracture of the casing **1**, will assist in separating the two sections of said casing, by propelling one of said sections in an axial direction, away from the other. An additional impact against the lower plate **3** will be caused by a secondary action of the explosion of the diverging walls of disk **6**. That is to say that, in addition to the jet directed perpendicularly to the longitudinal axis of the missile, this explosion will exert force in a circular path, parallel to said axis, which, acting upon the narrow peripheral portion of diaphragm **5**, extending at an angle to the central portion, will fuse this periphery. The result will be not only to aid in buckling the diaphragm but to direct a circular jet against the bottom plate.

This utilization of the explosive casing severing means to effect separation of the severed parts is of advantage in securing synchronization of the two effects and it also allows for extreme simplicity of structure.

It may be noted that the separating cartridge is insertible into the missile as a prefabricated unit.

Obviously, a number of cartridges may be secured at spaced points along the missile, and also, if a nose portion of the missile is to be separated and thrown forward, a standard cartridge may be secured, in reversed position, at the proper point.

I claim:

1. In a missile having an outer casing;
a casing severing means comprising a cartridge secured in said casing and comprising end plates permanently secured to each other, a disk of explosive material extending across the cartridge and designed upon explosion to effect circumferential severance of the missile casing, and ignition means contacting said disk at its center;
said severing means being in combination with axial separation means comprising a collapsible diaphragm supporting said disk, formed of material substantially lighter than that of said end plates and normally separating said explosive material from the lower plate by an interval comprising an expansion chamber for the gases of combustion generated by explosion of said material and released by collapse of a diaphragm under pressure of said gases.

2. In a missile according to claim 1;
particularized in that said disk of explosive material is formed with a peripheral portion comprising two outwardly diverging walls;
and further particularized in that said diaphragm consists of a plane central portion and an angularly disposed peripheral portion in contact with one of the diverging walls of said disk.

3. In a missile according to claim 1;
particularized in that said disk of explosive material is formed with a peripheral portion comprising two outwardly diverging walls, and in which the inter-

connected plates separate the space within said casing into sections;

and further particularized in that said ignition means is mounted in one of said plates and extends into one of said sections, a timer is mounted in the opposite section, and a lead from said timer to the ignition means passes through the interconnected plates.

4. In a missile having an outer casing, a regulating device secured to said casing and an activating device therefor separately secured to said casing;

a casing severing means comprising a cartridge attached to said casing, located between the regulating and the activating devices and containing a disk of explosive material formed with a peripheral portion comprising two outwardly diverging walls terminating adjacent said casing, and ignition means connected to said disk;

said severing means being in combination with an energy conductor connecting the regulating and activating devices and passing through the diverging walls of the explosive material disk, whereby said conductor will be severed by action of the ignited explosive material, together with the severance of the missile casing;

and means for axially separating one of the severed portions of the casing from the remainder of the missile.

5. A separation cartridge designed for insertion within a tubular structure;

comprising permanently interconnected end plates, a disk of explosive material extending across the cartridge and designed upon explosion to emit a radial blast, and ignition means contacting said disk at its center;

said disk being in combination with means for axially directing a portion of said blast comprising a collapsible diaphragm supporting said disk, formed of material substantially lighter than that of said end plates and normally separating said explosive material from the lower plate by an interval comprising an expansion chamber for the gases of combustion generated by explosion of said material and released by collapse of the diaphragm under pressure of said gases.

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