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Moskowitz et al.

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[54] MISSILE LAUNCHING APPARATUS

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[73] Assignee: **Philco-Ford Corporation,** Philadelphia, Pa.

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[21] Appl. No.: **79,652**

Related U.S. Application Data

[62] Division of Ser. No. 777,250, Nov. 20, 1968, Pat. No. 3,605,549.

[52] **U.S. Cl.** **102/49.3,** 102/34.1, 102/37.1, 102/92.7, 244/3.24

[51] **Int. Cl.** **F42b 15/10,** F42b 15/16

[58] **Field of Search**.....102/34.1, 37.1, 49.3, 49.4, 102/92.7; 244/3.22, 3.23, 3.24, 3.25

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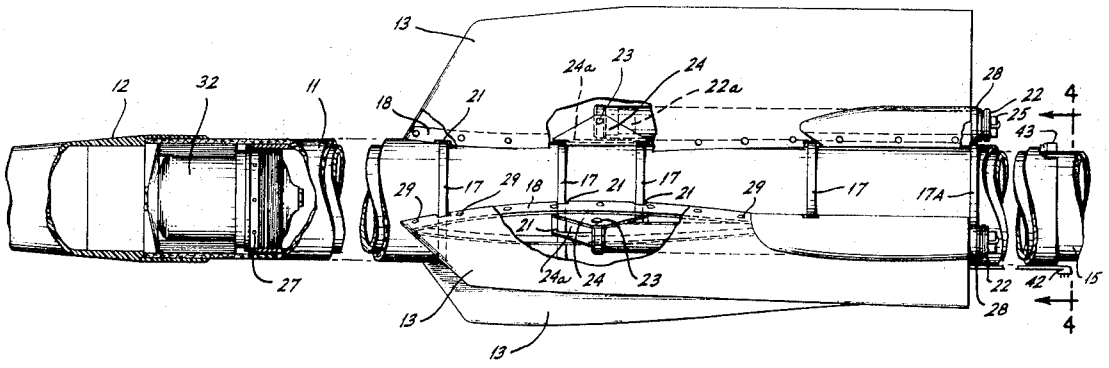
[57] **ABSTRACT**

A rocket powered missile and cooperating launching tube from which the missile can be catapulted at high initial velocity. The missile includes a hollow fuselage section which is telescopingly fitted over a launching tube open at its forward end and closed at its rearward end. Stabilizing fins and rocket motors are provided on the fuselage section, and a gas generator is provided toward the forward end of the section to supply sufficient gas pressure within the launching tube to launch the missile. Prior to launching, the missile is held on the launching tube by shear pins. Ignition of the gas generator pressurizes the launching tube so that the resultant force on the shear pins exceeds their shear strength, whereupon the missile is launched, and the rocket motors are ignited to propel the missile in its flight.

3 Claims, 6 Drawing Figures



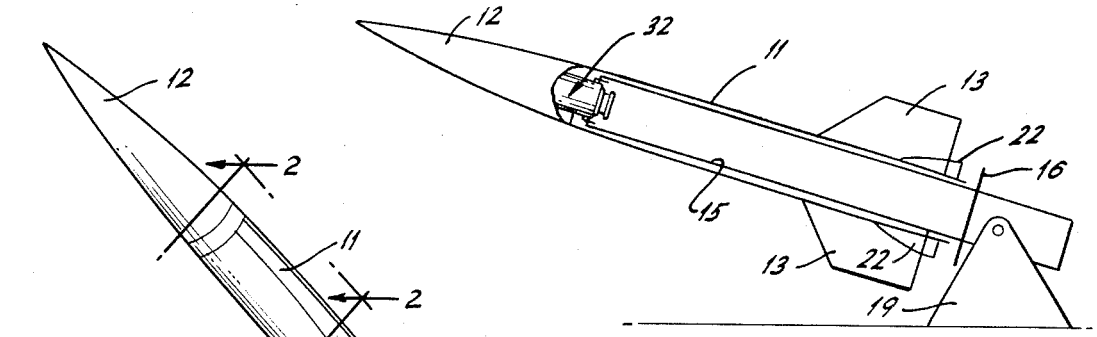


FIG. 1A.

FIG. 1.

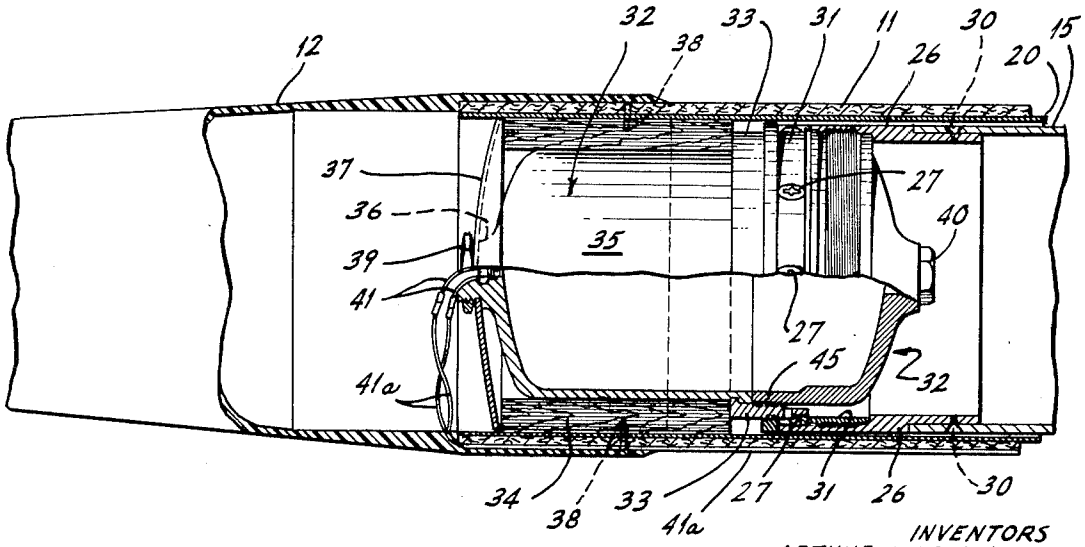


FIG. 2.

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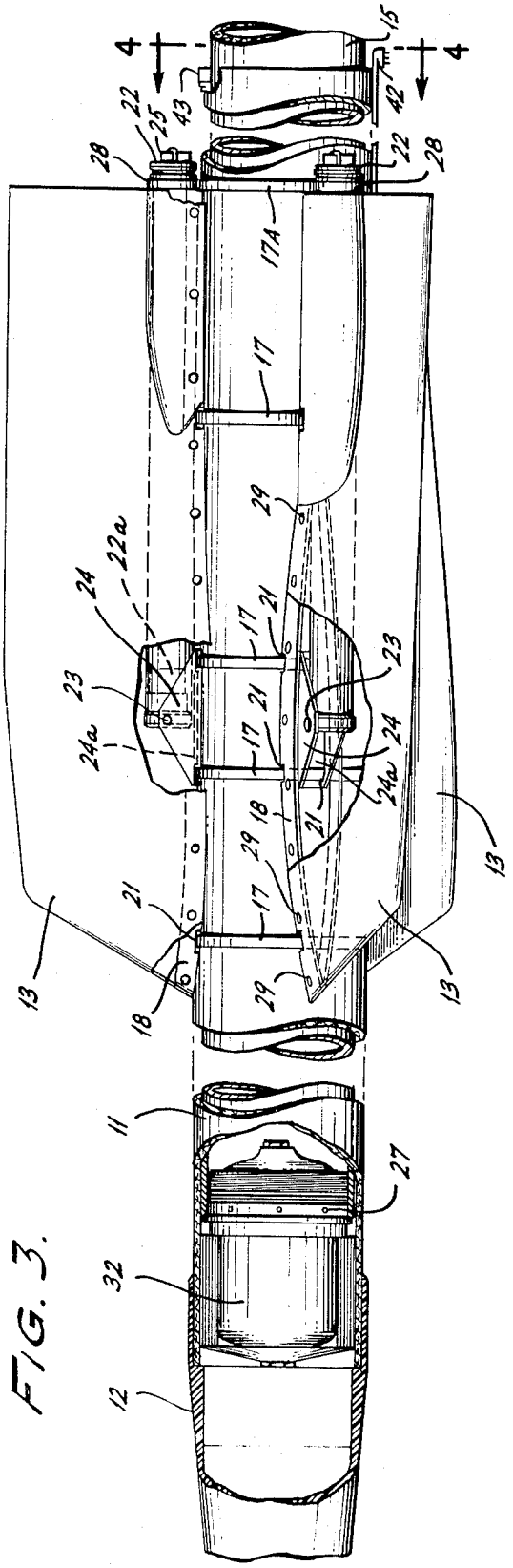

FIG. 3.

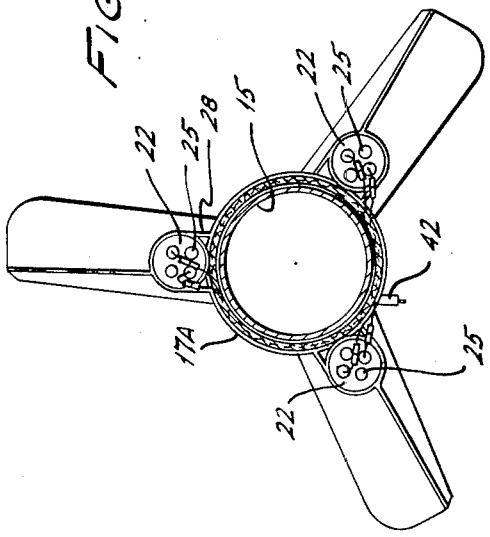

FIG. 4.

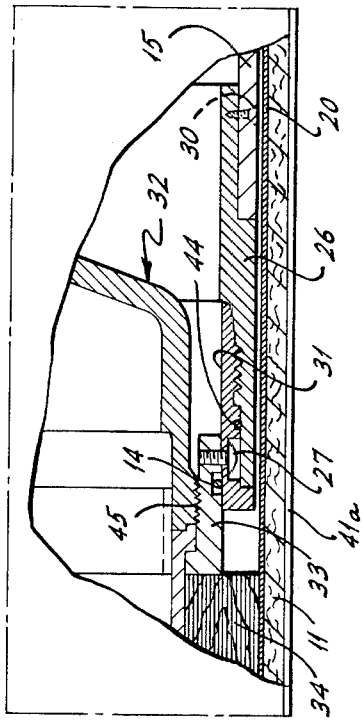

FIG. 2A.

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MISSILE LAUNCHING APPARATUS

This is a division of application, Ser. No. 777,250, now U.S. Pat. No. 3,605,549, filed Nov. 20, 1968.

BACKGROUND OF THE INVENTION

This invention relates to missile launching apparatus, and more particularly to apparatus for launching a missile propelled in flight by a rocket motor.

While of broader applicability, the present invention has particular utility in the field of aerial targets. Heretofore, it has been common to use jet-powered drone aircraft in target work. However, due to their high cost, such drones are often used only to tow an aerial target. This of course presents a less maneuverable and hence less realistic target.

It is therefore a general objective of the invention to provide an improved aerial target missile and launching apparatus characterized by low cost, simplicity, and effectiveness in achieving target realism.

It is a further general objective of the invention to provide missile launching apparatus of high reliability, and which lends itself to operation by non-technical personnel.

It is a further objective of the invention to provide improved, powered missile launching apparatus that is effective to retain a missile on its launching apparatus for development of a predetermined optimum thrust prior to release of the missile in its powered flight.

A further and more specific object is the provision of improved means for securing missiles to launching apparatus prior to launching.

SUMMARY OF THE INVENTION

In achievement of the foregoing as well as other general objectives, the invention contemplates provision of launching apparatus for a powered missile including a hollow launching tube having a closed end, and an open end portion over which a hollow fuselage portion of the missile is telescopingly fitted. Restraining means, such as shear-pins are provided to hold the missile on its launching tube, and a launching rocket motor provided in the forward portion of the fuselage is ported to the hollow launching tube. Propulsion rocket motors and suitable guidance fins are provided outside the fuselage, preferably on its lateral wall portion. Means are provided to ignite the launching rocket, and upon build-up of gaseous pressure in the launching tube, the resultant forces on the missile are effective to shear the restraining means, releasing and launching the missile, whereupon the propulsion rockets are ignited automatically and drive the missile in flight.

Advantageously, the apparatus of the invention achieves unusually high acceleration of a self-propelled missile to maximum speed, as is particularly desired when the missile is used as a target simulative of an aircraft, or the like.

The manner in which the foregoing and other objectives may best be achieved will be more fully understood from a consideration of the following description, taken in light of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an elevational showing, in perspective, of apparatus embodying the invention;

FIG. 1A is a simplified, somewhat diagrammatic, view illustrating the relation of the missile and its launch tube prior to launch.

FIG. 2 is an enlarged elevational view, partly in section and with parts broken away, of the apparatus in FIG. 1 as seen looking generally in the direction of arrows 2—2 applied to the latter;

FIG. 2A is an enlarged sectional view of a portion of the apparatus seen in FIG. 2;

FIG. 3 is a view similar to FIG. 2, but on a smaller scale, and showing additional elements of the apparatus; and

FIG. 4 is a sectional-elevational view of the apparatus as seen looking generally in the direction of arrows 4—4 applied to FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With more particular reference to FIG. 1, the missile 10 includes a hollow fuselage section 11 provided with a nose cone 12, tail fins 13 and propulsion rockets 22 housed within the fins. As seen to best advantage in FIG. 1A, hollow fuselage section 11 is slip-fitted over a launching tube 15 mounted on adjustable pivot means provided on stand 19 anchored to the ground or other suitable structure. Launching tube 15 is open at its forward end, is closed at its rearward pivoted end, and includes a transversely extending blast shield 16 in the region of its pivoted end.

With reference further to FIGS. 2, 3 and 4, fuselage section 11 comprises a tubular member, conveniently of rigid cardboard or like material, lined with a layer of aluminum foil 20 (see also FIG. 2A). Fins 13, preferably 3 in number, conveniently are made of molded, glass-reinforced plastic material affixed by screws or the like 29 to the leg portions of generally channel-shaped base portions 18 (FIG. 3) that extend longitudinally along outer surfaces of fuselage section 11. As seen to advantage in FIG. 4, fins 13 are inclined from the axis of fuselage section 11 so as to impart a stabilizing roll to the missile when in flight. Channel-shaped base portions 18 are frictionally retained on the surface of tubular fuselage section 11 by metal straps 17 that extend through openings 21 in the leg portions and over the web sections of the channel shaped base portions. Elongate, generally cylindrical rocket sustainer motors 22 are disposed within base portions of fins 13, and are attached at their forward ends by pins 23 to generally U-shaped brackets 24 including bases 24*a* affixed to fuselage section 11 by a pair of the same straps 17 that retain the fin base portions 18. As best seen in FIG. 3, the base 24*a* of each bracket 24 is seated upon the web section of a corresponding base portion 18. The rearwardly directed ends of motors 22 are encircled by a bracket 28, such as a screw clamp, held in place against the surface of fuselage section 11 by straps 17*a* located just to the rear of fins 13. Hence, the discharge nozzles 25 of motors 22 are disposed slightly forward of the rear open end of the fuselage section, as may be seen in FIG. 3.

Referring further to FIGS. 2, 2A and 3, and in particular accordance with the invention, an internally threaded adaptor ring 26 is affixed by screws 30 to the forward, overlapping, open end of launch tube 15. Internally threaded ring 26 receives an externally

threaded ring 31 (FIGS. 2 and 2A), and these rings are sealed to one another by a gasket 44 (FIG.2A). Another internally threaded ring 33 includes a non-threaded portion extending telescopingly into a non-threaded portion of ring 31 and is affixed thereto by means of a set of shear screws 27 — preferably eight in number — extending transversely of the telescoped non-threaded portions. A gasket 14 (FIG. 2A) affords a gas-tight seal between the aforementioned non-threaded portions.

The launching rocket motor 32 comprises a generally cylindrical housing 35 disposed concentrically within the bore of fuselage section 11. The motor also includes a nozzle 40 positioned to exhaust toward the open-ended tail portion of the fuselage section, and into the open end of hollow launching tube 15. A threaded ring 45 on cylindrical housing 35 is received by the internal threads of ring 33, whereby to complete the series of ring and gasket elements that hold rocket motor 32 in substantially gas-tight relation over the open end of the launching tube. Ring 33 abuttingly engages an annular wooden block 34 closely engaging and affixed to the inside of the fuselage section 11 by transversely extending screws 38 that also hold nose cone 12 in place on fuselage section 11, as shown to advantage in FIG. 2. The forward end of the cylindrical housing 35 of rocket motor 32 includes a threaded stud portion 36 that extends through a retaining clamp 37 held against annular block 34 by means of a nut 39 on the threaded portion 36. Thus, in addition to being affixed and sealed to the open end of launching tube 11, as is the case prior to launching, rocket motor 32 is mounted within fuselage section 11.

It should be understood that the rocket motors 22 and 32 do not, per se, form part of our invention. Accordingly consideration of their internal construction is not required in this description.

Important features of the above described construction will be more fully appreciated from a consideration of the several steps carried out in assembling the missile 10, and its mode of assembly with the launching tube 15. Starting with a hollow tube 11 of cardboard or the like, such as may be used in shipping carpets, a coating of enamel may be applied to the outside both as added protection against the elements and of such color as to enhance its visibility, and the surface of the inner bore is lined with a layer of heat-reflective aluminum foil 20. Fin base portions 18 are then attached (preferably spaced 120°) to the rearward portion of tube 11 by straps 17, such as metal packing straps. At the same time, brackets 24 and 28 are mounted, utilizing straps 17 and straps 17*a*, respectively. Rocket motors 22 are then affixed to adaptors 22*a* held to brackets 24 by pins 23, and to brackets 28. Fins 13 are then affixed to their base portions 18 by screws 29. Annular wooden block 34 is then inserted in the forward open end of the fuselage section or tube 11.

For further assembly, consideration is now given to the launching tube 15. First, adaptor ring 26 is affixed to launching tube 15 by screws 30. As a separate assembly, rings 31 and 33 are affixed to one another by shear screws 27. The threaded ring 33 thus sub-assembled is threaded onto rocket motor housing 35. The sub-assembly including housing 35 and rings 31, 33 is then threaded, via external threads on ring 31, into the threads of adapter ring 26 on the launching tube.

Next, the fuselage section 11, assembled as described, is slid tail first over the free end of the launching tube until ring 33 abuttingly engages wooden ring 34 and the latter is positioned just rearwardly of the open end of tube 11 about the distance of extension of stud 36 from motor housing 35. Clamp 37 is then slipped over stud 36, and nut 39 is threaded thereon to urge clamp 37 against wooden ring 33. It is worth mentioning at this point, and with reference to FIGS. 1 and 2 that motor 32 is of the type provided with an electric igniter (not shown) in the region of stud 36, and including wire connectors 41 to which a longer wire 41*a* is connected and strung from within fuselage section 11, and is taped or otherwise suitably attached along its length. Nose cone 12 is then fitted over the forward end of fuselage section 11, and wood screws 38 are driven through the overlapping sections of cone 12 and section 11, into wooden ring 34 to complete the missile and launching tube assembly.

As best seen in FIG. 3, lead wire 41*a* terminates in a disconnectible plug 42 releasably attachable to a mating plug of a ground-based control circuit (not shown).

Igniter circuit means for rocket motors 22 comprise a disconnectable plug 43 releasably attachable to further ground based control means (not shown).

For launching missile 10, the construction and arrangement is such that upon ignition of rocket motor 32, gas is discharged from nozzle 40 into hollow launching tube 15. Gas pressure then builds up until sufficient force is created on the closed end of the tube to shear screws 27 and launch the missile. Upon such launching, plugs 42 and 43 are pulled from their respective mating sockets. Disconnection of plug 43 conditions a circuit automatically to ignite motors 22 to propel the missile in flight.

It will be understood that once screws 27 have been sheared and the missile launched in flight, the ring 31 remains threaded in adaptor ring 26. Hence, ring 31 may then be unscrewed and re-used for subsequent shear-screw attachment to the ring 33 of another motor sub-assembly.

Flight parameters for the missile may be set by elevational variations afforded by the pivoted launching tube as well as by the number of shear screws, which may be varied. In effect, the missile when used as an aerial target is launched at such high velocity as to be compared with the launching of a clay pigeon on a shooting range.

The missile launching apparatus contemplated by the invention substantially eliminates the need for launching checkout equipment, admits of highly reliable operation, including assembly and launching, by non-technically trained personnel. It will be understood further that the aluminum foil lining 20 as well as affording thermal protection of interior surface portions of the fuselage section against the hot gases, also serves as a radar reflector for tracking purposes. Moreover, since it is the tube 15 which is subjected to the flame and high gas pressures present during launching, it is possible to use light weight material for fuselage section 11, i.e. the disclosed rolled paper tubing. Still further, external mounting of rockets permits infrared tracking of the missile, if desired.

We claim:

1. In combination with a missile having a generally tubular fuselage section provided with a nose portion and a tail portion, a tail fin and propulsion motor as-

sembly comprising: at least a pair of tail fins each having a base portion comprising an elongate member extending along the length of the surface of the tail portion of said fuselage section; a generally tubular propulsion rocket motor including a main body section enclosed within said base portion of each said fin and nozzle means positioned exteriorly of each said fin and directed to discharge away from said missile tail portion; a plurality of strap means encircling both the fuselage section and each said elongate member to hold the latter in place; first bracket means enclosed within the base portion of each said fin and affixed to the recited enclosed main body section of each said rocket motor, said first bracket means further being held in place by at least one of said strap means; and second bracket means affixed to said fuselage section and engaging each said rocket motor in the region of said nozzle means.

2. The combination according to claim 1, and characterized in that said first bracket means includes a pin connection to the forward end of the main body portion of a corresponding rocket motor, and further by the inclusion of additional strap means encircling said fuselage section for affixing said second bracket means thereto.

3. The combination according to claim 1, and further characterized in that each said base portion comprises an elongate channel member having its web section held against said fuselage section by said strap means, and in that each said fin comprises a hollow member defined by spaced wall sections that overlap and are affixed to correspondingly spaced leg portions of each said channel member.

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