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LAUNCHING DEVICES FOR SELF-PROPELLED MISSILES

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Fig. 2.

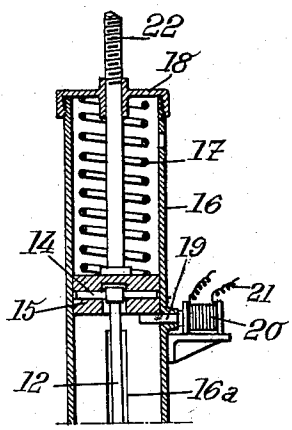
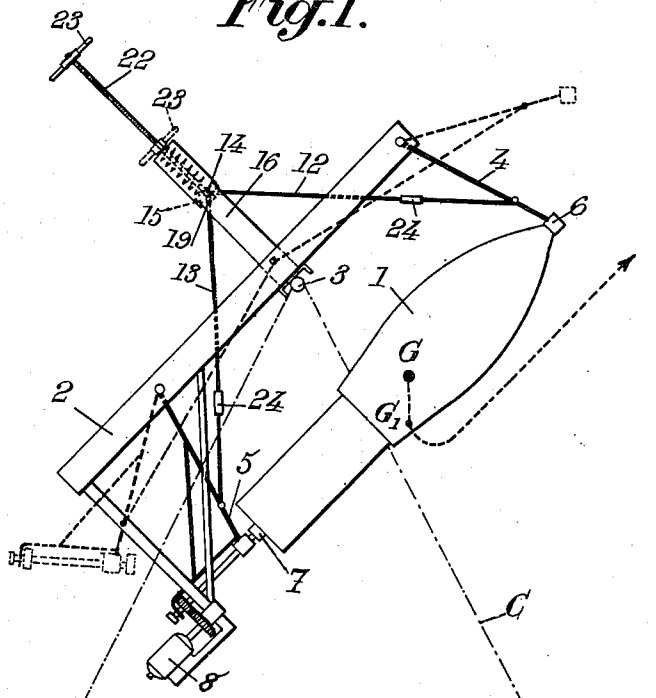


Fig. 1.



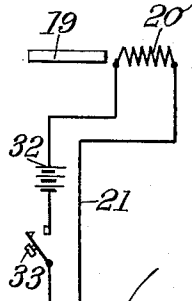


Fig. 4

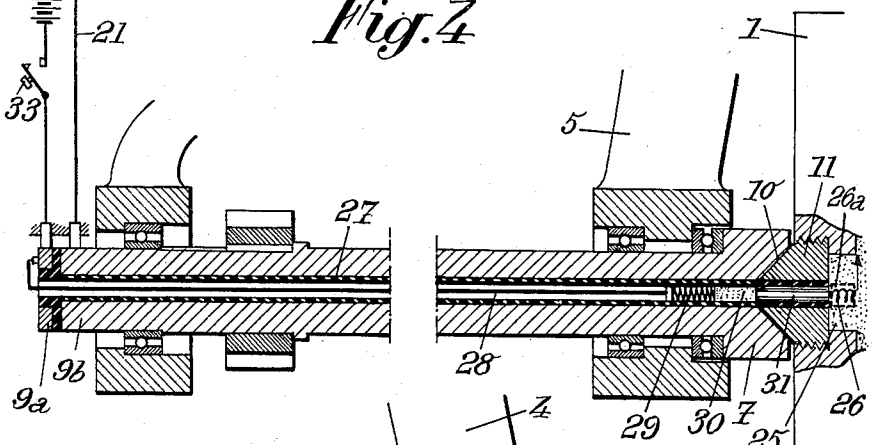
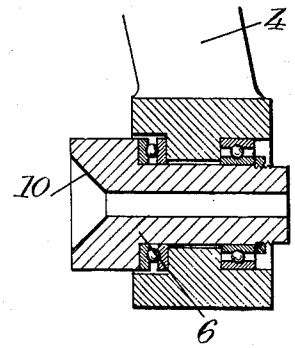


Fig. 3.



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LAUNCHING DEVICES FOR SELF-PROPELLED MISSILES

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9 Claims. (Cl. 89—1.7)

The present invention relates to the launching of self-propelled missiles, the word "launching" being taken in its broadest meaning, and the invention is more especially concerned with the launching of jet propelled aerial missiles, either from a fixed station or from a station located on board a land, sea or air vehicle.

It has been taught by experience that the launching devices known used up to this time, such as tubes or ramps, cause an important dispersion of the missiles.

This dispersion is partly due to the detrimental reactions exerted by the launching device on the missile already moving with a certain velocity under the effect of its propelling system but still in contact with said launching device. This is the case, in particular, when the missile is moving past the front end of the launching tube or ramp and is temporarily overhung.

The chief object of my invention is to obviate this drawback.

According to an essential feature of my invention, the missile to be launched, first held with its axis in a predetermined direction, is fully released in an instantaneous manner and its propelling system is caused to exert its normal driving action only after this release.

Preferred embodiments of my invention will be hereinafter described with reference to the accompanying drawings, given merely by way of example and in which:

Fig. 1 is a diagrammatical view showing a land device for launching rockets according to an embodiment of my invention.

Fig. 2 is a sectional view on a larger scale of the launching control means.

Fig. 3 is a sectional view, also on a larger scale, of the front supporting member.

Fig. 4 is a similar view showing the rear supporting member, and also, diagrammatically, the firing control circuit.

In order to launch from a land station a jet propelled missile such as a rocket 1, I provide a support including a frame 2 on which the rocket 1 can be adapted, and this frame is pivotally mounted about a horizontal axis 3 (for elevation adjustment) on a stand C the setting of which in a given direction ensures azimuthal adjustment.

The whole is arranged in such manner that rocket 1 is fully released or, to be more accurate, dropped in an instantaneous fashion, i. e. so that all the means for holding said rocket with respect to its support are simultaneously retracted, and the rocket propulsion system release mechanism is constituted and adjusted in such manner as to develop its normal power only after the missile has been thus released.

In this way, it can be considered that, owing to the simultaneous and instantaneous retracting of its supporting means, the rocket will keep, during the period that follows its release, a direction practically identical to that which had been given thereto by the initial adjustments of the launching device, the shooting of said rocket taking place subsequently in this previously determined favorable direction.

The rocket propelling system may be started (with a power below its normal value, say one third or one fourth thereof) before the missile is released, and even used to impart to this missile small axial displacements capable of operating, for instance by breaking a safety pin, the missile releasing means. But it will be supposed hereinafter that rocket 1 remains stationary in the axial direction in starting position and that the propelling system starts operating only after release has taken place.

Fig. 1 shows, by way of example, the trajectory of the center of gravity G of rocket 1 in the course of its launching period, points G_1 corresponding to the starting of the propelling system.

Of course, this is merely a theoretical curve intended to show the shape of the trajectory and to demonstrate clearly that the time at which the propelling system enters into action (point G_1) is to be fixed in such manner that, account being taken of the natural characteristics of the system and of the space available between the rocket starting position and the ground, no obstacle comes to unbalance said rocket as its center of gravity is moving from G to G_1.

The rocket may be left quite motionless until it is released, but it seems preferable, as it will be supposed hereinafter, preliminarily to give it a rotation movement (about its axis) so as to stabilize its direction once it has left its launching support.

Also it will be advantageous to make use of a control device, for instance an electrical one, actuated by a single control member, capable of operating both the rocket release mechanism and the mechanism for causing the propelling charge to start working (for instance a firing device if this charge is to be ignited).

However this last mentioned mechanism is to work with a certain delay if, despite the simultaneity of both operations, the propelling device is to develop an appreciable thrust only after the missile has fully left its support (point G_1).

It seems particularly advantageous to have rocket 1 held "between centers," that is to say by means of two retractable rotary thrust members cooperating respectively with the rocket ends. One of these thrust members may be freely journalled in the support, whereas the other one, for instance the rear one, acts as driving means for imparting the above mentioned preliminary rotary movement to the rocket, either of these thrust members, for instance again the rear one, being further arranged to include transmission means of the propelling charge firing system.

This mounting between centers has, among other advantages, that of localizing near the rocket axis (and therefore in a region where their displacement with respect to the axis is small) the parasitic reaction forces exerted by the support.

According to the embodiment illustrated by the drawings, I pivot in the ends of frame 2 arms 4 and 5 carrying respectively a front rotary thrust member 6 (which is freely journalled in arm 4) and a rear rotary thrust member 7 journalled in arm 5 and driven by an electric motor 8 (Figs. 3 and 4).

Rotary thrust members 6 and 7 hold rocket 1 through conical bearings 10 cooperating, for the front thrust member 6 (Fig. 3), with the point of the missile end, for the rear thrust member 7 (Fig. 4), with a plug 11 having a conical projecting portion and secured, for instance by screwing, in the base of said missile.

Arms 4 and 5 are operated by a control device adapted quickly and simultaneously to retract them by pivoting thereof on frame 2, so as fully and instantaneously to release rocket 1.

Such a control device is shown by Figs. 1 and 2.

To each of the arms 4 and 5 is pivoted the end of con-

trol rods 12, 13, the other ends of said rods being pivoted about a common spindle 14 carried by a sliding piece movable in a direction substantially parallel to the bisector of the angle formed by these two rods. For instance, as shown, said sliding piece is a piston 15 guided in a cylinder 16 the wall of which is provided with slots 16*a* to accommodate said rods and enable them to move.

Piston 15 is actuated by a motor element operable at will and constituted, in the example shown, by a spring 17 interposed between piston 15 and the end of cylinder 16. Preferably the action of this spring is made adjustable, for instance, as shown, by making the above mentioned cylinder end in the form of a threaded plug adapted to be screwed more or less in cylinder 16.

A retractable locking member holds piston 15 temporarily fixed in a position for which spring 17 is compressed, this locking member being constituted, in the example shown, by a finger 19 carried by cylinder 16, projecting across the path of displacement of said piston and adapted to be radially retracted against the action of return means by a solenoid 20 inserted in a general control circuit 21 which will be more explicitly referred to hereinafter when describing the propelling charge igniting system.

Finally, means are provided for returning, after a launching operation, piston 15 into initial position, so as to compress spring 17. For this purpose, as shown by the drawing, the upper portion of piston rod 22 is screw-threaded and carries a nut 23 cooperating therewith. If this bolt, bearing against the end 18 of cylinder 16, is rotated in the screwing direction, rod 22 is caused to move upwardly and spring 17 is compressed (position shown in dotted lines by Fig. 1). Then locking finger 19 is mounted under piston 15, bolt 23 can be unscrewed to come to the upper end of rod 22 (position shown in solid lines on Fig. 1), whereby rod 22 can then slide freely in the downward direction when finger 19 is retracted for another launching.

Of course, the strength of spring 17 and the amplitude of movement of rods 4 and 5 will be determined so that the holding thrust members 6 and 7 will be fully retracted, i. e. brought outside of the path of travel of rocket 1, when propulsion is applied to the rocket.

On the other hand, it will be of interest, in order to adapt the launching device to rockets of different lengths, to provide means for adjusting the distance between thrust members 6 and 7. For instance, each of the rods 12 and 13 is provided with a stretcher 24 which makes it possible to adjust its length and, consequently, the angular position of abutment carrying rods 4 and 5.

The launching device firing system for igniting propelling charge 25 (Fig. 4) might be operated mechanically, for instance by the release of a spring in response to the launching of the missile. But it will be supposed, as above stated, that this firing system is operated by the electric control main circuit 21 which also controls the retracting of locking finger 19, said circuit cooperating with a primer 26 housed in said propelling charge.

For this purpose, as shown by the drawing, I connect one of the collectors carried by rotating thrust member 7, for instance collector 9*b*, with the mass of said member and therefore also with the mass of missile 1.

The other collector 9*a* is connected, through a passage provided in the body of this thrust member and fitted with an insulating coating 27, with circuit elements including, on the one hand, inside member 7, a rod 28, a spring 29 and a carbon piece 30, and, on the other hand, inside the missile, a metallic rod 31 located in an insulated axial housing formed in conical plug 11, said rod 31 being in contact at one end with carbon piece 30 and at the other end with fuse 26 which, if the delay of ignition of the charge 25 is too short, can be combined with a sheath of relatively slow burning material 26*a*, whereby the beginning of the actual operation of charge 25 takes place at the appointed time (point G_1). Fuse 26 is electrically connected with plug 11.

The brushes which cooperate with collectors 9*a*, 9*b* are inserted in a circuit 21 including a source of current 32 and a switch 33 the closing of which causes current to flow through the above mentioned elements and thus simultaneously to retract locking finger 19, and to energize fuse 26 for ignition of charge 25.

Concerning this delayed igniting, it should be noted that most of the propelling charges that are normally used act with such a delay that it may be necessary, in some cases, in order to obtain the effective action of the jet device at the appointed time (point G_1) not to delay the effects of the energizing of fuse 26, but on the contrary to accelerate them, for instance by incorporating in charge 25 pyrotechnic products accelerating the pressure rise inside said charge.

The missile propelling system might be started operating, but with a reduced power, before the release of said missile for the purpose, for instance, of eliminating possible axial plays which would tend to prevent simultaneity of retraction of the points of support of the missile on its support.

In a general manner, while I have, in the above description, disclosed what I deem to be practical and efficient embodiments of my invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What I claim is:

1. A device for launching a rocket missile which comprises, in combination, support means for holding said missile with its axis in the direction of firing, means for instantaneously retracting said support means from said missile simultaneously for all points of contact between said missile and said support means, whereby said missile is made to drop freely with its axis parallel to said direction, and means operatively connected with said retracting means for igniting the propelling charge of said rocket missile immediately upon retraction of said support means.

2. A device for launching a rocket missile which comprises, in combination, support means for holding said missile with its axis in the direction of firing, means for imparting a rotary motion to said missile about its axis, means for instantaneously retracting said support means from said missile simultaneously for all points of contact between said missile and said support means, whereby said missile is made to drop freely with its axis parallel to said direction, and means operatively connected with said retracting means for igniting the propelling charge of said rocket missile immediately upon retraction of said support means.

3. A launching device for a self-propelled missile which comprises, in combination, a frame, at least two arms movably carried by said frame, thrust members carried by said arms adapted to accommodate the point and the center of the base of said missile respectively, means carried by said frame for holding said arms in respective positions for which said thrust members have their respective axes in line with each other and at a distance to accommodate the point and center of the base of said missile, release means carried by said frame for suddenly displacing both of said arms to move their thrust members away from each other, and means operatively connected with said release means for igniting the propelling charge of said missile in given time relation with the operation of said release means.

4. A launching device for a self-propelled missile which comprises, in combination, a frame, at least two arms movably carried by said frame, bearings carried by the ends of said arms respectively, rotary thrust members journalled in said respective bearings adapted to accommodate the point and the center of the base of said missile

respectively, means carried by said frame for holding said arms in respective positions for which said thrust members have their respective axes in line with each other and at a distance to accommodate the point and center of the base of said missile, release means carried by said frame for suddenly displacing both of said arms to move their thrust members away from each other, means for imparting a rotary motion to one of said thrust members about its axis, and means operatively connected with said release means for igniting the propelling charge of said missile in given time relation with the operation of said release means.

5. A launching device for a self-propelled missile which comprises, in combination, a frame, at least two arms pivotally carried by said frame, thrust members carried by the ends of said arms respectively, adapted to accommodate the point and the center of the base of said missile respectively, means carried by said frame for holding said arms in respective positions for which said thrust members have their respective axes in line with each other and at a distance to accommodate the point and center of the base of said missile, release means carried by said frame for suddenly displacing both of said arms to move their thrust members away from each other, and means operatively connected with said release means for igniting the propelling charge of said missile in given time relation with the operation of said release means.

6. A launching device for a self-propelled missile which comprises, in combination, a frame, at least two arms movably carried by said frame, thrust members carried by the ends of said arms respectively, adapted to accommodate the point and the center of the base of said missile respectively, means carried by said frame for holding said arms in respective positions for which said thrust members have their respective axes in line with each other and at a distance to accommodate the point and center of the base of said missile, release means carried by said frame for suddenly displacing both of said arms to move their thrust members away from each other, and means for simultaneously operating said release means and igniting the propelling charge of said missile.

7. A launching device for a self-propelled missile which comprises, in combination, a frame, at least two arms movably carried by said frame, thrust members carried by the ends of said arms respectively, adapted to accommodate the point and the center of the base of said missile respectively, means carried by said frame for holding said arms in respective positions for which said thrust members have their respective axes in line with each other and at a distance to accommodate the point and center of the base of said missile, release spring means carried by said frame for suddenly displacing both of said arms to move their thrust members away from each other, and electric means for simultaneously operating said release means and igniting the propelling charge of said missile.

8. A launching device for a self-propelled missile including an igniting circuit for igniting its propelling charge which comprises, in combination, a frame, at least two arms movably carried by said frame, thrust members carried by the ends of said arms respectively, adapted to accommodate the point and the center of the base of said

missile respectively, means carried by said frame for holding said arms in respective positions for which said thrust members have their respective axes in line with each other and at a distance to accommodate the point and center of the base of said missile, release spring means carried by said frame for suddenly displacing both of said arms to move their thrust members away from each other, a retractable locking member adapted in its active position to keep said release means out of action, electric means for retracting said member, current lead means carried by one of said thrust members for transmitting igniting current to the igniting circuit of said missile, a source of current, circuit means between said source and both said electric retracting means and said igniting current lead means, and a switch inserted in said circuit means for simultaneously connecting said source of current with said electric retracting means and said igniting current lead means.

9. A launching device for a self-propelled missile including an igniting circuit for igniting its propelling charge which comprises, in combination, a frame, at least two arms movably carried by said frame, bearings carried by the ends of said arms respectively, rotary thrust members journalled in said respective bearings adapted to accommodate the point and the center of the base of said missile respectively, means carried by said frame for holding said arms in respective positions for which said thrust members have their respective axes in line with each other and at a distance to accommodate the point and center of the base of said missile, release spring means carried by said frame for suddenly displacing both of said arms to move their thrust members away from each other, a motor carried by said frame coupled with one of said thrust members for driving it in rotation about its axis, a retractable locking member adapted in its active position to keep said release means out of action, electric means for retracting said member, current lead means carried by one of said thrust members for transmitting igniting current to the igniting circuit of said missile, a source of current, circuit means between said source and both said electric retracting means and said igniting current lead means, and a switch inserted in said circuit means for simultaneously connecting said source of current with said electric retracting means and said igniting current lead means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,018,312	Gherassimoff	Feb. 20, 1912
2,095,958	Allen	Oct. 19, 1937
2,145,507	Denoix	Jan. 31, 1939
2,421,752	Jones	June 10, 1947
2,481,542	Schuyler	Sept. 13, 1949
2,585,030	Nosker	Feb. 12, 1952
2,591,834	Kuka	Apr. 8, 1952

FOREIGN PATENTS

25,326	Great Britain	of 1894
14,000	Great Britain	of 1896
831,496	France	Sept. 5, 1938
457,302	France	Sept. 16, 1913