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MEANS FOR KEEPING AMMUNITIONS
SUSTAINED IN THE AIR
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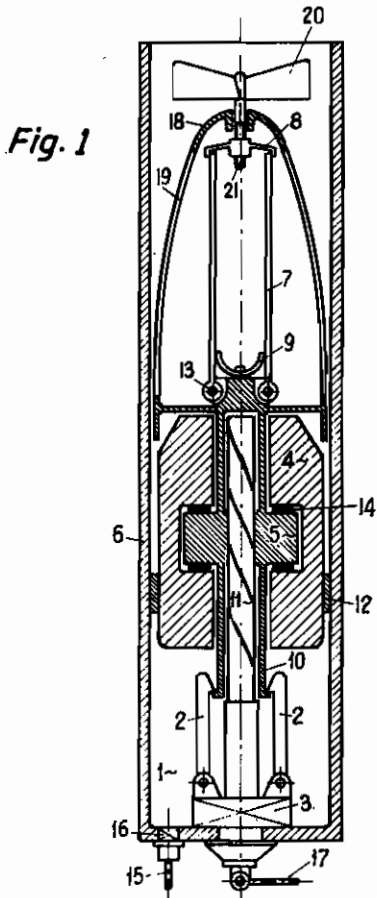


Fig. 1

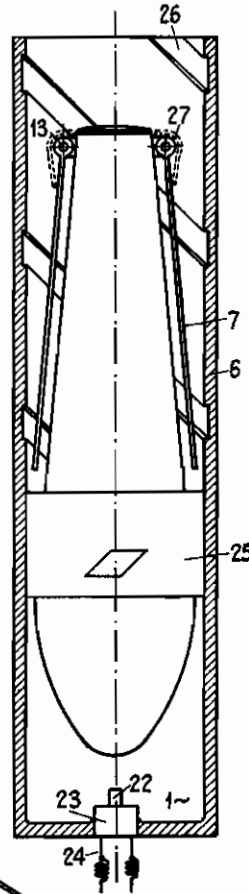


Fig. 2

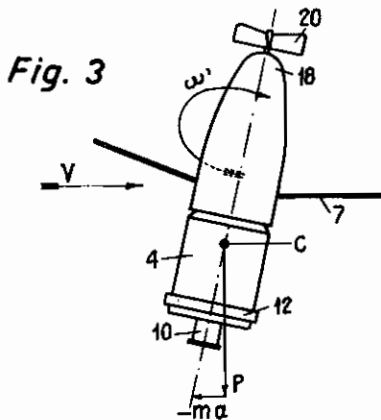


Fig. 3

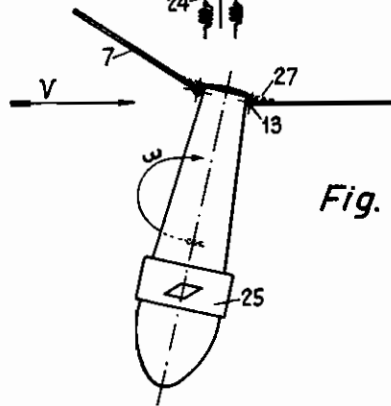


Fig. 4

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MEANS FOR KEEPING AMMUNITIONS SUSTAINED IN THE AIR

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It is in many circumstances desired to retard the speed of fall of an ammunition which has been released from an aircraft, in order to protract its permanence in the air. For like purposes little parachutes have been employed, for instance, in connection with signalling fires, lighting rockets or the like. The speed of fall can also be retarded by applying to the ammunition self rotating airscrews having a parachute-like action.

The present invention relates to new means intended for sustaining and even propelling ammunitions, and more particularly small bombs, launched from aircrafts generally in an upward direction, in order to retard their fall or even to cause them to travel a predetermined trajectory or to gain altitude after being launched.

The use of such bombs appears to be convenient both for defence or offence against hostile aircrafts particularly when an aircraft must repulse an enemy flying above or behind it.

An efficient defence against pursuing aircrafts can be obtained by launching from the pursued aircrafts bombs, preferably timed bombs, susceptible of exploding in the vicinity of the path of the pursuing aircraft. To this end, the present invention comprises the provision of a special type of bomb particularly intended for said use, a peculiar feature of said bomb being its aptitude to sustain itself in the air during a predetermined period of time, so as to retard its fall, or even to gain altitude after being launched.

Since the offensive action generally is taken from above, and the pursuing aircraft follows a line of flight which is at a somewhat greater altitude than that of the pursued aircraft, the bomb will be launched generally in an upward direction. This will be obtained through a suitable bomb launching device apt to launch a number of bombs either in immediate succession or simultaneously. The bombs embodying the invention may therefore interfere with the path of the pursuing aircraft both on account of a suitable direction of launching and owing to the presence of suitable aerodynamic devices fitted to the bombs.

According to this invention, the bomb, or a part thereof, is given a rapid rotary motion at the instant of being launched, such as by means of helical grooves formed in a launching tube, or by causing the launching tube itself to rotate. In a preferred embodiment of the invention, the bomb is given the required self-sustaining capacity by fitting to it a lifting rotor with fulcrumed blades susceptible of being folded

down before the launching. A plurality of rotors may also be employed instead of a single one. The blades of the rotor can also be so arranged as to have the rotor itself automatically kept in rotation after the launching, owing to the action of the aerodynamical forces, like an autogiro rotor.

In modified embodiments of the invention, the rotary motion of the rotor or rotors can be obtained by other means, such as through a compressed air engine with self-contained reservoir, or by reaction effect, with self-contained gas generator, or through a spring motor, or through a wind wheel designed to transform the impulse of a non-rotary launching in rotary kinetic energy, or through every other means suitable for this purpose.

The invention is illustrated on the accompanying drawings, wherein:

Fig. 1 shows a vertical cut through a bomb-launching device with a single launching tube, operated by compressed air, with the representation of a bomb fitted therein;

Fig. 2 shows a vertical cut through a bomb-launching device with electrically ignited explosive charge;

Fig. 3 is a side elevation, to a reduced scale, of the bomb shown on Fig. 1, at some instant after the launching;

Fig. 4, similarly is a side elevation of the bomb shown on Fig. 2.

The bomb launching device shown on Fig. 1 contains a bomb embodying the invention, wherein an apposite inner part is made rotatable. The bomb is fitted with a rotor, the blades of which are folded upward. 1 is the chamber of launching proper, wherein a supply of air under pressure is maintained for launching; 2—2 are hooks holding the bomb, which are released under control at the instant of launching. A box containing a device for operating the hooks 2—2 is conventionally shown at 3; 4 is the part of the bomb which does not rotate during the launching; 5 is the part of the bomb which is made to rotate whilst being launched; 6 is a launching tube; 7 are the upturned blades of the rotor; 8 is a locking device for the said blades; 9 is a device to control the opening of the rotor blades once these have been freed by the lock; 10 is a sleeve fixed to the rotatable part 5 and engaged by the hooks 2—2; 11 is a guide member with helical grooves, fixed to the bottom of the chamber of launching 1, this guide member being designed for imparting the rotary movement to the rotatable part 5 of the bomb; 12

is a packing ring; 13 is the fulcrum of the rotor blades; 14 is one of the bearings for the rotatable part 5; 15 is the supply tube for the compressed air; 16 is a valve; 17 is a wire leading to the controlling place for the release of the bomb; 18 is the ogive of the bomb; 19 are apertures in the ogive, through which the blades of the rotor can pass when the latter opens; 20 is a wind wheel which causes the spindle 21 to rotate and the locking device 8 to raise, so that after a certain number of revolutions of the wind wheel, the rotor blades are allowed to open.

Referring to Fig. 2, the launching is obtained through an explosive charge 22 the ignition device for which is conventionally shown at 23; 24 is the electrical wiring connected to the controlling place for the release of the bomb; the body 25 of the bomb is caused to revolve during the launching operation through the effect of an helical grooving 26 of the tube 6; 27 is a strip of a suitable soft metal, such as soft iron, bent to a C form and engaging the blades 7 in their rest position, so as to control the opening speed of the blades, when these are out of the launching tube.

Fig. 3 shows the bomb of Fig. 1 when out of the launching tube. As it will be seen, the bomb together with its rotor constitutes a little helicopter wherein the rotating mass of the bomb achieves the task of supplying the mechanical energy, exploiting the kinetic energy stored in its own mass during the launching phase. When this kinetic energy is consumed, the rotor behaves in the air like an autogiro-rotor and the rotation continues owing to the aerodynamic forces.

On Fig. 4 the control strip 27 is shown in its final position, the rotor blades 7 being spread out. C (Fig. 3) is the center of gravity of the bomb; V is the direction of the relative wind; P is the weight of the bomb body; $F = -ma$ is the force due to the horizontal deceleration; ω^1 is the angular speed of the rotation of the rotor.

Referring to the drawings, it will be seen that in order to make it easy to locate the bomb within the launching tube and on account of other technical reasons, the bomb is launched with the rotor blades in a folded position, whereby once the bomb is out of the launching tube, the rotor blades spread out under the effect of the centrifugal force and under control of suitable auxiliary means, such as those indicated by 9 or 27. The blades then set themselves in a position of

dynamic equilibrium, that is an equilibrium between the moment of the centrifugal force and the moment due to the lift of the blade, both referred to the fulcrum of the blade, in a similar manner to the case of an autogiro.

As a consequence of the launching direction or the aerodynamic drag produced by the rotor, the bomb-rotor unit, after the launching operation results to attack the relative wind with high angle, i. e. in a favourable condition for obtaining a strong lift and energetic deceleration.

The firing device of the bomb, that is the fuse, may be of a time or/and percussion type, e. g. one of the many known types. The operation of the fuse may be made to depend, besides upon the already mentioned wind wheel, upon the spreading out of the rotor blades, or an inertia effect, or the characteristic of the primer charge, or any other suitable means suggested by the art.

As has been previously stated, the bomb launching device in its preferred embodiment is designed for operation through compressed air, inasmuch as the compressed air supplying plant already existing on many modern types of aircrafts, particularly war aircrafts, is employed for this purpose.

The system of launching and sustaining in the air can be applied to ammunitions other than bombs, similarly sustained by means of a lifting rotor. The system can also be applied to ammunitions launched from vehicles other than aircrafts and even to ammunitions launched from the ground such as in the case of a lighting rocket which it is desired to keep sustained in the air for a longer period of time.

When a combustion takes place within the ammunition sustained by the rotor, such as in the case of a rocket, the outcoming of the combustion gases can also be conveniently utilised for further rotation of the rotor.

The rotor can be rigidly fastened to the sustained ammunition or not.

The launching device, which can also work electrically or by the effect of a spring or by any other known system, can either perform in a combined manner the actions of launching and imparting the rotary impulse, or impart the rotary motion only, whereupon the rotor will automatically take off, or perform the launching action only, leaving the rotary motion to take place through the effect of devices independent from that of launching.

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