Aug. 22, 1933. J. A. BULL 1,923,612

TORPEDO FOR LAUNCHING FROM A FLYING MACHINE

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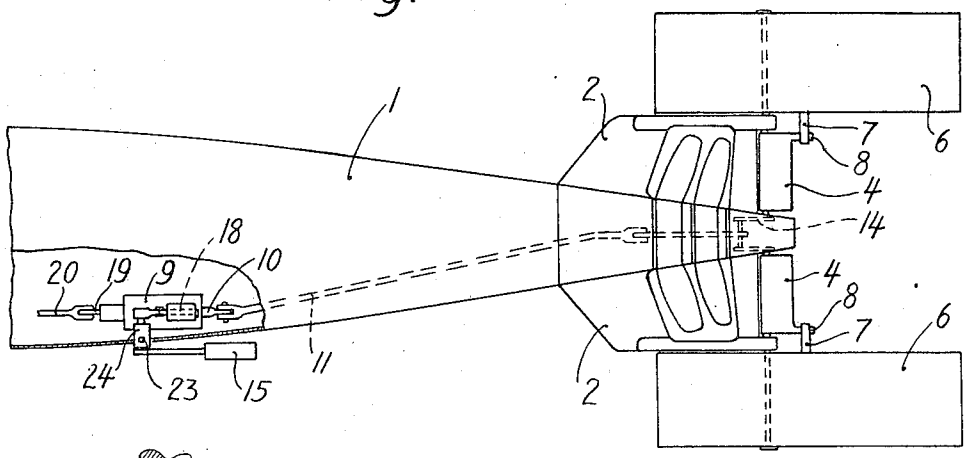
Fig. 1



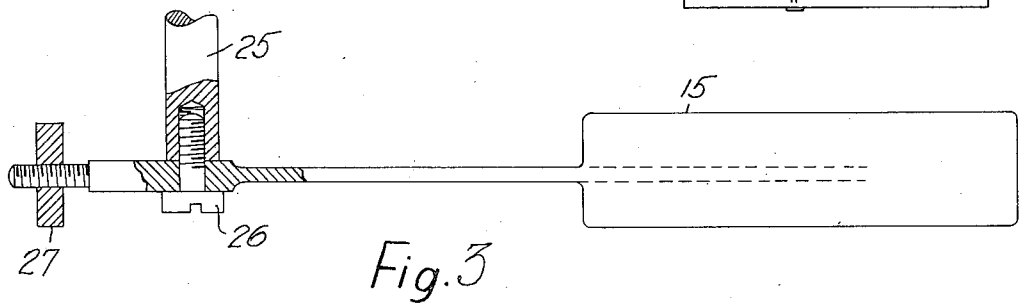


Fig. 3

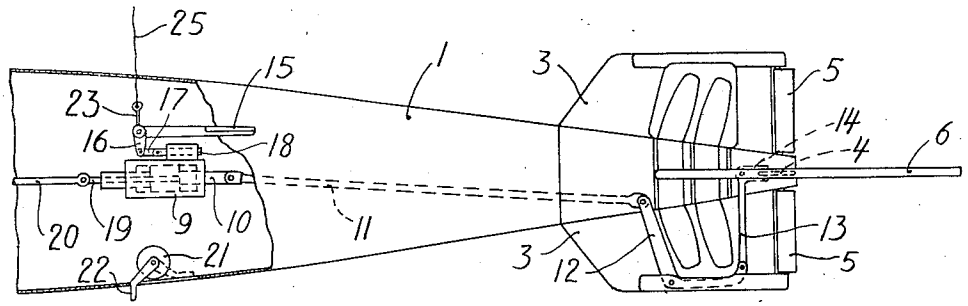


Fig. 2

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TORPEDO FOR LAUNCHING FROM A FLYING MACHINE

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8 Claims. (Cl. 114—20)

At the launching of a torpedo from a flying machine it is essential that the torpedo enter the water with its longitudinal axis at a tangent to its path, or at a certain adjustable angle to the same.

This is in the main or approximately obtainable thereby that the torpedo is given a rotation about its transverse axis during the fall, in such direction that its forward end is being swung downwards. By this arrangement a satisfactory adjustment of the torpedo is obtained up to heights of about 15 m.

At higher falls the deviation of the axis of the torpedo from the tangent to its path may become too large for securing of a successful shot; then a small initial fault in the velocity of the turning movement imparted to the torpedo may easily take place on account of movements of the flying machine, an inaccuracy in the turning device and the like, and this fault in connection with a disturbing influence of the air resistance during the fall may deflect the longitudinal axis of the torpedo more than permissible from the desired direction in or approximately in the tangent to the path.

The present invention has for its object to avoid such fault.

According to the invention the torpedo is provided with one or more comparatively large horizontal rudders, here below referred to as "steering rudders", for steering of the torpedo during the fall, which rudders are so constructed and arranged that they are released from the torpedo when the same strikes the water, preferably thereby that their connections are broken or released by the impact against the water. The steering rudders preferably are divided in two parts, with one rudder plane on each side of the tail of the torpedo, and more or less balanced.

The movement of the steering rudders is effected by means of an auxiliary rudder, preferably arranged on the side of the torpedo, and the weight of which is balanced, which rudder under the influence of the air current during the fall of the torpedo adjusts itself at the tangent to the path of fall and by a deviation of the longitudinal axis of the torpedo from this tangent acts on a steering machine for the steering rudders in such way that the rudders are moved in the direction so as to bring the torpedo back in the position with its longitudinal axis at the tangent to the path. The action of the auxiliary rudder on the steering machine is effected by means of an air slide or the like which is connected with the auxiliary rudder and at the relative movement between the rudder and the torpedo controls the admission of pressure medium to the steering machine.

A separate steering machine may be provided for the steering rudders, but preferably the steering machine for the depth rudders of the torpedo is used, this machine being under the influence of the auxiliary rudder during the fall of the torpedo, but being brought under the influence of the usual depth steering apparatus when the torpedo has entered the water. This change of the steering machine suitably may be effected by changing a valve or the like by means of an impact plate which is moved by the water pressure when the torpedo enters the water, or by means of a pendulum which owing to its power of inertia will swing at the retardation of the torpedo in the water. Where the same steering machine is used for steering rudders and depths the steering rudders may suitably be connected with the depth rudders in the way that they get their movement from the same. The steering rudders may, for example, be provided with a fork engaging the aft edge of the depth rudder, or a projection on this rudder.

A locking device may lock the auxiliary rudder in its zero position (no air admitted to the steering machine) until the torpedo has fallen a distance sufficient to be free from disturbing air currents from the flying machine. This may suitably be effected by means of a pin which prevents turning of the auxiliary rudder and which is connected with the flying machine by a line or wire which disengages the pin when the torpedo has fallen a predetermined distance.

The steering rudders with devices also may be arranged in conection with a resistance body for retardation of the torpedo upon its entering the water, in which case a quantity of pressure air sufficient for the operation of the steering rudders is stored in this resistance body.

The drawing illustrates an example of an embodiment of the invention, where the steering rudders are operated by the steering machine for the depth rudders of the torpedo, in which

Figure 1 is a plan view of the aft portion of a torpedo illustrating a steering arrangement constructed in accordance with the present invention;

Figure 2 is a side elevation of the arrangement shown in Figure 1; and

Figure 3 is a detailed view of an auxiliary rudder illustrating one method of mounting the same.

1 is the torpedo with horizontal tail fins 2, 2 and vertical tail fins 3, 3. 4, 4 are the usual depth rudders of the torpedo, and 5, 5 its course rudders. 6, 6 are the steering rudders for steering of the torpedo during its fall. They are in the shown example moved by means of forks 7, 7, engaging projections 8, 8 at the aft edge of the depth rudders.

9 is the usual steering machine for the depth rudders. Its piston rod 10 is connected in a known way by means of a rod 11 with one end of an angle lever 12, the other end of which is connected with a link 13 which acts upon the crank 14 on the shaft of the depth rudders.

During the fall of the torpedo the steering machine is under the influence of the auxiliary rudder 15, which by means of the lever 16 and the link 17 is connected with a slide 18 controlling the admission of air to both sides of the piston of the steering machine. When the torpedo has entered the water, the steering machine is changed so that it is operated by means of another slide 19 through the slide rod 20 by the usual depth steering devices.

The changing of the steering machine is effected by means of the changing or distribution valve 21, to which pressure air for the operation of the steering machine is conducted from the pressure regulator, and which valve is provided with air and exhaust conduits to the slide 18 connected with the auxiliary rudder as well as to the slide 19 connected with the depth steering devices. During the fall of the torpedo, the conduits to the slide of the auxiliary rudders are open and the conduits to the depth steering slide closed. The changing is effected by means of the impact plate 22, which during the fall of the torpedo projects beyond the shell of the torpedo as shown in full lines, but, when the torpedo enters the water is turned by the water pressure into the position shown in dotted lines, thereby turning the valve so that the conduits to the slide of the auxiliary rudder are closed and the conduits to the depth steering slide opened.

The auxiliary rudder may be locked by means of the pin 23 until the torpedo has fallen a distance sufficient to avoid any danger of the auxiliary rudder being influenced by air currents from the flying machine. The pin 23 is inserted into the bearing 24 for the shaft of the auxiliary rudder in such way, that a turning of the rudder is prevented, and is connected by a line 25 with the flying machine so that the pin is released by the line when the torpedo has fallen the desired distance.

It is sometimes desirable, as indicated hereinbefore, to so adjust the mechanism that the axis of the torpedo during the fall will be inclined at some predetermined angle with respect to the tangent to its path of movement. One simple arrangement for effecting the necessary adjustment is shown in Figure 3 of the drawing in which the auxiliary rudder is mounted on its supporting shaft 25 by means of a bolt 26 threaded in the end of the shaft and extending through an aperture in the rudder. Thus the rudder may be set to any desired position and clamped by tightening the screw 26. The rudder is preferably counter-balanced, for instance by means of a weight 27.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. In a torpedo adapted to be launched from aircraft into the water, the combination with the torpedo body, of a rudder for steering the body in a vertical plane during the fall through the air, means for temporarily supporting the rudder on the body, said means being releasable upon entering the water, mechanism for imparting steering movement to the rudder to maintain the longitudinal axis of the body in a predetermined angular relation with a tangent to the normal direction of fall of the body through the air, a controlling fin supported for free movement to a position in alignment with the instantaneous direction of movement of the body, and adjustable connections between said fin and said mechanism, whereby the angular position of the fin may be varied to alter the aforesaid predetermined angular relation.

2. In a torpedo adapted to be launched from aircraft into the water, the combination with the torpedo body, of a rudder for steering the body in a vertical plane during the fall through the air, means for temporarily supporting the rudder on the body, said means being releasable upon entering the water, and mechanism for imparting steering movement to the rudder to maintain the longitudinal axis of the body at a tangent to the normal direction of fall of the body through the air, said mechanism including a controlling fin supported for free movement to a position in alignment with the instantaneous direction of movement of the body, and means for locking the controlling fin against movement, said means being releasable after the body has fallen a predetermined distance.

3. In a torpedo adapted to be launched from aircraft into the water, the combination with the torpedo body, of a rudder for steering the body in a vertical plane during the fall through the air, means for temporarily supporting the rudder on the body, said means being releasable upon entering the water, and mechanism for imparting steering movement to the rudder to maintain the longitudinal axis of the body at a tangent to the normal direction of fall of the body through the air, said mechanism including a fluid operated device, and a fin freely movable to a position in alignment with the instantaneous direction of movement of the body for controlling the supply of fluid to said device.

4. In a torpedo adapted to be launched from aircraft into the water, the combination with the torpedo body, of a rudder for steering the body in a vertical plane during the fall through the air, means for temporarily supporting the rudder on the body, said means being releasable upon entering the water, a depth rudder for directing the body in the water, steering mechanism for actuating said depth rudder in the water, and means for operatively connecting said mechanism and said first named rudder to actuate the latter during flight through the air.

5. In a torpedo adapted to be launched from aircraft into the water, the combination with the torpedo body, of a rudder for steering the body in a vertical plane during the fall through the air, means for temporarily supporting the rudder on the body, said means being releasable

upon entering the water, a depth rudder for directing the body in the water, steering mechanism for actuating said depth rudder in the water, and means for operatively connecting said mechanism and said first named rudder to actuate the latter during flight through the air, said last named means including a freely mounted fin associated with said steering mechanism and responsive to deviation of the longitudinal axis of the body from a direction tangent to the normal direction of fall of the body to control said mechanism.

6. In a torpedo adapted to be launched from aircraft into the water, the combination with the torpedo body, of a rudder for steering the body in a vertical plane during the fall through the air, a depth rudder for steering the body in the water, a prime mover common to both rudders for actuating the latter, and separate means for controlling said prime mover during movement of the body in the air and in the water.

7. In a torpedo adapted to be launched from aircraft into the water, the combination with the torpedo body, of a rudder for steering the body in a vertical plane during the fall through the air, a depth rudder for steering the body in the water, a prime mover common to both rudders for actuating the latter, separate means for controlling said prime mover during movement of the body in the air and in the water, and a device acting automatically for selectively coupling said prime mover to either of said separate controlling means.

8. In a torpedo adapted to be launched from aircraft into the water, the combination with the torpedo body, of a rudder for steering the body in a vertical plane during the fall through the air, a depth rudder for steering the body in the water, a prime mover common to both rudders for actuating the latter, separate means for controlling said prime mover during movement of the body in the air and in the water, and a device acting automatically for selectively coupling said prime mover to either of said separate controlling means, said device including an element projecting from the body of the torpedo and responsive to impact with the water.

JOHAN ANDREAS BULL.