Jan. 1, 1935. E. W. O. UTTER 1,986,034

DROP BOMB

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Fig. 1

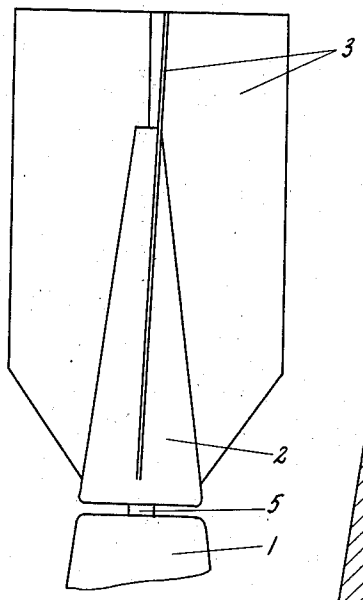


Fig. 2

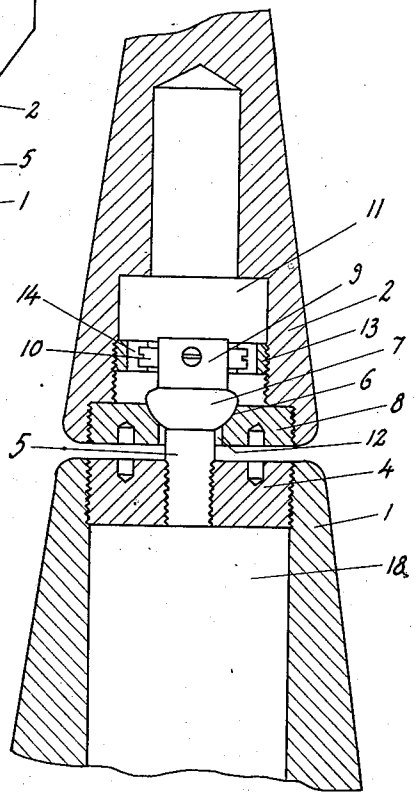
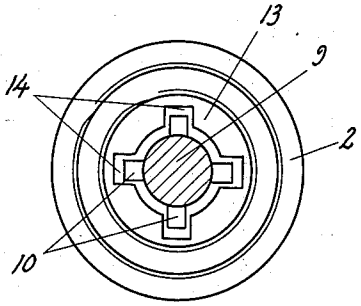


Fig. 3



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Fig. 4

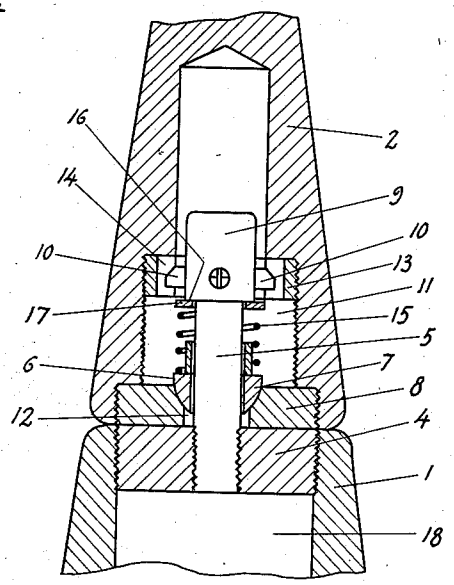
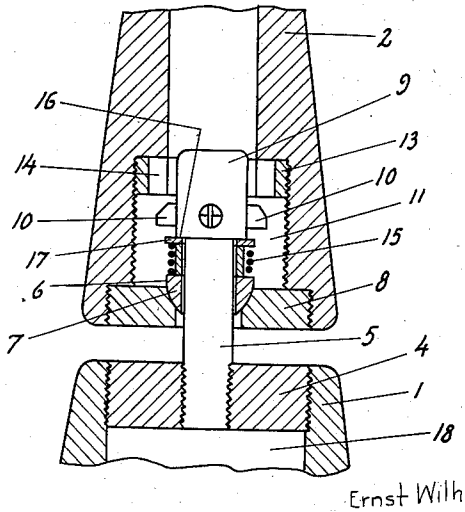


Fig. 5



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UNITED STATES PATENT OFFICE

1,986,034

DROP BOMB

Ernst Wilhelm Otto Utter, Helsinki, Finland

Application October 29, 1931, Serial No. 571,743
In Great Britain September 28, 1931

4 Claims. (Cl. 102—2)

The steering of drop bombs is obtained by means of steering wings attached to the rear end of the bomb. The steering wings have, in the bombs known hitherto, been fastened solidly to the body of the bomb. But owing to the fact that it has been impossible to manufacture the bombs so accurately that the geometrical axis of the bomb body would exactly coincide with the axis of the steering wing assembly, and that the centre of gravity of the entire construction would fall upon this very same mathematical line, it has been impossible to steer the bomb so that it would described an even parabola, the motion being always somewhat displaced thus rendering the accurate aiming of the bomb impossible.

Above defects are by the present invention either totally eliminated or at least reduced to a considerable extent and this is accomplished by means of applying such a bomb construction, in which the steering wings are not assembled solid with the bomb body, but are made flexible in any side direction by means of a universal joint. The axis of the steering arrangement is by this means adjusted automatically to coincide with the centre of gravity axis of the bomb body when falling on which mathematical line even the resultant of the air resistance acts. By non-rotating bombs all sideways acting forces are thus eliminated. Even the influence of some displaced weight distribution of the bomb body on the trajectory of the bomb is decreased. The factors causing side swing of rotating bombs are eliminated as well as some of the side drive caused by uneven displacement of the weights of the bomb body. The relative spreading of the bombs is thus decreased and the fall parabola assumes a steeper stoop thus rendering the aiming of the bomb considerably easier and more accurate.

The invention incorporates also an arrangement by means of which the rotative movement of the bomb is limited even at very high falls. It should be borne in mind that the screwed shape of the rear steering wings may at very high falls and corresponding high speeds give to the bomb such a high rotating speed that the bomb, while descending, may burst by the action of centrifugal force and/or assume too steep a trajectory. To prevent this the joint between the bomb body and the tail is made so, that when the air pressure against the tail wings increases beyond a certain predetermined limit, the coupling in the joint will get loose, after which the bomb body will not follow the rotation of the tail part, being thus prevented from assuming dangerous peripheral speeds.

The accompanying drawings illustrate certain ways to carry out the invention into practice. The drawings show:

Fig. 1 shows a side elevation of the tail portion of the drop bomb according to the invention.

Fig. 2 shows a longitudinal section of the joint coupling between the bomb body proper and the tail portion.

Fig. 3 shows the coupling between the bomb body and the tail portion.

Figs. 4 and 5 show such a bomb according to the invention, in which the coupling between the body and the tail may be disengaged, the elements being shown in longitudinal section.

1 is the bomb body and 2 the tail portion on which the steering wings 3 are attached in screw form. Either directly on the bomb body 1 or on the plug 4 threaded into the body or otherwise fastened thereto, there is a coupling pin 5 threaded or otherwise secured thereto. This pin 5 has an annular shoulder 7 the bottom surface 6 of which is spherical. This spherical shoulder 7 rests upon corresponding top surface of a plug nut 8 threaded into the tail body 2. Through a hole 12 in the nut 8 the pin 5 protrudes into the hollow space 11 in the tail body 2. By means of the spherical bearing thus obtained the joint between the bomb body 1 and the tail body 2 is made flexible in any side direction. To obtain the rotation coupling between said parts there are radial pins 10 arranged on the extension 9 of the coupling pin 5. These pins fit into corresponding radial grooves 14 in a ring nut 13 threaded into the tail body 2. So as to make the movement of the spherical joint as easy as possible, the play between the crossed pins 10 and the grooves 14 is fairly free; the play must not, however, be too big so as to jeopardize the safety of the coupling.

The construction according to Figs. 4 and 5 resembles otherwise that one described above, but in this the shoulder arrangement 6 and 7 is made in the shape of a gland gliding upon the stem of the coupling pin 5. A helical spring 15 on the coupling pin 5 thrusts by its bottom end towards said gland 7 with shoulder and by its top end towards the shoulder 16 on the extension 9 of the coupling pin 5 preferably by means of a washer 17. At the initial fall of the bomb the air pressure against the steering wings of the tail body is so light that the elasticity of the helical spring 15 retains the coupling pin 5 so deep in the hollowness of the tail body 2 that the radial pins 15 on the extension 9 of the coupling pin 5 engage the ring nut 13. The cross pins

10 coincide thus with the correspondingly crossed grooves 14 in the ring nut 13 by means of which the coupling is maintained (as shown in Fig. 4) and the bomb body 1 rotates with the tail portion. At a higher fall velocity of the bomb viz. when the air pressure against the steering wings 3 exceeds a certain value, this air pressure compresses the helical spring 15 to such an extent that the cross pins leave the crossed grooves 14 (see Fig. 5) and the coupling between the tail body 2 and the bomb body 1 is thus disengaged the bomb body not rotating with the tail any more.

The invention may of course be carried out into practice in different ways without deviating from the principle of the invention. There may for instance be a universal joint instead of the spherical joint to obtain the coupling between the bomb body and the tail portion. The above described cross pin type of a coupling may likewise be substituted by another form of coupling to the same effect. The flexible coupling and the coupling may naturally in contrary to the above, be housed in the hollowness 18 of the bomb body. The coupling may also be housed in one and the link coupling in another portion of the bomb, in which case the link coupling should incorporate the features of the coupling also as the case is with the universal joint for instance. This arrangement would in addition possess the advantage that it would not be necessary to make the coupling with considerable play in consideration of the link coupling. The coupling may in this case be made for instance in such a way that the extension 9 of the coupling pin is made conical being, by means of the helical spring 15, pressed into a corresponding conical hole, the friction between these parts thus creating the coupling.

The link coupling between the bomb parts may furthermore be made up of a chain or a flexible cord. The helical spring may be substituted by a flat spring or the like as well as by a hydraulic or an air brake.

I claim:

1. A bomb, comprising a body section, a tail member provided with a cavity, a stem rigidly attached to the rear end of the bomb body and provided with a spherical portion, a shoulder in said cavity forming a bearing for said spherical portion, a second shoulder in said cavity provided with grooves, the end of said stem being provided with a transverse pin engaging in said grooves.

2. A bomb, as claimed in claim 1, in which said spherical portion is movable on said stem and which comprises a spring interposed between said spherical portion and the cross pieces urging the latter into the said grooves, whereby upon compression of the said spring the pieces moving out of the grooves interrupt the interconnection between the bomb section and the tail member.

3. A drop bomb, comprising a body, a tail portion and a universal coupling between the body and tail portion, comprising releasing means whereby when the tension between the body and tail portion reaches a predetermined degree they automatically are released and the body no longer follows the rotation of the tail portion.

4. In a bomb of the character described, a body and tail connected together for rotational movement as a unit, and a control member to interrupt the connection at high velocities of descent.

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