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 [31] **12667**

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[54] **MISSILE WITH BRAKE FLAPS**
5 Claims, 4 Drawing Figs.

[52] **U.S. Cl.**..... **244/3.27,**
244/3.28, 244/3.29
 [51] **Int. Cl.**..... **F42b 13/32**
 [50] **Field of Search**..... **244/3.27,**
3.28, 3.29

ABSTRACT: A missile having a brake flap movable out from a normal position into an operating position against an adjustable stop. A latch member secures the flap in the operating position from any lifting off from the stop. A wedge-shaped member is arranged between the missile body and a cylindrical hub on the flap so that when the flap is lifted off the stop the friction between the hub and the wedge-shaped member urges the wedge-shaped member in between the body and the hub. A spring urges the wedge-shaped member between the body and the hub.

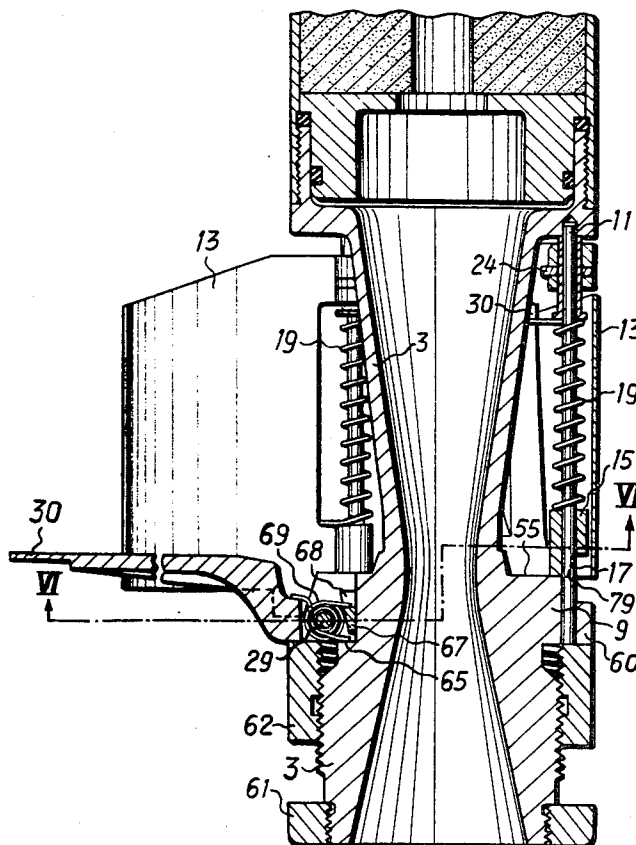
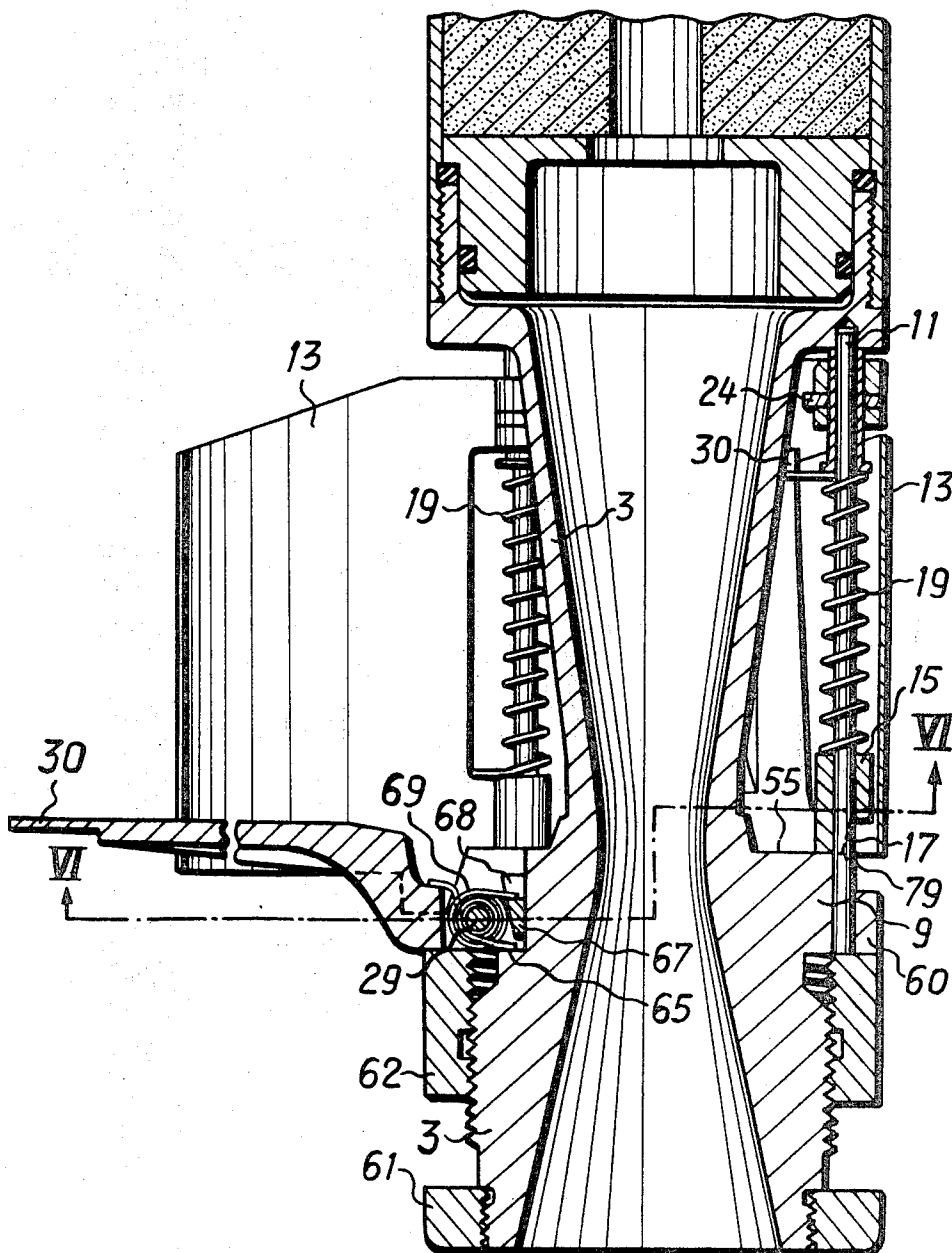
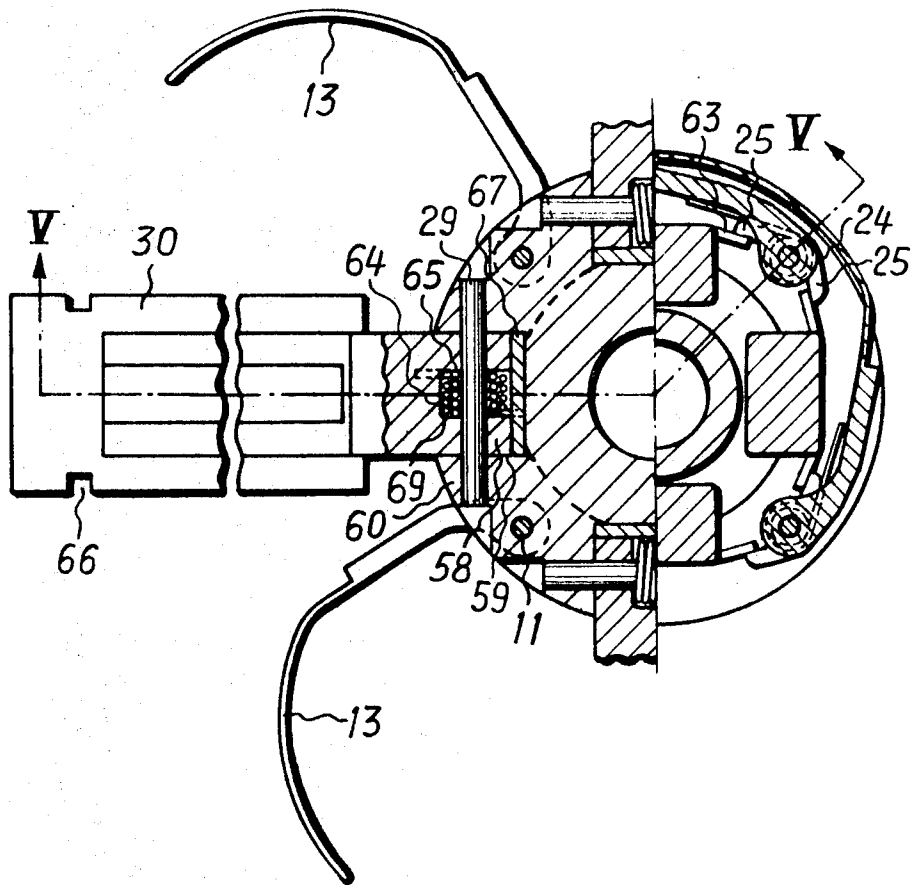


Fig. 1



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Fig. 2



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Fig. 3

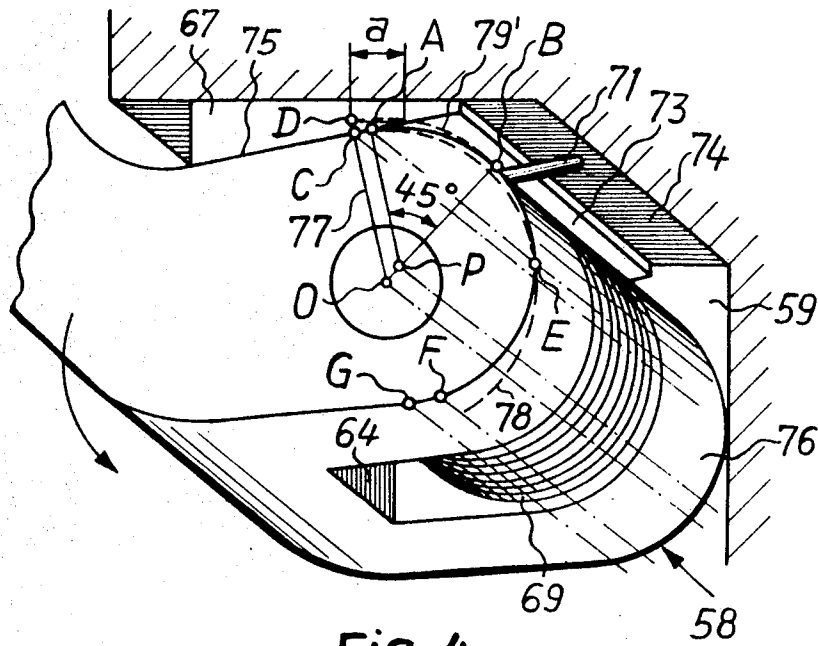
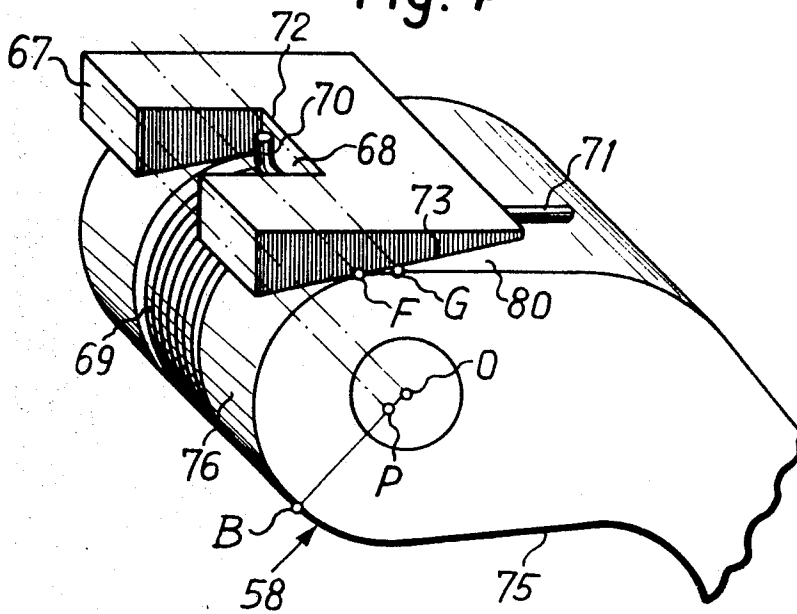


Fig. 4



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MISSILE WITH BRAKE FLAPS

The invention relates to a missile with brake flaps which can be swung out of a normal position into an operating position against an adjustable stop.

In a known missile of this type there is the risk that the flaps resting on the adjustable stop at the time of launching may begin to flutter. If, however, the flaps are lifted off the stop and do not stick in the requisite position determined by the stop, there is no assurance that the missile will move in the flight path leading to the target.

The object of the present invention is to avoid this drawback and to create a missile in which the flaps cannot be pulled off the said stop. The missile according to the invention is characterized by the fact that latch members are arranged which secure the flaps in any operating position from being lifted off the stop.

In the following an example of an embodiment will be described in detail with reference to the appended drawing, in which:

FIG. 1 shows an axial longitudinal cross section; on the right-hand side the section is made through the axis of a folded-in fin and a flap in the normal position, while in the left half the section is taken through the middle of a flap and fin and flap in the swung-out position.

FIG. 2 shows a cross section along the line VI-VI of FIG. 1, in which the fin and flap are in the swung-out position on the left side and in the normal position on the right.

FIG. 3 is a diagrammatic representation of the hub portion of FIG. 1 in the normal position, and

FIG. 4 is a diagrammatic representation of the hub portion of FIG. 1 in its operating position.

According to FIG. 1 the brake flaps 30 are adapted to pivot around axes 29, which are arranged in the region of the rear part of folding fin 13 of the empennage. The forked hub portions 58 (supported on axes 29) of the flaps 30 engage in grooves 59, arranged in a flange 60 of the nozzle body 3. The front part of flange 60 is offset with respect to the rear part and provided with a backward-extending extension 79, which terminates in a frontal area 55 which supports the hubs 15 of fins 13. Between the flange 60 and a ring 61 screwed on to the rear end of the nozzle body 3 is a thread on which the adjusting ring 62 is screwed and which can be shifted by turning in the axial direction. If the flaps 30 lie with the surfaces 80 (FIG. 4) of their hub portions in a plane perpendicular to the longitudinal axis of the rocket (see FIG. 1) in which also the rear surface of flange 60, forming the stop for setting ring 62, is situated, the braking action will be at the maximum.

In the case of the normal position of a flap 30, shown on the right in FIG. 1, said flap substantially extends along the nozzle body 3 which increases in diameter towards the front. In the normal position the flaps 30 are masked by the fins 13, which are arranged between the latter's axes 11. The abutting edges 63 (FIG. 2) of two adjacent flaps 30 are lapped over by the cams 25 of a bolt 24, which is arranged in the front hub portion of a fin 13. The ends of a spiral spring 65 surrounding axes 29 and arranged in a slot 64 of the hub portion 58 of a flap 30 are supported on the flap and on the nozzle body 3. The spring 65 endeavors to turn the flap 30 anticlockwise (see FIG. 1, left); but the flap is held in the inactive position by the locking cams 25. These cams 25 are in front of the slots 66 cut into the edges 63 of the flap 30. (FIG. 2).

A wedge-shaped latch member 67 indicated in FIG. 1, together with the hub portion 58 of a flap 30 is shown on an enlarged scale in FIGS. 3 and 4. A notch 68 is cut out from the front in said wedge-shaped latch member 67, which tapers from front to back. One end 70 of another spiral spring 69, which is wound around the spring 65 is supported on the surface 72 of the latch member 67 bordering the notch 68. The other end 71 of the spring 69 rests on the surface 73 (on the outside with respect to the axis of the rocket) of the latch member 67 and presses same against the bottom 74 of slot 59 in the nozzle body 3. The latch member 67 is pressed backwards through the end 70 of the pretensioned spring 69,

so that with its surface 73 it is supported on the surface 75 of the hub portion 58.

In accordance with FIGS. 3 and 4 the axis of rotation O of a flap 30 does not coincide with the axis P of the cylindrical surface 76, which forms the rounded end of the hub portion 58. The surface 73 of the latch member 67 is tangent to this cylinder 76 along a line A. The two parallel axes O and P, which are at a certain distance from each other, lie in a plane which, in the inactive position of the flap 30 (FIG. 3) intersects the cylinder 76 along the line B and forms an angle of 45° to the plane perpendicular to the axis of the rocket. A plane 77 containing the axis of rotation O intersects the surface 73 of the latch member 67, to which it is perpendicular, along a line C.

A cylinder 78 (indicated in dotted lines in the drawing), the axis of which coincides with the axis O and its radius is equal to the distance AO of the axis O from the tangent A, intersects the cylinder 76 along a line E. Another cylinder 79' (shown in dotted lines) surrounding O and having the radius OB, intersects the plane 77 along a line D. As also shown in FIG. 3, the distance of that part of the cylinder 76, which lies between A and E, from the axis O is greater than the distance of cylinder 78 from this same axis, the greatest distance between these two cylindrical surfaces 76 and 78 occurring in the plane which contains the axis O and the line B. The cylinder 76 runs along a line, designated as G, in the plane surface 80 of the hub portion 58. The distance of the cylinder 76 from the axis of rotation O decreases continuously from B to G.

In the position of the hub portion 58 shown in FIG. 4, in which the flap is swung into the operative position at 180° to the inactive position, the latch member 67 touches the cylindrical surface 76 of the hub portion 58 along a line F.

This embodiment operates in the following manner: The fins 13 are opened by the springs 19. The hub portions 17 are supported on the frontal flange portion 79 of the nozzle body 3, whereby the fins 13 are locked. Since the fins 13 are axially displaced when opening, the cams 25 of the coming bolts 24 slide over the slots 66 in the flaps 30. The latter are thereby released and swung by springs 65 around the axes 29 into the operating position, in which they are supported on the setting ring 62 (see FIG. 1).

The entire range of action of the flaps 30, determined by the limit positions of the setting ring 62, is bounded by the position of said flaps as shown on the left in FIG. 1, and also by a position completely swung back at 180° to the inactive position. The range of action of the flaps 30 is shifted to the rear region of the fin 13, which is an advantage insofar as the stabilizing effect of the empennage cannot be undesirably affected by the stream around the flaps. Another advantage of this arrangement lies in the fact that the aerodynamic braking forces, which also have a stabilizing effect upon the rocket, in this case affect a longer effort arm.

When a flap 30 is swung out of the normal position into the operating position shown in FIG. 1, then in accordance with FIG. 3, first of all the section of cylinder 76 which is between the lines A and B comes into contact with the latch member 67. Since the line B is at a distance from the axis of rotation O which is greater by the distance between line D and line C than the distance between line C and said axis O, the latch member 67 is thrust forward along the surface 74 of the nozzle body 3 against the pressure exerted by the spring end 70. If line B of cylinder 76 has reached the plane 77, the latch member 67 has travelled a path *a* and reached its foremost position. If the flap 30 is swung on beyond line B towards line G, the latch member 67 is thrust backwards, since the distance of the part of the cylinder 76 now passing in front of said latch member from the axis of rotation O is steadily decreasing, so that it remains in contact with hub portion 58.

Under the action of spring 65 and also that of an aerodynamic force which increases as the angle of traverse increases, and finally under the action of a force of inertia which acts on the flap 30 during the acceleration phase, the flap 30 bounces at a relatively high speed against the setting ring 62

and is rejected by it. This rebound movement is very powerfully damped by a strong frictional force which appears because the latch member 67 is now clamped between the surface 74 and the region of the hub portion 58 situated between line B and line G. The path taken by the flap 30 in rebounding from setting ring 62 is thus short, so that after a return movement occurring under the action of spring 65 and the aerodynamic force it again bounces back from the ring 62 but this time with so little energy that under the action of said frictional force it is immediately stopped and held in the operative position.

Owing to the development of the hub portion 58 of a flap 30, the latching member 67 of course also acts in the same manner in any other predetermined operating position of the flap.

In the case of rockets which perform a twisting movement, centrifugal forces act upon the flaps 30. These forces solicit the flaps when in their operative position, to turn in the opposite direction to the aerodynamic forces, that is (as seen in FIG. 4) clockwise. The latch members 67 now prevent the flaps 30 from being turned away from the setting ring by the centrifugal forces when the speed of the rocket decreases and therefore the aerodynamic forces are reduced.

I claim:

1. A missile comprising a body, a brake flap having a cylindrical hub movable on said body from a normal position into an operating position, a continuously adjustable stop against which said flap impinges when in said operating position and a

continuously adjustable latch member cooperating with said flap to secure said flap in said operating position from lifting off from said stop.

2. A missile according to claim 1 wherein said latch member comprises a wedge-shaped member arranged between said body and said cylindrical hub so that when said flap is lifted off said stop the friction between said hub and said wedge-shaped member urges said wedge-shaped member in between said body and said hub.

3. A missile comprising a body, a brake flap having a cylindrical hub movable on said body from a normal position into an operating position, an adjustable stop against which said flap impinges when in said operating position, and a latch member securing said flap in said operating position from lifting off from said stop comprising a wedge-shaped member arranged between said body and said cylindrical hub so that when said flap is lifted off said stop the friction between said hub and said wedge-shaped member urges said wedge-shaped member in between said body and said hub.

4. A missile according to claim 2 wherein a spring is provided urging said wedge-shaped member between said body and said hub.

5. A missile according to claim 2 wherein said hub has a borehole arranged eccentrically with respect to its cylindrical surface, and the swivel axis of said flap is arranged in said borehole.

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