

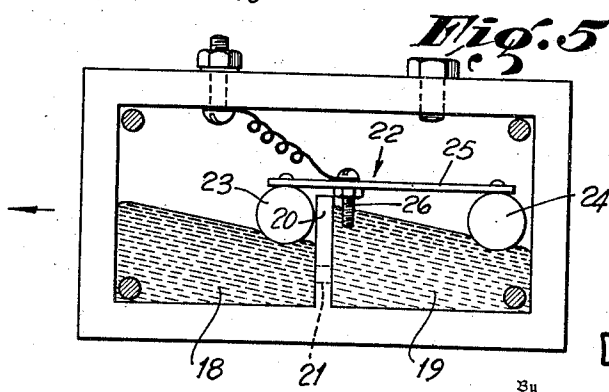
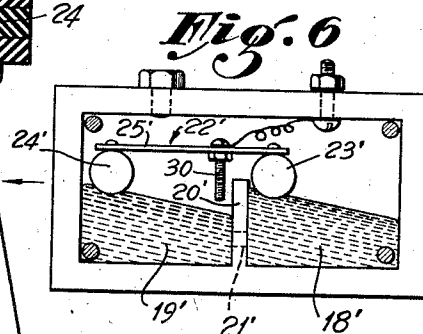
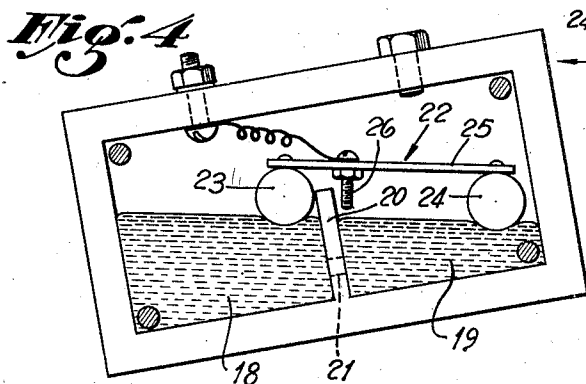
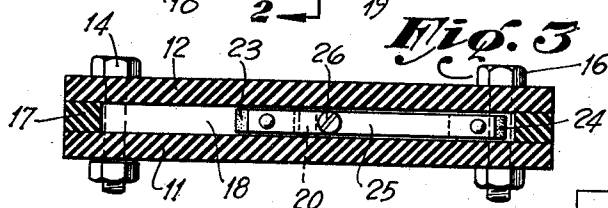
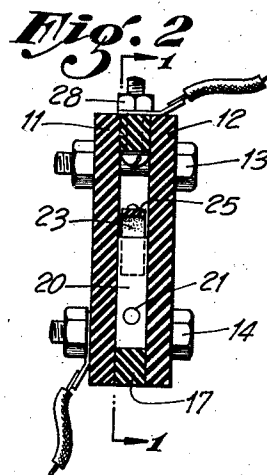
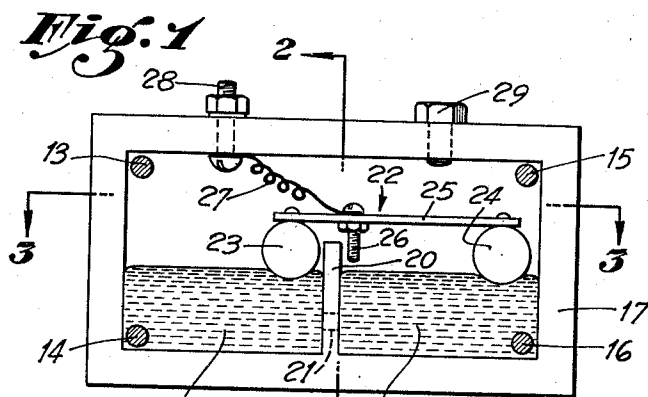
Jan. 6, 1948.

D. C. WISELEY

2,433,968

EQUILIBRATED INERTIA SWITCH

Filed Oct. 9, 1944



Inventor:  
**DON CARLOS WISELEY,**

*John H. Rouse,*  
Attorney.

## UNITED STATES PATENT OFFICE

2,433,968

## EQUILIBRATED INERTIA SWITCH

Don Carlos Wiseley, Los Angeles, Calif.

Application October 9, 1944, Serial No. 557,791

10 Claims. (Cl. 200—52)

1

My present invention relates to improvements in inertia-operated electric switches and more particularly in those of the type adapted for use on motor vehicles, such as automobiles or aircraft. Such a switch may be employed, for example, for controlling means for indicating acceleration or deceleration of the vehicle; or for effecting release, upon deceleration of an automobile, of automatic brake-holding means of the type disclosed in Patent No. 2,262,842 granted November 18, 1941, to Goepfrich.

An object of the invention is to provide an improved switch, of the character described, which is so equilibrated that it is not actuated by, nor is its designed operation adversely affected by, tilting such as that to which it would be subjected in an automobile when the same is ascending or descending an incline.

Another object of the invention is to provide a double-action switch wherein both of the circuit-controlling elements are actuated when the switch is subjected to the force of inertia, so that a magnified effect is produced.

Another object is to provide an inertia switch which is not affected by temperature variations.

Other objects and advantages of the invention will be found in the description, the drawing, and the claims; and, for full understanding of the invention, reference is to be had to the following detailed description and accompanying drawing, wherein:

Figure 1 is a front elevation, with plate 11 removed, of an inertia switch embodying the invention; the view being taken in the plane of line 1—1 of Fig. 2;

Figures 2 and 3 are sections taken along the lines 2—2 and 3—3, respectively, of Fig. 1;

Figures 4 and 5 are views of the switch, as shown in Fig. 1, with the parts in moved positions; and

Figure 6 is a view, corresponding to that of Fig. 5, of a slightly modified form of switch according to the invention.

Referring first to Figs. 1-5 of the drawing, the numerals 11 and 12 indicate a pair of plates which are secured together by bolts 13, 14, 15 and 16, with an apertured spacer 17 therebetween, to form an elongated receptacle for an electroconductive liquid such as the mercury indicated at 18 and 19; the plates and the spacer conveniently being of insulating material such as "Bakelite." Projecting upwardly from the bottom wall of the spacer 17, centrally of the length of the receptacle, is a portion 20 which serves as a partition dividing the mercury into the two portions 18 and 19;

2

the partition having a restricted opening 21 through which the mercury can pass.

Within the receptacle is a circuit-controlling member, generally indicated at 22, which comprises a pair of floats 23 and 24 rigidly joined together by an arm or bridge 25; these parts also conveniently being of material such as "Bakelite." The member 22 is arranged to float on both portions of the mercury with float 24 adjacent the right-hand wall of the receptacle and float 23 adjacent the left side of partition 20; longitudinal movement of the member being limited by float 23 and a contact element or screw 26 which extends downwardly from arm 25 adjacent the other side of the partition to a point spaced from the surface of the mercury portion 19. A flexible wire 27 connects the element 26 to a terminal screw 28 mounted in the top wall of the partition; the bolt 16 or 14, in contact with the mercury, serving as the other terminal of the switch.

The operation of the switch shown in Figs. 1-5 will be described, by way of example, with reference to its use on an automobile.

In Fig. 1, the switch is shown in its normal position as when the automobile is stationary on a level surface or is moving at a constant speed thereon; the switch being mounted horizontally with its left-hand end toward the front of the automobile. Under these conditions the contact element 26 is out of engagement with the mercury so that the circuit of the switch is open.

In Fig. 4, the switch and its parts are shown in the positions which they assume when the automobile is stationary on an incline or is descending at a constant speed; the mercury flowing through the restricted opening 21 when the switch is tilted so that the surfaces of the portions 18 and 19 are coplanar. Contact element 26 is still out of engagement with the mercury since the tip of the element is substantially central of the length of the receptacle and is maintained by the floats at a point a short distance above the surface of the mercury, which point is substantially equidistant between the top and bottom of the receptacle. The conditions are generally the same when the switch is tilted in an opposite direction from the horizontal.

In Fig. 5, the switch parts are shown in the positions assumed when the force of inertia acts on the mercury in the direction of the arrow; i. e., when the movement of the automobile is retarded while it is moving forwardly in the direction of the arrow. Under the force of inertia, the mercury recedes from the left side of partition 20 and from the right-hand wall of the receptacle,

3

at which places the floats 23 and 24 are located, so that the float member 22 is lowered with respect to the receptacle; and, since the mercury correspondingly rises at the right side of the partition where the contact element 26 is located, the tip of the same is immersed in the mercury to complete the circuit of the switch. It is thus seen that under the force of inertia a magnified effect is produced because of the simultaneous occurrence of two actions: (1) lowering of the contact element, and (2) rise of the mercury adjacent that element.

It is apparent that the effect produced by inertia, acting in the direction indicated, is substantially the same as shown in Fig. 5 if the automobile is on an incline. When the movement of the automobile becomes constant or when it stops, the two portions of the mercury soon reach a common level due to the opening 21 in the partition, and the switch circuit is opened.

The mercury is introduced into the receptacle through an opening, normally closed by plug 29, in its top wall. The amount of mercury in the receptacle is not critical (as it would be if a fixed contact were employed) since the contact element is normally maintained by the floats in predetermined position relative to the surface of the mercury. For the same reason, expansion or contraction of the mercury, due to temperature variations, does not alter the setting of the switch.

Referring now to Fig. 6, the modified form of switch there shown is of the normally-closed type, as distinguished from the normally-open switch shown in the other figures and described hereinabove. The switch of Fig. 6 differs structurally from that of Figs. 1-5 only in the length of its contact element 30; the other parts shown in this figure therefore having been assigned the same numerals as in Figs. 1-5 with a prime mark added. In Fig. 6, the direction of the switch is reversed with respect to that of the switch shown in the other figures, i. e., its opposite end is toward the front of the automobile. The length of contact element 30 is such that its tip is below the surface of the mercury when the switch is in a normal horizontal or inclined position. The switch is shown in the figure as when the force of inertia is acting on the mercury in the direction of the arrow and the float member 22 is therefore raised with respect to the receptacle and the surface of the mercury adjacent contact element 30 is lowered—relatively wide separation of the contact element from the mercury resulting from these two effects.

Since the point on the float member midway between the ends of the receptacle is moved upwardly or downwardly only under the force of inertia and is not substantially changed in position with respect to the receptacle when the same is tilted longitudinally, it is apparent that yieldable contact means, extending from the top of the receptacle and engageable with the float arm as the other contact means, could be employed; in which case the liquid could be of a non-conductive type, such as oil.

The embodiments of the invention herein shown and described are obviously susceptible of further modification without departing from the spirit of the invention, and I intend therefore to be limited only by the scope of the appended claims.

I claim as my invention:

1. In an inertia switch: an elongated receptacle, an electroconductive liquid partly filling

4

said receptacle, a partition arranged generally centrally of the length of the receptacle and so as to divide said liquid into two portions, said partition having a restricted opening through which the liquid can pass, and a member floating on the liquid and including electrical contact means engageable with the liquid adjacent said partition and adapted to be influenced by relative vertical displacement of the surfaces of the two portions of the liquid adjacent the partition due to the force of inertia acting longitudinally of the receptacle.

2. In an inertia switch: an elongated receptacle, an electroconductive liquid partly filling said receptacle, a partition arranged generally centrally of the length of the receptacle and so as to divide said liquid into two portions, said partition having a restricted opening through which the liquid can pass, and a member arranged to float on both of said portions of the liquid and including electrical contact means immersible in the liquid adjacent said partition and adapted to be influenced by relative vertical displacement of the surfaces of the two portions of the liquid adjacent the partition due to the force of inertia acting longitudinally of the receptacle.

3. In an inertia switch: an elongated receptacle, an electroconductive liquid partly filling said receptacle, a partition arranged generally centrally of the length of the receptacle and so as to divide said liquid into two portions, said partition having a restricted opening through which the liquid can pass, a member comprising a pair of floats individually supported by said portions of the liquid and an arm joining the floats and extending above the level of the liquid, and an electrical contact element carried by said arm and electrically contactable with one of said liquid portions upon relative vertical displacement of the two portions of the liquid adjacent said partition due to the force of inertia acting longitudinally of the receptacle.

4. In an inertia switch: an elongated receptacle, an electroconductive liquid partly filling said receptacles, a partition arranged generally centrally of the length of the receptacle and so as to divide said liquid into two portions, said partition having a restricted opening through which the liquid can pass, a member comprising a pair of floats individually supported by said portions of the liquid and an arm joining the floats and extending above the level of the liquid, said member being of such length and so limited in longitudinal movement that one of said floats is adjacent one side of said partition and the other of the floats is adjacent the end wall of the receptacle remote from the other side of the partition, and an electrical contact element carried by said arm and engageable with the liquid adjacent said other side of the partition and adapted to be influenced by inclination of the surface of the liquid due to the force of inertia acting longitudinally of the receptacle.

5. In an inertia switch: an elongated receptacle, an electroconductive liquid partly filling said receptacle, a partition arranged generally centrally of the length of the receptacle and so as to divide said liquid into two portions, said partition having a restricted opening through which the liquid can pass, a member comprising a pair of floats individually supported by said portions of the liquid and an arm joining the floats and extending above the level of the liquid, said member being of such length and so limited

5

in longitudinal movement that one of said floats is adjacent one side of said partition and the other of the floats is adjacent the end wall of the receptacle opposite the other side of the partition, and an electrical contact element carried by said arm and cooperable with the liquid adjacent said other side of the partition, said contact element being so disposed that it is normally out of contact with the liquid but is contacted thereby when the liquid rises adjacent said other side of the partition due to the force of inertia acting longitudinally of the receptacle.

6. In an inertia switch: an elongated receptacle, an electroconductive liquid partly filling said receptacle, a partition arranged generally centrally of the length of the receptacle and so as to divide said liquid into two portions, said partition having a restricted opening through which the liquid can pass, a member comprising a pair of floats individually supported by said portions of the liquid and an arm joining the floats and extending above the level of the liquid, said member being of such length and so limited in longitudinal movement that one of said floats is adjacent one side of said partition and the other of the floats is adjacent the end wall of the receptacle opposite the other side of the partition, and an electrical contact element carried by said arm and cooperable with the liquid adjacent said other side of the partition, said contact element being so disposed that it is normally in contact with the liquid but is out of contact therewith when the liquid falls adjacent said other side of the partition due to the force of inertia acting longitudinally of the receptacle.

7. An inertia switch comprising: a housing defining a forward and rearward chamber connected at their lower portions by a restricted opening and at their upper portions by a clearance opening; conductive liquid bodies partially filling said chambers and united through said restricted opening; a float including float elements in each chamber and a bridging element extending through said clearance opening and joined to said float elements; a depending contact element carried by said bridging element adjacent one of said floats but located in the other of said chambers for movement relatively to said liquid body therein when said body is subjected to inertia forces acting longitudinally of said housing.

8. An inertia switch as set forth in claim 7 wherein said chambers are relatively thin in a transverse direction and said float is slidably guided between the sides of said chambers formed by side walls of said housing.

6

9. An inertia switch comprising: a housing defining a forward and rearward chamber connected at their lower portions by a restricted opening and at their upper portions by a clearance opening; conductive liquid bodies partially filling said chambers and united through said restricted opening; a float including float elements in each chamber and a bridging element extending through said clearance opening and joined to said float elements; a contact element carried by said float and depending into one of said chambers for relative movement toward the conductive body when said body is subjected to inertia forces in one direction longitudinally of said housing and for relative movement away from said conductive body when said inertia forces are applied in the opposite direction.

10. An inertia switch comprising: a housing, a partition dividing said housing into a forward and rearward chamber connected at their lower portions by a restricted opening and at their upper portions over said partition by a clearance opening; conductive liquid bodies partially filling said chambers and united through said restricted opening; said liquid bodies tending to define a common plane when said housing is tilted, but tending to define vertically displaced planes when said housing is subjected to forwardly or rearwardly directed inertia forces; a float element in each chamber; a bridging element extending through said clearance opening and joining said elements; and a contact depending from said bridging member near one of said float elements, said contact being located on the opposite side of said partition from the adjacent float element and cooperating therewith to maintain said float element adjacent said partition and the other float element at a point remote from said partition whereby the relative depression of one body of liquid and elevation of the other body due to inertia forces effecting electrical connection and disconnection between said contact and the corresponding body of liquid.

DON CARLOS WISELEY.

#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

| Number    | Name  | Date         |
|-----------|-------|--------------|
| 2,307,441 | Wyman | Jan. 5, 1943 |

55