Nov. 10, 1942. H. L. LAMBERT 2,301,217

SWITCH

Filed Nov. 26, 1941

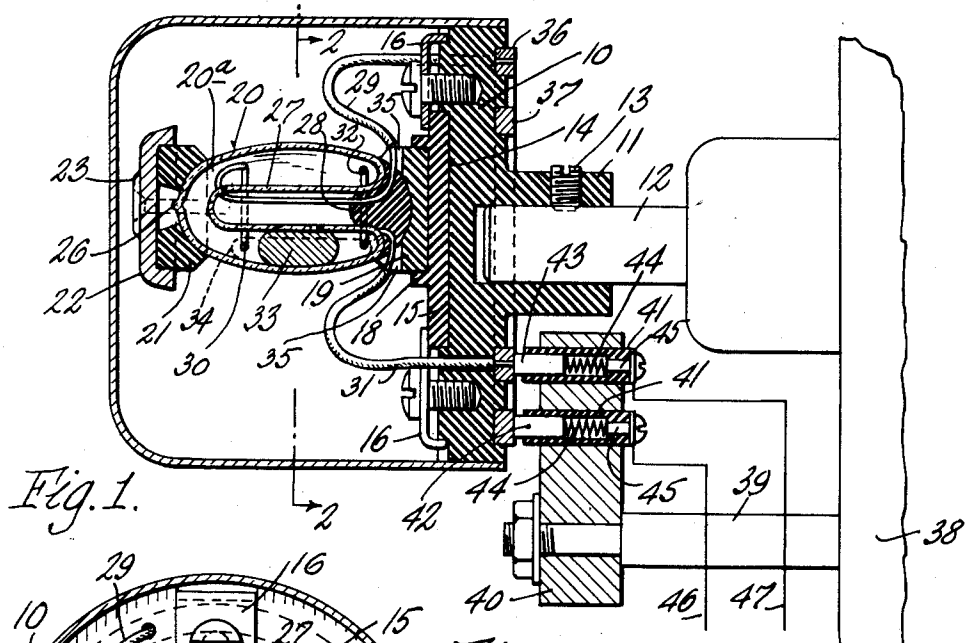


Fig. 1.

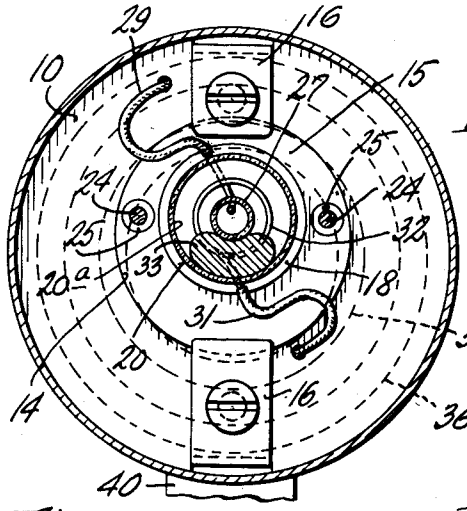


Fig. 2.

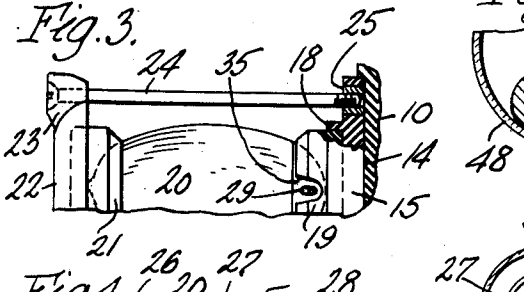


Fig. 3.

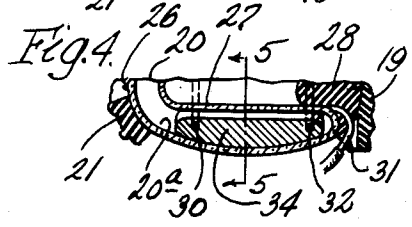


Fig. 4.

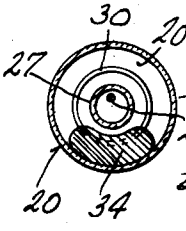


Fig. 5.

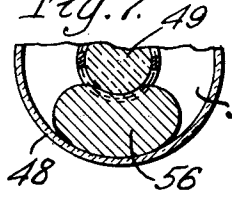


Fig. 7.

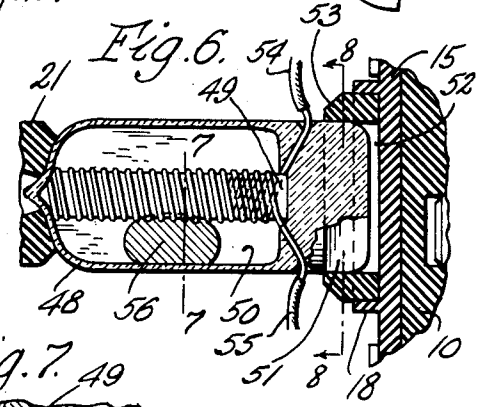


Fig. 6.

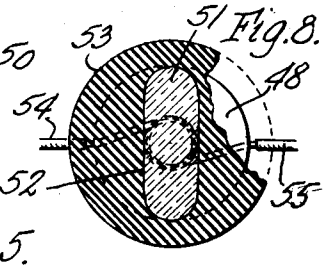


Fig. 8.

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UNITED STATES PATENT OFFICE

2,301,217

SWITCH

Harry L. Lambert, Enfield, N. Y., assignor to Allen Wales Adding Machine Corporation, Ithaca, N. Y.

Application November 26, 1941, Serial No. 420,507

16 Claims. (Cl. 200—80)

This invention relates to switches and more particularly to those in which an electrically conducting liquid is confined in a housing, and rotated to cause an opening or closing of a circuit when a predetermined speed of rotation has been reached. It is also in the nature of an improvement on the switch disclosed in my copending application Serial No. 296,124 filed September 22, 1939.

An object of the invention is to improve liquid switches, of the type in which the liquid makes or opens a circuit while remaining in the same relative position.

Another object of the invention is to provide an improved liquid switch of this type, which may be more easily and inexpensively manufactured, which will be compact, sensitive, and operate in any angular position in which it may be placed, and with which the switch or tube element may be easily replaced in its mounting by a new tube or switch element.

Another object of the invention is to provide an improved switch of this type with which the speed at which it opens or closes a circuit may be varied within a selected range by simple adjustments, which will be relatively simple, compact, durable and inexpensive, and will operate for long periods of time without the need of attention or servicing.

Other objects and advantages will be apparent from the following description of two embodiments of the invention, and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

In the accompanying drawing:

Fig. 1 is a side elevation of a switch constructed in accordance with this invention, and its mounting on a motor, by which it is rotated, and illustrating the closing of a circuit when a predetermined speed is reached;

Fig. 2 is a transverse, sectional elevation through the switch part of the same, the section being taken approximately along the line 2—2, Fig. 1;

Fig. 3 is a plan, partly in section, of a portion of the switch showing the manner of mounting the switch tube or element itself;

Fig. 4 is a sectional elevation through a part of the switch element of Figs. 1 and 2, and illustrating the position of the globule of mercury when a selected speed has been reached and a circuit has been completed therethrough;

Fig. 5 is a transverse, sectional elevation through the switch element shown in Fig. 4, the section being taken approximately along the line 5—5, Fig. 4;

Fig. 6 is a sectional elevation through another switch element and its mounting, and representing a modification of the invention shown in Figs. 1–5, and which switch is of the type adapted to open a circuit between a pair of conductors when a predetermined speed of rotation of the switch is reached;

Fig. 7 is a transverse, sectional elevation of the same, with the section taken approximately along the line 7—7, Fig. 6; and

Fig. 8 is another transverse, sectional elevation through the same, with the section taken approximately along the line 8—8, Fig. 6.

In the embodiment of the invention illustrated in Figs. 1–5, the improved switch includes a base element 10, having a tubular hub 11 extending lengthwise therefrom and telescoping over a driving shaft 12 and removably secured thereon in any suitable manner such as by a set screw 13. The shaft 12 may be the shaft of a motor, or any other rotatable body. The base element 10 on its face opposite from the shaft 12 is provided with a shallow recess 14, Fig. 2, in which a disk 15 is received. The recess 14 and disk 15 are circular in circumference, but both are eccentric to the axis of the shaft 12. Both the base element 10 and disk 15 are of insulating material, and the disk 15 is preferably thicker than the depth of the recess 14 in which it is disposed.

The disk 15 is provided on its exposed face with a circular rib 18 eccentric to the center of the disc, and it receives an elastic block or member 19 which has, on its exposed face, a concave seat that receives one end of a generally elliptical switch element 20 with a hollow housing 20a. This housing 20a is formed of insulating material, such as glass or the like, and the switch element abuts endwise against the block 19. A clamping block 21 of elastic material abuts against the other end of the switch element 20 and, in turn, is snugly received in a recess in a plate 22. The plate 22, Fig. 3, has lateral ears or extensions 23 through which extend tie rods 24 that are disposed along the sides of the switch element 20 and are threaded into rigid inserts 25 incorporated in the disk 15. This provides a simple means for releasably clamping the switch element 20 to the disk 15. The blocks 19 and 21 are preferably made of soft or sponge rubber, or other similar elastic material, so that when the housing 20a is made of glass, it may be securely clamped, without danger of breakage, to the disk 15. When made of glass, the housing 20a has a

tip 26, Fig. 1, formed when the housing is exhausted and filled with an inert gas. The block 21 is provided with a recess which receives the tip 26, and it also has a concave seat which fits over the end of the housing 20a.

While the switch element 20 is of generally elliptical shape, the end of the housing 20a adjacent the block 19 is made re-entrant, so as to provide a tubular core 27 projecting across the interior of the housing, shown clearly in Fig. 1. A member 28 of insulating material, and preferably resilient, such as soft gum or sponge rubber, is disposed against the re-entrant end of the housing so as to form a continuation of the generally elliptical shape of the housing, and also to close the tubular core at its outer end. This member 28 has its outer face convex, so as to form the convex end of the switch element 20 which is received in the concave seat in the block 19.

A conductor 29 extends through the member 28 and along the inside of the tubular core 27 approximately to the inner end thereof, thence through the wall of the core in which it is sealed, and into the annular chamber around the core. The end of this conductor within the chamber of the housing 20a is then bent into the form of a substantially closed loop 30. The end portion of the conductor within the chamber of the housing 20a is exposed that is, it is free of any insulation. The face of the loop 30 is transverse to the axis of the core 27, as shown in Fig. 1, and is adjacent one end of the chamber around the core. A second conductor 31 also extends through the insulating member 28 to the outer end of the core 27 and then extends through the wall of the core, in which it is sealed, into the chamber of the housing 20a adjacent the base end of the core.

The end of the conductor 31 within the chamber of the housing 20 is also exposed, that is, it is free of insulation, and it is also formed into a substantially closed loop 32, the face of which is in a plane transverse to the longitudinal axis of core 27, that is, it is transverse to the longitudinal axis of the housing 20a. Thus, the loops 30 and 32 are parallel to one another and spaced apart in the chamber of the housing 20 along the core 27. The side wall of the housing 20a in the zone between the loops 30 and 31 is preferably, but not necessarily, outwardly bowed, due to the general elliptical shape of the housing, so that when the housing 20 is disposed with its longitudinal axis horizontal, a globule 33 of electricity conducting material, disposed within the chamber of the housing 20a and resting on the side wall of the housing, will assume a position in the convave surface of the wall between the loops 30 and 31 as shown in Fig. 1.

The globule 33 is of a size such that its surface tension causes it to assume a somewhat ball-like shape, when resting on the side wall of the housing 20a, against the action of gravity and, when the globule is flattened without subdivision and without displacement on the side wall of the housing 20a, it will become elongated into the approximate shape shown by the dashlines 34 in which it engages the loops 30 and 31 to complete an electric circuit between the conductors 29 and 31. When the globule is released from its flattening force, it reassumes the ball-like shape shown in Fig. 1 and withdraws from contact with one or both loops 30 and 32 and thus opens the electric circuit between conductors 29 and 31. The block 19 may have notches 35 formed therein to facilitate passage of the conductors 29 and 31 to the base element 10 of the housing.

The conductor 29 extends through the base element 10 and is electrically connected to an annular metallic ring 36 mounted on the rear face of the element 10, concentric to the shaft 12. The conductor 31 also extends through an aperture in the base element 10, and is electrically connected to another annular metallic ring 37, also concentric with the shaft 12 and ring 36. The rings 36 and 37 may be secured on the base element 10 in any suitable manner.

Mounted on the support or bearing 38 for the shaft 12 is a stud 39 which, at its free end carries a bar 40 that extends generally parallel to but spaced from the rear face of the base element 10 that carries the metal rings 36 and 37. The bar 40 is provided with apertures from face to face which are filled with sleeves 41 of insulating material in which contact brushes 42 and 43 are mounted for endwise reciprocation and which bear respectively on the rings 36 and 37. These brushes are yieldingly urged into contact with the rings 36 and 37 in any suitable manner, such as by springs 44 which bear upon and are electrically connected to pins 45 extending through the outer end of sleeves 41, and to which circuit wires 46 and 47 are connected. Thus, during the rotation of the shaft 12 and switch element 20, the wires 45 and 47 will be continuously and electrically connected to the loops 30 and 32 within the housing 20a.

Referring now to the embodiment of the invention illustrated in Figs. 6 to 8, a housing 48 of suitable insulating material such as glass, is made generally cylindrical in shape between its ends, and a rod 49 of insulating material is disposed in the chamber 50 of said housing 48, with its longitudinal axis substantially coincident with the longitudinal axis of the chamber 50. The rod 49 is supported from at least one end of the housing and preferably extends substantially across the chamber 50 from end to end. One end of this housing 48 is provided with a projecting diametrically extending rib 51 which is received in a corresponding slot or recess 52 in an elastic block 53 which is of material similar to, and corresponds generally in function to, the block 19 of Fig. 1, and which is mounted within the annular flange 18 of the disk 15. The disk 15 is similarly mounted in a recess in the base element 10, in the same manner as explained in connection with Figs. 1 to 5, so that the housing 48 will be rotated about an axis parallel to, but eccentric of, the axis of the chamber 50. The degree of eccentricity, as in the embodiment shown in Figs. 1 to 5, may be varied by rotating the disk 15 in its recess so as to carry the housing or switch element supported thereby nearer to or farther from the axis of rotation of the shaft 12, that is, the axis about which the housing containing the globule of conducting liquid is rotated. The housing 48 is clamped to the block 53 in the same manner as housing 29 is clamped to block 19 in Fig. 1.

A pair of conductors 54 and 55 extend through the housing 48 into the chamber 50, and within the chamber 50, these conductors are wound helically or spirally about the rod 49 of insulating material in a direction to progress from end to end of the rod 49. The surface of rod 49 is preferably provided with helical grooves in which the conductors are received and confined so that they will be maintained in spaced relation to one another at all times. The portions of the conductors along the rod 49 are outwardly exposed, that

is, are free of insulation. A globule 56 of conducting liquid such as mercury, is disposed within the chamber 50 and is of a size such that its surface tension will draw it into a generally ball-like shape.

The globule does not fill the entire chamber 50, but when resting on the side wall of the chamber and free of outside forces except gravity, it will contact with both of said conductors and form a connection between them, yet when flattened, without subdivision, against the side wall of the housing and against the action of surface tension, it will separate from one or both of said conductors wound on said rod 49 and open the circuit between them. When the housing with conducting liquid therein is rotated about an axis eccentric to the axis of the rod 49, the globule of conducting liquid will be flattened by centrifugal forces against the action of surface tension until it separates from one of said conductors and opens the circuit between conductors. Conductors 54 and 55 are connected to rings 36 and 37 the same as explained for Fig. 1.

If such a switch is used as a speed governor, it is included in series with the circuit of the motor or of a relay circuit controlling the motor, so that when a predetermined speed is reached, the centrifugal forces will flatten the globule until it opens the circuit and causes the speed of the motor to decrease, whereupon the surface tension of the globule overcomes centrifugal forces acting thereon and causes it to again reengage the conductors and complete the circuit between them, and hence cause the reapplication of power to the motor. This causes the motor to run at a substantially uniform speed.

While the globule may be formed from any electrically conducting liquid, for either of these switches the surface of the chamber in which the liquid globule is disposed is one which is not wet by the liquid. The preferred liquid which has been found most satisfactory for the switches is mercury, which has a high surface tension and good electricity conducting properties, and which is not destroyed by any arcing which may take place when the circuit is broken through the globule. Because the surface tension of a mercury globule is high, it assumes a very pronounced ball-like form when free. When the liquid globule is of mercury, the housing may be made of plastics, glass or various other insulating materials, but preferably and conveniently can be made of transparent glass, so that the condition of the interior of the housing is at all times ascertainable without opening it. Glass is also an inexpensive material, and air can be easily withdrawn from a housing made of this material, inert gas introduced, and the housing then sealed inexpensively.

It will be observed from the foregoing description that in both embodiments of the invention, the housing may be made of glass or other frangible material and mounted on the base element 10 in such a manner that when replacement of the housing is necessary, the old housing or switch element may be quickly and easily removed and a new housing or switch element substituted.

In the operation of the switch shown in Figs. 1 to 5, the switch will operate successfully in any angular position in which it may be placed, because regardless of the position of the switch, as soon as it starts to operate, that is, as soon as the housing 20 starts to rotate about an axis eccentric to its longitudinal axis and irrespective of the angular position of such axis, the liquid globule will move into a position between the loops down to the concave portion of the wall between the loops and will be confined there by centrifugal forces. As the speed increases, the centrifugal forces acting on the globule will oppose the surface tension and progressively flatten the globule until it becomes elongated endwise sufficiently to engage both loops of the conductors and complete an electric circuit between them. Such a shape of the globule is shown by the dash lines in Fig. 1, and by full lines in Figs. 4 and 5.

As soon as the speed falls, the surface tension will draw the globule back towards a ball-like shape, that is, towards the normal position shown in Figs. 1 and 2, and as the globule returns to its normal form, it contracts in an axial direction out of contact with one or both of said loops to open the circuit between them. A circuit is established to the conductors 29 and 31 throughout their rotation by reason of the brushes 42 and 43 bearing on the conducting rings 36 and 37 respectively.

In the operation of the switch shown in Figs. 6 to 8, the switch element also may be placed in any desired angular position, and while the globule 56 will at first roll by gravity to the lowest part of the chamber 50, as soon as the housing 48 begins to rotate about an axis eccentric thereto, the globule 56 will move by centrifugal force into a position somewhere along the side wall of the housing and be retained there by centrifugal force since the axis of rotation is parallel to the axis of the rod 49, that is, parallel to the side wall against which the globule is resting. If desired, the side wall of the chamber 50, intermediate of its ends, may be slightly concave on its inner face so that the globule will remain in such concavity in a manner similar to that for the globule in Figs. 1 to 5. The globule normally completes a circuit between the conductors 54 and 55, but as the speed of rotation increases, centrifugal forces acting on the globule will tend to flatten it out to progressively greater extents, against the surface tension of the globule, without subdivision of the globule until the globule separates from one or both of the conductors on the rod 49 and thus opens the circuit between such conductors. If this circuit controls the speed of the motor, its opening will cause the motor to decrease in speed and the forces of surface tension will tend to return the globule to its normal ball-like shape and re-establish contact with both the same conductors and recomplete the circuit between them.

It will be understood that various changes in the materials, details, and arrangements of parts which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

I claim:

1. In a mercury switch, a closed, hollow housing of insulating material, a pair of conductors extending into the chamber of said housing and terminating therein in exposed portions spaced apart from one another along a wall of said housing, a globule of mercury within and only partially filling the chamber of said housing, and disposed against said wall, and of a size to assume a somewhat ball-like form by its surface tension acting against the force of gravity, the terminals of said conductors being so spaced apart and positioned with respect to said globule

that a circuit between said conductors may be made and broken by changes in the shape of said globule while said globule remains in the same position on said wall, and means causing a change in the shape of said globule against the forces of surface tension while said globule remains undivided and in substantially the same relative position on said wall.

2. In a mercury switch, a closed, hollow housing of insulating material, a pair of conductors extending into the chamber of said housing and terminating therein in exposed portions spaced apart from one another along a wall of said housing, a globule of mercury within and only partially filling the chamber of said housing, and disposed against said wall, and of a size to assume a somewhat ball-like form by its surface tension acting against the force of gravity, the terminals of said conductors being so spaced apart and positioned with respect to said globule that a circuit between said conductors may be made and broken by changes in the shape of said globule while said globule remains in the same position on said wall, and means for rotating said housing about an axis eccentric thereto and which causes said globule to remain in its said position on said wall, to cause a change in the shape of said globule against the forces of surface tension of said mercury, and by said change in shape, a change in the condition of said circuit between said exposed portions of said conductors.

3. In a mercury switch, a closed, hollow housing of insulating material, a pair of conductors extending into the chamber of said housing and therein having exposed portions spaced apart along a side wall thereof, a globule of mercury, of a size to assume a somewhat ball-like form by its surface tension acting against the force of gravity, disposed in and only partially filling the chamber of said housing and disposed against said wall between said exposed portions of said conductors, one of said exposed portions being normally beyond an end of said globule when said globule rests in one position on said wall, but close enough to be engaged by said globule when said globule is flattened somewhat against said wall and in opposition to its surface tension, while remaining unmoved thereon, and means for causing a flattening of said globule while it remains in said position on said wall until it engages said one exposed portion and completes a circuit between said conductors.

4. In a mercury switch, a closed, hollow housing of insulating material, a pair of conductors extending into the chamber of said housing and therein having exposed portions spaced apart along a side wall thereof, a globule of mercury, of a size to assume a somewhat ball-like form by its surface tension acting against the force of gravity, disposed in and only partially filling the chamber of said housing and disposed against said wall between said exposed portions of said conductors one of said exposed portions being normally beyond an end of said globule when said globule rests in one position on said wall, but close enough to be engaged by said globule when said globule is flattened somewhat against said wall and in opposition to its surface tension, while remaining unmoved thereon, and means for rotating said housing about an axis eccentric to the axis of the housing and which causes said globule to remain in its said position on said wall and by the action of centrifugal force causes a flattening of the globule without division thereof and against its surface tension until it engages said one exposed portion and completes a circuit thereto.

5. In a mercury switch, a closed, hollow housing of insulating material, a core of insulating material extending into the chamber of said housing, a pair of conductors extending in parallel relation to one another, but spaced apart, along said core in a direction generally parallel to one side wall of said housing, a globule of mercury of a size to assume a somewhat ball-like form by its surface tension acting against gravity, disposed in and only partially filling the chamber of said housing, resting upon said wall and normally contacting said conductors to form an electrical connection between them, and means for causing a flattening of said globule against said wall while it remains substantially in the same position on said wall and undivided, until it withdraws from one of said conductors to open the circuit between said conductors.

6. In a mercury switch, a closed, hollow housing of insulating material, a core of insulating material extending into the chamber of said housing, a pair of conductors extending in parallel relation to one another, but spaced apart, along said core in a direction generally parallel to one side wall of said housing, a globule of mercury of a size to assume a somewhat ball-like form by its surface tension acting against gravity, disposed in and only partially filling the chamber of said housing, resting upon said wall and normally contacting said conductors to form an electrical connection between them, and means for rotating said housing about an axis eccentric to said core and generally parallel to said side wall, without displacement of said globule from its said position on said wall, to cause by centrifugal action a flattening of said globule without division thereof until it withdraws from contact with one of said conductors to open the circuit between said conductors.

7. In a mercury switch, a closed hollow housing of insulating material and generally circular in cross-section intermediate of its ends, a rod-like core extending in a direction generally endwise in the chamber of said housing, a pair of conductors entering the chamber of said housing and wound around said core spirally in spaced relation to one another, with the portions of said wire wound on said core exposed to the interior of said chamber, a globule of mercury within said chamber and of a size to assume a somewhat ball-like form by its surface tension acting against gravity, and only partially filling the chamber, so that when resting on one side wall of the housing it will contact and electrically connect the exposed portions of said conductors as wound on said core, and means for causing a flattening of said globule while it remains undivided in substantially the same position on said wall until it separates from one of said conductors and thereby opens the circuit between said conductors.

8. In a mercury switch, a closed, hollow housing of insulating material and generally circular in cross section intermediate of its ends, a rod-like core extending in a direction generally endwise in the chamber of said housing, a pair of conductors entering the chamber of said housing and wound around said core spirally in spaced relation to one another, with the portions of said wire wound on said core exposed to the interior of said chamber, a globule of mercury within said chamber and of a size to assume a

somewhat ball-like form by its surface tension acting against gravity, and only partially filling the chamber, so that when resting on one side wall of the housing it will contact and electrically connect the exposed portions of said conductors as wound on said core, and means for rotating said housing about an axis parallel to said core and said side wall, but eccentric to said core, whereby when the centrifugal force acting on said globule overcomes the surface tension of the globule, the globule will be flattened against said wall to progressively greater extents with increases in speed of rotation without division of the globule until the globule separates from one of said conductors and opens the circuit between said conductors.

9. A switch comprising a closed, hollow housing of insulating material having a tubular reentrant portion at one end to form a core extending axially of said housing, a conductor extending within said reentrant portion approximately to the inner end thereof, then through the reentrant wall of said housing into the chamber between the core and outer part of the housing, a second conductor extending into the chamber of the housing adjacent the beginning of the reentrant portion, said conductors within the housing having exposed portions spaced from one another along said core, a globule of mercury in the chamber of said housing between the core and outer wall of the housing and of a size to assume a somewhat ball-like form by its surface tension acting against gravity, only partially filling said chamber and normally out of contact with at least one of said conductors, but when confined and flattened, without subdivision, against a side wall of the housing at a point between said exposed portions of said conductors, engageable with said exposed portions to complete a circuit between them.

10. A switch comprising a closed, hollow housing of insulating material having a tubular reentrant portion at one end to form a core extending axially of said housing, a conductor extending within said reentrant portion approximately to the inner end thereof, then through the reentrant wall of said housing, a second conductor extending into the chamber of the housing adjacent the beginning of the reentrant portion, said conductors within the housing having exposed portions spaced from one another along said core, a globule of mercury in the chamber of said housing between the core and outer wall of the housing and of a size to assume a somewhat ball-like form by its surface tension acting against gravity, only partially filling said chamber and normally out of contact with at least one of said conductors, and means for rotating said housing about an axis eccentric to said core but approximately parallel thereto, whereby when the centrifugal force acting on the globule overcomes the surface tension of the globule, the globule will be flattened against the outer wall of said housing to progressively greater extents with increases in speed of rotation, without division of the globule, until the globule contacts both of said conductors and completes a circuit between them.

11. A switch comprising a closed, hollow housing of insulating material having a tubular reentrant portion at one end to form a core extending axially of said housing, a conductor extending within said reentrant portion approximately to the inner end thereof, then through the reentrant wall of said housing into the chamber between the core and outer part of the housing, a second conductor extending into the chamber of the housing adjacent the beginning of the reentrant portion, said conductors within the housing having exposed portions spaced from one another along said core, a globule of mercury in the chamber of said housing between the core and outer wall of the housing and of a size to assume a somewhat ball-like form by its surface tension acting against gravity, only partially filling said chamber and normally out of contact with at least one of said conductors, and means for rotating said housing about an axis eccentric to said core but approximately parallel thereto, whereby when the centrifugal force acting on the globule overcomes the surface tension of the globule, the globule will be flattened against the outer wall of said housing to progressively greater extents with increases in speed of rotation, without division of the globule, until the globule contacts both of said conductors and completes a circuit between them, the exposed portions of said conductors being in the form of substantially closed loops in parallel planes which are crosswise of the longitudinal axis of said core.

12. An electric switch comprising a generally cylindrical housing of insulating material having a core of insulating material extending axially of the chamber of the housing, approximately in a direction from end to end of said chamber, a pair of conductors entering the chamber of said housing supported by said core and progressing in spaced relation to each other along the core in a direction from end to end, said progressing portion being outwardly exposed, and a globule of conducting liquid disposed in the chamber of said housing and of a size to assume a somewhat ball-like form by its surface tension acting against gravity, only partially filling said chamber, and when resting on the side wall of the chamber contacting both of said conductors to complete a circuit between the same, but separating from at least one of said conductors when sufficiently flattened, without subdivision, against the forces of surface tension.

13. An electric switch comprising a generally cylindrical housing of insulating material having a core of insulating material extending axially of the chamber of the housing, approximately in a direction from end to end of said chamber, a pair of conductors entering the chamber of said housing supported by said core and progressing in spaced relation to each other along the core in a direction from end to end, said progressing portion being outwardly exposed, a globule of conducting liquid disposed in the chamber of said housing and of a size to assume a somewhat ball-like form by its surface tension acting against gravity, only partially filling said chamber, and when resting on the side wall of the chamber contacting both of said conductors to complete a circuit between the same, but separating from at least one of said conductors when sufficiently flattened, without subdivision against the forces of surface tension and means for rotating said housing about an axis eccentric to the axis of said core, whereby centrifugal forces will flatten said globule, without subdivision of the globule, in opposition to the forces of surface tension until the globule separates from contact with one of said conductors.

14. In a mercury switch, a hollow housing of a material not wet by mercury and having a

closed chamber, a globule of mercury within and only partially filling said chamber, resting on a side wall thereof, and of a size to assume a curved form in which a substantial portion thereof is held above, and against spreading along, said wall solely by its surface tension opposing the action of gravity thereon, and a pair of conductors extending into said chamber from the exterior thereof and having within said chamber exposed contact portions of a material not wet by mercury, which said portions are spaced apart in a direction along said side wall and positioned relatively to said globule to be electrically connected and disconnected by said globule only as said globule is distorted in its shape while it remains undivided and in the same relative position on said side wall.

15. In a mercury switch, a hollow housing of a material not wet by mercury and having a closed chamber, a globule of mercury within and only partially filling said chamber, resting on a side wall thereof, and of a size to assume a curved form in which a substantial portion thereof is held above, and against spreading along, said wall solely by its surface tension opposing the action of gravity thereon, and a pair of conductors extending into said chamber from the exterior thereof and having within said chamber exposed contact portions of a material not wet by mercury spaced apart in a direction along said side wall and positioned relatively to said globule to be electrically connected by the globule when the globule is flattened against said side wall against the forces of surface tension while remaining undivided and in the same relative position on said side wall, and to be electrically disconnected by said globule when said globule resumes its normal shape under the action of its surface tension and gravity only.

16. In a mercury switch, a hollow housing of a material not wet by mercury and having a closed chamber, a globule of mercury within and only partially filling said chamber, resting on a side wall thereof, and of a size to assume a curved form in which a substantial portion thereof is held above, and against spreading along, said wall solely by its surface tension opposing the action of gravity thereon, and a pair of conductors extending into said chamber from the exterior thereof and having within said chamber exposed contact portions of a material not wet by mercury, spaced apart in a direction along said side wall and positioned relatively to said globule to be electrically connected by said globule when the globule is resting on said side wall and subject only to the forces of its surface tension and gravity, and to be electrically disconnected by said globule when the globule is distorted by flattening against said wall against the action of its surface tension and while it remains undivided and in the same relative position on said side wall.

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