May 12, 1931. H. J. MURRAY 1,805,147

PENDULUM CONTROLLED CIRCUIT CLOSER

Filed Jan. 12, 1921

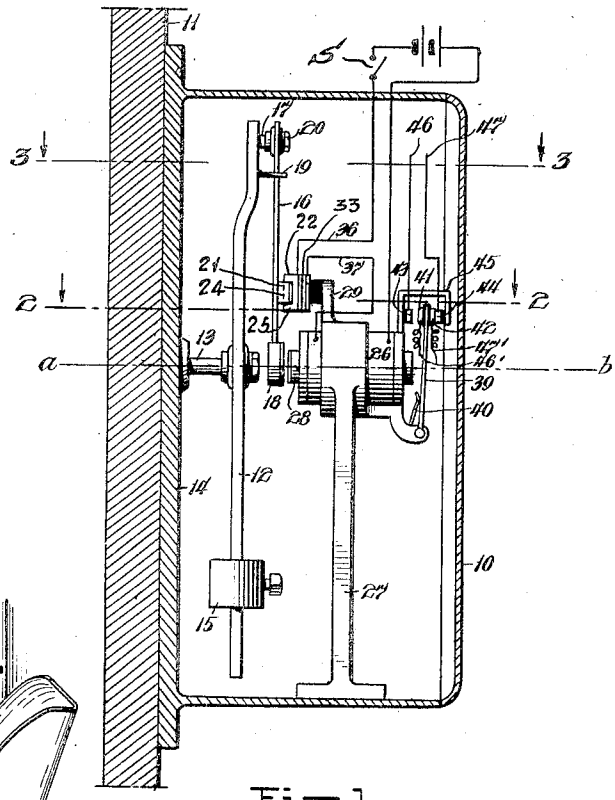
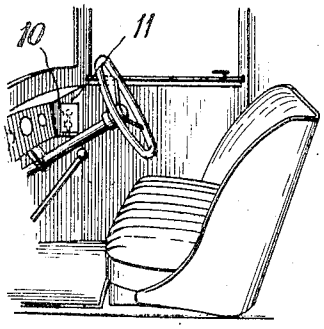


Fig. 1.

Fig. 4.



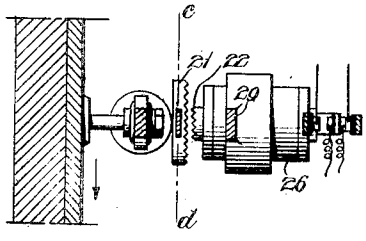


Fig. 2.

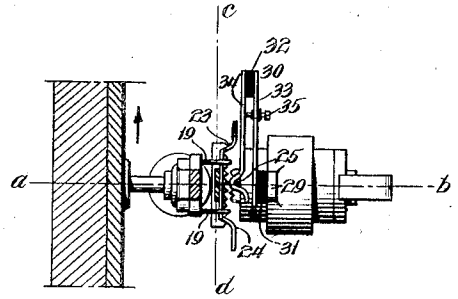


Fig. 3.

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UNITED STATES PATENT OFFICE

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PENDULUM CONTROLLED CIRCUIT CLOSER

Application filed January 12, 1921. Serial No. 436,804.

The invention relates to an automatically actuated control for a plurality of electric circuits and constitutes a development of the subject matter disclosed in my Patent No. 1,288,128, December 17, 1918.

In the patented disclosure a circuit was controlled by an inertia controlled member therein illustrated as a swinging pendulum, which when mounted on a vehicle was oscillated by variation in speed of the vehicle and when once oscillated was held by a lock in position to maintain the circuit in closed condition to operate different instruments in the circuit. It was found, however, that such a device was also influenced by the inclination or tilting of the vehicle as it moved up and down hills in that the tilt of the vehicle frequently was sufficient to cause the pendulum to close the circuit and thus actuate the devices controlled thereby under conditions in which it was not desired that the devices function.

In my Patent No. 1,400,229, December 13, 1921, electric circuit controls, it was suggested to mount the support which carried the swinging pendulum and its contact elements pivotally on the vehicle so that the circuit would be closed, opened or otherwise affected by those inertia forces which were due solely to changes in horizontal movement of the vehicle to which the device is attached and which contacts would be substantially uninfluenced by vertical or inclined movement of the vehicle.

The present application like the above identified Patent No. 1,400,229 features for a general object the providing of means for causing the control of the circuit to be influenced solely by changes in horizontal speed in either direction. This application has for additional objects the providing of a simple device of the class described characterized by a circuit closing organization of parts including a circuit closer and actuator therefor, both of which are sensitively adjustable independently of each other and independently of the pivotally mounted support for the actuator, which is not operatively dependent upon the necessarily loose electric connections which characterizes the connection of the electric conductors in loosely mounted members; which features a means for readily changing the sensitiveness of the actuator to fit various demands of the instruments in the several circuits and which is provided with means for automatically securing the actuator in operative position when it has been once actuated under the influence of the inertia controlled member irrespective of the inclination of the vehicle or other support.

Still another object of the invention is to provide a means for forming a plurality of independent electric circuits all under the influence of one electromagnet, or a set of electromagnets, which electromagnet or electromagnets are in turn under the control of a single inertia controlled actuator.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of mechanism embodying my invention, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawings:—

Figure 1 is a vertical sectional view taken through a mechanism containing casing, enclosing a preferred embodiment of the invention mounted on a support;

Figures 2 and 3 are horizontal transverse sectional views taken respectively on the lines 2—2 and 3—3 of Figure 1 looking downwardly as indicated by the arrows and Fig. 4 is a view showing part of the interior of an automotive structure adjacent the drivers seat illustrating on a reduced scale the position of the mechanism shown in the preced-

ing figures and mounted on the side extension of the instrument or dash board.

In the following description and in the claims, parts will be identified by specific names for convenience of expression but they are intended to be as generic in their application to similar parts as the art will permit.

In the drawings, the parts are shown to be housed within a casing 10 preferably in the form of a locked box or safe designed to prevent access to the parts by unauthorized persons. The box is fixedly attached to a support 11 which for the purpose of this disclosure may be regarded as the dash board or other part of an automotive structure subject to movement in space. A pendulum 12 hereinafter referred to as a pivotal support is fulcrumed intermediate its length on a fulcrum pin 13 fixedly attached to the side wall 14 of the casing 10 so as to form a rocking member. The pivotal support is free to swing about an axis of rotation or axis of reference *a—b* and is provided on its lower part with an adjustable weight 15 in order to change the rate of swing and thus affect the sensitiveness of the parts, as hereinafter more fully described.

A second pendulum 16 hereinafter referred to as an actuator is fulcrumed to hang from a pin 17 at the upper end of the pivotal support. The actuator is in the form of a flat strip of spring metal having its greatest cross-sectional dimension in its normal plane of swing *c—d* and being relatively thin in the direction of the axis *a—b* so as to be sufficiently flexible to bend easily under the influence of the electromagnet hereinafter described. The lower end of the actuator 16 is provided with a bob 18 normally disposed in the axis *a—b* and in advance of the free end of the pin 13 and constituting an armature for one end of the electromagnet. The pendulum actuator 16 is limited in its arc of movement in the plane *c—d* by a pair of stops 19 which extend laterally from the pivotal support and are disposed on opposite sides of and relatively close to the actuator 16 as shown more particularly in Figure 3. However, it will be understood that it is within the scope of this disclosure to clamp the upper end of the actuator 16 to the pivotal support through the agency of a jam nut 20 mounted on the outer end of the pin 17 and thus cause the actuator to swing as a unit with the pivotal support 12. In this case the stops 19 can be omitted.

The actuator 16 is provided just above the bob 18 with an outwardly facing and relatively long tooth plate 21 (see Figure 2), designed to engage with and be locked from swinging movement by a coacting fixed tooth plate 22, hereinafter more fully described. The actuator is also provided with a pair of outwardly inclined spring fingers 23 and 24 spaced apart in a plane parallel to the plane *c—d* and at opposite ends of the tooth rack. The fingers are inclined in the direction of the axis *a—b* so as to overlap opposite inclined sides of a U-shaped spring electric contact 25 disposed in spaced relation therebetween as shown more particularly in Figure 3.

An electromagnet 26 is mounted upon a standard 27 fixed in position within the casing 10 and is disposed in the axis *a—b* with one end of its core 28 facing the bob 18 so as to draw the same electromagnetically when energized. The lateral movement of the actuator carries the tooth plate 21 into locking engagement with the plate 22 to prevent further swing of the actuator. The standard 27 also provides an upstanding support 29 for a circuit closer 30 insulated therefrom by means of the insulation 31. The circuit closer 30 includes a pair of relatively long parallel metallic strips separated at one end by means of a block of insulating material 32. One of the strips 33 constitutes the fixed contact and the other strip 34 which has its free end formed into the U contact 25 constitutes the relatively movable contact of the circuit closer. A set screw 35 controls the tension of the movable contact strip and is insulated from the fixed contact strip 33.

The device illustrated includes three electric circuits. One of the circuits includes a conductor 36 which leads to one of the contacts, a conductor 37 which leads from the other contact to one end of the electromagnet and a conductor 38 which leads from the other end of the electromagnet.

The other two circuits are shown one of the normally closed and the other of the normally open type, both controlled by a rocking armature 39 facing the opposite end of the electromagnet core 28 and normally maintained in spaced relation to the electromagnet by means of a spring 40. The armature 39 is provided on opposite sides of its free end with a pair of contacts 41 and 42 movable respectively relative to coacting contacts 43 and 44 carried by an overhanging bracket 45 and respectively making or breaking contact through circuits which include conductors 46 and 46′ forming one circuit and 47 and 47′ forming the other circuit, all as is more particularly shown in the disclosure in Figure 1.

In operation and assuming for illustration that the device disclosed is mounted on a vehicle and in circuit with a burglar alarm or other instrumentalities, the operator on leaving the vehicle will close the circuit through some suitable switch, such as the magneto keys and thus place the device in operative condition to be actuated automatically when the vehicle is moved. Any movement or jar of the vehicle in either of the directions indicated by the arrows in Figures 2 and 3 will cause the actuator 16 to swing in its normal plane of movement so as to

bring either the finger 23 or 24 into engagement with the movable contact element 25 with a force sufficient to move the movable element into circuit closing relation with the coacting relatively fixed contact 33 of the circuit closer. As the circuit closer is positioned as close to the axis *a—b* as is physically possible and as the actuator 16 is rather long, it is not possible for the actuator to close the magnet circuit under conditions of ordinary inclinations of the vehicle to the horizontal. In this case, the pivotal support 12 simply swings about its axis *a—b* without disturbing the normal position of the bob 18. The closing of the circuit through the electromagnet will cause the same to act at one end on the bob 18 to draw the same laterally out of its plane of swing *c—d*, or, in other words longitudinally of the axis *a—b* and thus cause the teeth on the plates 21 and 22 to interlock and hold the actuator against swinging movement.

With the toothed plates engaged the contacts are pressed into engagement and act to maintain the circuit closer in circuit closing position.

It will be appreciated that the device is operable either while the vehicle is moving on level ground or when on an inclination, moving either up or down hill. Any inclination of the vehicle will merely tend to cause the pivotal support 12 to rotate on its axis but the stops 19 will prevent any abnormal swing of the actuator. However, while so inclined it will be appreciated that one or the other of the spring fingers will tend to approach the circuit closer element 25 so that when on the incline the apparatus is more sensitive to changes in velocity than when the pendulum actuator is in its normal position centered relative to the element 25 of the circuit closer.

Assuming that the spring 40 normally acts on the rocking armature 39 to maintain the circuit closed between the conductors 47 and 47′ with the electromagnet de-energized, the closing of the circuit through the electromagnet as previously described will shift the rocking arm to break the circuit between contacts 42 and 44 and closing contacts 41 and 43 completing the circuit through conductors 46 and 46′.

By means of a device of the type disclosed it is possible to provide for an easily manipulated adjustment of the tension between the spring contacts of the circuit closer and the conductors and other electric current carrying members can be made rugged, and, if necessary, massive for they are not mounted on a swinging support which must feature sensitiveness in response to forces which tend to make it swing.

While I have shown and described, and have pointed out in the annexed claims, certain novel features of my invention, it will be understood that various omissions, substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

Having thus described my invention, I claim:

1. In a device of the class described, the combination with a support, a pendulum fulcrumed to said support to swing about a horizontal axis, a second pendulum fulcrumed to said first pendulum above said axis, and normally having its bob in said axis, said second pendulum provided with a pair of fingers adjacent said axis and spaced apart in the plane of swing of the pendulum, means for forming an electric circuit including a circuit closer comprising said fingers and an element disposed between the fingers whereby a swing of the second pendulum in either direction will cause the same to move one of the fingers into engagement with said element of the circuit closer and thus close the electric circuit.

2. In a device of the class described, the combination with a support, a pendulum fulcrumed to said support to swing about a horizontal axis, a second pendulum fulcrumed to the first pendulum above its axis, said second pendulum provided with a pair of fingers spaced apart in the plane of its swing, means for forming an electric circuit including a circuit closer formed of said fingers and a movable element disposed between the fingers whereby a swing of the second pendulum in either direction will cause the same to move the circuit closer into circuit closing position, the bob of said pendulum having a freedom of movement in a direction at right angles to its plane of swing and an electromagnet acting on the bob of said pendulum to draw the same out of its plane of swing.

3. In a device of the class described, the combination of a supporting pendulum mounted for rocking movement about a horizontal axis, an actuator pendulum hung from a portion of said supporting pendulum above said axis and provided with a bob constituting an armature normally disposed in said axis, an electromagnet coacting with the armature to hold the same magnetically, means forming an electric circuit, including a normally open circuit closer and said electromagnet and means controlled by a swing of said pendulum under its own inertia into certain angular positions to close said circuit closer and thus cause the electromagnet to attract and grip the armature and thus hold the circuit closer in its circuit closing position.

4. In a device of the class described, the combination of a pendulum member pivotally supported to swing about a horizontal axis, said member having an extension above the

point of support, an electromagnet having its core in said axis, an actuator pendulum pivotally supported on said extension and having a bob constituting an armature for said electromagnet and swinging across said axis, means forming an electric circuit including said electromagnet and a fixedly mounted circuit closer, said circuit closer having a movable element disposed in the path of swinging movement of the actuator pendulum, and means whereby in certain angular positions the actuator pendulum causes the movable element of the circuit closer to close the circuit thereby causing the electromagnet to grip the armature and hold the actuator pendulum in circuit closing position.

5. In a device of the class described, the combination of a supporting pendulum mounted for movement about a horizontal axis, an electromagnet having its core disposed in said axis, an actuator pendulum fulcrumed to the supporting pendulum above the axis with its bob disposed in said axis and in position to be held by the electromagnet when actively disposed and movable across said axis, means forming an electric circuit including said electromagnet and a fixedly mounted circuit closer with its contacts normally in spaced relation to the pendulums and movable in a direction along said axis to and from circuit closing position, and having its movable contact disposed in the path of swing of the actuator pendulum whereby a movement of the actuator pendulum in its path of swing or a movement thereof towards the electromagnet will cause the actuator pendulum to act on the movable contact and thus close the circuit controlled by the circuit closer and said electromagnet disposed when energized to hold the actuator pendulum in its circuit closing position.

6. A device of the class described comprising a supporting member, means pivoting said member to swing about a horizontal axis, said member having an actuator member pivoted thereto at a point offset from a horizontal plane through said axis, with its free portion extending toward the pivoting means, a stationary electromagnet having a pole in the axis, an armature on said actuator member opposite said core in the normal position of the device, means forming an electric circuit including said magnet and a fixedly mounted circuit closer, said circuit closer having a movable element disposed in the path of the pivoted actuator member, and means whereby in a certain position of the latter on opposite sides of said axis the movable member of the circuit closer is operated to close the circuit and to thereby cause the electromagnet to attract the armature and hold the actuator member in position to keep the movable circuit closing member in circuit closing position, said device including gravity operated means for holding the supporting member in such position that the pivots of said members are in vertical alignment, and said device also including means for normally holding the actuator member so that the armature thereon is axially aligned with said magnet pole.

Signed at New York city in the county of New York and State of New York this 5th day of January, A. D. 1921.

HOWARD J. MURRAY.