Dec. 16, 1930. H. B. TAYLOR 1,785,705

CIRCUIT CONTROLLER

Filed June 22, 1928

FIG. 1.

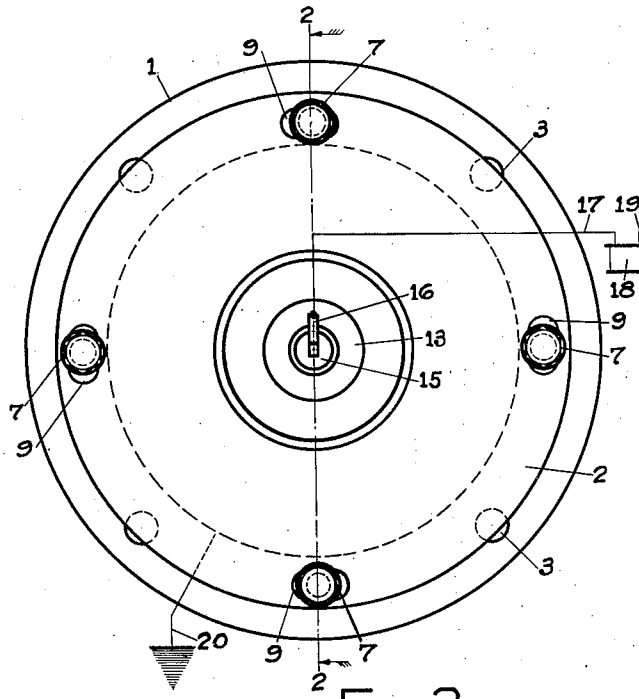


FIG. 2.

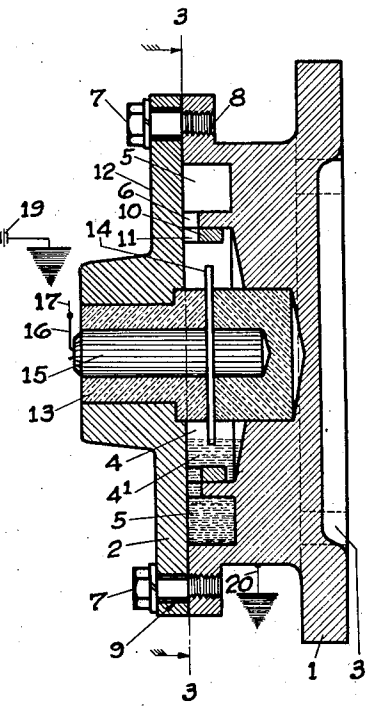
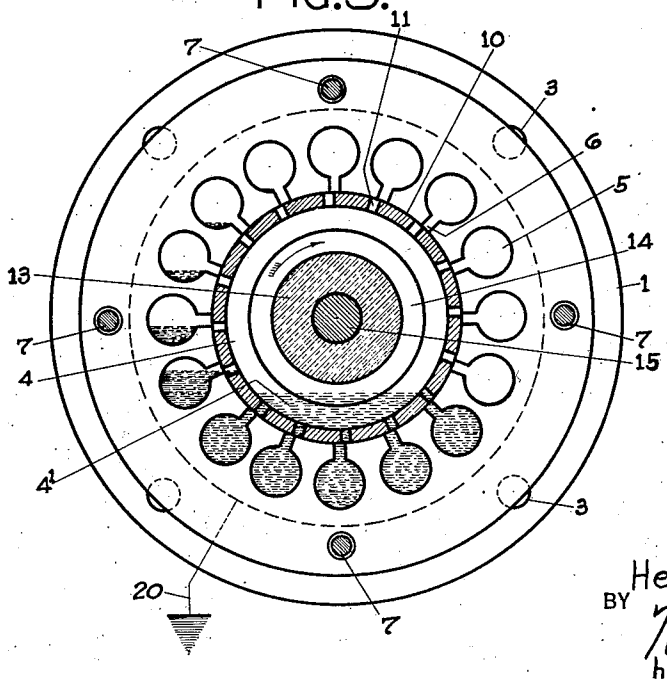


FIG. 3.



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UNITED STATES PATENT OFFICE

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CIRCUIT CONTROLLER

Application filed June 22, 1928. Serial No. 287,568.

The invention relates, in general, to an automatic centrifugally operated circuit controller, and has more particular reference to a circuit controller of this type provided with means for adjusting the speed at which the controller functions to make or break a circuit.

While the circuit controller forming the subject matter of this invention can be used to advantage in various connections, it is suggested that it is of particular advantage in connection with various types of automatic train control systems, such, for example as shown in the following application and patents: application 470,592 filed May 18, 1921 of C. S. Bushnell, and Patents 1,593,552 to C. S. Bushnell granted June 20, 1926, 1,593,553 granted July 20, 1926 to W. K. Howe and 1,291,523 granted January 14, 1919 to W. K. Howe.

The controller can be used, in connection with the above systems, and others, as an automatic low speed reset means for permitting the engineer to release the train from an automatic brake application incurred due to failure to acknowledge when required, upon the train being brought to a predetermined low speed such, for example, as two miles per hour. It can also be employed to advantage in train control systems for the purpose of cutting out train control apparatus below certain minimum speeds which are considered safe at all times such, for example, as 15 miles per hour. It can also be used to advantage to set up various maximum speed limit which, if exceeded, causes the controller to exert any desired train movement restricting influence.

In connection with the above cited uses, and with many other uses which it is thought quite unnecessary to enumerate herein, it is desirable to be able to adjust the controller to function at various speeds.

With the above and other objects in view, it is proposed, in accordance with this invention, to provide a circuit controller arranged for connection to a vehicle so as to be rotated at a speed proportional to the vehicle speed, and having spaced contacts electrically connected by conducting fluid, such as mercury, when at a standstill, and disconnected when the controller is rotated at a sufficiently high speed, together with means whereby the speed at which the contacts are disconnected can be varied at will.

Further objects, purposes and characteristic features of this invention will appear as the description progresses, reference being had to the accompanying drawing showing, solely by way of example, and in no manner in a limiting sense, one form which the invention can assume. In the drawing:—

Fig. 1 is a front elevational view of a controller in accordance with this invention.

Fig. 2 is a sectional view, taken on line 2—2 of Fig. 1 and viewed in the direction of the arrows, with parts shown in elevation.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2.

Referring now to the drawing, the controller of this invention, as exemplified in the present application, and shown at standstill, comprises a casing formed of a body 1, and a cover 2, the body 1 being arranged to be bolted or otherwise secured to the outer end of a vehicle axle, or like part, by means of bolts passing through holes 3 therein.

The body 1 is furnished with a center axial chamber 4, and a plurality of peripherally arranged pockets 5, encircling the chamber 4, and each connected therewith by a port 6.

The plate 2 is rigidly connected to the body 1 by bolts 7 screwed into the body at 8 and passing through elongated slots 9 in the plate 2, whereby the angular position of the plate, relative to the body, can be readily adjusted and the plate then fixed in such adjusted position. An inwardly projecting collar 10 is carried by plate 1 and is provided with control ports 11, one to correspond with each of the conducting ports 6 above referred to, the collar 10 fitting within, and bearing snugly against the partition 12 which separates the axial chamber 4 from the peripheral pockets 5. As best seen in Figs. 2 and 3, it is readily apparent that it is easily possible to adjust the cross sectional area of the passage ways connecting each pocket 5 with the cham-

ber 4 by axially adjusting the plate 2 on body 1.

Carried in the members 1 and 2 is a plug 13 of insulating material within, and projecting from which is an axial contact 14, carried on a pin 15 against which bears a contact finger 16 connected by wire 17 to a control relay 18, (or any other desired translating means) with the other side of the control relay connected through a battery 19, to ground by means of a wire 19^1. The casing 1 is likewise connected to ground by means of a wire 20.

Positioned within the chamber 4, and certain of the pockets 5, is a body 4^1 of electrically conducting liquid such as mercury, in amount to immerse the lower portion of axial contact 14 when the controller is at rest, to thereby electrically connect the contact 14 with the casing body formed by plates 1 and 2. Thus, when at rest, the relay 18 is energized through a circuit which includes, from ground to the controller casing, mercury 4^1, contact 14, pin 15, contact finger 16, wire 17, relay 18, wire 19^1, battery 19, and back to ground.

The control relay 18 can, of course, be replaced, or supplemented, by any other desired translating device, and the controller can control such device in any desired manner. This translating device or relay 18 can act as an automatic reset, or as a train control cut-out, as mentioned above, or can perform any other desired or useful function without departing from the spirit of this invention.

The controller described above operates at zero speed, as set forth above, to complete a circuit by electrically connecting the axial contact 14 with the controller casing.

As the controller of this invention is rotated on an axis passing through the pin 15, centrifugal force tends to position the mercury in the pockets 5 and removed it from the chamber 4. This tendency is aided by the force of gravity with regard to base pockets 5 which are, at any instant, below the chamber 4, but is opposed by the force of gravity with regard to base pockets 5 which, are at any instant, positioned above chamber 4, so as to tend to return liquid from such pocket to chamber 4.

Above a certain critical speed of rotation of the controller, the centrifugal force is always at least equal to the force of gravity, to thus overcome gravity, so that no mercury whatsoever will flow back into the chamber 4 from the pockets 5. As a result enough mercury will be removed from chamber 4 to break connection with contact 14, and thus open a circuit such, for instance, as the above referred to energizing circuit for relay 18.

At every speed below this critical speed, the force of gravity is greater than the centrifugal force, with the result that some of the mercury in base pockets 5 at that instant above the chamber 4 will flow back into such chamber and tend to make contact with 14.

Clearly, the lower the speed or rotation of the controller, the greater is the differential advantage of the force of gravity over centrifugal force, and other things being equal, the greater is the amount of mercury returned to chamber 4 from pockets 5. It is also clear that the larger the connecting passage between a pocket 5 and the chamber 4, the greater the amount of mercury that will be returned by a given pressure to the axial chamber 4.

From the above it clearly follows that the larger the port openings between the pockets and the axial chamber, the higher the speed at which contact is made between the body of mercury 4^1 and the contact 14. Hence, for a reset for example at 15 miles per hour for an automatic train control system, a given port opening between the pockets and the axial chamber, in the present case a rather large opening, is needed. If now it be desired to adjust the controller to reset only when the speed is brought down to two miles per hour for example, a much smaller port opening is required. In the case of the smaller port opening, a speed of 15 miles per hour does not permit the return of enough mercury from the pockets to the axial chamber to maintain contact between the body of mercury and contact 14, or, in other words, no reset is effected at this speed.

The controller can, of course, be otherwise adjustable, for varying the speed at which it operates, as, for instance, making it so as to adjust the distance of the various parts from the rotational axis, to thus vary the relation of the centrifugal force to gravity at given speeds of rotation.

It should be noted, as shown in Fig. 2, that the passages connecting the pockets 5 with the chamber 4 are positioned to one side of, rather than vertically above the contact 14. This construction is used to largely avoid contact between contact 14 and the mercury which is being returned to the chamber 4, in order to safeguard against any possible closing of the circuit between contact 14 and the controller casing due to the streams of returning mercury. An insulating shield could be used, if desired.

The above rather specific description of one form of this invention, is given solely by way of example, and is not intended, in any manner whatsoever, in a limiting sense. Obviously, the invention can assume various different physical forms, and is susceptible of numerous modifications, and all such forms and modifications as come within the scope of the appended claims, are intended to be covered by this application.

Having described my invention, I now claim:—

1. In a circuit controller, a casing adapted for connection to rotate in accordance with the speed of a vehicle, spaced contacts in said casing, fluid means for electrically connecting said contacts when said casing is stationary and for disconnecting said contacts when said casing is rotated, and adjusting means for varying flow of the liquid means for causing said contacts to be disconnected upon various speeds of rotation depending on the adjustment.

2. A circuit controller, comprising, spaced contacts, means for rotating said controller at a speed proportional to the speed of a vehicle, electrically conductive fluid in said controller assuming a position to make or break connection between said contacts dependent upon the rate of rotation of said controller, and adjusting means for varying paths of flow for said fluid for causing said connection to be made below various speeds dependent on the adjustment.

3. In a circuit controller, spaced contacts and a body of electrically conductive fluid, control means whereby the force of gravity tends to cause flow of said fluid to close said contacts and centrifugal force tends to cause flow of said fluid to open said contacts, and adjusting means for said control means for varying the effectiveness of the gravitational tendency to flow of said fluid in closing said contacts.

4. In a circuit controller, a casing means for connecting said casing for rotation at a rate proportional to that of a rotating element, spaced contacts in said casing, a body of electrically conductive fluid in said casing positioned to electrically connect said contacts when said casing is stationary and to disconnect said contacts when said casing is rotated at a sufficiently high speed, and adjustable flow passages for said fluid body whereby adjustment of said flow passages causes said contacts to be disconnected above various speeds of rotation according to the adjustment.

5. In a centrifugal circuit controller for train control, a casing arranged for connection to a vehicle to rotate at a rate proportional to the speed of said vehicle, an axially and a peripherally positioned contact, a central chamber surrounding said axial contact, peripheral chambers positioned about said central chamber, ports connecting said central and peripheral chambers, a body of electrically conductive fluid in said chambers and connecting said contacts when said controller is at rest and disconnecting said contacts when said controller rotates sufficiently rapidly, and means for adjusting said ports.

6. In a centrifugal circuit controller for train control, a two part casing arranged for connection to a vehicle to rotate at a rate proportional to the speed of said vehicle, an axially and a peripherally positioned contact, a control chamber surrounding said axial contact, peripheral chambers positioned about said central chamber ports formed partly in each of the two parts of said casing for connecting said peripheral chambers, a body of electrically conductive fluid in said chambers and connecting said contacts when said controller is at rest and disconnecting said contacts when said controller rotates sufficiently rapidly, and means for adjusting the relative position of said two parts of said casing for adjusting the flow area of said ports to thus cause said contacts to be disconnected above various ratio of rotation dependent upon the adjustment.

7. In a circuit controller, a body member adapted to be rotated about an axis, an axial chamber in said body member, a plurality of peripherally arranged pockets in said body member and connected with said chamber through connecting ports, a cover plate for said body member, a flange on said plate having control ports registrable with said ports, means adjustably connecting said plate to said body member to permit adjusting the flow area of said connecting ports, an axial contact in said body, and a quantity of electrically conductive fluid in said body connecting said contact and body when the controller is stationary and disconnecting the same when the controller is rotated at a sufficiently high rate.

8. In a circuit controller, a body member adapted to be rotated about an axis, an axial chamber in said body member, a plurality of peripherally arranged pockets in said body member and connected with said chamber through connecting ports, a cover plate for said body member, a flange on said plate having control ports registrable with said ports, slot and bolt means adjustably connecting said plate to said body member to permit adjusting the flow area of said connecting ports, an axial contact in said body, and a quantity of electrically conductive fluid in said body connecting said contact and body when the controller is stationary and disconnecting the same when the controller is rotated at a sufficiently high rate.

In testimony whereof I affix my signature.

HERBERT B. TAYLOR.