Nov. 3, 1959 L. PERAS 2,910,884

AUTOMATIC CONTROL DEVICE FOR GEARBOXES

Filed July 25, 1956 2 Sheets-Sheet 1

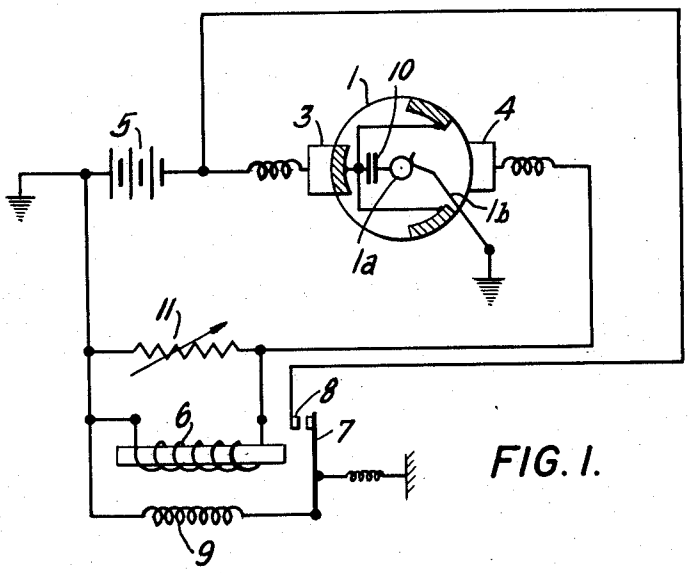


FIG. 1.

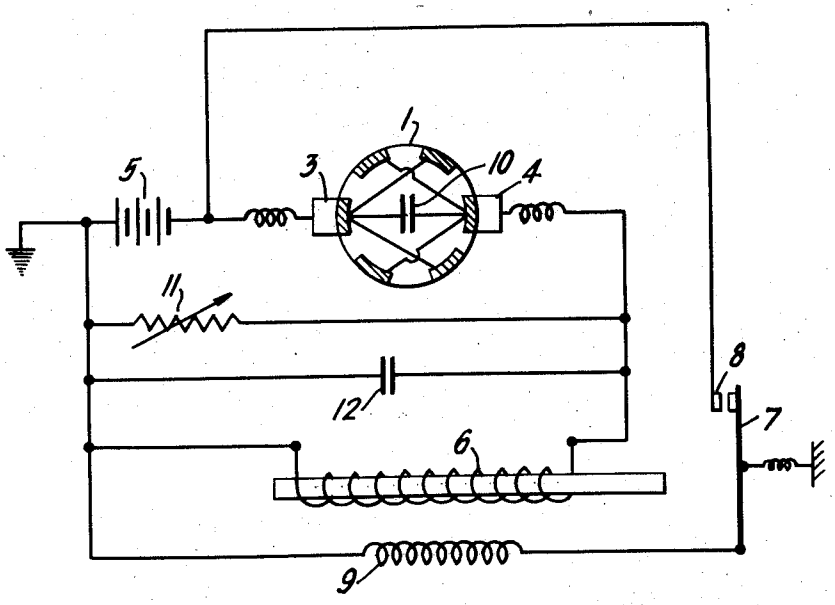


FIG. 2.

AUTOMATIC CONTROL DEVICE FOR GEARBOXES

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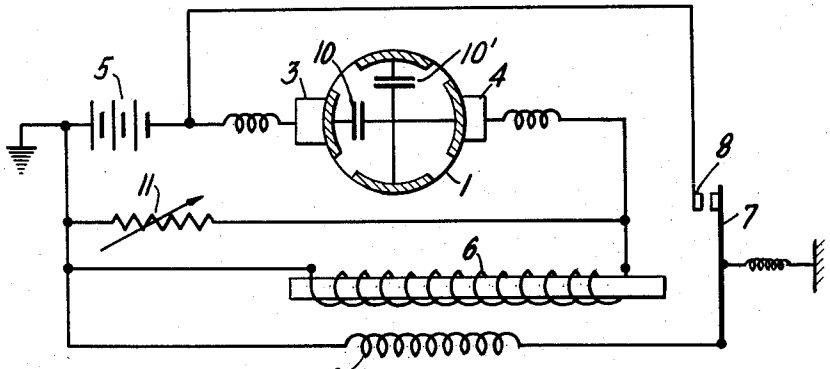


FIG. 3.

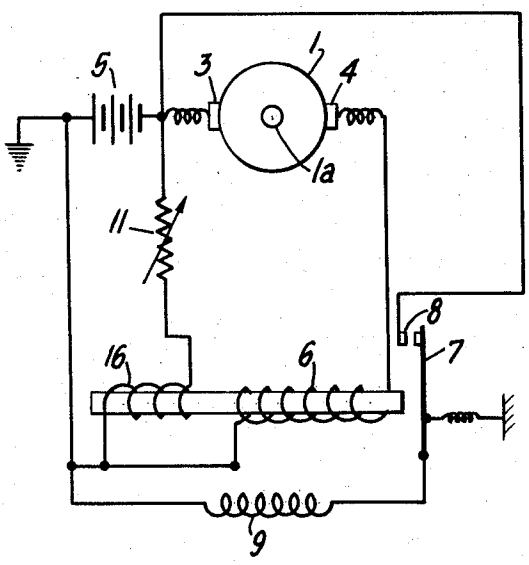


FIG. 4.

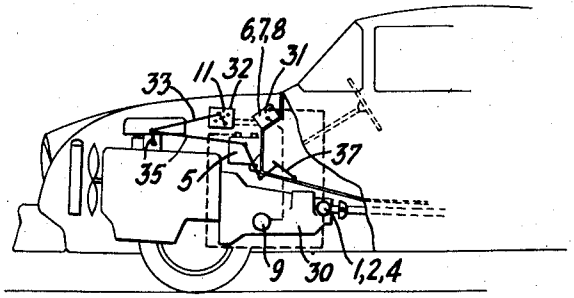


FIG. 5.

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AUTOMATIC CONTROL DEVICE FOR GEARBOXES

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Application July 25, 1956, Serial No. 599,971

Claims priority, application France August 11, 1955

8 Claims. (Cl. 74—472)

The patent application Serial No. 500,976 of April 12, 1955, in the name of the present applicant, described an automatic control device for gearboxes, more particularly for vehicles, of the type in which the passage from one gear ratio to another is effected under the influence of the speed of rotation of a shaft, characterized in that it comprises at least one system of contacts connected to a suitable electrical source and actuated by the said shaft, in such a manner as to supply an external circuit comprising the coil of one or more relays, and preferably a condenser, with a pulsating current whose average intensity is a function of the speed of the shaft, the purpose of the said current being to engage the relay or relays at a predetermined speed.

The present application relates to a control device which is improved as regards the method of producing the pulsating current and the determination of the point of operation of the control relay. The said point being determined independently of the voltage of the battery and the temperature of the relay coils. According to the invention, at least one impulse-generating condenser is arranged on a rotor driven by the shaft whose rotational speed is to influence the change-over from one transmission ratio to the other. The rotor is constructed as a bar-type commutator through whose bars the condenser is charged and discharged. Furthermore, gear changing may be controlled by a double-coil relay.

Several forms of embodiment of the improved device according to the invention will now be described, by way of non-limitative example, with reference to the accompanying drawings, wherein:

Figs. 1 to 3 are schematic circuit diagrams and illustrate diagrammatically three methods of arranging condensers on the rotor;

Fig. 4 is a general diagrammatic view of the device provided with the double-coil relay.

Fig. 5 is a perspective view illustrative of an overall arrangement of the present invention in a vehicle.

It should be noted that in the following description, those parts which are common to the various embodiments have been given the same reference numerals. Moreover, it will be understood that the present invention is described with respect to an automatic control device for gear boxes (not shown) in vehicles of the type in which the change of one gear ratio to another is effected as the function of the speed of an output shaft of the gear box as later herein described.

The device illustrated diagrammatically in Fig. 1 is provided with a condenser **10** arranged on a rotor **1**, which is constructed as a bar-type commutator as shown, and which is driven by an output shaft, not shown, of a gear box **30**, whose speed variations are to influence the system. The different bars of the commutator are connected

to one of the armatures of the condenser **10** which rotates with the commutator, the other armature being connected to ground by means of a shaft **1***a* and the bearings thereof, with or without the use of a contact, for example, a sliding contact **1***b*. A brush **3** is connected to an electrical source **5**, and a brush **4** is connected to a relay **6**. The dimensions and number of the commutator bars, the dead spaces separating them, and the angle which the brushes **3** or **4** form between them, are such that the cycles of charging and discharging the condenser succeed one another without its being possible for current to pass directly between the brushes **3** and **4**.

The condenser **10**, one side of which is constantly connected to ground, is charged at the voltage of the electrical source **5** each time that one of the bars of the commutator to which the other armature of the said condenser is connected, comes into contact with the brush **3**, and is discharged into the circuit of the relay **6** each time that a bar comes into contact with the brush **4**, thus producing in the said circuit a pulsating current which, when its mean intensity reaches a predetermined value, causes the relay **6** to engage. A blade **7** is attracted and the contact **8** closed, so that an operating winding of an apparatus **9**, for changing gear ratios in the gear box **30**, in known manner has current supplied thereto. A rheostat **11**, connected to an accelerator **37** for the vehicle, allows a variable fraction of this current to be diverted, and thus to alter, as a function of load, the main current flowing in the winding **6** and consequently the speed at which the relay pulls in and causes a change of gear ratios.

In the device according to Fig. 2 of the accompanying drawings, the condenser **10** is also fast with the rotor **1** which has the form of a commutator having an equal number of bars (six in the case of this figure). In this embodiment, the two sides of the condenser **10** are connected respectively to two series of alternate bars. The bars are separated by non-conductive spaces. These non-conductive spaces and the width of the brushes are so dimensioned that each brush can only come in contact with one bar at a time. When the rotor **1** has rotated through such an angle that the following pair of bars is in contact with the brushes **3** and **4** respectively, the condenser armature previously connected to the brush **4** is now connected to the brush **3**, and vice versa, and the charge voltage of the condenser is added to that of the electrical source, sending through the circuit of the relay **6** an impulse of greater energy than in the preceding case where only the voltage of the source was used. The other circuit members of the device are illustrated as arranged in the manner of Fig. 1 except that a condenser **12** is connected in parallel with the rheostat **11**.

Fig. 3 illustrates a device wherein condensers such as **10** and **10'**, two condensers in the case of this figure, are carried by the rotor **1**, which has the form of a commutator having twice as many bars as there are condensers (four bars in the case of this figure), the sides of each of the condensers are connected respectively to two opposite bars. This arrangement makes it possible to reduce the dead space between two consecutive bars to the smallest possible amount compatible with their insulation. It is possible in this case for the brushes to be in contact at the same time with two consecutive bars.

Each of the condensers **10** and **10'** is charged when the two commutator bars connected to its armatures are respectively in contact with the brushes **3** and **4**, and is

discharged when this same pair of bars again comes in contact with the two brushes in the inverse position, the condenser charge voltage being added to that of the electrical source as in the preceding case. It being understood that the rest of the circuit elements are connected similarly to the embodiment in Fig. 1.

Fig. 4 concerns a form of embodiment in which the core of the electromagnet of the relay carries not only a coil **6** which is supplied by the pulsating current proportional to the speed of the shaft **1***a*, but also, according to a well-known method, a coil **16** in opposition with the first coil. It is in the circuit of this coil **16**, fed by the same electrical source **5** (batteries) as the rest of the device, that the rheostat or rheostats such as **11** can be provided. The rheostat **11** is intended, for example, to cause the "engine load" factor to act upon the point at which the relay is engaged.

The attraction force acting on the blade **7** will be a function, apart from one constant, of the relative fluxes produced by the coils **6** and **13**. The fact that these coils, wound on the same core, are traversed by currents proportional to the voltage of one and the same source, has the advantage of making the point of operation of the relay largely independent of the voltage of the battery and of the ambient temperature of the coils.

As shown in Fig. 5, the invention is easily mounted in a vehicle. Thus the make-break switch is mounted adjacent the output shaft of the gear box **30** and the relay **6** and its associated condensers are mounted in an enclosure **31** and the variable resistance **11** is in an enclosure **32**. A link **33** connects the resistance **11** with the throttle control links **35** connected to the vehicle accelerator **37**. The battery **5** is connected to the various elements, as shown, for operably controlling device **9** actuating the gear box **30**.

While preferred embodiments of the invention have been shown and described it will be understood that many modifications and changes can be made within the scope of the invention.

I claim:

1. In combination with a power transmission system having an automatic change-speed gear box provided with means for changing gear ratios and a driven output shaft, a rotor shaft operatively driven by said output shaft at a speed corresponding to the speed of the output shaft and provided with angularly spaced, peripheral, conductive portions, a speed-responsive control circuit operatively connected to said rotor shaft comprising a source of direct current, first electro-responsive means for actuating said means for changing gear ratios, normally open electrical connections between the source of direct current and the first electro-responsive means, second electro-responsive means for closing said connections at selected mean current values of pulsating current and holding them closed while said current values obtain, the current values corresponding to selected rotational speeds of the gear box output shaft, at least one capacitor mounted to rotate with said rotor shaft and connected to the rotor shaft conductive portions, a first contact means connected to the source of direct current and a second contact means connected to the second current-responsive means, said contact means being arranged to successively make electrical contact with said conductive portions as said rotor shaft rotates, whereby said capacitor is successively charged and then discharged to said second current-responsive means thereby to energize it with pulsating current.

2. In combination with a power transmission system having an automatic change-speed gear box provided with means for changing gear ratios and a driven output shaft, a rotor shaft operatively driven by said output shaft at a speed corresponding to the rotational speed of the output shaft and provided with angularly spaced, peripheral, conductive bar members, a speed-responsive control circuit operatively connected to said rotor shaft comprising

a source of direct current, first electro-responsive means for actuating said means for changing gear ratios, normally open electrical connections between the source of direct current and the first electro-responsive means, second electro-responsive means for closing said connections at selected mean current values of pulsating current and holding them closed while said current values obtain, the current values corresponding to selected rotational speeds of the gear box output shaft, at least one capacitor mounted to rotate with said rotor shaft and connected to the rotor shaft conductive bar members, a first contact means connected to the source of direct current and a second contact means connected to the second current-responsive means, said contact means being arranged to successively make electrical contact with the conductive bar members as said rotor shaft rotates, whereby said capacitor is successively charged and then discharged to said second current-responsive means thereby to energize it with pulsating current.

3. The combination according to claim 2, including connections between the conductive bar members arranged for allowing energization of the second current-responsive means from the capacitor and the direct current source and arranged so that the discharges of the capacitor correspond in timing with current pulses from the direct current source thereby to make the direct current pulses and the discharge currents additive.

4. The combination according to claim 2, including at least a second capacitor, each of said capacitors being connected to an individual pair of diametrically opposed conductive bar members, and in which said first and second contact means are arranged to make electrical contact with two successive conductive bar members simultaneously thereby to energize the second current-responsive means with pulsating direct current from the direct current source and simultaneously synchronizing the capacitor discharges with the current pulses, from said direct current source and making the direct current pulses and discharge currents additive.

5. The combination according to claim 2, in which said second current-responsive means comprises a relay having a first coil connected to said first contact means and a second coil connected to the second contact means, said coils having turns wound in opposition and both connected in parallel to said direct current source.

6. The combination according to claim 5, in which the power transmission system includes a variable speed prime mover and an accelerator for varying the speed of the prime mover and in which the control circuit includes variable impedance means in series with said first coil for varying the pulsating current energizing said second current-responsive means as a function of the actuation of the accelerator of said prime mover, and means operably connecting said variable impedance means to said accelerator.

7. The combination according to claim 2, in which said second current-responsive means comprises a plurality of flux generating actuating coils arranged for rendering the second current-responsive means responsive substantially independent of the voltage of said direct current source and the ambient temperature of the coils.

8. In combination with a power transmission system having an automatic change-speed gear box provided with means for changing gear ratios and a driven output shaft, a rotor shaft operatively driven by said output shaft at a corresponding speed and provided with angularly spaced, peripheral, conductive bar members, a speed-responsive control circuit operatively connected to said rotor shaft comprising a source of direct current, first electro-responsive means for actuating said means for changing gear ratios, second electro-responsive means for controlling said first electro-responsive means as a function of selected mean current values of pulsating current and holding them closed while said current values obtain, the current values corresponding to selected rotational speeds of

the gear box output shaft, at least one capacitor mounted to rotate with said shaft and connected to the rotor shaft conductive bar members, a first contact connected to the source of direct current and a second contact connected to the second current-responsive means, each contact arranged to successively make contact with the conductive bar members as said rotor shaft rotates, whereby said condenser is successively charged and then discharged to

said second current-responsive means thereby to energize it with pulsating current.

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