

May 23, 1939.

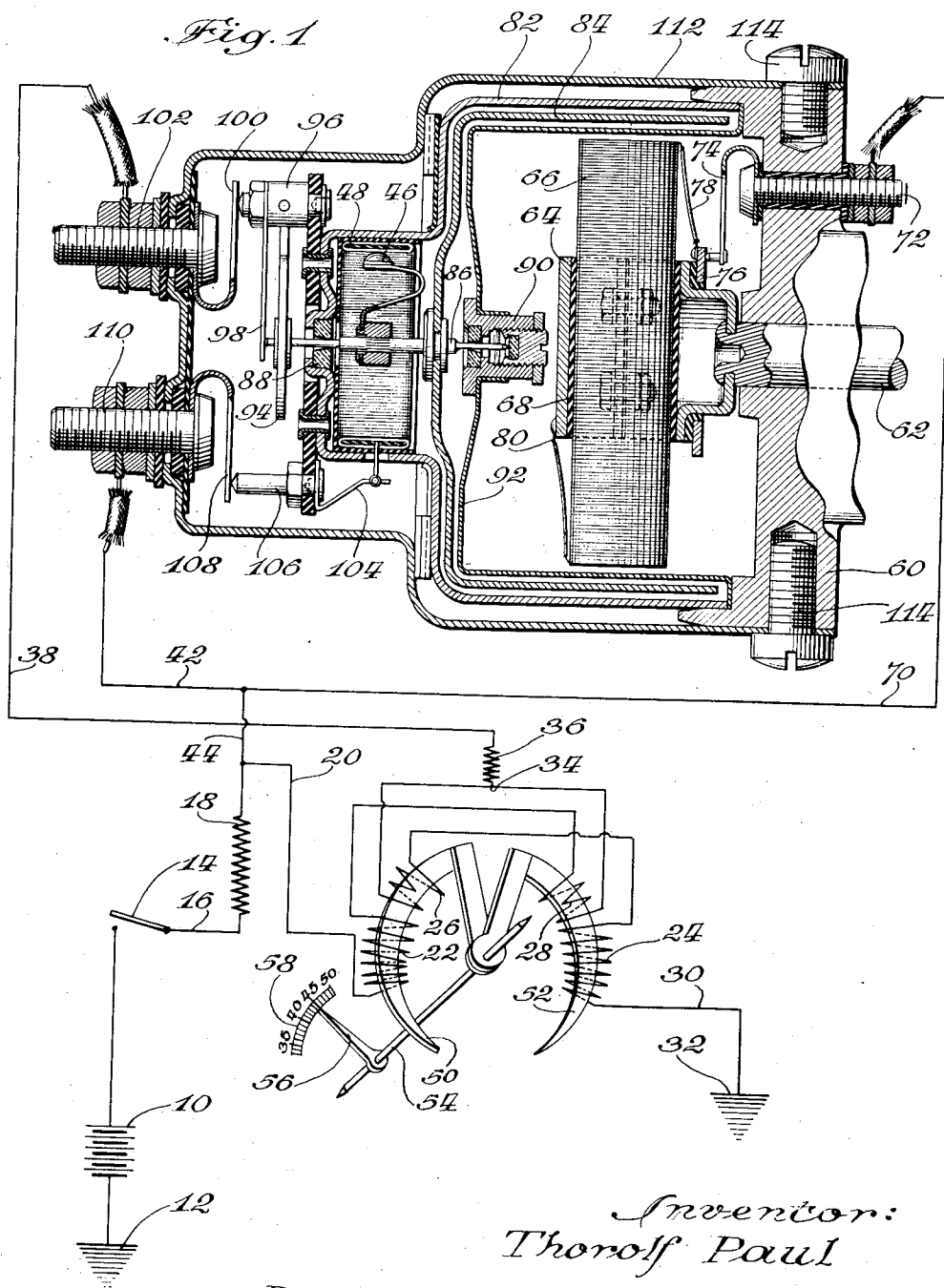
T. PAUL

2,159,341

ELECTRICAL SPEEDOMETER

Filed Feb. 20, 1936

2 Sheets-Sheet 1



Inventor:
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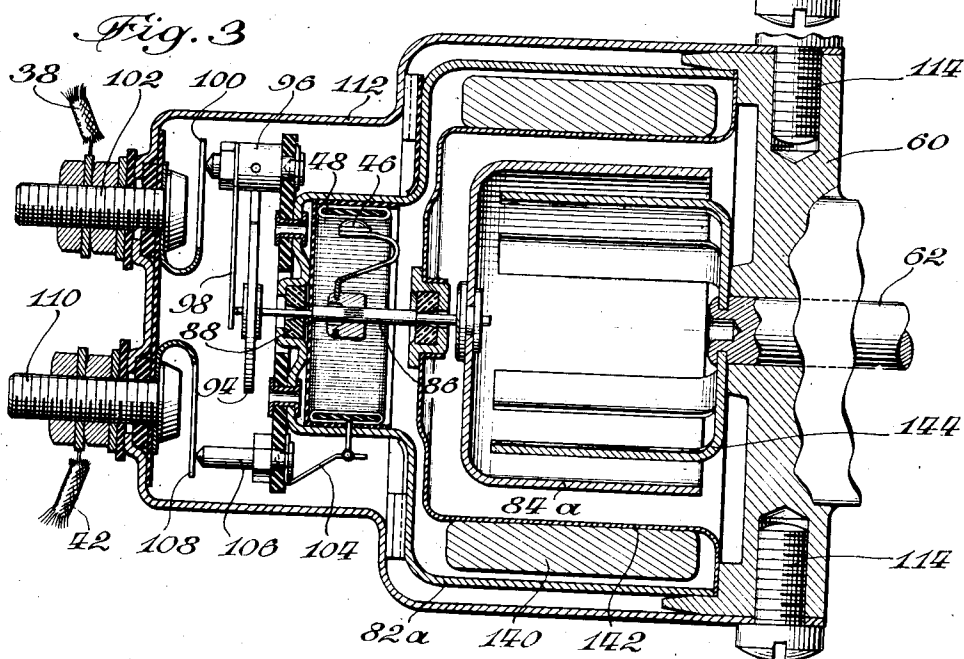
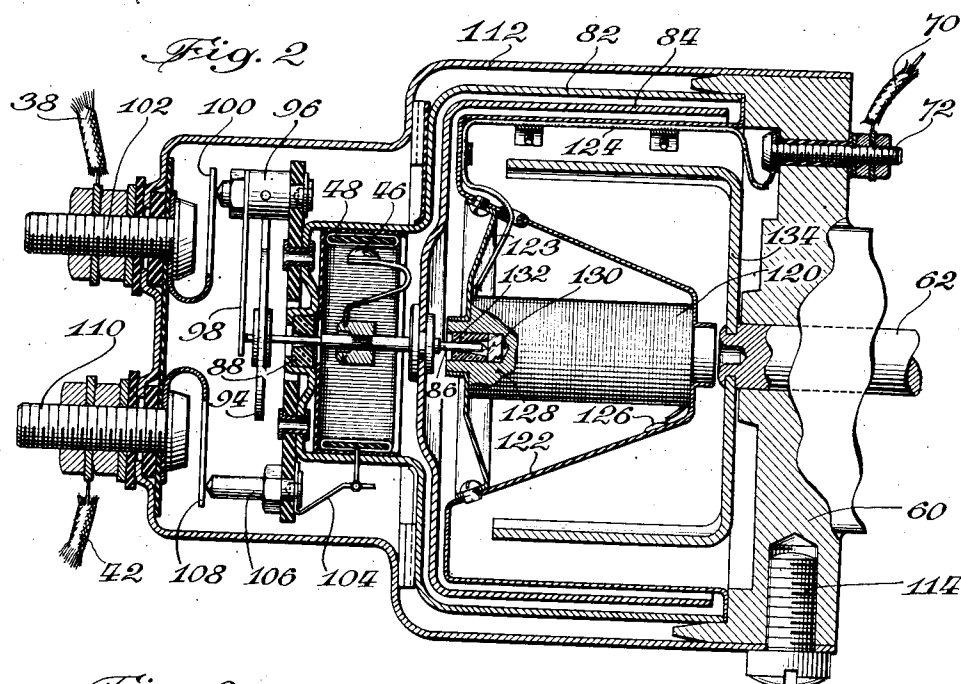
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ELECTRICAL SPEEDOMETER

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,159,341

ELECTRICAL SPEEDOMETER

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Application February 20, 1936, Serial No. 64,913

8 Claims. (Cl. 175-183)

My invention pertains to electric speedometers particularly adapted for automobiles in which the engine is located at the rear of the vehicle, and is an improvement on the electric speedometer disclosed in application, Serial No. 754,522, filed November 23, 1934.

An object of my invention is to provide an improved electric speedometer.

Another object is to provide an electric speedometer which more accurately indicates the true speed of the vehicle at all times.

Another object of my invention is to provide an electrical speedometer which is simple in construction and economical to manufacture.

Another object of my invention is to provide an electric speedometer which is capable of withstanding the severe jolting and other hard usage to which an automobile speedometer is subjected and still maintain its accuracy.

Other objects and advantages will become apparent as the description proceeds.

In the drawings,

Figure 1 is a diagrammatic view of one embodiment of my invention, showing in cross-section the translating mechanism which converts speed variations into electrical current variations;

Figure 2 is a cross-sectional view of a modified form of translating mechanism; and

Figure 3 is a sectional view of a third form of translating mechanism.

Referring to Figure 1 of the drawings, I have indicated my electric speedometer as being connected in the electrical circuit of an automobile having the usual battery 10 which is grounded to the frame of the automobile, as indicated at 12. The other side of the battery is connected to the usual ignition switch 14, and attached to one side of the ignition switch is a wire 16 leading to a ballast resistance 18 which compensates for voltage variations in the battery 10 by increasing its resistance upon increase in current due to increased battery voltage.

A wire 20 connects the other side of the ballast resistance 18 with a pair of electromagnets 22 and 24 which are in series with each other and with a pair of heating coils 26 and 28. A wire 30 grounds the electromagnet 24, as indicated at 32.

An intermediate point 34 on the circuit containing the electromagnets 22 and 24 and heating coils 26 and 28 is connected through ballast resistance 36 and wire 38 with contact finger 46 movable over a resistance element 48. One end of the resistance element 48 is grounded, and

the other end is connected to the ballast resistance 18 through wires 42 and 44. When the contact finger 46 is moved over the resistance element 48, the relative voltage impressed upon each of the electromagnets 22 and 24 is varied, thereby varying the relative strength of these magnets.

The electromagnets 22 and 24 act, respectively, upon armature segments 50 and 52 supported on shaft 54, the action of the electromagnets on their respective armatures being such as to tend to rotate this shaft in opposite directions. The shaft 54 carries a pointer 56 movable over a dial 58 to indicate the speed of the vehicle at any particular instant.

The translating mechanism, shown in cross-section at the top of Figure 1, comprises a base 60 which is suitably supported on a part of the automobile frame or running gear, and through the base 60 extends a shaft 62 which is geared to a rotating part of the automobile which always rotates in unison with one of the wheels, preferably one of the rear wheels of the vehicle. One end of the shaft 62 carries a clamp 64 holding an electromagnet 66 shown as supported in a protecting sleeve 68 of rubber or other suitable material. The electromagnet 66 receives its current through a wire 70 which connects one side of the ballast resistance 18 with a binding post 72. This binding post extends through the base 60 and carries a resilient contact 74 for engaging a ring 76 which rotates with but is insulated from the clamp 64. This ring 76 is connected to one end of the wire 78 of the electromagnet 66, the other end of this wire being connected to the clamp 64 as indicated at 80. The clamp 64 is grounded to the automobile frame. It is to be understood that the wire 78 of the electromagnet 66 is wound on a soft iron core.

The electromagnet 66 creates a strong magnetic field between itself and an iron field piece 82 which forms a support for the resistance element 48. This magnetic field rotates with the magnet 66 and creates eddy currents in a speed cup 84 of aluminum or other suitable material carried on a shaft 86 supported in jeweled bearings 88 and 90 carried, respectively, by the field piece 82 and a supporting cup 92 of non-magnetic material. The shaft 86 carries finger 46 so that rotation of the shaft 86 moves this finger over the resistance element 48 and varies the resistance of the circuit in which this resistance element is located.

Rotation of the shaft 86 is resisted by a spring 94 which connects this shaft with a post 96 which

is supported on but insulated from field piece 82. Both the spring 94 and finger 98 cooperate to form an electrical connection between the shaft 86 and finger 46 and the post 96, it being understood that the jeweled bearings insulate the shaft 86 from its supporting structures. Post 96 is electrically connected to wire 38 through spring finger 100 and binding post 102.

The resistance element 48 is insulated from its supporting field piece 82, and one end of this resistance element is connected through conduit means 104, post 106, spring finger 108 and binding post 110, with wire 42 leading to ballast resistance 18. The binding posts 102 and 110 are carried by a cover 112 attached to the base 60 by means of screws 114. The parts are so arranged that this cover secures the field piece 82 and supporting cup 92 to the base 60.

The operation of this form of my invention is as follows:

When the ignition switch 14 is closed, an electrical circuit is established through the electromagnet 66, whereupon this magnet becomes energized and creates a strong magnetic field between itself and the iron field piece 82. Movement of the automobile causes the shaft 62 and electromagnet 66 to rotate at a speed bearing a direct relation to the speed of travel of the vehicle. The magnetic field created by the magnet 66 rotates therewith and causes the speed cup 84 and finger 46 to move in opposition to the spring 94 a distance proportional to the speed of rotation of the magnet 66.

The resistance element 48 is in parallel with the circuit containing the electromagnet 22 and 24, and the contact point 34 is connected to the movable contact finger 46. The resistance element 48 thus functions as a potentiometer or voltage divider for controlling the voltage applied to the electromagnets 22 and 24. Shifting the contact finger 46 to one end of the resistance 48 impresses full voltage on the electromagnet spanned by the corresponding section of the resistance and reduces the voltage across the other electromagnet to practically zero value, and vice versa. For intermediate positions of the contact finger the voltage impressed upon each electromagnet is proportional to the relative amount of the resistance bridged across it. As the relative strength of each electromagnet is determined by the proportion of the total voltage impressed upon it, the resulting positions assumed by the armature 50 and 52 correspond accurately with relative positions of the contact finger 46 on the resistance 48.

When the ignition switch is turned to the "off" position, no current flows through the electromagnet 66, resistance element 48 or electromagnets 22 and 24 so that there is no drain on the automobile battery while the ignition switch is in this position. The resistance of the electromagnet 66 and of the other circuits is made of such order that, even when the ignition switch 14 is in the "on" position and the speedometer is operating, the amount of current consumed is exceedingly small.

In the embodiment of Figure 2, the electromagnet 120 is stationary and is carried by the supporting cup 122 of non-magnetic material. The upper end of the magnet 120 is held in central position by a sheet metal disk 123 also of non-magnetic material. The magnet is supplied with current through a wire 124 which connects the magnet with the terminal 72, the other end of the

magnet being grounded to the cup 122 as indicated at 126.

The upper end of the soft iron core 128 is provided with a recess in which are located the jewels 130 and 132 which support and guide one end of the shaft 86 which controls the contact finger 46 and moves it over the resistance element 48. The lower end of the core 128 is reduced in diameter and extends in close proximity to the end of the iron or steel shaft 62 which in this embodiment carries and rotates a relatively light pole piece 134 comprising a U-shaped strap of iron or other magnetic material. The rotation of this pole piece 134 has the same effect as does the rotation of the electromagnet in the previous embodiment.

In the embodiment of Figure 3, a permanent magnet 140 is used in lieu of an electromagnet. This magnet 140 is supported in stationary relationship with respect to the base 60 by means of non-magnetic cup 142. In this embodiment, the shaft 62 rotates a field ring 144 which is formed of iron or other magnetic material and which is provided with spaced fingers, as clearly shown in the drawings. This field piece is considerably lighter than the permanent magnet 140.

In this form of my invention the part 82^a, which may be identical in shape and size with the field piece 82 of the previous embodiments, is made of non-magnetic material instead of magnetic material as in the previous forms of my invention. In the structure of this Figure 3, the main magnetic field is created between the permanent magnet 140 and the field ring 144 and, as the spaced fingers of this field ring rotate, eddy currents are created in the aluminum speed cup 84^a, with the result that this speed cup tends to rotate with the field ring 144. This rotation is opposed by the spring 94 as in the previous embodiments, and the resultant position assumed by the speed cup 84^a controls the position of the contact finger 46 with respect to its resistance element 48, all as previously described.

While I have shown only three forms of my invention, it is to be understood that my invention is not limited to the details shown and described but may assume various forms, and that the scope of my invention is to be limited solely by the following claims.

I claim:

1. An electrical indicator for an automobile comprising indicating means, electrically-operated means for shifting said indicating means, a variable resistance for controlling said last-named means, a part for varying said resistance, an electromagnet for influencing said part, rotating means for varying the influence of said magnet on said part in proportion to the speed of the automobile, and electrical conduits connecting said electrically-operated means, variable resistance and electromagnet with a common battery.

2. In an indicator of the class described, the combination of indicating means, an electric drive therefor, a variable resistance for controlling said drive, a stationary electromagnet, a stationary field piece spaced from said electromagnet, a speed cup interposed between said field piece and said electromagnet, a connection between said speed cup and said variable resistance, a rotatable pole piece for said magnet inside said speed cup, and means for rotating said pole piece.

3. In an electrical indicator of the class described, the combination of a stationary magnet, a pivoted part influenced thereby, a rotating

piece of magnetic material for controlling the effect of said magnet on said pivoted part, means for rotating said magnetic piece, and indicating means responsive to the influence of said magnet on said part.

4. In an indicator of the class described, the combination of a stationary magnet, a speed cup influenced thereby, a U-shaped strap of magnetic material interposed between said magnet and said speed cup, means for rotating said strap, and indicating means controlled by said speed cup.

5. In an indicator of the class described, the combination of a stationary magnet, a speed cup influenced thereby, a magnetic ring having spaced fingers, said speed cup being between said magnet and said ring, means for rotating said ring, and indicating means controlled by said speed cup.

6. In an electrical indicator of the class described, the combination of indicating means, an arcuate permanent magnet having a center, a non-magnetic member adjacent said magnet, a magnetic member providing spaced fingers, means for rotating said magnetic member about said

center to vary the influence of said magnet on said non-magnetic member, and a drive for said indicating means controlled by said non-magnetic member.

7. In an electrical indicator of the class described, the combination of a stationary magnet of substantially constant magnetic strength, a pivoted part influenced thereby, rotating fingers of magnetic material for controlling the effect of said magnet on said pivoted part, means for rotating said fingers, and indicating means responsive to the influence of said magnet on said part.

8. In an electrical indicator of the class described, the combination of a magnet adapted to produce a stationary magnetic field, a pivoted part capable of responding to magnetic influence, a rotating piece of magnetic material for controlling the effect of said magnet on said pivoted part, means for rotating said magnetic piece, and indicating means responsive to the influence of said magnet on said part.

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