May 27, 1941. I. E. MATHER 2,243,738

ODOMETER

Filed Feb. 23, 1937 2 Sheets-Sheet 1

Fig. 1

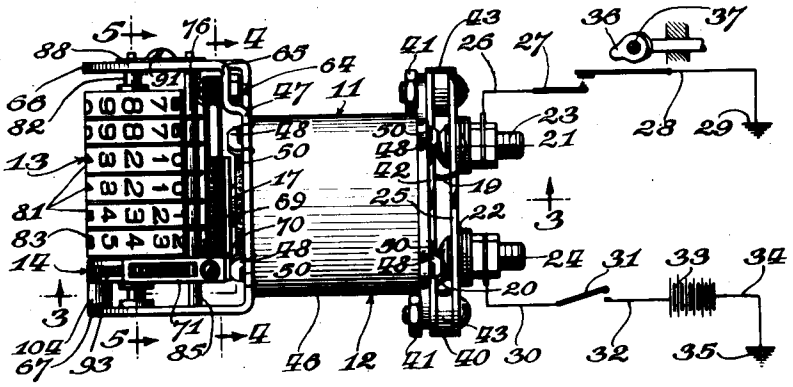


Fig. 4

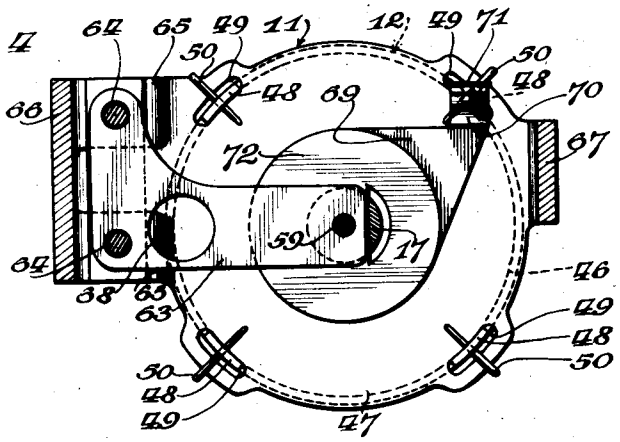


Fig. 5

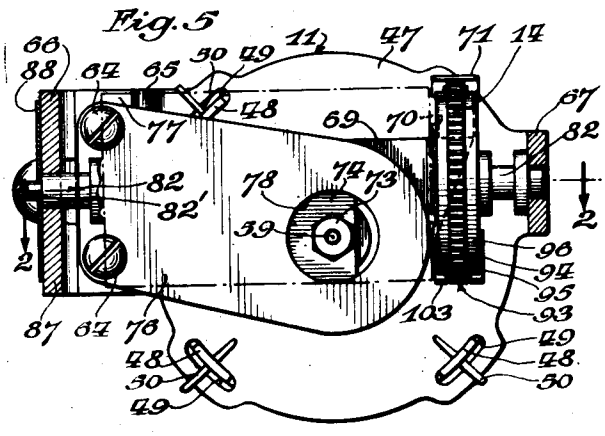
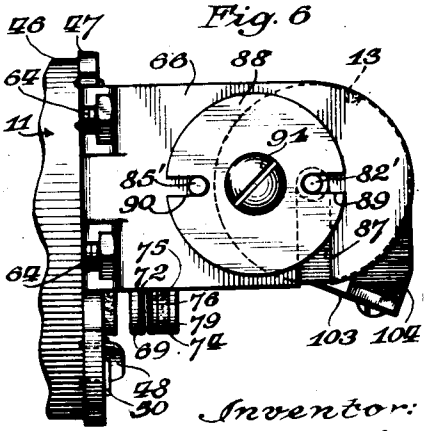


Fig. 6



Inventor:
Irwin E. Mather

By Williams, Bradbury, McCaleb & Hinkle
Attys.

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Filed Feb. 23, 1937 2 Sheets-Sheet 2

Fig. 2

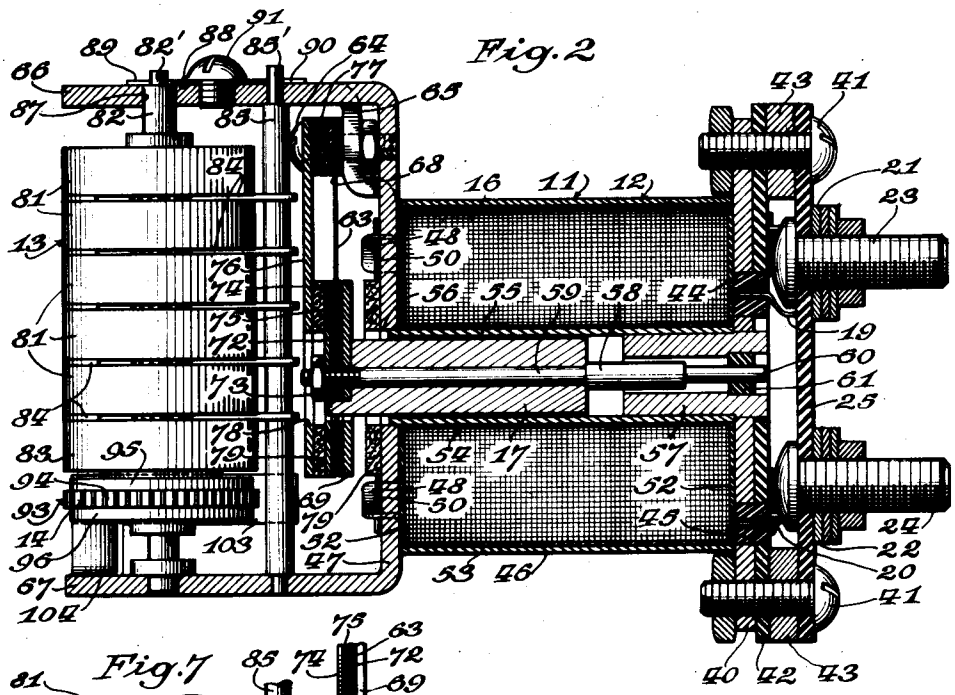


Fig. 7

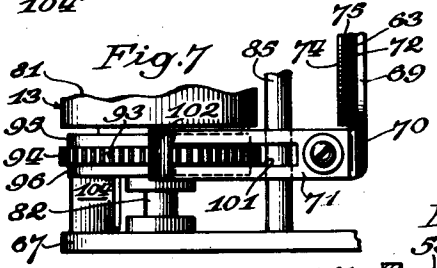


Fig. 3

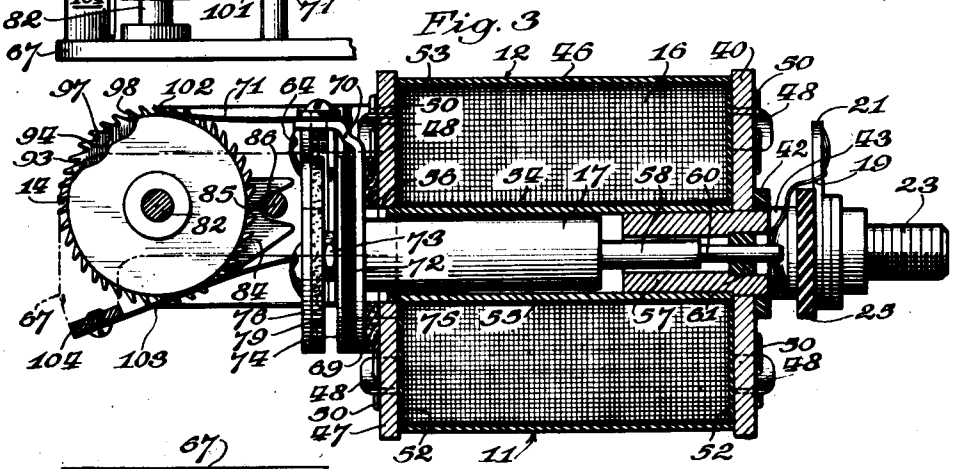
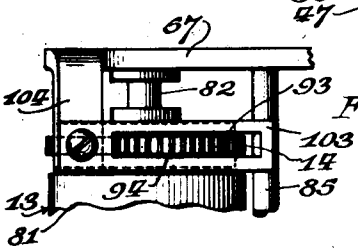


Fig. 8



Inventor:
Irwin E. Mather

By Williams, Bradbury, McCabe & Hinkle
Attys.

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UNITED STATES PATENT OFFICE

2,243,738

ODOMETER

Irwin E. Mather, Chicago, Ill., assignor to Stewart-Warner Corporation, Chicago, Ill., a corporation of Virginia

Application February 23, 1937, Serial No. 126,962

5 Claims. (Cl. 74—160)

This invention relates to improvements in electric odometers and particularly to improvements in the construction of odometers rendering them more economical to manufacture and more satisfactory in operation.

Electric odometers are now available to owners of automotive vehicles, but are not extensively used because of their cost as compared to the cost of other types. The present invention is directed particularly to the type of odometer that utilizes an electromagnetically operated pawl and ratchet mechanism for imparting intermittent one-way movement to a rotatable indicia-carrying member. In this type of odometer the electromagnetic means is energized periodically as the vehicle travels and the movement imparted to the indicia-carrying member is directly proportional to the distance travelled by the vehicle.

The primary object of the present invention is to provide a new and improved odometer that is substantially noiseless in operation and which can be manufactured very simply and economically.

Another object of the invention is to provide a new and improved electromagnetic operating means for the odometer.

A further object of the invention is to provide a new and improved pawl and ratchet mechanism adapted intermittently to be actuated by the electromagnetic actuating means and so constructed and arranged with respect to the actuating means that these two parts may be readily assembled to form a unit that is noiseless, rugged and dependable in operation.

An ancillary object of the present invention is to provide an improved housing and support for the electromagnetic actuating means and the indicia-carrying member.

Further objects and advantages of the present invention will become apparent from the ensuing description of an illustrative embodiment of the invention.

In the drawings:

Fig. 1 is a top plan view of an odometer embodying the present invention, showing diagrammatically the manner in which the electromagnetic actuating means forming a part thereof may be connected to a moving part of the vehicle;

Fig. 2 is a horizontal section through the odometer illustrated in Fig. 1;

Fig. 3 is an irregular longitudinal vertical section, taken on line 3—3 of Fig. 1;

Fig. 4 is a transverse vertical section, taken on line 4—4 of Fig. 1;

Fig. 5 is a transverse vertical section, taken on line 5—5 of Fig. 1, with the rotatable indicia-carrying member omitted therefrom;

Fig. 6 is an enlarged partial side view showing the details of the mounting for the indicia-carrying member and ratchet wheel;

Fig. 7 is an enlarged partial top plan view of the pawl and ratchet mechanism shown in Fig. 3; and

Fig. 8 is an enlarged partial bottom plan view of the pawl and ratchet mechanism shown in Fig. 3.

Referring particularly to Figs. 1 and 2 of the drawings, there is shown an odometer indicated generally by reference numeral 11, comprising a translating device 12 and an indicia-carrying member 13 intermittently rotated thereby in a single direction by means of a pawl and ratchet mechanism 14. The translating device consists of a solenoid coil 16 wound of a large number of turns of relatively small diameter wire and an armature 17 made of any suitable magnetic material and adapted to actuate the pawl and ratchet mechanism 14 in a manner to be fully described hereinafter.

The coil 16 is connected by lead wires 19 and 20 to terminal clips 21 and 22, respectively, secured in suitable manner to binding posts 23 and 24, respectively, mounted in spaced-apart relation to each other on a terminal board 25 made of any suitable insulating material. Binding post 23 is connected by a conductor 26 to a normally open cam-actuated switch 27 and the latter in turn is connected by a conductor 28 to ground 29. Binding post 24 is connected by a conductor 30 to one terminal of a diagrammatically illustrated ignition switch 31 usually mounted on the dashboard of a vehicle. The other terminal of the ignition switch is connected by a conductor 32 to a storage battery 33 and the latter is connected through conductor 34 to ground 35. The cam actuated switch 27 is periodically closed by cam 36 driven by a shaft 37 connected to any suitable moving part of the transmission of the vehicle. As the cam rotates an obvious energizing circuit for the coil 16 is closed periodically and it is apparent that this circuit is closed each time the vehicle travels a predetermined distance.

The terminal board 25 is secured to a metallic base plate 40 by a pair of screw bolts 41 and the terminals are insulated therefrom by a strip of insulation 42 separated from the terminal board by spacing washers 43. The lead wires 19 and 20 are insulated from the base plate 40 by bush-

ings 44 and 45 pressed into the openings in the base plate through which these wires extend. The coil 16 is securely held in place by means of the previously mentioned base plate 40, a substantially cylindrical outer casing 46 and a cover plate 47. The casing 46 and the end plates 40 and 47 are held in abutting relationship by fingers 48 formed at the ends of the frame and extending through complementary openings 49 on the end plates. These fingers are provided with transverse openings through which wedge-shaped pins 50 are driven securely to hold the parts together.

The coil is spaced from the end plates 40 and 47 by a pair of insulating washers 52 and from the outer casing by a wrapping of insulating material 53. A layer of insulation 54 also separates the coil from a central brass spacing tube 55 closely surrounding the armature 17 and acting as a guide for it in its movements. The spacing tube 55 is secured to the cover plate 47 by a press fit therebetween and the centrally located aperture 56 formed on the cover plate. The tube 55 is also rigidly secured to the bottom plate 40 by means of a brass tube 57 upon which it is pressed and which in turn is pressed into a centrally located aperture in the base plate.

It may be noted from Figs. 2 and 3 that the tube 57 extends slightly less than half the length of coil 16 into the tube 55 and that it closely surrounds an intermediate portion 58 of a longitudinal pin 59 extending through and upon which the armature is mounted. The intermediate portion 58 is formed with a diameter slightly greater than that of portion 59, thereby forming a shoulder against which the armature abuts. The other end 60 of the pin 59 is made with a somewhat smaller diameter than the intermediate portion and extends through a guiding bushing 61 of insulating material pressed into tube 57.

The armature 17 is supported at its left end by a resilient flexible arm 63 adapted to bias the armature for movement away from the coil and secured by screws 64 to a pair of shoulders 65 formed at the lower end of one of a pair of integral arms 66 and 67 extending outwardly from the cover plate 47. These arms, together with the cover plate, form a substantially U-shaped bracket for the support of the armature, the pawl and ratchet mechanism 14 and the indicia-bearing member 13. The flexible arm 63 is provided with a circular opening 68 to give it greater flexibility. Mounted for movement with the armature and flexible arm is a substantially circular brass disc 69 provided with a triangular flanged extension 70 upon which is secured a pawl 71 made of resilient spring steel and constructed in a novel manner to be described hereinafter.

The flexible arm 63 and disc 69 are separated from each other by an insulating washer 72 and are secured for movement with the armature by a nut 73 secured to the end of pin 59 and bearing against a brass disc 74 also separated from the flexible arm by an insulating washer 75. The movement of the armature 17 away from the coil 16 by the flexible arm 63 is limited by a stop arm 76 also secured to the shoulder 65 by the screws 64 and separated from the flexible arm thereat by insulating strips 77. The stop arm 76 is provided with a circular aperture 78 aligned with the armature so that it will not limit movement thereof.

In order to render the electromagnetic actuating means just described substantially noiseless in operation, its movement in both directions is limited by noise-absorbing material such as cotton washers 79 suitably secured, as by shellac, to the outer side of cover plate 47 and the inner side of stop arm 76, respectively.

The indicia-bearing member 13, the component cylinders 81 of which are rotatable about a shaft 82 fixed to the arms 66 and 67, may be of any well known construction. It may be constructed as shown in the copending application of Le Fevre et al., Serial No. 754,522, filed November 23, 1934, and assigned to the assignee of the present application. Preferably it is of a type therein disclosed in which the cylinders, with the exception of cyinder 83, are rotated a unit distance only when an adjacent cylinder has rotated through 360 degrees and in which all cylinders are spaced by gear mounting spacers 84 held against rotation in either direction by a shaft 85 also mounted in the arms 66 and 67.

The spacers 84 are provided with V-shaped portions 86 ((see Fig. 3) fitting over the shaft 85 when the indicia-carrying unit 13 is assembled on arms 66 and 67. The indicia-carrying member just described is assembled by first placing shaft 85 on the arms 66 and 67 and then placing one end of shaft 82, on which the cylinders 81 and 83 are mounted, into an opening in arm 67 and then sliding the opposite end along a groove 87 (see Fig. 6) formed on arm 66. The shafts are held in place on arm 66 by a washer 88 provided with diametrically opposed radial openings 89 and 90 adapted to fit around the projecting ends of 82' and 85' of shafts 82 and 85, respectively. The washer 88 is suitably secured to the arm 66, as by a screw bolt 91.

The indicia-bearing cylinders are driven by a ratchet wheel 93 of novel construction. The wheel is constructed of a plurality of relatively thin sections made of a phenolic condensation product. In the illustrated embodiment (see particularly Figs. 3 and 7), the wheel consists of a toothed center section 94 and outer sections 95 and 96 having smooth peripheral faces. The teeth 97 of the tooth portion 94 are of an unusual shape in that the portion 98, engaged by the pawl 71 on its down stroke, is made with an obtuse angle so that there is no danger that the pawl 71 will slide off the tooth as it is drawn toward the coil by the armature.

In order to make the operation of the pawl and ratchet mechanism quieter, the sections 95 and 96 of the ratchet wheel are made with an outside diameter somewhat larger than the root diameter of the toothed portion 94. By so constructing the ratchet wheel, the movement of the pawl 71 toward the axis of rotation as it is moved upward and over a tooth is restricted so that it does not strike the ratchet wheel with as much force as it would otherwise.

Referring now more particularly to Fig. 7, it will be seen that the pawl 71 is substantially rectangular in shape and is provided with a rectangular centrally located aperture 101 having a width slightly greater than that of the toothed portion 94 of the ratchet wheel. The outer end of the pawl is bent outwardly as indicated at 102 so that the pawl rides on the smooth portions 95 and 96. When the pawl is moved upward by the flexible resilient arm 63 from the position illustrated in Fig. 3, the bent portion 102 rides over the particular tooth thereunder at that time.

Retrograde or other undesired movement of

the indicia-carrying member is prevented by a second apertured rectangular member 103 similar in all respects to pawl 71, but mounted nearer to the ratchet wheel upon a flange 104 formed integral with arm 67. By positioning the member 103 nearer the ratchet wheel so that the central portion thereof bears against the smooth portions 95 and 96 of the ratchet wheel, the member presses against the ratchet wheel and thereby frictionally prevents movement of the ratchet wheel except when the latter is actuated in a predetermined direction by the pawl.

It is believed that the operation of the odometer will be apparent from the above description, but it may be reviewed briefly at this point. The odometer will remain inoperative as long as ignition switch 31 remains in its open position. However, when the ignition switch is closed, the circuit for the operating coil 16 is conditioned for closure by the cam-actuated switch 27 so that when the switch 27 is periodically closed by the cam 36 the coil is accordingly periodically energized.

The normal position of the armature is illustrated in Fig. 2. In this position the armature and disc 14 attached thereto are held against the cotton washer 79 on the underside of stop arm 76. When the coil is energized, the armature 17 is pulled toward the coil by magnetic attraction until the pawl-carrying disc 68 is stopped by the cotton washer 79 on the outer side of cover plate 47. When the energizing circuit is opened again, the armature is moved back to its initial position by the flexible resilient arm 63. The periodic reciprocation of the armature results in a similar movement of pawl 71, which imparts one-way movement to the ratchet wheel 93 in an obvious manner. On release of the armature and movement thereof by the flexible arm 63, the portion 102 of pawl 71 rides over a tooth so that upon subsequent downward movement of the armature by energization of the coil, the pawl 71 rotates the ratchet wheel a unit distance.

The arrangement described is very rugged in construction and is not affected by vibrations transmitted thereto by the vehicle when the vehicle is travelling over a rough road. The undesired movement of the ratchet wheel is prevented under these conditions by the member 103 pressing against the ratchet wheel.

The odometer may be readily assembled and disassembled in case repairs are necessary. In order to disassemble the unit it is necessary only to remove the pins 50 from the openings in fingers 48 and the various parts of the odometer become readily separable. Furthermore, the actuating and indicating means of the odometer may be assembled separately at different places and thereafter assembled to form a single unit at any desired location.

The ratchet wheel of the described embodiment is provided with forty teeth and the pawl is adapted to be actuated a like number of times when the vehicle moves a mile. The use of this comparatively large number of teeth reduces the stroke of the pawl and armature and, therefore, also reduces the power necessary to operate the odometer.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a pawl and ratchet mechanism, the combination including a multiple section ratchet wheel comprising a toothed section and a section having an outside diameter greater than the root diameter of said toothed section and smooth peripheral surface, a pawl constructed of resilient material having a portion adapted to engage said teeth to impart movement to said wheel and another portion adapted to engage said smooth portion to define the point of engagement between the pawl and teeth, and a resilient member adapted to bear against said smooth peripheral surface to prevent rotation of the wheel except when moved in a predetermined direction by said pawl.

2. A pawl adapted to be used with a ratchet wheel having toothed and smooth peripheral portions comprising, in combination, a portion adapted to engage said toothed portion when actuated in a predetermined direction for imparting movement to said wheel, and a portion adapted to engage the smooth portion of said wheel to define the point of engagement between said teeth and tooth-engaging portion.

3. A pawl for use in a pawl and ratchet mechanism comprising a ratchet wheel having a toothed central and smooth outer peripheral portions, including in combination, a substantially rectangular strip of resilient material provided with a substantially rectangular centrally located aperture of a width greater than the width of the teeth on the ratchet wheel, the portions of said strip adjacent the aperture being adapted to ride on the smooth portions of said wheel, the forward end of said pawl being curved away from said wheel at the point of engagement whereby said end of the pawl will readily engage the teeth when moved in a predetermined direction and slide over the teeth when moved in an opposite direction.

4. In a pawl and ratchet mechanism, the combination including a multiple section ratchet wheel comprising a toothed section and a section having a smooth peripheral surface, a pawl constructed of resilient material having a part adapted to engage said teeth to rotate said wheel and another part adapted to engage said smooth portion to define the point of engagement between the pawl and teeth, and a resilient member adapted to bear against said smooth peripheral surface to prevent rotation of the wheel except when moved in a predetermined direction by said pawl.

5. In a pawl and ratchet mechanism, the combination including a ratchet wheel provided with peripheral toothed and smooth portions, said toothed portion being located between two smooth portions, a pawl provided with a part adapted to engage said toothed portion for rotating said wheel in a predetermined direction and parts adapted to engage said smooth portions to define the point of engagement of said tooth engaging part with the teeth on said toothed portion, and a friction member adapted to engage said smooth portions for preventing movement of said wheel except when actuated in said predetermined direction by said pawl.

IRWIN E. MATHER.