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Ozaki et al.

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[54] **TAXIMETER HAVING DEVICE FOR ELECTRONICALLY SETTING INCREASED BASE FARE RATE**

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[52] **U.S. Cl.** ..... **235/30 R**

[51] **Int. Cl.** **G07b 13/10**

[58] **Field of Search** .... 235/30 R, 92 TC; 58/23 AC; 331/179, 177 R, 176

[56] **References Cited**

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[57] **ABSTRACT**

A taximeter having no speed governor and provided with a device for electronically setting an increased base fare rate, comprising an electronic oscillation circuit for generating a train of pulses for driving a taximeter drive motor, and means for varying the time constant of the oscillation circuit thereby counting the fare at a selected increased base fare rate.

1 Claim, 5 Drawing Figures

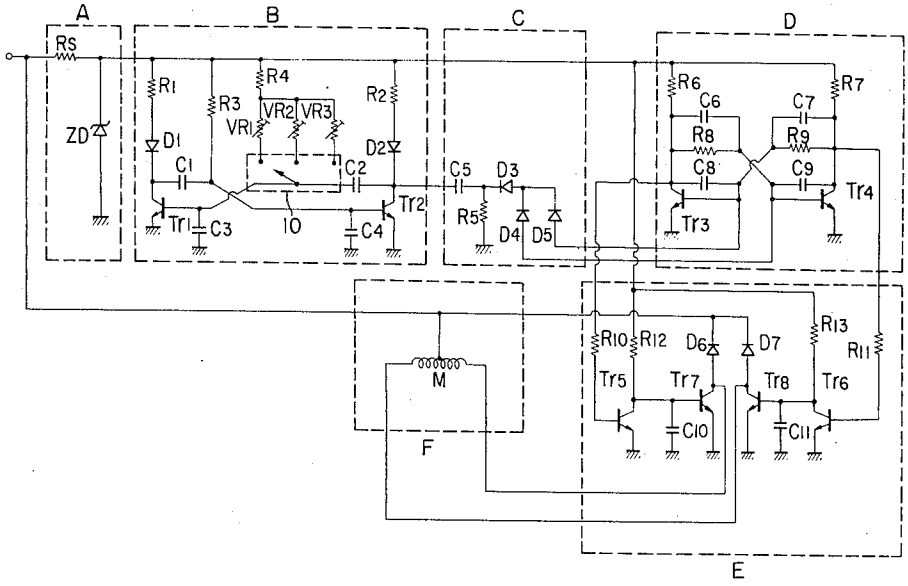
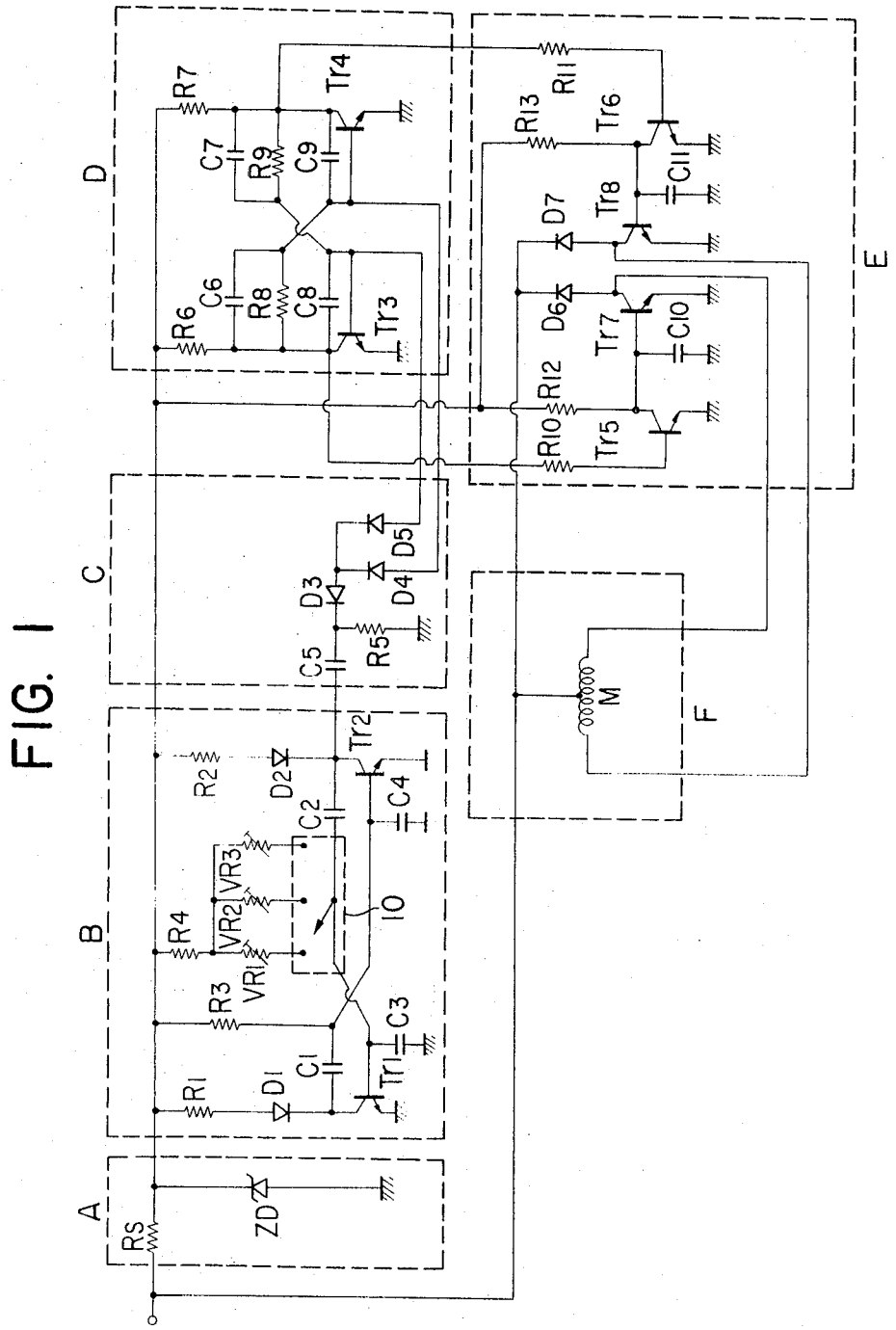


FIG. 1


A
B
C
D
E
F
RS
ZD
R1
D1
C1
Tr1
R3
VR1
R4
VR2
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C3
R2
D2
C2
Tr2
C4
D3
D4
D5
C5
R5
M
R7
Tr4
C7
R9
C9
R6
C6
R8
C8
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D6
Tr7
C10
R12
R10
Tr5

FIG. 2

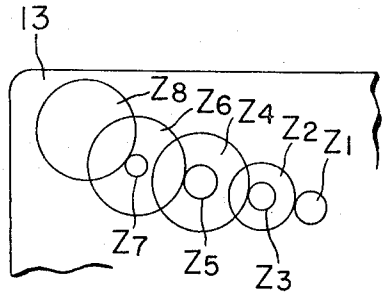


FIG. 3

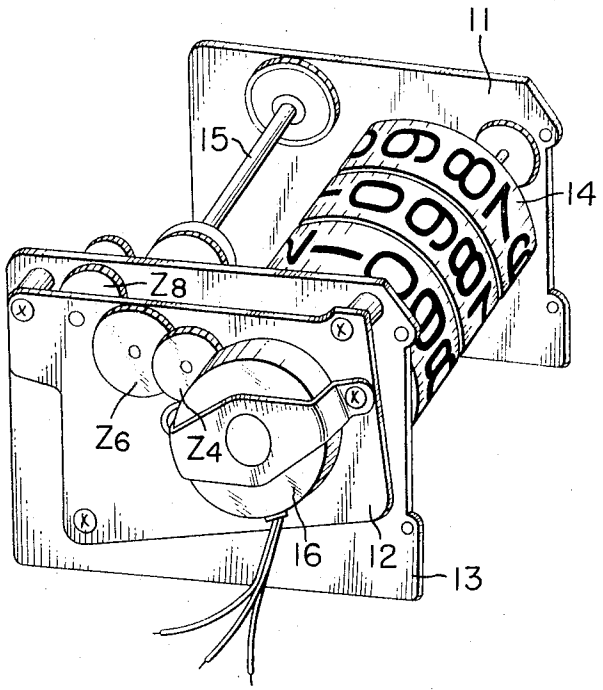


FIG. 4

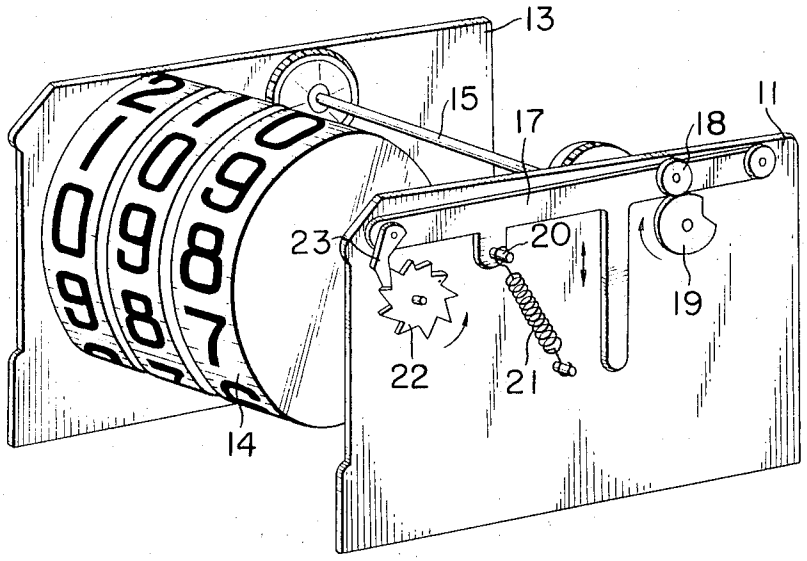
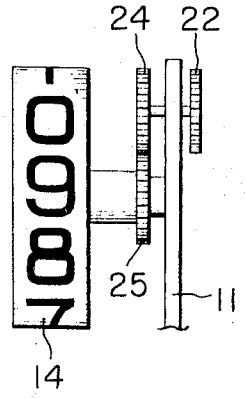


FIG. 5



TAXIMETER HAVING DEVICE FOR ELECTRONICALLY SETTING INCREASED BASE FARE RATE

This invention relates to a taximeter having an increased base fare rate setting device which is simple in construction and can operate reliably.

Prior art taximeters employ a clock mechanism which consists essentially of a power source means such as a hand-actuated power spring, a solenoid or a drive motor, a speed governor and a train of geared wheels. The inherent complexity of this clock mechanism has been disadvantageous in respect of production costs and has resulted in an increased tendency toward possibility of mal-operation and trouble. Further, some taximeters are designed for counting the fare on the basis of a predetermined time and various increased base fare rates are approved in some districts. Therefore, in the districts in which these various increased base fare rates are approved, the prior art clock mechanism adapted for merely counting the increased base fare on the basis of the predetermined time is not suitable for the purpose and some means for counting, for example, a 20 percent increased base fare and a 30 percent increased base fare must be added to the taximeter. However, the clock mechanism has the inherent property of punctuality due to the fact that the speed governor is employed therein. Therefore, means for setting these increased base fare rates must be disposed in the stage after the stage including the speed governor, However, provision of such means consisting of mechanical parts adds another complexity to the taximeter and is difficult in view of the limited space available for the taximeter presently widely used.

With a view to obviate such difficulties, it is a primary object of the present invention to provide a novel taximeter in which the speed governor is eliminated, an electronic oscillation circuit is provided for controlling the drive motor in the clock mechanism by clock pulses with exact timing, and the time constant of this oscillation circuit is suitably varied to vary the frequency of the clock pulses thereby carrying out the counting of the fare on the basis of the selected increased base fare rate.

The above and other objects, features and advantages of the present invention will be apparent from the following detailed description of a preferred embodiment thereof taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a wiring diagram of an electronic circuit in a taximeter according the present invention;

FIG. **2** is a diagrammatic view showing the arrangement of a gear train for transmitting power from a drive motor to a clutch means;

FIG. **3** is a schematic perspective view showing the arrangement of the drive motor, gear train, clutch means and fare display drum;

FIG. **4** is a schematic perspective view of part of the taximeter when viewed from the side opposite to that shown in FIG. **3**; and

FIG. **5** is a schematic sectional view showing the driving connection between a drum advancing ratchet wheel and the fare display drum.

A taximeter according to the present invention includes a clock mechanism which comprises a pulse generator as shown in FIG. **1**, a gear train as shown in FIGS. **2** and **3**, a clutch means as shown in FIGS. **3** and **4**, and fare counting means as shown in FIGS. **3** to **5**.

The electrical circuit shown in FIG. **1** is printed on a printed circuit board and is divided into a plurality of sections A to F surrounded by the dotted lines. The section A is a constant-voltage power supply means which is composed of a stabilizing resistor R_S and a Zener diode ZD and regulates the variable voltage of the power supply in the vehicle to a constant voltage for supplying this constant voltage to the section B. The section B is an astable multivibrator which is composed of transistors T_{r1}, T_{r2}, capacitors C_1, C_2, C_3, C_4, resistors R_1, R_2, R_3, R_4 and semi-fixed resistors VR_1, VR_2, VR_3 for generating a train of clock pulses. An externally actuated changeover contact **10** is provided in the section B for selectively connecting one of the variable resistors VR_1, VR_2 and VR_3 in series with the resistor R_4. The time constant determined by this resistor R_4, selected variable resistor and capacitor C_2 determines the oscillation frequency of the astable multivibrator. Therefore, the base fare rate such as the non-increased base fare rate, 20 percent increased base fare rate or 30 percent base fare rate can be set as desired by selecting one of these semi-fixed resistors and varying the frequency of the clock pulses.

The rectangular waveform collector output of the transistor T_{r2} in this astable multivibrator is applied to the section C. The section C includes a differentiator which is composed of a capacitor C_5 and a resistor R_5 for differentiating the rectangular waveform collector output of the transistor T_{r2}. The output of the differentiator is applied to the section D through a steering circuit which is composed of diodes D_3, D_4 and D_5.

The section D is a bistable multivibrator which is composed of transistors T_{r3}, T_{r4}, capacitors C_6, C_7, C_8, C_9 and resistors R_6, R_7, R_8, R_9. In response to the application of the differentiated input to the base of the transistor T_{r3} and T_{r4} from the steering circuit in the section C, the section D delivers an output having a waveform such that the frequency of the output of the section B is divided into ½. The section D is provided for obtaining a waveform having a "0" level and a "1" level of equal duration due to the fact that the "0" level and "1" level in the output waveform of the section B are not equal to each other and this output waveform is not suitable for causing rotation of a drive motor **16.**

The section E is a motor driving circuit which acts to amplify the output of the section D (appearing at the collector of the transistors T_{r3} and T_{r4}) by transistors T_{r5} to T_{r8} for driving the motor **16.** Diodes D_6 and D_7 are provided for preventing application of a surge voltage.

The section F includes the winding M of the motor **16.** The motor **16** is rotated by alternately flowing current through the portions on opposite sides of the central point, and the number of revolutions of the motor **16** is proportional to the frequency of the current supplied to the winding M. This motor **16** is of the type which is commonly called a bifilar timing motor in the art. The drive motor **16** having a structure as above decribed rotates at one of a plurality of speeds depending on the position of the externally actuated changeover contact **10** in the oscillator mounted in the taximeter. For example, the motor **16** rotates at a speed of 250 r.p.m. to count the fare at a rate of 30 yen every 3 minutes when the base fare is set at the ordinary base fare rate, and the rotating speed of the motor **16** is increased to 300 r.p.m. so as to count the fare according

to a 20 percent increase base fare rate when such rate is set by the change-over of the contact **10.**

The rotation of this drive motor **16** is reduced by a train of gears Z_1 to Z_8 which are supported together with the motor **16** on a mounting plate **12** fixed to another mounting plate **13** as shown in FIGS. **2** and **3,** and the increased torque is transmitted to a clutch means **15.** This clutch means **15** is selectively actuated depending on the running condition of the taxi so that the fare can be counted on the basis of the distance run by the taxi or on the basis of the time lapsed during running. Taximeters presently widely employed are designed to count the fare on the basis of the time when the running speed of the taxi is reduced to less than 10 Km/h in the district in which the fare is counted on the basis of both the distance and the time. The rotation of the clutch means **15** causes rotation of a cam **19** in a direction shown by the arrow in FIG. **4** for counting the fare. A drum advancing lever **17** having a pawl **23** at one end thereof is pivoted at the other end thereof to a mounting plate **11** as shown in FIG. **4.** A counter lever spring **21** is anchored at one end thereof to the plate **11** and at the other end thereof to a pin **20** fixed to the lever **17** so as to ensure rolling engagement between a roller **18** pivoted to the lever **17** and the cam **19.** Thus, the rotation of the cam **19** in the direction shown by the arrow in FIG. **4** causes vertical swinging movement of the lever **17** in directions shown by the arrows. This vertical swinging movement of the lever **17** causes rotation of a ratchet wheel **22** in a direction shown by the arrow by the action of the pawl **23** engaging with the ratchet wheel **22.** A gear **24** is mounted on the shaft of the ratchet wheel **22** for unitary rotation therewith and is in meshing engagement with a gear **25** mounted on the shaft of a fare display drum **14** as shown in FIG. **5.** Thus, the rotation of the ratchet wheel **22** causes rotation of the fare display drum **14** which counts the fare.

It will be understood from the foregoing detailed description that, in the taximeter of the present invention having a structure as above described, mechanical means for setting the increased base fare rate are utterly unnecessary due to the fact that such increased base fare rate can be set electronically. Further, the present invention is advantageous in that the speed governor is entirely unnecessary and a small-sized assembly having a simple construction can attain the complex function of setting the increased base fare rate. Thus, the taximeter according to the present invention can operate with very high precision and reliability.

What is claimed is:

1. A taximeter having fare indicating means and a device for electronically controlling a time signal generating mechanism to establish a base fare rate, comprising:

an astable multivibrator, including a plurality of variable resistors selectively in connection with a capacitor through an operator-actuatable switch;

a differentiator connected to the astable multivibrator, receiving and differentiating the output thereof;

a bistable multivibrator connected to said differentiator and receiving the output thereof and accordingly producing a symetrical square wave;

a motor for driving said fare indicating means; and

a motor driving circuit interconnected between the motor and the bistable multivibrator for driving said motor at a rate commensurate with the frequency of the signal from the bistable multivibrator.

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