

[54] **ROTATABLE POINTER DRIVEN AND INDEXED BY THE ROTOR OF AN ELECTRONICALLY CONTROLLED MOTOR HAVING PERMANENT MAGNET POLES**

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[58] Field of Search.....273/141 A, 138 A, 145 CA, 142 B, 273/143 C; 340/258

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[57]

ABSTRACT

An electronic game which includes a motor with its output shaft connected to a non-integral gear train for driving a pointer and in which the pointer may randomly stop at any of a number of discrete positions. The motor is energized in response to contact made by the user between a pair of terminals and the motor rotates the pointer such that it stops in a random manner after the circuit has been interrupted with the indexing depending upon the permanent magnets of the motor stopping the rotor of the motor at discrete positions.

5 Claims, 2 Drawing Figures

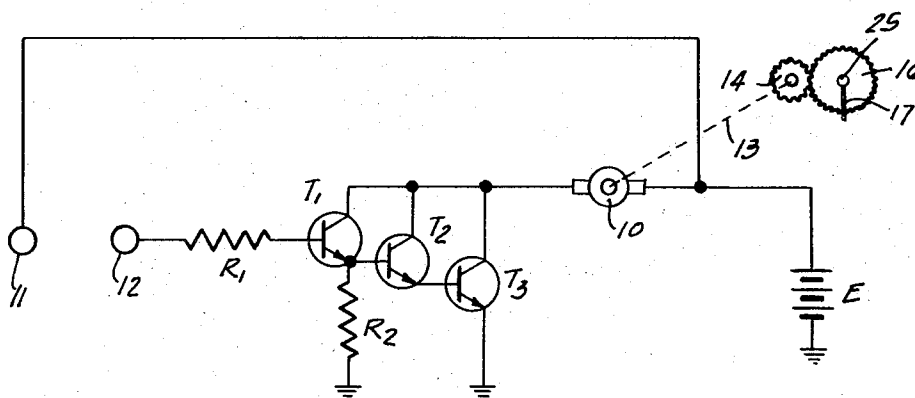


Fig. 1

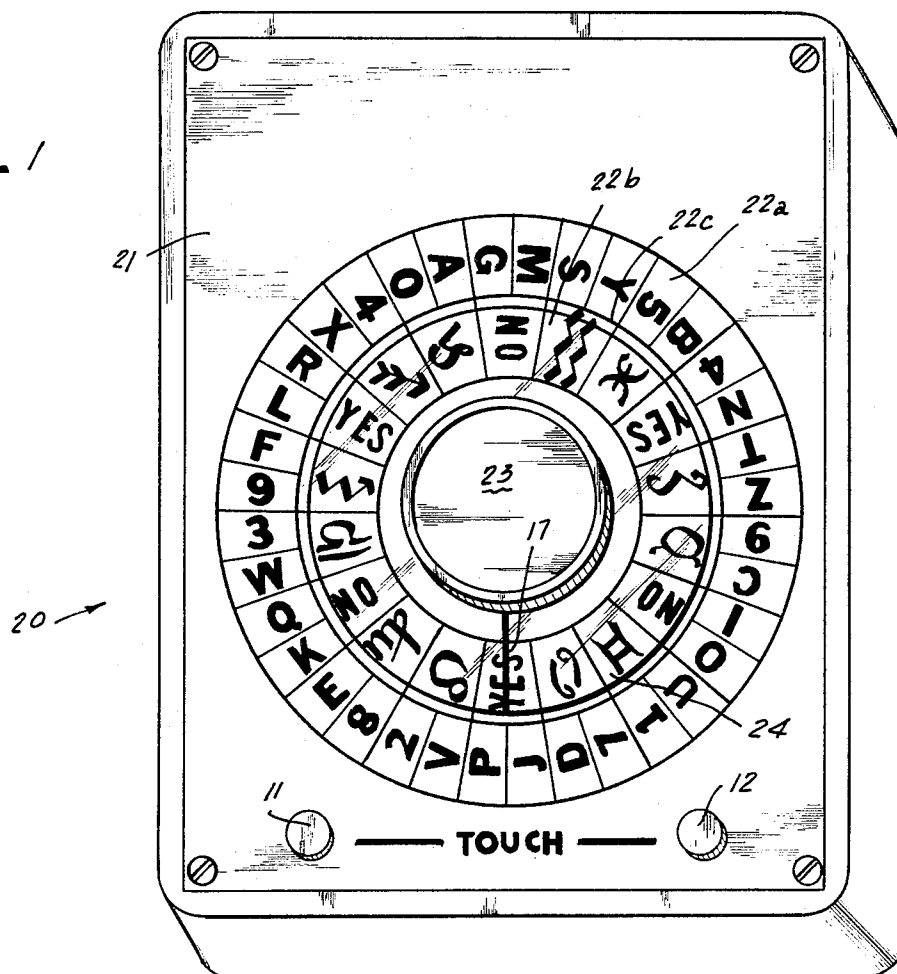
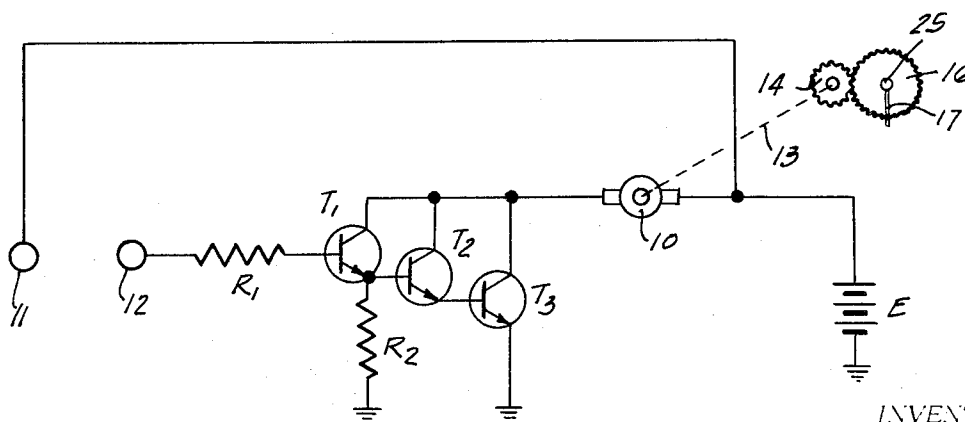


Fig. 2



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ROTATABLE POINTER DRIVEN AND INDEXED BY THE ROTOR OF AN ELECTRONICALLY CONTROLLED MOTOR HAVING PERMANENT MAGNET POLES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to electronic games and in particular to a motor in combination with a non-integral gear train for driving a pointer that may be stopped at any one of a number of discrete positions.

2. Description of the Prior Art

Spinners for games in the prior art have normally been manually spun and coast to a stop as a function of the energy manually imparted to the pointer.

SUMMARY OF THE INVENTION

The present invention comprises a motor which is coupled to a pointer through a non-integral gear train and which includes a pair of touch posts through which the circuit to the motor may be completed to energize it. The non-integral gear train assures that the motor will stop in a random manner at any of the discrete positions at which the pointer may select. D.C. permanent magnet motors have a tendency to stop at discrete positions associated with the number of magnetic poles in the machine. The use of a non-integral gear ratio in the present invention allows the pointer to stop in a random manner.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of a preferred embodiment thereof taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is the electronic game of this invention illustrating the pointer and the touch contacts; and

FIG. 2 is an electrical schematic of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 illustrates an electronic game according to this invention comprising a case 20 which has a top cover 21 upon which are mounted a pair of touch contacts 11 and 12. A pair of concentric mounted annular indicia 22a and 22b are printed on the face of the cover 21 and are printed with indicia. The outer annular ring 22a for example may be printed with the alphabet and the numbers from 1-0 and in a preferred embodiment may have 36 different segments. The inner annular ring 22b may be divided into 18 segments and in a preferred embodiment may include three YES segments and three NO segments. The remaining of the inner ring 22b may be printed with signs of the Zodiac. The rotating pointer 17 is imprinted on a transparent plastic disc 24 which is rotatably supported on a shaft 25 supported by the case 20. A knob 23 is also mounted on shaft 25 to allow the pointer 17 and disc 24 to be manually rotated if desired.

FIG. 2 is an electrical schematic of the invention. A motor 10 which might for example be a D.C. motor has one terminal connected to one terminal of a battery E which has its opposite terminal grounded. The ungrounded terminal of the battery E is also connected to the touch post contact 11. The touch post contact 12 is connected to one end of resistor R₁ which has its other side connected to the base of a transistor T₁. The emitter of transistor T₁ is connected to a resistor R₂ which has its opposite side connected to ground. The emitter of transistor T₁ is also connected to the base of a transistor T₂ which has its emitter connected to the base of a transistor T₃. The emitter of transistor T₃ is connected to ground. The collectors of transistors T₁, T₂ and T₃ are connected together and to the second terminal of the motor 10. The output shaft 13 of the motor 10 drives a gear 14 which in turn drives a gear 16 that is mounted on the shaft 25. The shaft 25 carries the pointer disc 24 and thus drives the pointer 17.

The battery E might be three dry cells in series to produce a voltage of 4.5 volts. Transistors T₁ and T₂ may be silicon NPN, low current types as, for example, type No. 2N5133. Transistor T₃ may be a silicon NPN, high current type No. 2N5135. Resistor R₁ may be a 10K ¼ watt resistor. Resistor R₂ may be a 100 K ¼ watt resistor. The motor 10 may be a permanent magnet motor which draws 700 milliamps of current. The gear 14 may have 14 teeth and the gear 16 may have 40 teeth. These gear may be smooth-running plastic gears.

In operation a user touches the touch terminals 11 and 12 as by placing different fingers of one hand in contact with the terminals 11 and 12. Alternatively, the touch terminals may be touched by the left and right hand, respectively, of the user. The touch terminals may also be contacted by two or more users who hold hands and who engage the touch terminals 11 and 12. When the circuit is completed between the touch terminals 11 and 12 by the user making contact between the terminals the transistor T₁ is turned on to in turn, turn on transistor T₂ which in turn, turns on transistor T₃ to complete the circuit from the battery through the motor so that the motor 10 starts to run rotating shaft 13, the gear 14, the gear 16 and the pointer 17. The motor rapidly comes up to speed and continues to rotate at maximum speed as long as contact is made by the operator between the touch terminals 11 and 12. When the operator quits touching terminals 11 and 12, the transistor T₁ is turned off which in turn, turns off transistor T₂ which in turn, turns off transistor T₃, and the power to the motor is disconnected. The motor coasts to a stop and the pointer 17 aligns with one of the indicia in the annular rings 22a and 22b. It is a characteristic of permanent magnet motors that the rotor will stop at discrete positions determined by the number and position of the magnetic poles. Thus, in the present invention provisions are made such that the pointer 17 stops in a random manner and has the same probability of stopping at any of the segments in the annular rings 22a and 22b. This is accomplished by the use of the non-integral gear ratio between the gears 14 and 16. If the gear 14 has K₁ teeth the gear 16 has K₂ teeth, the following relationships exist:

The motor 10 and therefore gear 14, which is directly connected by means of shaft 13, has 360°/n discrete pole positions. For each 360°/n turn of gear 14, the gear 16 will turn (360°/nK₁/K₂). The large gear 16 must turn (m 360°), where m is an integer in order to repeat a position. Therefore, to repeat a position there must be S steps of the small gear totaling (m 360°) where (m 360°)=S(360°/n)(K₁/K₂) and S and m are integers.

$$m=(s/n) K_1/K_2 \quad (1)$$

where

K₁ is the number of teeth of the gear 14

K₂ is the number of teeth of the gear 16

n is the number of poles in the motor

In a specific example, if

K₁ = 14

K₂ = 40

n = 6

Then the smallest integers to solve equation (1),

$$m=(S/6)(14/40) \quad (\text{simplifying } 120 m=7 S)$$

are m = 7 and S = 120.

Thus the use of the gear ratio K₁ and K₂ for the motor of a fixed number of poles allows the pointer 17 to stop in a great many places and renders the apparatus of the invention approximately random such that any of the segments on rings 22a and 22b may be selected by the pointer 17. This is in contrast to the utilization of a direct drive D.C. permanent magnet motor which would stop at discrete intervals only as large in number as the number of pole positions of the motor.

Thus it is seen that this invention allows the pointer to be driven by a motor and to randomly stop at any one of a plurality of positions due to the non-integral gear train arrangement between the motor and the pointer drive.

Thus, by considering the number of pole or stopping positions (in the above example, six) in the analysis, the solution for S is 120 so the original six stopping positions have become 120 which is more than adequate for a 36 character dial face.

Although minor modifications might be suggested by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of our contribution to the art.

We claim:

1. An electronic game comprising
a frame with indicia;
a spin pointer rotatably supported by said frame and readable against said indicia on said frame;
a motor with permanent magnet poles mounted on said frame, said motor including a rotor;
a non-integral gear train coupling said rotor to said spin pointer;
a control circuit for energizing said motor which includes a power source, a pair of touch terminals, and an electronic switch connected in circuit with said motor to energize it and with the indexing of the spin pointer with respect to said indicia being dependent upon the permanent magnet poles of said motor positioning the rotor and non-integral gear train when the motor is de-energized.
2. An electronic game according to claim 1 wherein said electronic switch includes first, second and third transistors with the collectors of said first, second and third transistors connected to a first terminal of said motor, the emitter of the

first transistor connected to the base of the second transistor, the emitter of the second transistor connected to the base of the third transistor, the emitter of the third transistor connected to a first terminal of said power source, the other terminal of the motor connected to the other terminal of the power source and to one of said touch terminals, and the other touch terminal connected to the base of the first transistor.

3. An electronic game according to claim 2 including a first resistor connected between the other touch terminal and the base of said first transistor, and a second resistor connected between the emitter of the first transistor and the first terminal of the power source.

4. An electronic game according to claim 1 wherein said motor has n magnetic poles and the non-integral gear train includes a first gear with K_1 teeth driven by said motor means and a second gear with K_2 teeth in mesh with the first gear and driving said spin pointer and $m = (S/n) (K_1/K_2)$, where m is an integer in order to repeat a position of said spin pointer, and S is the smallest number of positions at which said spin pointer will randomly stop.

5. An electronic game according to claim 4 wherein said indicia on said frame is divided into a number of segments equal to or less than S .

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