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[54] **ELECTRIC TYPEWRITER AUTOMATIC ON-OFF SWITCH**

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[52] **U.S. Cl.** ..... **307/121**, 197/12, 197/19, 197/17, 235/145 R

[51] **Int. Cl.** **H01h 35/00**

[58] **Field of Search** ..... 197/12, 13, 14, 19, 197/107, 193, 17; 307/121, 120, 116, 141, 141.4, 141.8, 149; 235/145 R, 61 R

[56] **References Cited**

UNITED STATES PATENTS

2,903,118	9/1959	Link	197/17
1,927,761	9/1933	Tauschek	197/14

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[57] **ABSTRACT**

An Inertia Sensor with an oscillatory reed connectible upon actuation to reed protection circuitry, timing circuitry, AC switch circuitry, and power supply circuitry for turning on an electric typewriter upon actuation of the spacer bar and automatically turning off the typewriter after a predetermined time delay. Another embodiment discloses an impact sensor utilizing a vibration sensitive reed having a magnet thereon movable within a coil for creating an electromotive force for producing a signal which is amplified by amplifier circuitry, detected, and utilized to actuate timing circuitry and an on-off switch which is connected to a power supply.

17 Claims, 9 Drawing Figures

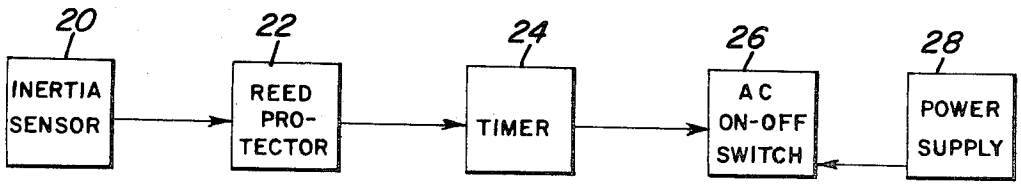


Fig. 1

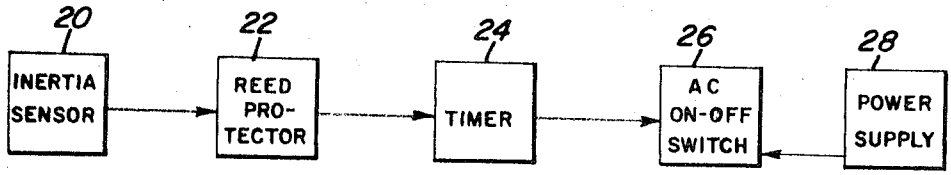


Fig. 2

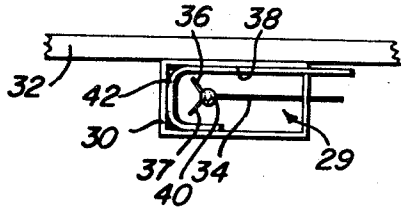


Fig. 3

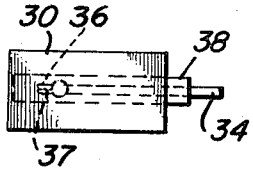


Fig. 4

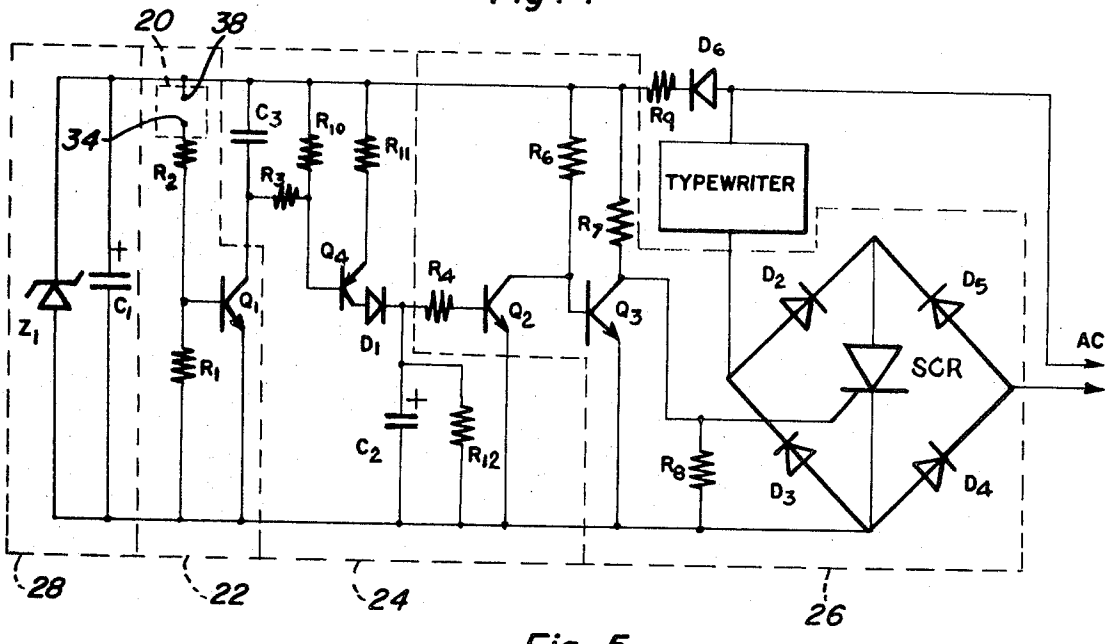
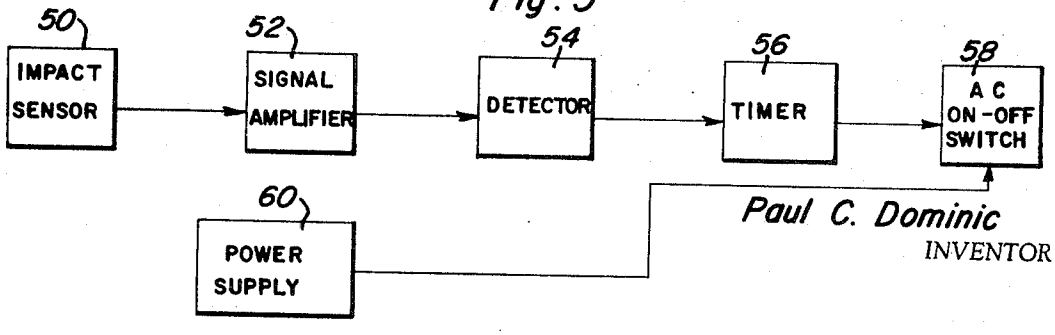


Fig. 5



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Fig. 6

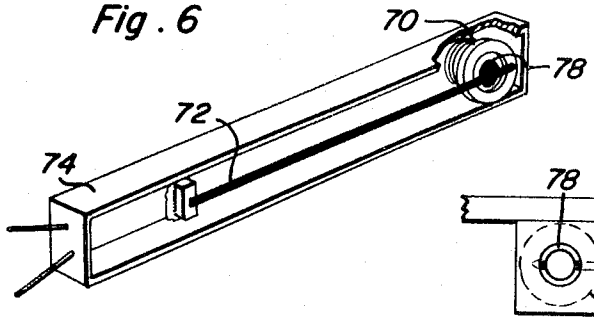


Fig. 7

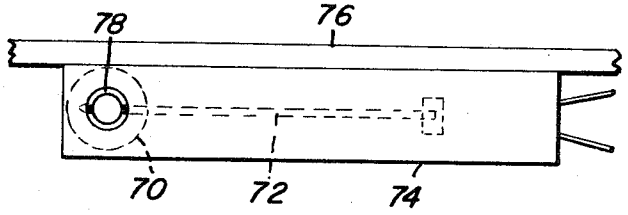


Fig. 8

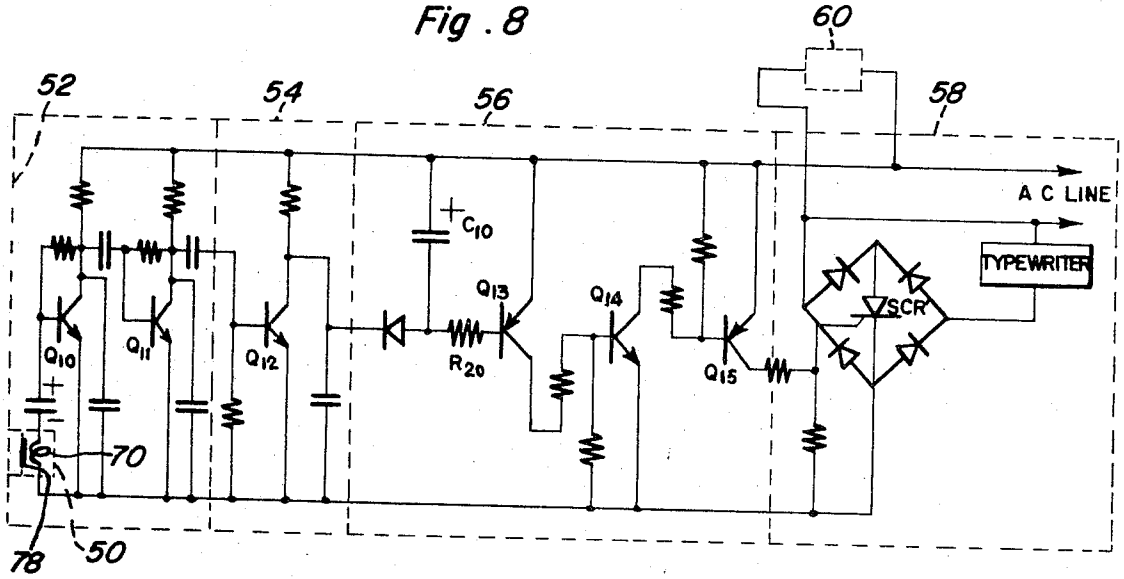
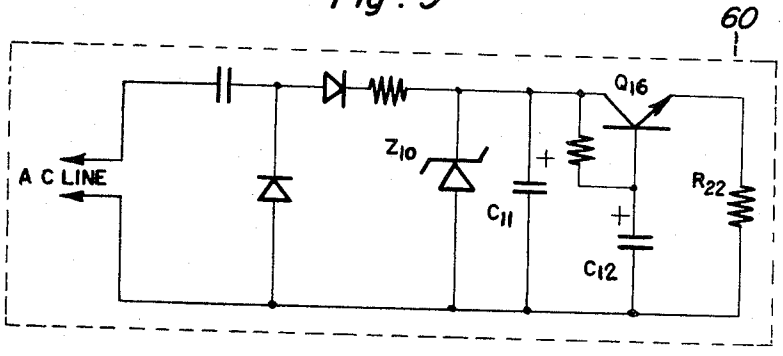


Fig. 9



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ELECTRIC TYPEWRITER AUTOMATIC ON-OFF SWITCH

BACKGROUND OF THE INVENTION

Electric typewriters in the past have been equipped with manual on-off switches which have been placed somewhere alongside the top of the keyboard giving an unsightly appearance. More recently, switches have been hidden below the typewriter alongside one edge or the other near the front of the typewriter. Unfortunately, due to the fact that the switches are hidden, it is commonplace for typists to forget to flip the switch to the off position notwithstanding that many modern typewriters have an indicator window alongside the keyboard showing whether the typewriter is on or off. Also, many typewriters are left on after they have been used because of advances in the art which have reduced the noise of the power mechanism while the typewriter is on. Thus, it is sometimes difficult even in the relatively quiet office having a low decibel noise level to determine from the noise of the typewriter whether it is on or off which results in many typists leaving their typewriters on after they have finished work for the day.

SUMMARY OF THE INVENTION

This invention relates to an on-off power switch for typewriters and other keyboard office equipment wherein means are provided for turning on the equipment concurrently with the operation thereof and automatically turning the power to the equipment off after a predetermined time delay.

Accordingly, the primary object of this invention is the provision of means for automatically turning on equipment such as an electric typewriter and turning it off after a predetermined time delay obviating the necessity of flipping a manual on-off switch.

Another object of this invention is the provision of a sensor secured to the spacer bar of a typewriter for detecting impact on the bar or movement thereof and concurrently actuating the power switch to turn the typewriter on.

A further object of this invention is the provision of compact and inexpensive circuitry for receiving the sensor signal, supplying power, and timing the period in which power is supplied prior to the next sensing signal.

BRIEF DESCRIPTION OF THE DRAWING

The above and other objects of this invention will become apparent to those skilled in the art after a consideration of a detailed description of preferred embodiments of this invention taken together with the accompanying drawing wherein:

FIG. 1 is a block diagram of the invention;

FIG. 2 is a side elevational view of the sensor;

FIG. 3 is a plan view of the sensor;

FIG. 4 is a schematic diagram of the invention;

FIG. 5 is a block diagram of an embodiment;

FIG. 6 is a perspective view of the sensor of the embodiment;

FIG. 7 is a rear elevational view of the sensor;

FIG. 8 is a schematic diagram of the embodiment; and

FIG. 9 is a schematic of the power supply for the embodiment.

DETAILED DESCRIPTION

Referring in detail to the drawing, there is shown a sensor **20**, a reed protector **22**, a timer **24**, an AC on-off switch **26**, and a power supply **28** in FIG. **1** forming the major components of the preferred embodiment of this invention.

As clearly shown in FIGS. **2** and **3**, sensor **20** is an inertia switch **29** mounted in a housing **30** which is in turn secured to the bottom of a spacer bar **32** of an electric typewriter. Inertia switch **29** includes a flexible conducting reed **34** passing through and mounted to one end of housing **30**. An end portion of reed **34** within housing **30** is split longitudinally in half with one side **36** extending upward and the other side **37** extending downward. A conducting band **38** passes through and is mounted to the same end of housing **30** as reed **34**. A weight **40** is placed at the abutment of sides **36** and **37**, permanently fixing the upward and downward angles of sides of **36** and **37** respectively. Band **38** forms a U-shaped loop **42** vertically enclosing sides **36** and **37** and weight **40**.

When sensor **20** is not excited, reed **34** rests in the middle of housing **30**. As spacer bar **32** is pushed down, weight **40** tends to remain in place because of its inertia causing side **36** to make physical contact with the upper leg of U-shaped loop **42** of band **38**. As spacer bar **32** comes to a stop, weight **40** continues to travel downwards due to the resiliency of reed **34** which has been bent upwards and is now exerting a force downward. The downward force of weight **40** will terminate upon physical contact between side **37** and the lower leg of U-shaped loop **42** of band **38**. The end surfaces of sides **36** and **37** are parallel with an axis along the width of the inside surface of loop **42** of band **38** and are turned upward and downward respectively at angles to insure good contact with loop **42** of band **38**. Thus, the free end of reed **34** within housing **30** moves up and down when excited due to inertia so that reed **34** makes electrical contact with band **38** twice for each cycle of up and down movement with band **38** forming one pole of inertia switch **29** and reed **34** forming the other pole.

Referring to FIG. **4**, it will be seen that transistor Q1 is inserted in the charging path of the timing capacitor C2 in order to prevent surges on the reed contacts. When inertia switch **29** is closed so that reed **34** and band **38** are in physical contact with each other, turn on bias is provided through resistor R2. When transistor Q1 is turned on, the timing capacitor C2 charges through the collector of transistor Q4 and diode D1. Reed contacts or sides **36** and **37** can only handle a small amount of power, and because transistor Q1 requires an extremely low current to turn on in reed protector circuitry **22**, reed **34** is protected from burning out and sticking to band **38**. Resistor R1 provides turn off bias between the base and emitter of transistor Q1.

If diode D1 and timing capacitor C2 were merely to be connected to the collector of Q1, it was discovered during lab tests that timing capacitor C2 would need more than just a pulse to charge up. This was finally solved by placing a capacitor in the conducting path of the collector of transistor Q1 in parallel with R3 and R10 so that when capacitor C3 is charged up by transistor Q1, it holds transistor Q4 on for approximately one tenth of a second after the pulse has elapsed which is long enough for timing capacitor C2 to charge up to

full capacity. It should be noted that resistors R10 and R11 are in series between the base and emitter of transistor Q4 for providing turn off bias. R11 is a current limiting resistor which protects Q4 and D1 from a surge upon charging of capacitor C2. Another difficulty encountered was that the time constant varied considerably from one prototype to another, and this problem was successfully eliminated by putting a resistor R12 in parallel with timing capacitor C2 in order to provide a discharge path independent of the gain of the transistor Q2.

Timer 24 provides a desired duration of time within a range of 10 to 20 minutes of typewriter operation after the last charge received by timing capacitor C2 through diode D1. The discharge path of timing capacitor C2 is through resistor R4 and transistor Q2.

The AC on-off switch 26 includes a bridge formed by diodes D2, D3, D4, and D5 with a silicon controlled rectifier SCR connected between diodes D2 and D5 at one end and diodes D3 and D4 at the other end thereof. In the original prototypes built, the current discharging from timing capacitor C2 eventually passed from the collector of a transistor into the SCR applying a positive bias to the gate causing the SCR to switch from its high impedance off state to a very low impedance on state. Once the SCR was triggered, it stayed on as long as the transistor was conducting current through its collector. Unfortunately, there were several difficulties with the prototype circuitry.

During experimentation the motors of some typewriters would heat up the SCR to an extent so that the low impedance on state of the SCR would be maintained even after timing capacitor C2 completely discharged. It was also found that because of the large time constant involved, the turn off is gradual and some of the SCRs do not have a clean cut off at the turn off point. Instead, these SCRs would go off and then come on again repeating this cycle several times before they would permanently go off causing the typewriter to vibrate prior to the shut-off of power thereto.

In order to eliminate these critical problems, the circuitry was substantially overhauled. A constant positive bias was applied to the gate of the SCR through a resistor R7. A resistor R8 was inserted to hold the gate of the SCR at a safe negative level. This arrangement would normally hold the SCR on all the time; however, when timing capacitor C2 completely discharges and transistor Q2 turns off, transistor Q3 turns on, its turn on bias being supplied through R6. When transistor Q3 turns on, it grounds the gate of the SCR turning the SCR off sharply.

When timing capacitor C2 is discharging, transistor Q2 is on and transistor Q3 is off so that the SCR is turned on by means of the positive bias applied through resistor R10. With the new circuit arrangement, the SCR is no longer adversely affected by rising temperature due to the typewriter motor and has a much sharper cut off when the negative bias is increased as transistor Q3 turns on than the cut off characteristics with the old prototype circuitry where the SCR was turned off with the gradual decrease in positive bias to the gate of the SCR. The turn off initiated by timing capacitor C2 is still, of course, gradual, but it now has no effect on the cut off of the SCR which is accomplished by an increase in the negative bias.

When the SCR is in the off state, the AC supply to the typewriter is blocked because diodes D2 and D4 prevent the passage of the positive portion of the cycle and diodes D3 and D5 prevent passage of the negative portion of the cycle. When the SCR is in the on state, the typewriter receives the full AC supply due to the passage of the positive portion of the cycle through D5, the SCR, and D3 and the passage of the negative portion of the cycle through D4, the SCR, and D2.

Power supply 28 includes a Zener diode Z1 in parallel with a filter capacitor C1 for holding the voltage of the parallel circuit at a constant Z level and for determining the exact voltage across timing capacitor C2 and therefore the exact duration of time which timing capacitor C2 is discharging, preferably 15 minutes. Diode D4 is utilized as a half-wave rectifier for the power supply, and resistor R9 is the dropping resistor for the circuit while diode D6 isolates the power supply from the AC line.

FIG. 5 shows another embodiment of the invention which is not as superior as the preferred embodiment disclosed in FIGS. 1–4. The impact sensor 50, signal amplifier 52, detector 54, timer 56, on-off switch 58, and power supply 60 differ from the major components of FIG. 1 due to the different method of sensing movement of the electric typewriter spacer bar.

As shown in FIGS. 6 and 7, an inductor coil 70 and one end of a metallic reed 72 are secured near opposite ends of a housing 74 which is in turn connected to an electric typewriter spacer bar 76. A two pole magnet 78 is attached to the other end of reed 72 and is centered inside coil 70.

Upon impact when a typist finger strikes spacer bar 76 downward, reed 72 will vibrate in a torsion like manner moving the free end of magnet 78 up and down within inductor coil 70 creating an electromotive force.

The electromagnetic sensing of impact by sensor 50 is amplified by high gain amplification circuitry comprising transistors Q10 and Q11.

Transistor Q12 reaches saturation whenever the amplified signal is applied to its base causing a timing capacitor C10 to charge and subsequently discharge through the resistor R20 for approximately 10 minutes.

When timing capacitor C10 is charged, transistors Q13 and Q14 are held on and transistor Q15 triggers a silicon controlled rectifier SCR' to saturation, AC on-off switch 58 operating in the same manner as the preferred embodiment for providing positive and negative portions of the AC supply until the timing capacitor C10 has completely discharged after the last impact on spacer bar 76.

Power supply 60 utilizes a small size low voltage capacitor C11, and a Zener diode Z10 is placed in parallel therewith to hold the voltage at an unfluctuating safe level. Transistor Q16 acts as a capacity multiplier so that capacitor C12 can be small while having the effect of a large capacitor with as much as 100 times the capacitance of C12, and the ripple produced at the load R22 is therefore very low. It should be noted that power supply 60 is a condenser input type employing a voltage doubler rectifier.

While preferred embodiments of this invention have been illustrated and described, it should be understood by those skilled in the art that numerous changes and modifications may be resorted to without departing from the spirit and scope of this invention. For instance, the connection of the sensor to the typewriter spacer bar is not limited to the bottom of the bar. As has already been mentioned in the summary of the in-

vention the sensing structure and circuitry can be modified for any type of electrical office equipment having keys or bars that are pressed for recording information. It might also be mentioned that housing 74 of FIGS. 6 and 7 and housing 30 of FIGS. 2 and 3 may be comprised of plastic or any other non-ferrous material.

What is claimed is:

1. An electric keyboard office machine having at least one pressable keyboard element and having means for automatically turning the power to the machine on concurrently with the operation of the keyboard element and for automatically turning said power off after a predetermined time delay, said means being connected between said at least one pressable keyboard element and the machine circuitry and comprising sensing means connected to said pressable keyboard element for sensing movement of said element when pressed, electrical timing means responsive to said sensing means for producing an electrical signal of predetermined duration at the output of said electrical timing means, and switch means connected to said electrical timing means output, said machine circuitry, and adapted to be connected to the source of AC power to which the office machine is connected for blocking the passage of AC current prior to the existence of said electrical signal, for allowing the passage of AC current upon movement of the pressable keyboard element and during the existence of said electrical signal, and for blocking the passage of AC current after the termination of said predetermined duration commencing from the last time said pressable keyboard element is pressed.

2. The apparatus of claim 1, wherein said sensing means includes a metallic reed fixedly secured at one end thereof and projecting means extending from the free end of said metallic reed, said reed moving the free end of said projecting means upon movement of the pressable element.

3. The apparatus of claim 2, wherein said sensing means includes second switch means securely fixed thereto for movement with the pressable element and at least partially encircling said projecting means for charging said electrical timing means upon said movement of the free end of said projecting means.

4. The apparatus of claim 3, wherein said sensing means includes a housing secured to the pressable element, said second switch means and the fixed end of said metallic reed being secured within said housing, and including inertia means located at the abutment of said projecting means and said metallic reed for preventing downward movement of said projecting means so that said projecting means makes physical contact with said second switch means as the pressable element is depressed.

5. The apparatus of claim 4, wherein said inertia means causes said projecting means to close circuit said second switch means with said metallic reed for charging said electrical timing means.

6. The apparatus of claim 5, wherein said electrical timing means includes reed protection means for preventing said reed from burning out or sticking to said second switch means.

7. The apparatus of claim 6, wherein said electrical timing means includes first chargeable means and said reed protection means includes a transistor for charging said first chargeable means upon the passage of a low current between said reed and said second switch means below the safe level of current which can flow through said reed without a burnout or sticking.

8. The apparatus of claim 7, wherein said electrical timing means includes second chargeable means and actuating means connected between said first chargeable means and said second chargeable means for charging said second chargeable means to full capacity.

9. The apparatus of claim 8, wherein said electrical timing means includes fixed timing means in parallel with said second chargeable means.

10. The apparatus of claim 6, wherein said electrical timing means includes a power supply means at least a portion of which is in parallel with said reed protection means.

11. The apparatus of claim 10, wherein said power supply means includes a resistance means in parallel with a capacitor for determining said predetermined duration.

12. The apparatus of claim 11, wherein said resistance means includes a Zener diode.

13. The apparatus of claim 1, wherein said switch means includes rectifying means connected to said electrical timing means output and blocking means connected between the machine circuitry and the AC source of power for preventing the passage of alternating current to the machine circuitry, said rectifying means providing an alternate electrical path allowing the alternating current to bypass said blocking means upon movement of the pressable element.

14. The apparatus of claim 13, wherein said switch means includes conductive means connected to said rectifying means for providing said alternate electrical path when said conductive means is not conducting and for preventing said passage of alternating current when said conductive means is conducting current.

15. The apparatus of claim 14, wherein said conductive means includes a transistor selectively applying an increased negative bias to said rectifying means whenever said signal of predetermined duration is absent.

16. The apparatus of claim 3, wherein said electrical timing means includes amplifying means and detecting means and said sensing means feeds an electromagnetically induced signal to said amplifying means upon pressing the pressable element downward, said amplifying means amplifying said electromagnetically induced signal, said electrical timing means including capacitive means, and said detecting means saturating upon receiving said amplified signal and charging said capacitive means for determining said predetermined duration.

17. The apparatus of claim 1, including power supply means connected to said switch means and comprised of capacity multiplier means allowing the use of small size and low voltage capacitors.

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