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Pope

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[54] **ELECTRONIC SMOKING INHIBITING DEVICE**

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[51] **Int. Cl.** **A24f 15/06**

[58] **Field of Search** ..... 35/22 R; 70/267-274; 131/8 A, 170 A, 171 A, , 178; 128/404, 409; 272/27 N, 27 R; 340/277, 279, 407

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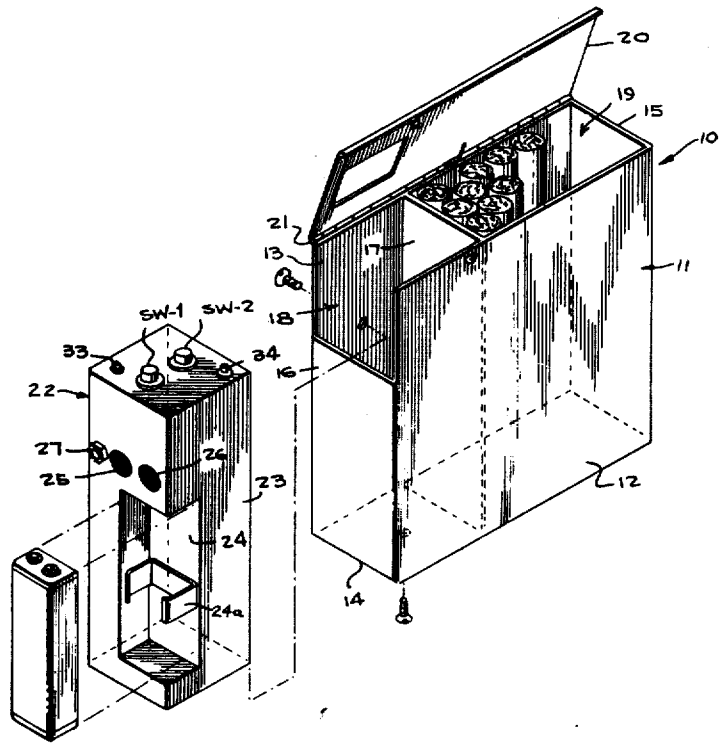
[57] **ABSTRACT**

A compact portable battery powered cigarette smoking inhibiting device having a cigarette storage compartment covered by a moveable lid controlled by a releasable latch. An electronic smoking inhibiting circuit means is provided in the case for the device which includes a first delay device for delaying release of the lid following actuation of the latch, an electrical delay for producing a signal, and a faradic shock generator responsive to the signal for applying a faradic shock to the user.

22 Claims, 4 Drawing Figures



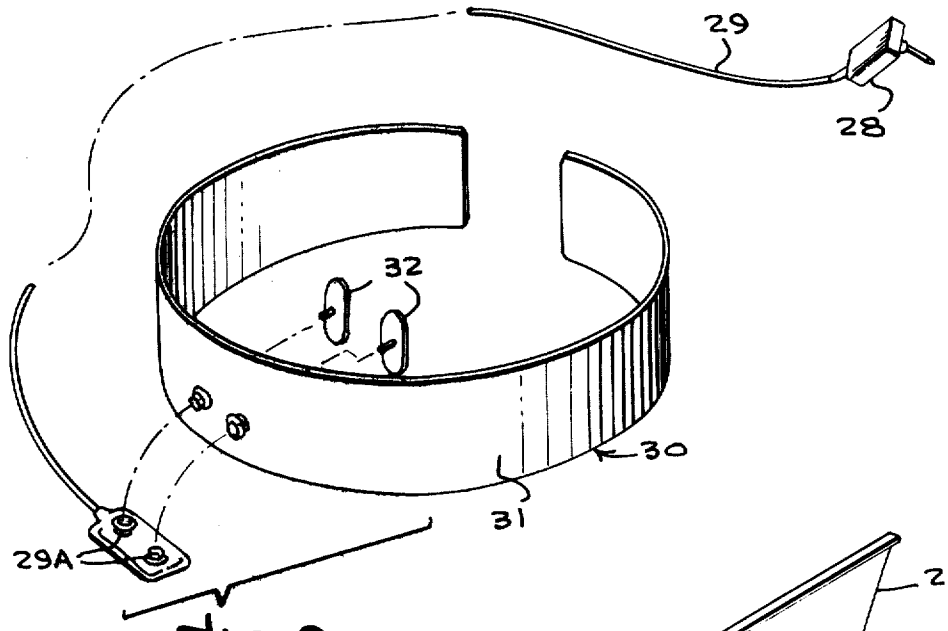

29
28
32
30
31
29A

Fig-2

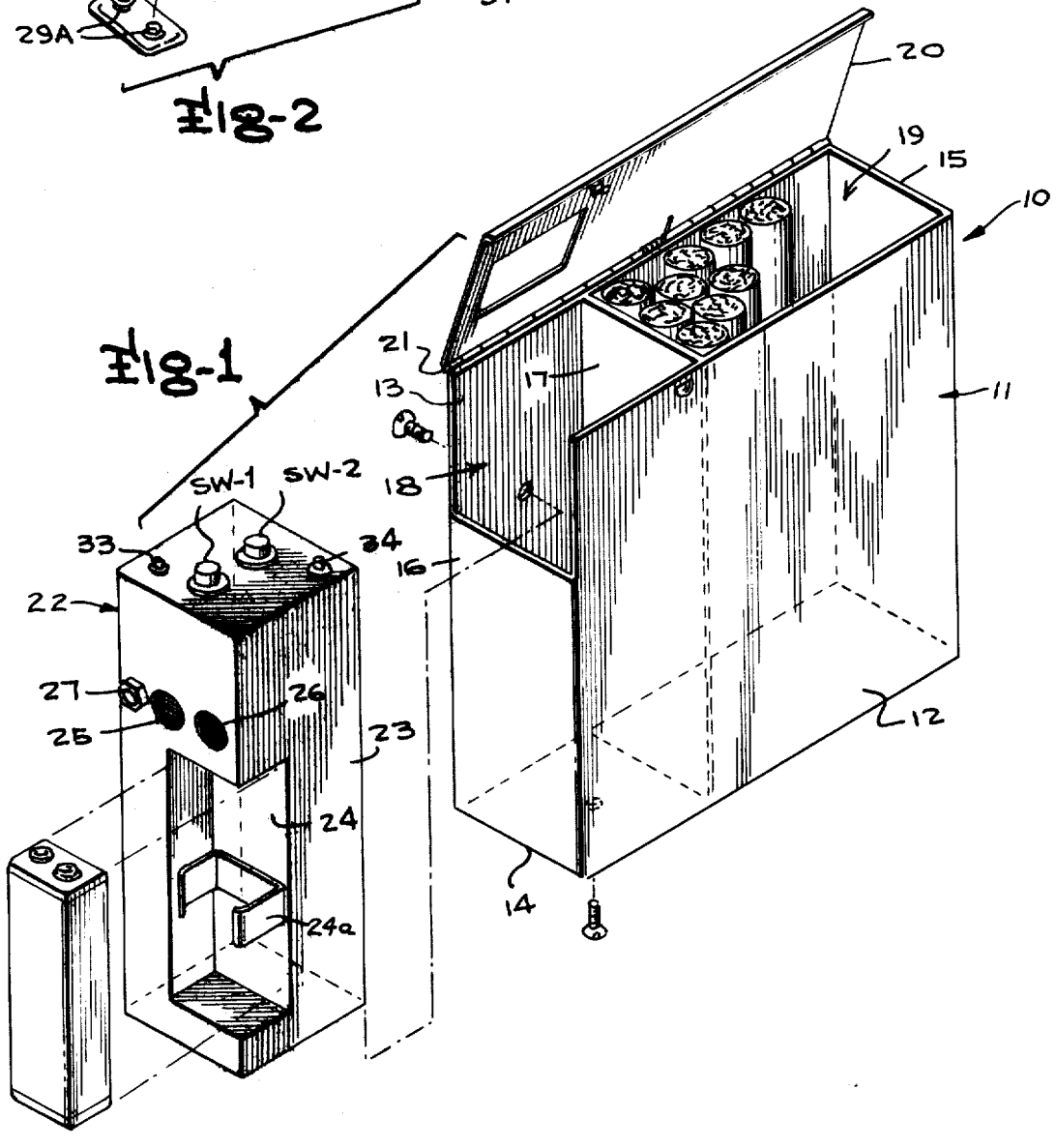
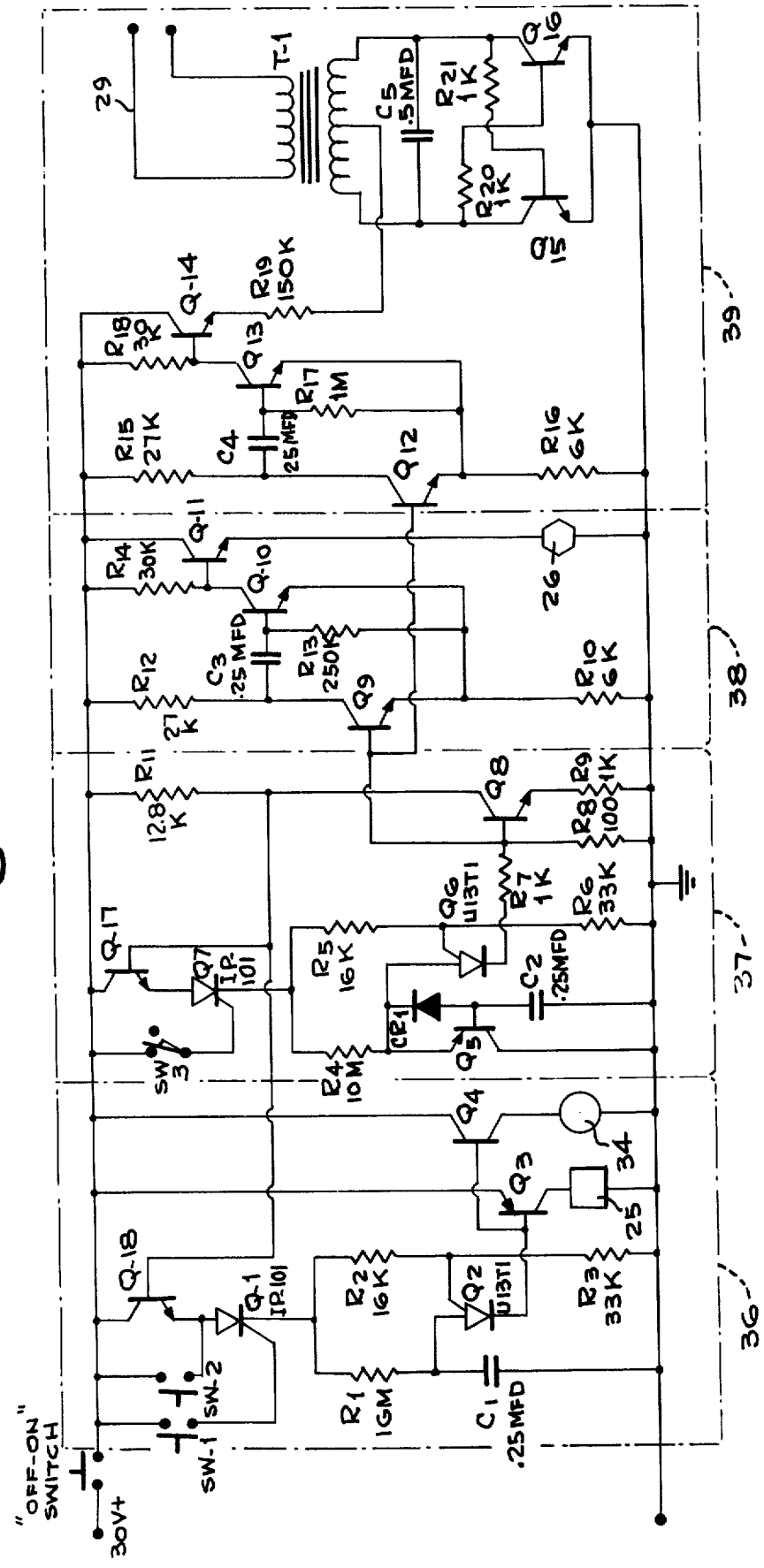

20
19
15
10
21
17
13
11
18
SW-1
SW-2
33
34
16
22
27
26
25
23
12
24
14
24a

Fig-1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Q16
R20 1K
Q15
Q-14
R19 150K
R18 39K
Q13
R17 1M
R15 27K
C4 .25MFD
Q12
R16 6K
Q-11
R14 30K
Q-10
26
R12 27K
C3 .25MFD
R13 250K
Q9
R10 6K
R11 128K
Q8
R8 100
R9 1K
R7 1K
R6 33K
Q6 U13T1
Q-17
Q7 IP101
R5 16K
C2 .25MFD
CR1
SW3
R4 10M
Q5
Q4
34
Q3
25
Q-18
Q-1 IP101
R2 16K
Q2 U13T1
R3 33K
SW-2
SW-1
R1 1GM
C1 .25MFD
"OFF-ON" SWITCH
30V+
39
38
37
36

FIG-4

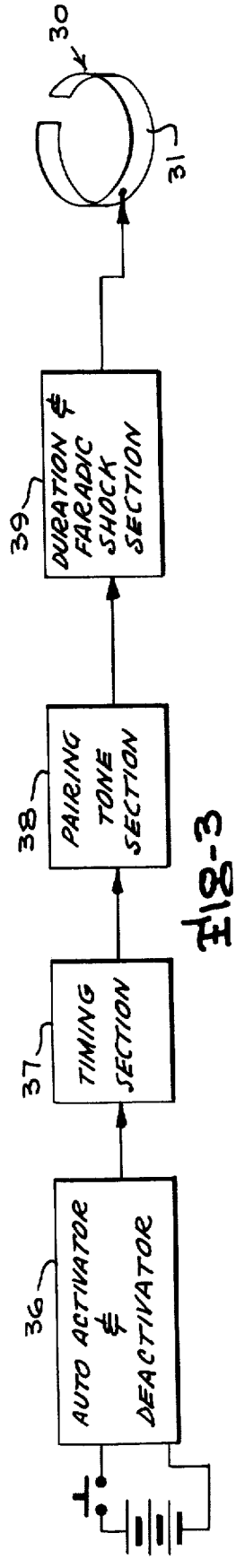
30
31
39
DURATION & FARADIC SHOCK SECTION
38
PAIRING TONE SECTION
37
TIMING SECTION
36
AUTO ACTIVATOR & DEACTIVATOR

FIG-3

ELECTRONIC SMOKING INHIBITING DEVICE

BACKGROUND AND OBJECTS OF THE INVENTION

This present invention relates in general to cigarette smoking inhibiting devices, and more particularly to small portable battery powered electronic devices for systematically inhibiting the behavior of cigarette smoking by administering faradic shock punishment and thereby inhibiting smoking by aversion therapy.

Following the release of the Surgeon General's Report in 1964 concerning the dangers of cigarette smoking, there has been much research conducted regarding the development of methods to extinguish cigarette smoking behavior. Various methods have been employed or suggested for inhibiting cigarette smoking or extinguishing cigarette smoking behavior, ranging from psychotherapy to various forms of behavior therapy. Within the area of types of therapy previously considered, there has been interest in electrical shock paired with smoking behavior. This is variously referred to as aversive therapy, electrotherapy, noxious stimulus presentation, and faradic shock punishment.

The currently used electric shock punishment method of treatment of smoking behavior is subject to a number of disadvantages as currently used. Treatment must be conducted within a clinical or experimental setting; it is only received on a scheduled basis, usually bi-weekly; treatment is limited within the experimental settings to only those individuals selected for an experiment, and is limited within the clinical setting to only those individuals who can economically afford such treatment; and as a practical measure such treatment is limited to urban areas. Antismoking clinics are few, and treatment by this method necessitates the use of large machines, and someone to administer the faradic shock punishment techniques.

As presently administered, the faradic shock punishment treatment most often consists of the sequence of (a) attaching electrodes to the patient's arms, hand, finger, etc., (b) adjusting the faradic shock instrument to a varying degree to establish the milli-amperage to be dispensed, (c) testing theh machine, (d) having the patient begin to smoke cigarettes, and (e) administering the faradic shock treatment while the patient is actually smoking. This treatment is limited in effectiveness in that punishment is only received within the clinic and no opportunity is given to avoid the punishment. Thus within the clinical or experimental setting, the individual cannot escape the electrical shock by refraining from the use of cigarettes. Nor does the frequency of administration of the shock treatment throughout any 24 hour period bear relation to the cigarette smoking frequency during that period. For these and other reasons, the methods previously suggested do not provide controlled and effective therapy for the general public.

An object of the present invention is the provision of a portable, battery operated case serving as a holder for a pack of cigarettes from which the cirgarettes are dispensed by the user, together with an electrode or electrodes placed on the smoker's preferred smoking hand, finger or arm for administering a shock to the user after a selected delay period following manipulation of the device to dispense a cigarette. Buttons are provided for the user to obtain a cigarette and to activate the device in a certain way to avoid shock and electronic circuits

are provided to perform certain operational sequences including emission of selected sounds to achieve certain conditioning in connection with the sequence of operation.

The subject smoking inhibiting device avoids the limitation of treatment to clinical or experimental settings, the treatment is automatically dispensed in relation to the cigarette smoking frequency throughout a 24 hour period, the treatment is available at minimal cost, and is available to all smokers regardless of geographic location. It is not contingent on administration of the treatment by a professional, there is no necessity to predetermine shock intensity or skin resistance, the duration of punishment is uniform and preset to occur in a fixed ratio following inception of smoking behavior, the electrode band placement may be on the preferred smoking arm or the index finger of the preferred smoking arm, and the device, due to its portability, can be carried at all times where smoking frequency occurs, with the assurance of automatically controlled therapy.

Other objects, advantages and capabilities of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings illustrating a perferred embodiment of the invention.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1** is an exploded perspective view of a cigarette case including smoking inhibiting device, with the smoking inhibiting components formed in a module shown separated from the case;

FIG. **2** is an exploded perspective view of a typical faradic shock arm band and snap connector type leads to a jack, usable with the smoking inhibiting device of the present invention;

FIG. **3** is a block diagram of the electronic components forming the smoking inhibiting device; and

FIG. **4** is a schematic diagram of the electronic circuit for the smoking inhibiting portion of the device.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to the drawings, wherein like reference characters designate corresponding parts throughout the several figures, the cigarette case and smoking inhibiting device of the present invention is indicated generally by the reference character **10** and, in one preferred form, comprises a case **11** of generally rectangular, box like configuration having front and rear walls **12, 13**, a bottom wall **14**, a full end wall **15**, and a partial end wall **16**. An intermediate partition **17** paralleling the end wall **15** but spaced a selected distance between the full end wall **15** and partial end wall **16**, defines a module compartment **18** extending the full height of the case and open at the top and along the upper portion of the outer end between partition **17** and partial end wall **16**, and defines a cigarette storage compartment **19** between the partition **17** and end wall **15** which is open at the top of the case. The cigarette storage compartment **19** and module compartment **18** are covered at the top by a hinged top or cover **20**, which in the illustrated example, is hinged along the entire length of the top edge of rear wall **13** by a spring loaded hinge **21** biasing the hinged top or cover **20** to the open position. The partial end wall **16** at the left-hand end of the case, as viewed in FIG. **1**, extends upwardly from the bottom wall **14** to a level spaced a se-

lected distance below th top of the case so that the upper region of the module compartment **18** is open to the left of the case, as viewed in FIG. **1**.

The smoking inhibiting components are formed into a smoking inhibiting module unit **22** adapted to be removably housed in the module compartment **18**, and comprising a module casing **23** having a well formed therein, indicated at **24**, for removably receiving a battery, such as a 30-volt transistor battery, and having a spring holding clip, as indicated at **24***a* for releasably holding the battery in the well or compartment **24**. The height of the battery compartment or well **24** is so correlated to the height of the partial end wall **16** that the partial end wall covers the battery compartment and the battery therein when the module is fully seated in the module compartment **18**. The electronic components of the module, forming the smoking inhibiting components of the device, are housed in the module unit casing **23**, and, in the preferred embodiment, two manually operable push-buttons, indicated SW-1 and SW-2 project from the top of the module casing **23** and through a suitable opening of cut-out formed in the hinged top or cover **20**. Also projecting from the top of the module unit casing **23** are a micro-switch actuator pin or rod **33** and a solenoid plunger **34**, for purposes to be later described.

In the preferred embodiment, the upper end wall portion of the module **22** disposed immediately above the partial end wall **16** includes a minature buzzer **25** and a tone generator **26** which are exposed above the partial end wall **16** to produce audible sounds. Also a female plug **27** is disposed in this portion of the module casing to receive a male jack **28** connected by flexible conductors or leads **29** to faradic shock arm band **30**, illustrated in FIG. **2**, by which electric shocks are applied as punishment to the arm of the user or subject in accordance with the present invention, from the electronics in the module unit **22**. The typical arm band **30** may comprise a **16**-gauge spring steel metallic band covered, for example, with dielectric rated heat shrinkable plastic, curved to releasably fit over and be held on the arm of the user. The steel band **31** supports copper contact pads **32** which may be silver-plated, electrically interconnected pads secured on the steel band **31** and electrically connected to a pair of conventional electric snap connectors mating with similar snap connectors **29A** to permit the electrical leads connected to the jack **28** to be releasably de-coupled from the arm band. If desired, of course, the electrical leads may be permanently attached to the arm band. Also, if desired, a finger band of similar construction to the arm band but sized to releasably fit on the finger of the user may be used instead of the arm band.

A block diagram of the electronic system incorporated in the module to activate the buzzer **25** to produce an audible sound upon manual activation of the device to open the lid or cover **19** and to apply faradic shock punishment to the user, by the arm band or finger band, if the unit is not manually deactivated within a selected delay period before the lid opens, is illustrated in FIG. **3** and comprises, as the major stages thereof, an Auto-activator and Deactivator Section **36**, a Timing Section **37**, a Pairing Tone Section **38**, and a Duration and Faradic Shock Section **39**.

The schematic circuit for a preferred embodiment of the smoke inhibiting device electronics is illustrated in FIG. **4**, with representative values for the circuit elements being indicated in the drawing. Referring to the schematic diagram of FIG. **4**, it will be noted that the main on-off switch, which for convenience may be incorporated in the plug structure **27** to be closed by the jack **28** when the jack is inserted in plug **27**, controls the application of the positive 30-volt supply from the battery to the electronic circuit components. The DEACTIVATE button switch SW-2 is connected across the transistor Q-18 and the CYCLE INITIATE push-button switch S-1 is connected to the gate of silicon control switch (or SCR) Q-1, as shown. To initiate the cycle of operation, assuming the OFF-ON switch is closed or ON, the CYCLE INITIATE push-button switch SW-1 is depressed manually, which caused the SCR Q-1 to conduit and places a postive pulse through resistors R-1 and R-2 to cause SCR Q-2 and transistor Q-3 to conduct. Conduction through Q-2 causes the buzzer **25** to sound for a period of 10 seconds. SCR Q-1, once energized by momentary closure of the CYCLE INITIATE switch SW-1, serves as a "seal-in" device for the momentarily closed contacts of the CYCLE INITIATE switch SW-1. The resistors R-1, R-2, and R-3 form a bias circuit in conjunction with the capacitor C-1, whcih requires ten seconds to charge and fire, thus causing a positive pulse which switches SCR Q-2 off. When SCR Q-2 is thus turned off the buzzer **25** is deactivated, and transistor Q-3 is simultaneously turned on for the duration of the pulse, to energize the solenoid plunger **34** and release the spring loaded hinged lid or cover **20** which opens, allowing the subject or user to obtain a cigarette from the cigarette storage compartment, after which he manually closes the cover or lid. For pairing response purposes, the subject may deactivate the entire circuit operation by depressing the DEACTIVATE switch SW-2, which turns off SCR Q-1 and as a result removes power from the circuit, if the DEACTIVATE switch SW-2 is depressed prior to completion of ten second time period, determined by R-1, R-2, R-3 and C-1, when the buzzer **25** is in the on or activated condition.

When the lid or cover **20** is opened following the ten second delay period and tripping of the lid latch formed by the plunger of the solenoid **34**, the micro switch SW-3 which bears against the lid is automatically tripped by the movement of the micro switch actuator **33** which occurs upon opening of the lid. The tripping of micro switch SW-3 causes SCR Q-7 to conduct, which serves to seal-in the circuit after the momentary activation by switch SW-3. When SCR Q-7 conducts, voltage is applied to a timing circuit comprising resistors R-4, R-5, R-6, transistor Q-5, and capacitor C-2 in combination, which serve to bias SCR Q-6 to keep it in a non-conducting state for a period of two minutes, at which time capacitor C-2 becomes fully charged and fires, applying a position pulse to SCR Q-6 to turn Q-6 on. Diode CR-1 serves to block a charge path from R-4 and forces a timed charge rate through transistor Q-5.

When the SCR Q-6 of the Timing Section **37** is thus pulsed ON, voltage is switched through transistor Q-8, causing transistors Q-9 and Q-12 to be energized. Transistor Q-10 is biased with resistors R-10 and R-12, causing transistor Q-11 to conduct and energize the tone generator **26**. Capacitor C-3 is allowed to charge in conjunction with resistors R-13, R-14 and transistor Q-10, establishing a charge rate of five seconds to charge and fire capacitor C-3, switching transistors

Q-10 and Q-11 off and thereby de-energizing the tone generator 26 after the five second period.

The voltage switched through transistor Q-8 when SCR Q-6 was pulsed ON also energized transistor Q-12 in the Duration and Faradic Shock Section 39, having a circuit including resistors R-15, R-16, R-17, R-18, capacitor C-4 and transistors Q-13 and Q-14 which function the same as the similar circuits in the Pairing Tone Section 38, except that capacitor C-4 requires 70 milliseconds to discharge and thereby fixes the duration of the shock to be applied to the patient. A shock of four milliamperes at 600 volts is applied through the conductor leads 29 to the subject when the transistor Q-14 is switched on and applies voltage through resistor R-19 to the oscillator circuit comprising transistors Q-15 and Q-16, resistors R-20 and R-21, and capacitor C-5, converting the direct current 30-volt supply from the battery to a 30-volt AC voltage which is applied to the step-up transformer T-1 having a winding ratio appropriate to produce a 600-volt peak-to-peak 4 milliampere shock signal. The faradic shock of 4 milliamperes at 600 volts is applied for a duration of 70 milliseconds through the arm band 30 or similar finger band connected to the subject with a galvanic skin resistance of 250K to 500K ohms.

Following energizing of transistors Q-9 and Q-12, initiating the switching on of transistors Q-11 and Q-14 in the Tone Pairing Section 38 and Faradic Shock Section 39, transistors Q-17 and Q-18 are de-energized, dropping the seal-in circuits of SCR's Q-1 and Q-7 to clear the circuit for another complete cycle.

It will be apparent from this description that in the normal use of the cigarette case and smoking inhibiting device of the present invention, the subject will normally depress the CYCLE INITIATE button SW-1 to commence an automatic cycle which results in the automatic opening of the lid 20 by energization of the lid opening solenoid 34 after a ten second delay period. Immediately upon depression of the CYCLE INITIATE button SW-1, the buzzer 25 is energized, producing an audible sound indicating to the subject that the automatic lid opening cycle is being timed out for the ten second delay period and that he will be subjected to faradic shock punishment five seconds after the lid is open if he does not terminate the lid opening cycle before the end of the ten second period. The subject has the option of deciding within the ten second period to deactivate the entire circuit, by depressing the DEACTIVATE button SW-2 before completion of the ten second period, so that the lid or cover is not released to provide access to the cigarettes and the faradic shock punishment is avoided. If the DEACTIVATE button SW-2 is not depressed during the ten second delay period during which the buzzer 25 is sounding, the electronic circuit automatically activates the solenoid 34 to retract its plunger and automatically open the lid 20, which allows the micro switch actuator 33 to rise and close the micro switch SW-3. The closure of the micro switch SW-3 senses the fact that the lid is opened and conditions the circuit so that the delay faradic shock punishment is unavoidable even if the lid is closed shortly after activation of the micro switch. Closure of the micro switch SW-3 immediately commences the five second tone produced by the tone generator 26, and at the conclusion of this five second delay period, the circuit immediately delivers the faradic shock punishment through the plug 27, jack 28 and leads 29 to the arm band 30 or finger band.

Variations of the above may be provided, as, for example, by removing or omitting the arm band jack 28 and substituting a dummy jack, thus eliminating the faradic shock punishment feature. With such a modified system, opening of the lid results in only the tone being produced by the tone generator 26 without producing the faradic shock punishment, preceded by the initial presentation of the noise of the buzzer 25 for the ten second delay period.

Obviously, a manually releasable lid latch may be provided, rather than employing a CYCLE INITIATE switch and circuitry for energizing a lid opening solenoid, to permit the lid to be opened manually by depressing the manually releasable latch, and/or the buzzer 25 and associated circuitry as well as the latch opening solenoid circuitry may be eliminated, so that only the delayed faradic shock punishment, with or without the tone generator sound, would be the only features retained.

I claim:

1. Apparatus for inhibiting cigarette smoking, comprising a cigarette case having a cigarette storage compartment, a moveable lid normally closing said compartment and moveable to an open position permitting access to the compartment for removal of a cigarette, releasable latch means for releasing said lid to move to open position responsive to actuation of a lid opening actuator; smoking inhibiting means carried by the case administering faradic shock punishment to a user person operating the case under predetermined conditions comprising first delay means for delaying release of the lid for a predetermined pre-opening delay period following actuation of the latch means, second electrical delay means for producing a shock initiating signal a predetermined post-opening delay period following opening of said lid, an electrical faradic shock generator for producing a faradic shock electrical signal responsive to said initiating signal, and an electrically conductive shock applying device to be conductively connected to said shock generator and to be supported in contact with the skin of the user for applying the faradic shock signal to the user to produce the shock punishment.

2. Apparatus as defined in claim 1, wherein said first delay means comprises an electric buzzer, a lid unlatching solenoid, and electrical delay circuitry for timing out the predetermined pre-opening delay period coupled to the buzzer to activate the buzzer to produce sound throughout said pre-opening delay period.

3. Apparatus as defined in clain 1, wherein said first delay means comprises an electric buzzer, a lid unlatching solenoid, and electrical delay circuitry for timing out the predetermined pre-opening delay period coupled to the buzzer and solenoid to activate the buzzer to produce sound throughout said pre-opening delay period and to energize the solenoid momentarily at the end of the pre-opening delay period to release the lid to open position.

4. Apparatus as defined in claim 1, including a manually operable deactivating switch for disabling the smoking inhibiting means for generating the faradic shock signal when the deactivating switch is actuated during said pre-opening period before termination thereof.

5. Apparatus as defined in claim 2, including a manually operable deactivating switch for disabling the smoking inhibiting means for generating the faradic shock signal when the deactivating switch is actuated during said pre-opening period before termination thereof.

6. Apparatus as defined in claim 3, including a manually operable deactivating switch for disabling the smoking inhibiting means for generating the faradic shock signal when the deactivating switch is actuated during said pre-opening period before termination thereof.

7. Apparatus as defined in claim 1, including means for automatically initiating operation of said second-mentioned delay means responsive to opening of the lid comprising a switch member having an actuator resiliently biased into contact with the lid and held in switch-opening position when the lid is closed, and said second-mentioned delay means including an electronic delay circuit for timing out the post-opening delay period responsive to closing of said switch member upon opening of the lid.

8. Apparatus as defined in claim 2, including means for automatically initiating operation of said second-mentioned delay means responsive to opening of the lid comprising a switch member having an actuator resiliently biased into contact with the lid and held in switch-opening position when the lid is closed, and said second-mentioned delay means including an electronic delay circuit for timing out the post-opening delay period responsive to closing of said switch member upon opening of the lid.

9. Appartus as defined in claim 3, including means for automatically initiating operation of said second-mentioned delay means responsive to opening of the lid comprising a switch member having an actuator resiliently biased into contact with the lid and held in switch-opening position when the lid is closed, and said second-mentioned delay means including an electronic delay circuit for timing out the post-opening delay period responsive to closing of said switch member upon opening of the lid.

10. Apparatus as defined in claim 4, including means for automatically initiating operation of said second-mentioned delay means responsive to opening of the lid comprising a switch member having an actuator resiliently biased into contact with the lid and held in switch-opening position when the lid is closed, and said second-mentioned delay means including an electronic delay circuit for timing out the post-opening delay period responsive to closing of said switch member upon opening of the lid.

11. Apparatus as defined in claim 6, including means for automatically initiating operation of said second-mentioned delay means responsive to opening of the lid comprising a switch member having an actuator resiliently biased into contact with the lid and held in switch-opening position when the lid is closed, and said second-mentioned delay means including an electronic delay circuit for timing out the post-opening delay period responsive to closing of said switch member upon opening of the lid.

12. Apparatus as defined in claim 1, wherein said second-mentioned delay means includes an audible tone generator, an electronic delay circuit, first circuit means coupled to said delay circuit for activating said tone generator to produce audible sound throughout said post-opening delay period, and second circuit means coupled to said delay circuit to activate said faradic shock generator to produce the faradic shock signal at the termination of said post-opening period.

13. Apparatus as defined in claim 2, wherein said second-mentioned delay means includes an audible tone generator, an electronic delay circuit, first circuit means coupled to said delay circuit for activating said tone generator to produce audible sound throughout said post-opening delay period, and second circuit means coupled to said delay circuit to activate said faradic shock generator to produce the faradic shock signal at the termination of said post-opening period.

14. Apparatus as defined in claim 3, wherein said second-mentioned delay means includes an audible tone generator, an electronic delay circuit, first circuit means coupled to said delay circuit for activating said tone generator to produce audible sound throughout said post-opening delay period, and second circuit means coupled to said delay circuit to activate said faradic shock generator to produce the faradic shock signal at the termination of said post-opening period.

15. Apparatus as defined in claim 4, wherein said second-mentioned delay means includes an audible tone generator, an electronic delay circuit, first circuit means coupled to said delay circuit for activating said tone generator to produce audible sound throughout said post-opening delay period, and second circuit means coupled to said delay circuit to activate said faradic shock generator to produce the faradic shock signal at the termination of said post-opening period.

16. Apparatus as defined in claim 5, wherein said second-mentioned delay means includes an audible tone generator, an electronic delay circuit, first circuit means coupled to said delay circuit for activating said tone generator to produce audible sound throughout said post-opening delay period, and second circuit means coupled to said delay circuit to activate said faradic shock generator to produce the faradic shock signal at the termination of said post-opening period.

17. Apparatus as defined in claim 6, wherein said second-mentioned delay means includes an audible tone generator, an electronic delay circuit, first circuit means coupled to said delay circuit for activating said tone generator to produce audible sound throughout said post-opening delay period, and second circuit means coupled to said delay circuit to activate said faradic shock generator to produce the faradic shock signal at the termination of said post-opening period.

18. Apparatus as defined in claim 10, wherein said second-mentioned delay means includes an audible tone generator, an electronic delay circuit, first circuit means coupled to said delay circuit for activating said tone generator to produce audible sound throughout said post-opening delay period, and second circuit means coupled to said delay circuit to activate said faradic shock generator to produce the faradic shock signal at the termination of said post-opening period.

19. Apparatus as defined in claim 11, wherein said second-mentioned delay means includes an audible tone generator, an electronic delay circuit, first circuit means coupled to said delay circuit for activating said tone generator to produce audible sound throughout said post-opening delay period, and second circuit means coupled to said delay circuit to activate said faradic shock generator to produce the faradic shock signal at the termination of said post-opening period.

20. Apparatus as defined in claim 5, wherein said shock applying device comprises a flexible band member for partially encircling and gripping a limb portion of the human body to retain the band member in selected position thereon, an electrically conductive metallic contact pad formation carried by the band member to be held thereby in contact with the skin of the user, and flexible electrical conductors coupled to and extending from the pad formation for releasible connection with the shock generator carried by the case.

21. Apparatus as defined in claim 11, wherein said shock applying device comprises a flexible band member for partially encircling and gripping a limb portion of the human body to retain the band member in selected position thereon, an electrically conductive metallic contact pad formation carried by the band member to be held thereby in contact with the skin of the user, and flexible electrical conductors coupled to and extending from the pad formation for releasible connection with the shock generator carried by the case.

22. Apparatus as defined in claim 19, wherein said shock applying device comprises a flexible band member for partially encircling and gripping a limb portion of the human body to retain the band member in selected position thereon, an electrically conductive metallic contact pad formation carried by the band member to be held thereby in contact with the skin of the user, and flexible electrical conductors coupled to and extending from the pad formation for releasible connection with the shock generator carried by the case.

* * * * *