United States Patent

[11] 3,576,407

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[73] Assignee **Morris Lavine**
Continuation-in-part of application Ser. No. 500,818, Oct. 22, 1965, now abandoned.

[54] **TIME CONTROL SYSTEM AND METHOD FOR PRODUCING TELEVISION, RADIO AND VIDEO TAPE PROGRAMS AND FOR OTHER USES**
3 Claims, 18 Drawing Figs.

[52] **U.S. Cl.** **200/46,** 235/61.2, 318/33
[51] **Int. Cl.** **H01h 43/08**
[50] **Field of Search** ..... 339/18 (C); 235/61.111, 61.113, 61.2; 200/46; 317/101 (CX)

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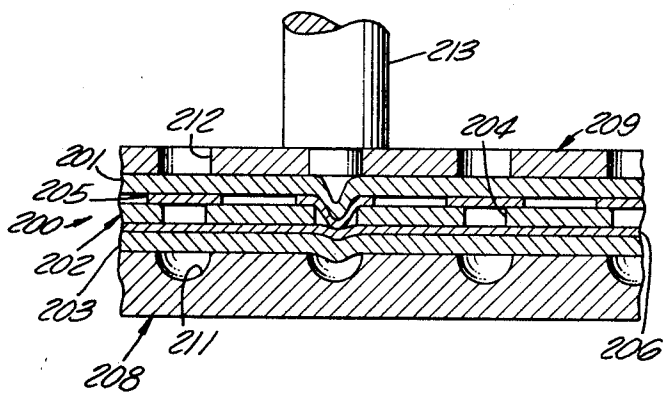
Primary Examiner—David Smith, Jr.
Attorneys—A. Donald Stolzy and Kendrick, Subkow and Stolzy

ABSTRACT: The control card apparatus includes a first insulative sheet having on one surface thereof a plurality of spaced parallel conductor elements of a material sufficiently ductile that it may be deformed without breaking or separating. A second insulative sheet includes a plurality of similarly spaced conductor elements on one surface thereof. The two sheets including conductive strips are sandwiched with their conductive areas facing one another to a third insulative layer having a plurality of openings, each of which openings corresponds to the crossover point of the conductive areas. Connection to selectively desired crossover points is made by forcing a punch, stylus or the like through the associated opening which deforms the one conductor element into contact with the other element at the given crossover.



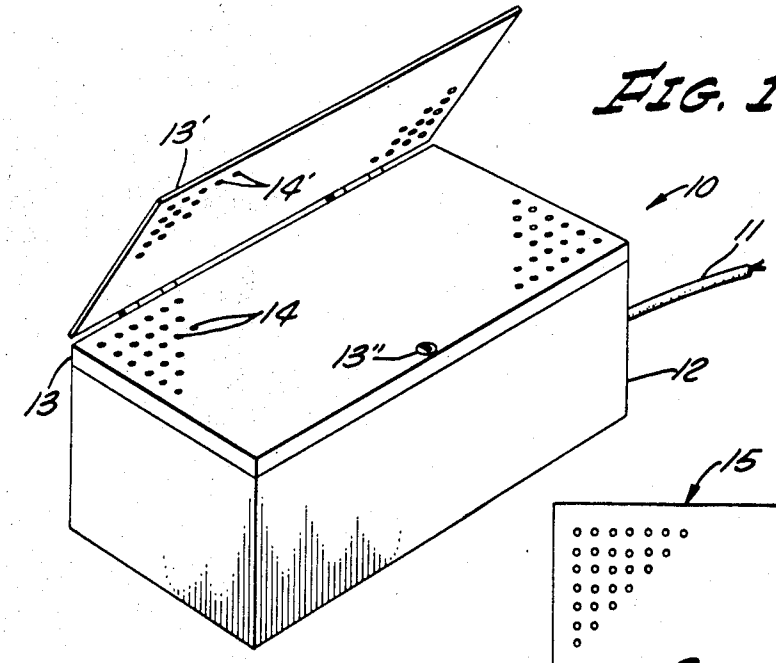


FIG. 1.

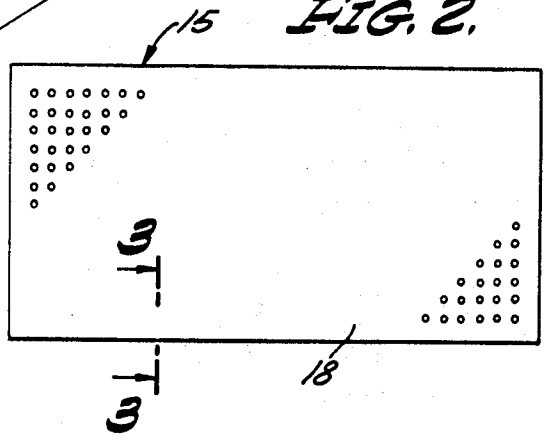


FIG. 2.

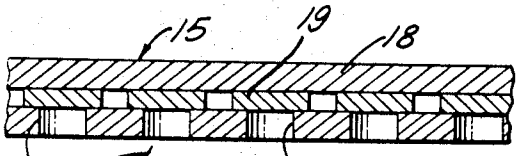


FIG. 3.

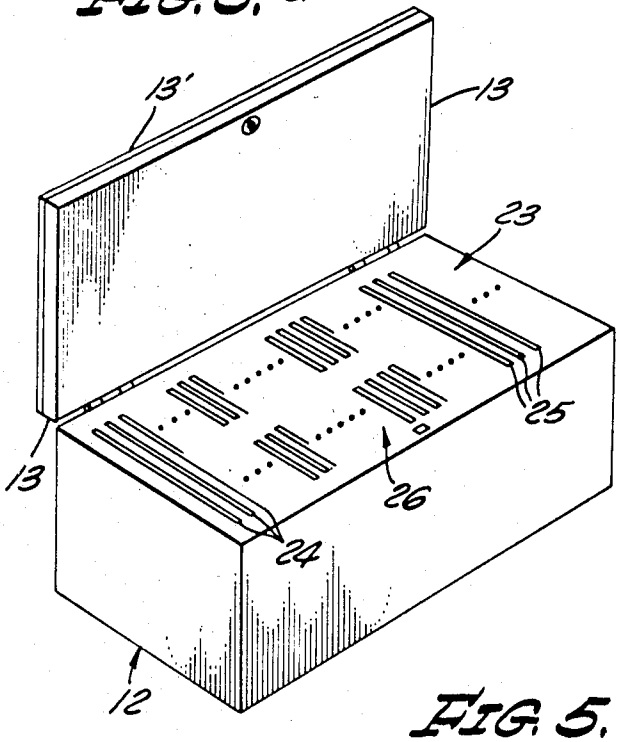


FIG. 5.

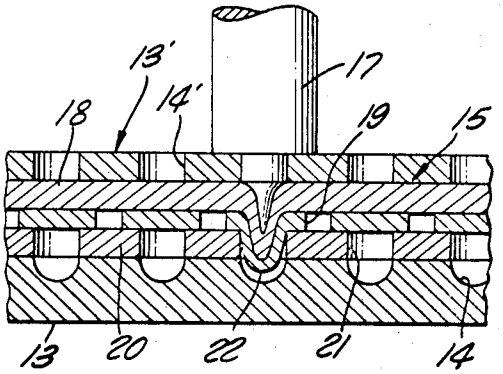


FIG. 4.

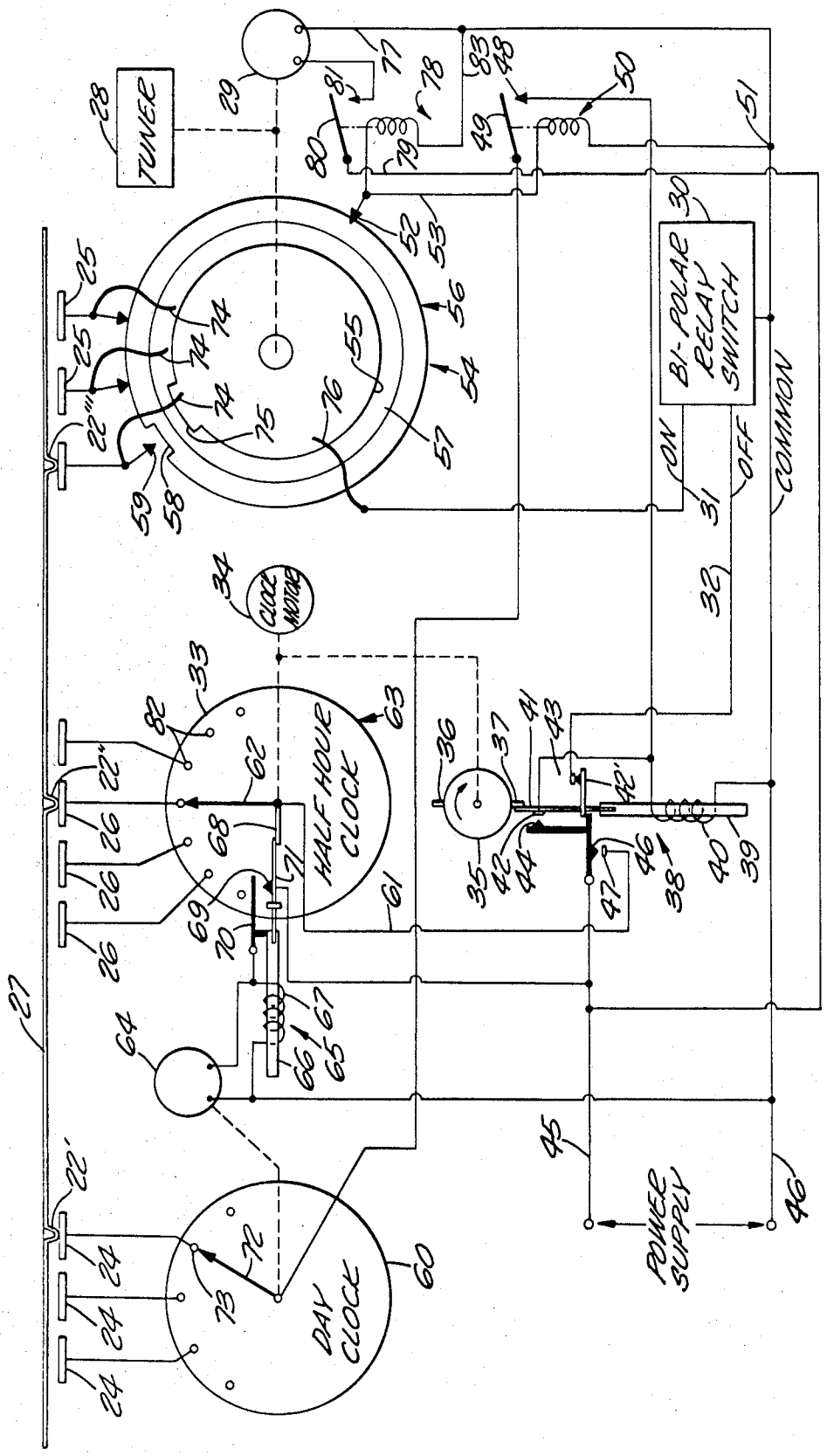
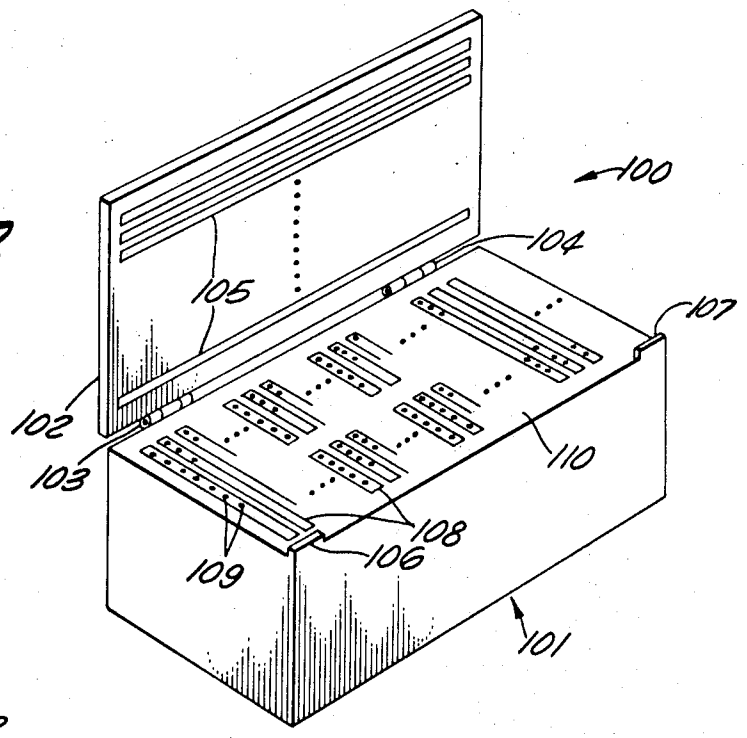

TUNER
BI-POLAR RELAY SWITCH
ON
OFF
COMMON
CLOCK MOTOR
HALF HOUR CLOCK
DAY CLOCK
POWER SUPPLY

FIG. 6.

FIG. 7.



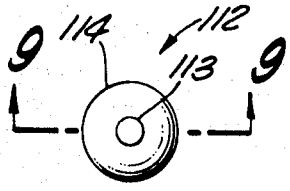


FIG. 8.

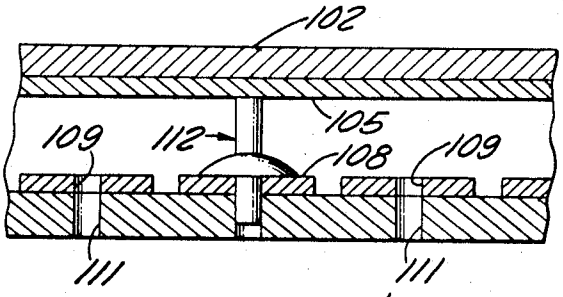


FIG. 10.

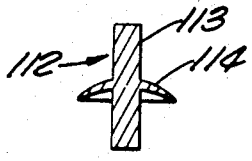


FIG. 9.

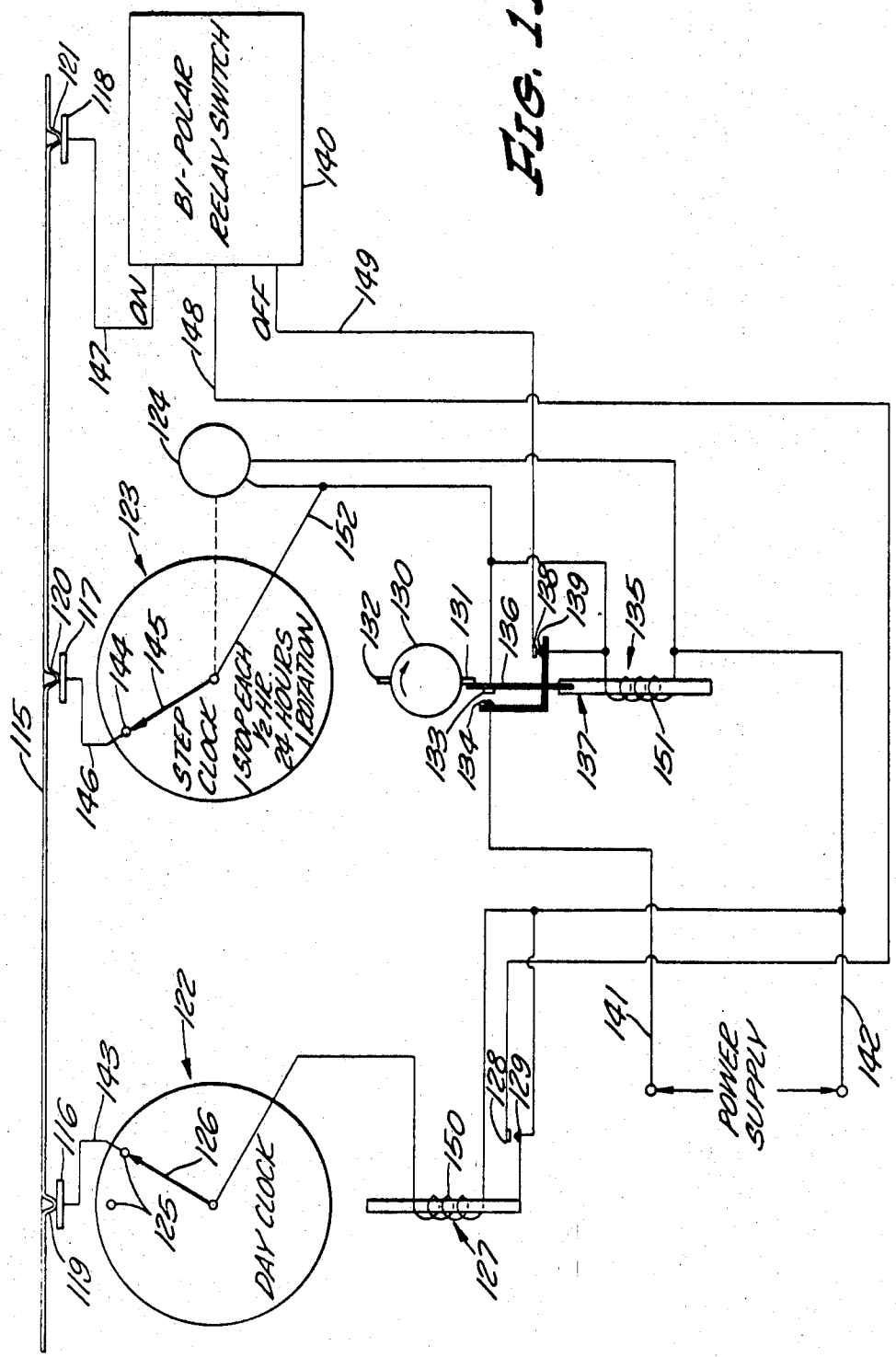

BI-POLAR RELAY SWITCH
140
ON
147
148
OFF
149
121
118
120
117
115
123
144
145
STEP CLOCK
1 STOP EACH ½ HR. 24 HOURS 1 ROTATION
146
124
152
132
130
131
136
138
139
135
133
134
137
151
122
143
116
126
125
119
DAY CLOCK
127
150
128
129
141
POWER SUPPLY
142

Fig. 11.

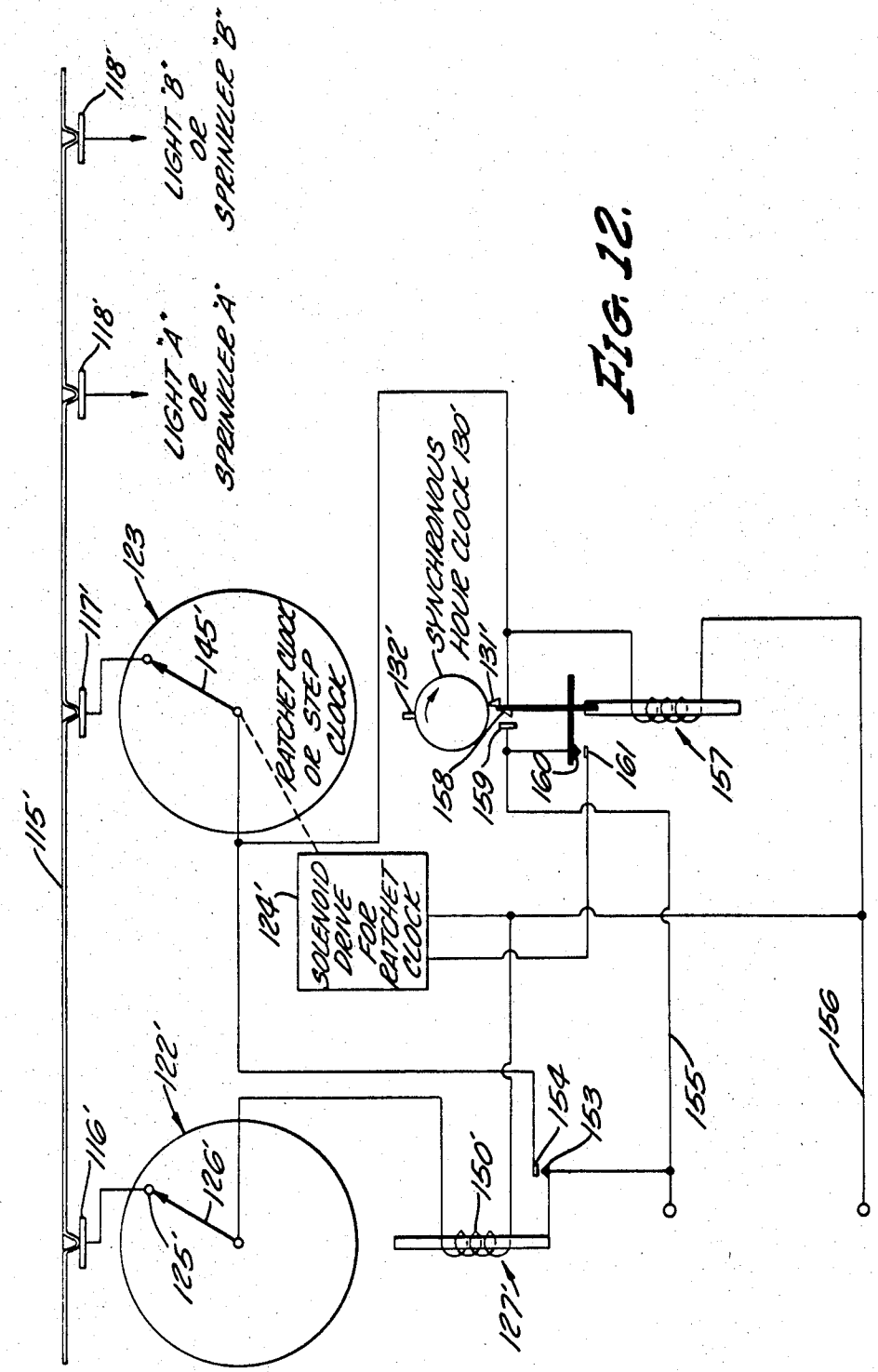

118'
LIGHT "B" OR SPRINKLER "B"
118'
LIGHT "A" OR SPRINKLER "A"
123
117'
145'
RATCHET CLOCK OR STEP CLOCK
132'
SYNCHRONOUS HOME CLOCK 130'
131'
158
159
160
161
157
115'
124'
SOLENOID DRIVE FOR RATCHET CLOCK
122'
116'
126'
125'
150'
154
153
155
156
127'

FIG. 12.

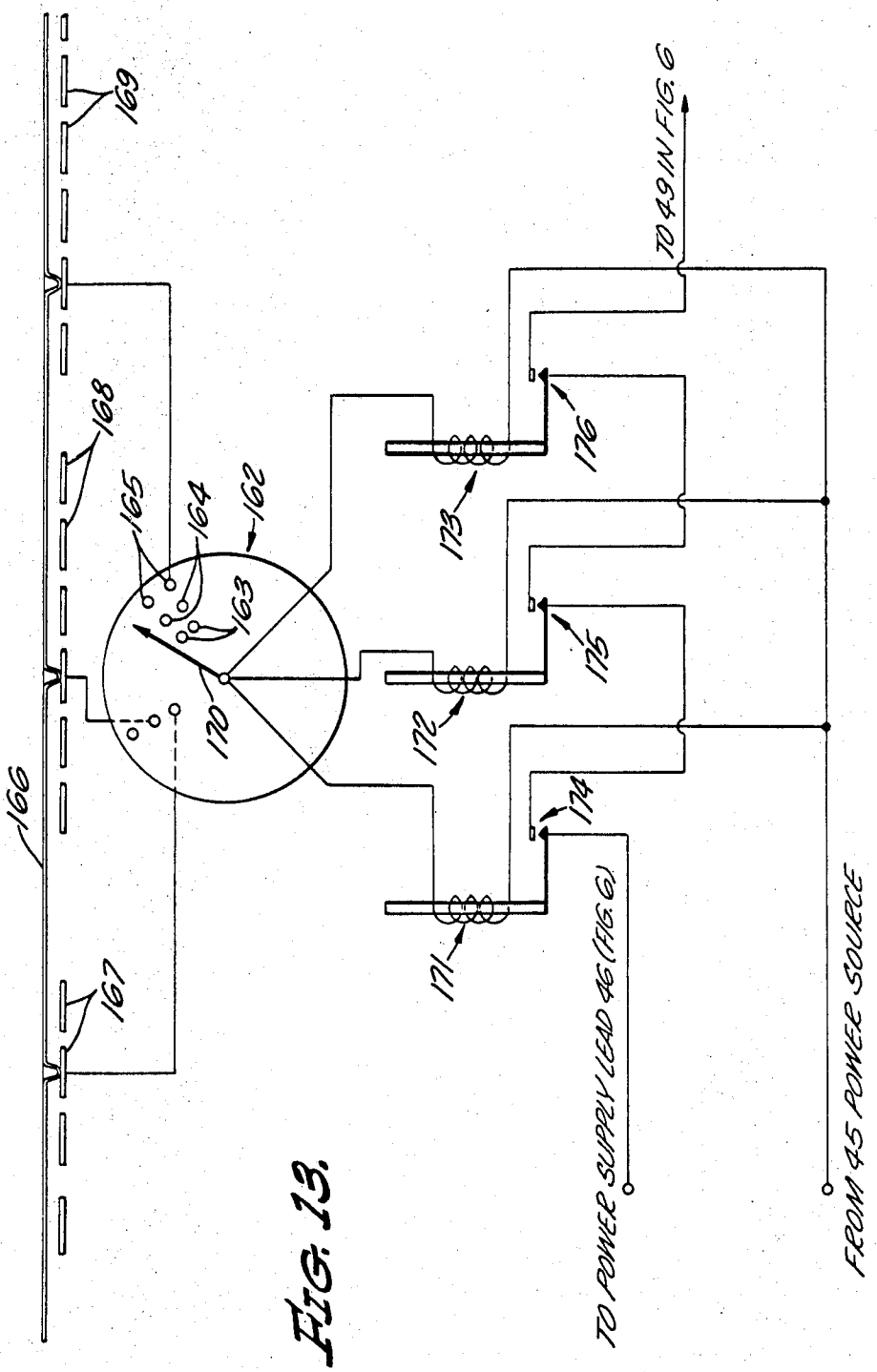
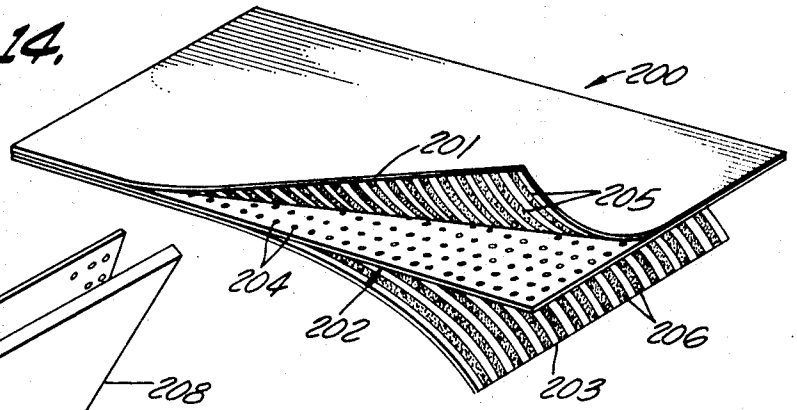

169
168
165
164
162
163
170
166
167
173
176
175
172
174
171
TO 49 IN FIG. 6
TO POWER SUPPLY LEAD 46 (FIG. 6)
FROM 45 POWER SOURCE

FIG. 13.

FIG. 14.



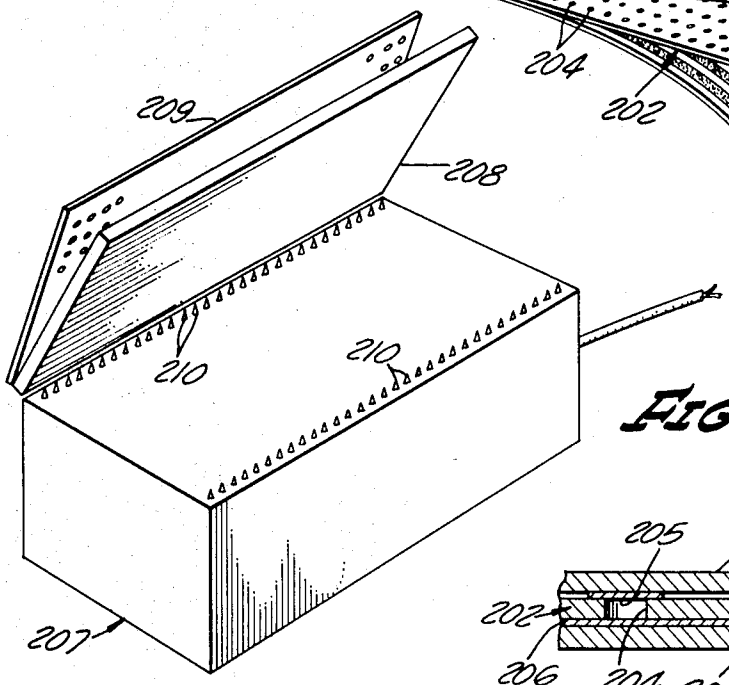


FIG. 15.

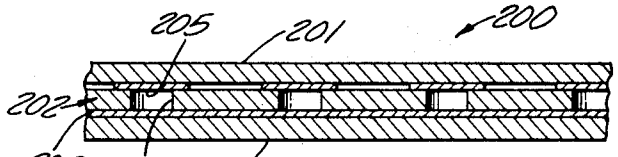


FIG. 16.

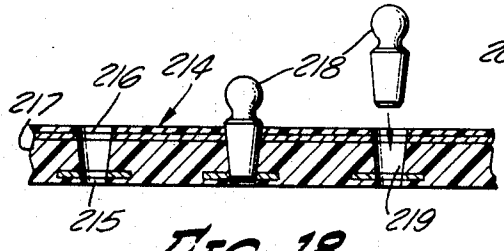


FIG. 18.

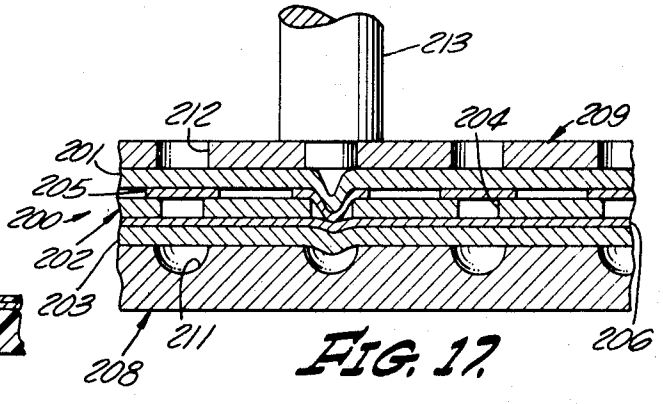


FIG. 17.

TIME CONTROL SYSTEM AND METHOD FOR PRODUCING TELEVISION, RADIO AND VIDEO TAPE PROGRAMS AND FOR OTHER USES

This application is a continuation-in-part of copending application Ser. No. 500,818 filed Oct. 22, 1965 now abandoned, by the inventor hereof for CONTROL SYSTEM AND METHOD. The benefit of the filing date of said copending application is therefore hereby claimed for this application as to subject matter common to both of said applications.

There is a great need for an automatic timing device that will project the matter of timing as to future events, be they television or radio, water sprinkling or opening and locking buildings, and a great many other projections in the future, by a simple automatic system in which the matters may be projected for a future date and time at which the event is to occur.

To meet this need, the inventor has invented an electrical apparatus coordinated, if desired, with a card-punching system that can project timely events in the future, specifically over periods of weeks or months or days, hours and minutes. More particularly, this invention relates to a method and device for making a plurality of electric contacts selectively in succession and momentarily or for predetermined and lengthy time intervals, depending on the purpose, and arranging that these contacts may be made by a card that can be punched or merely indented to select the time and service desired.

Thus, this invention will enable a person to select television or radio programs at the beginning of the week, leaving to the mechanism the matter of station selection and turning the television or radio on and off at the time scheduled. It would also enable turning tape recorders on and off to record such programs at specific times and to turn video tape recordings on and off to record and copy the programs for an entire day, month or year, and to set any copying device for the same period. It would also provide a timing device for cameras for taking pictures. It could have many military uses which would suggest themselves to persons concerned with such matters.

Although the system of the present invention will have applications other than those disclosed herein and should not therefore be limited to those so disclosed, the invention has been found to possess exceptional utility in the automatic tuning of a television receiver.

In application to a television receiver, it will function to turn the receiver on and to select the desired channel at the appointed time and turn the receiver off at the conclusion of the selected program. The programs may be selected for a week or longer in advance and the device then locked. If the channel selector of the television set is electrically operated, the act of locking the device described may also disconnect the power supply to any manual electrically operated channel selector. Or the channel selector may be located next to the device described and under the lid. This makes it possible to preselect programs suitable for children and impossible for the child to change the selection or enlarge the time during which television programs may be watched.

If not locked, programs may be manually changed or selected at all times when the automatic mechanism is not momentarily in actual operation. The selection of programs need not be in any time sequence. The first schedules in time may be the last to be indicated on the selector mechanism. The selections may be made in any order without affecting the proper sequence of their presentation to the viewer.

Prior art automatic devices for tuning radio and television sets are relatively difficult to operate and complicated in construction. Further, they provide no easily actuable device to control a receiver for an entire day or for an entire week according to a preselected program sequence.

In accordance with the device of the present invention, the above-described and other disadvantages of the prior art are overcome by providing an electric motor having an output shaft fixed to a tuner. A plurality of switches with a detector for opening and closing selective ones of the switches responsive to perforations or indentations in a card are provided. A plurality of input conductors are connected to corresponding ones of the switches. Clock means are provided to supply an actuating voltage to each of the input conductors in succession. A plurality of output conductors are connected from corresponding ones of the switches. A motor control device for energizing the motor is also provided so that the motor is energized in such a manner to tune the receiver to a single radio frequency corresponding to the one of the said output conductors to which the actuating voltage is applied.

According to another feature of the invention, a selector mechanism is provided including a housing having a plurality of conductive strips in a predetermined position thereacross. A lid to place a card against the conductors is also provided. A card fits on top of the conductors beneath the lid. The card is composed of a top nonconductive layer to which is affixed a plurality of conductive strips over which is affixed a nonconductive layer containing perforations spaced along the lines of and directly over the conductive strips. The card and a conductive strip are deformed through the sheet perforations at a plurality of positions along at least one conductive strip.

According to another outstanding feature of the present invention, a clock motor is provided with a wheel. A projection is provided on the wheel also. A solenoid having a spring biased projection at one end of its armature is provided. This projection is referred to herein as a leaf spring for convenience and ease in understanding the operation of the invention. A pair of normally open contacts are carried by the leaf spring. The contacts referred to should be designed to have a snap closed and open action such as is provided by a micro switch. Means are then provided to energize the solenoid to withdraw the leaf spring from the projection when the contacts are closed by the projection. According to this feature of the present invention, a day clock commutator is provided with a one-half hour commutator. The tuner drive has a mechanism. A series of corresponding conductors are connected to the commutators and to the tuner drive mechanism. Means are then provided to interconnect one of each series of conductors. The solenoid is used as before to energize momentarily when the wheel rotates through an interval equal to one-half hours. Means are also provided to keep the solenoid energized when a program has been selected. Further means are provided to deenergize the solenoid when a selected television receiver channel is tuned in.

According to another feature of the present invention, an actuating card is made by placing a card having conductive strips over perforations over a body having depressions at the perforations. The point of a stylus is then pressed through a perforation to place a portion of a strip through a corresponding perforation and into one of the depressions.

Along this same line, the control card may have a plurality of conductive strips fixed to a sheet having perforations therein so that the strips overlie rows of corresponding perforations or holes in the sheet.

The above-described and other advantages of the present invention will be better understood from the following description when considered in connection with the accompanying drawings.

In the drawings, which are to be regarded as merely illustrative:

FIG. 1 is a perspective view of a control arrangement constructed in accordance with the present invention;

FIG. 2 is a bottom plan view of a card employed with the arrangement shown in FIG. 1 showing perforations;

FIG. 3 is a sectional view of a portion of a laminated card taken on the line 3–3 shown in FIG. 2; arrows indicate direction of view;

FIG. 4 is another sectional view through the card and certain apparatus shown in FIG. 1;

FIG. 5 is a perspective view of the arrangement shown in FIG. 1 with the lid of the box open;

FIG. 6 is a diagrammatic view of the control system of the present invention;

FIG. 7 is a perspective view of an alternative embodiment of the invention;

FIG. 8 is a top plan view of one of a series of three pins which are employed with the embodiment shown in fIG. 7;

FIG. 9 is a longitudinal view of the pin taken on the line 9–9 shown in FIG. 8;

FIG. 10 is an enlarged sectional view of the embodiment shown in FIG. 7 with one pin inserted therein;

FIG. 11, 12 and 13 are diagrammatic views of alternative embodiments of the present invention;

FIG. 14 is a perspective view of a control card employed with another embodiment of the present invention;

FIG. 15 is a perspective view of a control housing for use with the card of FIG. 14;

FIG. 16 is a sectional view of the card shown in FIG. 14;

FIG. 17 is a sectional view of the card of FIG. 14 demonstrating how it is used; and

FIG. 18 is a sectional view of a card which may be used in lieu of the card of FIG. 14.

An arrangement 10 is shown in FIG. 1 having a lead-in cable 11 to a box or housing 12. Housing 12 has a lid 13 which has slight depressions 14, therein. It is covered by a perforate template 13'. Lid 13 may be locked at 13''. Template 13' has holes 14' which are in registry with depressions 14.

A card 15 is shown in FIG. 2. Depressions in card 15 are made as indicated in FIG. 4, causing a metallic strip in the card to be deformed to protrude through perforations in the card. The card is then used between box lid 13 and box 12 to contact certain conductive strips to be described.

Although card 15 may be made solely of two layers, it is shown having three layers in FIGS. 3 and 4. Card 15 has an upper layer which may be used for advertising matter.

Card 15 as shown in FIG. 3 and FIG. 4 is a laminated affair having an upper nonconductive layer 18, an intermediate layer of spaced conductive strips 19 and a lower nonconductive layer 20 which has perforations 21 therein. The spaced conductive strips in the card and the spaced conductive strips shown in FIG. 7 as 105 may both be referred to as the top grid.

As shown in FIG. 4, conductive strip 19 is bent out or shape and protrudes at 22 through a hole in nonconductive sheet 20. The protrusion is produced by the use of a stylus 17.

Template 13' has holes in registry with depressions 14 in lid 13. Template 13' therefore guides stylus 17 through layer 18 and a conductive strip 19, and through a perforation 21 into a corresponding depression 14.

No indentation is shown in any strip 19 in FIG. 3. In other words, FIG. 3 is a showing prior to the time indentations are made in strip 19 as in FIG. 4.

According to the specific embodiment selected, three such protrusions 22 must be provided on the same strip in the card 15.

As shown in FIG. 5, housing 12 has a series of conductive strips 23 which are connected to a mechanism inside housing 12, as will be explained. If desired, a sufficient number of strips 24 may be provided for each day of the week or for a longer period of time, as will be explained. A second set of strips 25 may be provided to indicate which channel on a television receiver could be selected. For this reason, if desired, the number of strips 25 may be equal to the number of television channels available for reception. The remainder of the strips 26 on the exterior of housing 12 may be equal in number to 48 to correspond to the 48 one-half hours in each day. Alternatively, the number of strips 26 may be sufficient only for the hour and one-half hours between 8:00 o'clock in the morning and 11:00 o'clock at night, if desired. They may be divided, as shown, to provide for an on the hour group and an on the half hour group selection, one group above the other. The conductive strips 24, 25 and 26 may be referred to as the lower grid.

As stated previously, a card 15 to be used must have three conductive projections such as projection 22 for a single strip to energize the control system for one television program at one particular time of the day, at one particular time during the week, and on one particular channel.

As shown in FIG. 6, a conductive strip 27 is provided to demonstrate how the system operates. Only one conductive strip 27 is shown in FIG. 6. However, note will be taken that a conductive strip 27 must be provided for each program selected. Conductive strip 27 is formed as one of several conductive strips which may be formed in card 15. It has depressions 22', 22'' and 22'''.

A television tuner is indicated at 28. Tuner 28 is driven by a tuner drive mechanism 29. The television set has a bipolar relay switch 30 which has two input leads 31 and 32. When input lead 31 receives a signal, the television set is turned on. When the switch 30 receives a signal on lead 32, the television receiver is turned off.

The system has a clock 33 which makes one rotation every 24 hours. It is called a one-half hour clock both to distinguish it from what is called the day clock, to be described later, and because it changes certain electrical contacts each one-half hour of the day. This clock is driven by a synchronous motor 34. Motor 34 drives a wheel 35 which has projections 36 and 37 thereon. The system has a solenoid 38 with an armature 39 and a coil 40. Armature 39 has a leaf spring 41 at the end thereof to be engaged by projections 36 and 37 on wheel 35. It is the engagement of one of the projections 36 and 37 on wheel 35 with leaf spring 41 which, in fact, initiates a television program or turns the set off through switch 30. When projection 37 moves leaf spring 41, contact 42 engages a conductive arm 44 which is connected to a power supply via lead 45. When contact 42 engages arm 44, solenoid 38 is immediately energized and draws a pole 46, which is connected to a power supply via lead 45 against a contact 47. Solenoid 38 is energized from a circuit through the power supply via arm 44 through contact 42 which leads to one side of the winding of solenoid 38, the other end of winding 40 being connected to common power supply lead 46.

Energization of solenoid 38 retracts armature 39 so that leaf spring 41 likewise is drawn downwardly as viewed in FIG. 6. This pulls leaf spring 41 away from projection 37 and causes it to snap back behind it. In this case, contacts 42 and 43 are broken. Although one side of solenoid winding 40 no longer receives power through contact 42 solenoid 38 is continued to be energized through a normally open contact 48 which is engaged by pole 49 of a relay 50. One side of the winding of relay 50 is connected to the common power supply lead 46 at 51. The other side of the winding of relay 50 is connected to a brush contact 52 via a lead 53.

Part of the tuner drive mechanism 54 has an inner conductive disc 55 and an outer conductive ring 56 which are spaced by an insulating ring 57. Rings 55, 56 and 57 are joined together to form a unitary structure and as such are driven together by motor 29. Disc 56 has a notch 58. Motor 29 drives discs 55 and 56 until any one of a plurality of contacts 59 reside in notch 58 and lead 53 is not connected through ring 56 with a conductive power carrying brush contact 59. Brush contacts 59 are flexible so that the ones not carrying power can go into notch 58 and out again until notch 58 picks out the power carrying contact 59.

As shown in FIG. 6, a contact corresponding to metal strip depression 22''' is the only contact which receives electrical power, Motor 29 will then not drive discs 55 and 56 and they will remain stationary and solenoid 38 and relay 50 will both be deenergized instantaneously. Motor 29 may be driven continuously or may be a stepping switch or stepping motor of the type described in U.S. Pat. Nos. 2,501,950 and 2,932,812. Should notch 58 be in a different position from that shown in FIG. 6, motor 29 will drive discs 55 and 56 until contact 59 becomes in alignment with notch 58. When no such alignment exists, relay 50 is energized and contact 48 thereof is closed to pole 49. This keeps solenoid 38 energized through contact 48, arm 49 and through a day clock 60.

Arm 49 of relay 50 receives power incoming from power supply lead 45 through day clock 60. The appropriate brush 59 receives power from power line lead 45 through a metal strip depression 22''. This power is transmitted through contact 47 through a lead 61 through a wiper 62 on a one-half hour clock 63.

As stated previously, wheel 35 and one-half hour clock are driven synchronously by clock motor 34. Day clock 60 is driven in a step fashion by a stepping motor 64 every 24 hours.

To operate day clock 60, a solenoid 65 similar to solenoid 38 is employed. It has an armature 66 and a winding 67.

One-half hour clock 63 has an arm 68 which closes a contact 69 to a pole 70. Solenoid 65 is then energized and the momentary contact of contact 69 with arm 70 advances day clock 60 one day. The contact is only momentary because solenoid 65 pulls a leaf spring 71 away from projection 68 and leaf spring 71 snaps back to the open position between contact 69 and arm 70. Day clock 60 has a wiper 72 that engages contact 73. Like brush contacts 74 are provided to contact a projection 75 on disc 55. Brush contacts 74 do not contact ring 56. Wiper 76 contacts disc 55 but does not contact ring 56.

Tuner drive motor 29 is connected to power supply common lead 46 by a connection 77. A relay 78 connects drive motor 29 to power supply lead 45 through a conductor 79. Conductor 79 is connected to a pole 80 which engages a contact 81 connected to motor 29. Note will be taken that one side of the relay winding 78 is connected to the common power supply lead 46 through a connection 83. Relays 78 and 50 are thus connected in parallel and are energized simultaneously.

One-half hour clock 63 with wiper 62 connects one of a plurality of contacts 82 corresponding to each one-half hour during the day. Note will be taken that at the end of each one-half hour, the television set is turned off because contact 42' which is attached to armature 39 is normally in contact with 43 and is not drawn away from contact by retraction of armature 39 until after a signal has been transmitted to switch 30 on line 32. Contact 43 is connected to switch 30 via lead 32. Contact between 42' and 43 is broken before contact is made between 46 and 47. Switch 30 is turned on whenever one of the brushes 74 engages projection 75 on disc 55.

One of the strips shown as 24 must be contacted by a depression in 27, such as 22', to select the day. One of the strips shown as 26 must be contacted by a depression in 27, such as 22'', to select the time of day. One of the strips shown as 25 must be contacted by a depression in 27, such as 22''', to select the channel. Note will be taken that so long as three depressions, such as 22', 22'' and 22''', are not made in one of connecting strips 27 as shown in FIG. 6, or in one of strips 19 as shown in FIGS. 3 and 4, to contact one of each of said strips 24, 25 and 26, tuner 28 will not be driven by motor 29. This is true because solenoid 38 self-locks through contact 48 and arm 49 of relay 50 through day clock 60. If no depression 22' is made, solenoid 38 simply will be energized each one-half hour and will then be immediately deenergized. Similarly, if no depression 22 is made to contact one of strips 26, no power from power supply lead 45 will be provided to either day clock contact 73 or to drive motor 29. The reason for this is that neither day clock contact 73 nor motor 29 will receive power because wiper 62 will be engaged with contacts 82 which are deenergized.

Again, if no indentation 22''' is made in strip 27, motor 29 cannot receive power to turn it because motor 29 receives power through brush contact 52, and ring 56 will receive no power through any one of the brushes 59, etc.

In the operation of the system of the present invention, if any one of the indentations 22', 22'' and 22''' is not made, switch 30 will always be turned off by the momentary energization of solenoid 38.

There are only tow other possibilities of operation. One is that tuner 28 is already positioned at the correct channel. This happens when the indentations 22', 22'' and 22''' are made as shown in the drawing. In this case, solenoid 39 will be energized. Power will be supplied to strip 27 through lead 61, wiper 62 and a corresponding metal strip 26. Even though day clock wiper 72 is positioned at an appropriate contact 73 connected to a corresponding metal strip 24, solenoid 38 cannot self-lock because relay 50 will not be energized. This is due to the fact that brush 59 extends in notch 58 of ring 56 and is not therefore connected thereto. Nevertheless, switch 30 will be turned on. This is true because the brush contact 74 corresponding to brush 59 will engage projection 75 on disc 55 and brush 76 will be connected through lead 31 to the on connection of switch 30.

In the operation of the system of the present invention, when notch 58 is located at some position straddling brushes other than brush 59, ring 56 will receive a signal causing relays 50 and 78 to energize. Solenoid 38 will then self-lock through contact 48 and arm 49 of relay 50 until notch 58 straddles the brush corresponding to metal strip 25 where an indentation of strip 27 comes into contact with it. As soon as this happens, both relays 50 and 78 will deenergize. The self-locking contact 48 with pole 49 will then open and deenergize solenoid 38.

Note will be taken that a principal current path from lead 45 is through contacts 47 and 42 through half hour clock 63. The current path then divides at indentation 22'' and goes to both indentations 22' and 22'''. From indentation 22' the current path is through day clock 60, through contacts 49 and 48 and through relay winding 40 to power supply lead 46.

From indentation 22''', the current takes two paths. One is through a brush contact 59 to ring 56 and thence to power supply lead 46 through relays 50 and 78. The other path is through a corresponding brush 74, through disc 55, and through brush 76 to switch 30.

An auxiliary path from lead 45 is through contacts 69 and 70 and through solenoid winding 67 to power supply lead 46.

In the drawing in FIG. 7, an alternative embodiment of the invention is indicated at 100. It includes a housing 101 which has a lid 102. Lid 102 is hinged to housing 101 by hinges 103 and 104. Lid 102 carries the same number of conductive strips 105 that card 15 shown in FIG. 2 carries. When lid 102 is closed, it rests upon stops 106 and 107 on housing 101.

Housing 101 carries conductive strips 108 that are arranged in the same position as strips 24, 25 and 26, shown in FIG. 5. However, strips 108 are provided with holes 109 therethrough. Housing 101 has a top 110 which has holes 111 that register with holes 109. Stops 106 and 107 prevent strips 105 from contacting strips 108. Three pins are provided to select a single program which makes contacts corresponding to the contacts that depressions 22', 22'' and 22''' make as shown in FIG. 6. One such pin is indicated at 112 in FIG. 8. It is provided with a vertical shaft 113 out from which a radial leaf type spring 114 extends. As shown in FIG. 9, spring 114 is similar to a Belleville spring. The manner in which pin 112 is assembled with housing 101 and lid 102 is shown in FIG. 10 to make contact between a metal strip 105 and a metal strip 108. Any other type of selector pin designed to effect contact between the lower and the top grids of contact strips is an acceptable substitute for the pin described.

Note will be taken that any means may be provided to make contact between the top grid and conductors 24, 25 and 26. Printed conductive ink on a card might serve the same purpose. The same may be true of a punched card between the lid 102 and the housing 101, which lid or housing would carry spring loaded metal projections to effect contact between the top and bottom grids through holes selectively punched in the card to effect the desired selection of day, time and channel. Further, any conventional gate operated mechanism may be employed to energize tuner motor 29. Other means may be also provided to make a momentary contact as did the springs 71 and 41 on solenoid armatures 66 and 39, respectively.

It will also be apparent that the design of the card 15 and the design of the conductive strips 24, 25 and 26 may be varied without departing from the invention.

Note will be taken that the device of the present invention may be employed to program any set of sequential operations such as turning on lawn sprinklers or electrical lights. It will also be apparent that the device of the present invention can be operated to provide a program for both radio and television programs.

The device of the present invention thus presents a comprehensive plan for programming. Such may be used in the programming of magnetic tape recorders, electric stoves and washing machines. Lawn sprinklers or electric lights which are controlled by bipolar relay switches may be programmed in a variable preselected sequence to turn on one at a time or in any combination. More than one unit may be turned on at once by simply selecting more than one contact at the channel

strip portion of the lower grid in one of the ways already described. Employment of this invention for such purpose permits a simpler mechanism to be employed as indicated in FIG. 11.

A system for turning electric lamps or sprinkler valves on or off is shown in FIG. 11. A strip of metal 115 is provided as before with corresponding housing strips 116, 117 and 118. A connection is made between strips 115, 116, 117 and 118 at indentations 119, 120 and 121 in strip 115. A day clock 122 is provided which may be identical to day clock 60 shown in FIG. 6. Similarly, a half-hour clock 123 is provided which may employ a stepping motor as day clock 122 does. Such a motor is indicated at 124.

Day clock 122 has contacts 125 against which a wiper 126 operates. Wiper 126 is connected serially with a relay 127 having normally open contacts 128 and 129.

A wheel 130 is provided having projections 131 and 132 thereon to close normally open contacts 133 and 134. Wheel 130 is driven at a constant speed as before. This energizes a relay 135 that pulls portion 136 of armature 137 away from projection 131 and allows contacts 133 and 134 to open. Contacts 138 and 139 are normally closed and are opened upon energization of relay 135.

A bipolar relay switch 140 is provided to energize each electric lamp or each sprinkler head valve.

Power is supplied to the system of FIG. 11 by leads 141 and 142. Strips 116 are connected to corresponding contacts 125 on day clock 122 by leads 143. As before, half-hour clock 123 has contacts 144 engaged by a wiper 145. Strips 117 are connected to contacts 114 by corresponding leads 146.

Strip 118 is connected to the "on" side of bipolar relay switch 140 by a lead 147. A common lead for bipolar relay switch 140 is provided at 148 from relay contacts 128. Contact 138 is connected to the "off" side of bipolar relay switch 140 by a lead 149.

Relay 127 has a winding 150 which is connected to power supply lead 142. Power supply lead 141 is connected to contact 134. Relay 135 has a winding 151 which is connected from power supply lead 142 to contacts 139 and 133. Stepping motor 124 is connected in parallel with relay winding 151. Wiper 145 of half-hour clock 123 is connected at 152 to contact 133.

In the operation of the embodiment of the invention shown in FIG. 11, bipolar relay switch 140 is maintained off normally by normally closed contacts 138 and 139. When proper indentations are made in strip 115, relay 135 is energized through contacts 133 and 134.

Contacts 138 and 139 break prior to the time that contacts 133 and 134 break.

In the operation of the invention of FIG. 11, contacts 133 and 134 are made by projection 131 or projection 132. If day clock 122 is in the correct position, contacts 128 and 129 close. This permits bipolar relay switch 140 to be turned on through clock 123. Otherwise, bipolar relay switch 140 is turned off by closure of contacts 138 and 139.

Lawn sprinklers, electric lights, or other devices requiring that current be maintained, may be programmed in a variable preselected sequence, individually or in any combination in the manner indicated above. Employing this invention for such purpose permits the use of an even simpler mechanism as indicated in FIG. 12.

An alternative embodiment of the invention to turn lamps or sprinkler heads on is shown in FIG. 12. The system is the same as that shown in FIG. 11 including the use of strip 115' and strips 116', 117' and 118'. Bipolar relay switch 140 is not used. Day clock 122', identical to day clock 122, is used. Similarly, a half-hour clock 123' identical to half-hour clock 123 is employed. A solenoid drive for clock 123' is provided at 124'. Day clock 122' has contacts 125' and a wiper 126' which is connected to a winding 150' of a relay 127'. Relay 127' has contacts 153 and 154 which are connected from a power supply lead 155 to a wiper 145' on clock 123'. Winding 150' of relay 127' is connected to a power supply lead 156. A synchronous hour clock 130' is provided having projections 131' and 132'. A relay 157 is provided with a pair of contacts 158 and 159 which actuate it. Relay 157 also has a pair of contacts 160 and 161 which actuate solenoid drive 124'.

In the operation of the invention shown in FIG. 12, projection 131' or 132' closes contacts 158 and 159. This supplies current to clock 123' and to relay 127' through clock 122'. Contacts 153 and 154 therefore close. Each appropriate light or sprinkler selected is then maintained energized for one-half hour through contacts 153 and 154. Contacts 160 and 161 advance clock 123' through solenoid drive 124'.

It is contemplated that low voltage current would be preferred for most of the uses above-mentioned in the interests of safety, but where this is not a governing factor, higher voltages may be used with appropriate provision against arcing and by employment of sufficiently rugged equipment.

Note will be taken that the present invention may be designed to control the closure of electrical contacts at preselected times on an annual basis. This can be accomplished by converting the day clock 60 in FIG. 6 from a 7-day clock to a 336-day clock and providing 24 connecting strips, such as 24 on the lower grid in FIG. 5. The first four of such strips from left to right would represent hundreds of days, the next 10 would represent tens of days and the next 10 would represent individual days.

Each of the contact strips mentioned above would represent a number. The first group would represent 0, 1, 2 and 3. The second and third groups, numbers 1 to 9, inclusive, respectively, each plus 0. This arrangement permits the designation of a particular day of the year by choosing a number from each of the groups as necessary.

The choice of the appropriate day would be programmed by making depressions as necessary in card 15 at points which would form contacts with the indicated strip or strips as already described.

The clock would advance in steps, one step each day. The clock's hand would be equipped with three separate brushes insulated from one another. Each day the said brushes would make contact with three contact points on the face of the clock, such as 73. As the clock advanced one step to the next day, the brushes would be brought in contact with another set of three contact points just as clock hand 72 makes brush contact with a succession of contact points 73 as it is advanced from day to day.

The three contact points would be appropriately wired to the lower grid strips in combination so that the three contact points on the clock face at a given position would numerically represent a particular day of the year. The next succeeding group of contact points constituting the next step of the clock would be wired to a numerical combination representing the next succeeding day.

Each of the brushes on clock hand 72 would be connected to an electrical relay which normally would be open but would close when the current flowed between a grid strip and the relay by way of a contact point on the clock face and a brush on the clock arm. The relay contacts of the three relays closed in the manner described would be wired in series between 45 and 49. Only when all three of the relays closed would they permit current to pass from the power source 45 to 49. The device would otherwise operate as already described.

If the day to be selected is prior to the hundredth day, the selection of number 0 of the first four numerals marking hundreds of days must be made. If the day selected is less than the 10th day, number 0 from the first four numbers and number 0 from the next 10 numbers must be selected in addition to the day itself. For example, to program the seventh day of the year, a selection of numbers reading 007 must be made.

The foregoing description of a means for extending the programming time of this invention from seven days to a year or more made reference to contact points being positioned on the face of a clock to be contacted by brushes on the clock hand as the most readily understood explanation of the princi-

ple because of the convenience of reference to FIG. 6. It will be readily understood that any other form of step mechanism suitably combined with contact strips which permit program selecting in the manner described in this invention daily, weekly, monthly, or annually, or in other time combinations, is equally suitable and the invention should not be limited by the foregoing description which was for illustration only.

A device to be used in lieu of day clock **60** in FIG. **6** is shown in FIG. **13**. A day clock **162** is provided having sets of contacts **163**, **164** and **165**. A strip **166** is provided as before. A set of four strips is provided at **167**. A set of 10 strips is provided at **168**. A set of 10 strips is also provided at **169**. One of the strips **167** is connected to a series of contacts **163**. Each one of the strips **168** is connected to a series of contacts **164**. Each one of the strips **169** is connected to one of the contacts **165**. Day clock **162** has a wiper **170** that contains three brushes, one for each set of contacts **163**, **164** and **165**. Wiper **170** also has slip rings which are connected to three corresponding pairs of relays **171**, **172** and **173** having normally open contacts **174**, **175** and **176**, respectively, connected serially with input power supply lead **46**.

One of the four strips **167** is selected corresponding to hundreds of days. A strip **168** is selected depending upon the number of tens of days. A strip **169** is selected depending upon the number of tens of days. A strip **169** is selected depending upon the number of units of days.

An alternative card **200** is shown in FIG. **14**. Card **200** incorporates both upper and lower grids. Card **200**, other than the conductors therein, may be made of three layers **201**, **202** and **203** of any convenient insulating material such as paperboard or paper. Layers **201** and **203** are solid. Layer **202** has holes **204** therethrough. Layer **201** has the lower grid cemented thereto including conductive strips **205**. Layer **203** has the upper grid cemented thereon including conductive strips **206**. Strips **205** and **206** are also cemented to layer **202**. Strips **205** and **206** may be made from aluminum foil or thin sheet material of, for example, copper.

A control housing **207** is shown in FIG. **15**. As before, housing **207** has a lid **208** hinged thereto and a template **209** hinged to lid **208**. Housing **207** also has conical pins **210** projecting upwardly from the upper surface thereof. Pins **210** are connected, for example, to the leads from strips **24**, **25** and **26** shown in FIG. **6**.

As shown in FIG. **16**, a strip **205** overlies each transverse row of holes **204** in layer **202**. A strip **206** underlies each longitudinal row of holes **204**.

As shown in FIG. **17**, lid **208** has recesses **211**, as before. Template **209** also has holes **212**.

In preparing card **200** to control the apparatus, card **200** is placed between template **209** and lid **208** as shown in FIG. **17**. Holes **204** in layer **202** are thus aligned with holes **212** in template **209**. Card **200**, template **209** and lid **208** may all have the same length and width so that when the edges of all three are flush, holes **204** lie in alignment with holes **212**. A stylus **213** is then pressed through a hole **212** to deform a strip **205** into contact with a strip **206**.

When card **200** has been s et up completely by the use of stylus **213**, it is removed from the space between template **209** and lid **208**. It is then placed between lid **208** and housing **207**. Layer **201** is then pressed, at its edges, onto pins **210** so that pins **210** puncture layer **201** and lie in contact with corresponding strips **205**. However, pins **210** will not contact strips **216**.

Layers **201** and **203** may be eliminated and strips **205** and **206** cemented to layer in FIG. **14**, if such layer **202** is rigid.

An alternative construction for the two grids **214** is shown in FIG. **18**. Part **214** has transverse conductive strips **215** and longitudinal conductive strips **216**, all of which may be embedded in plastic at **217**, as shown, taking the place of the construction shown in FIG. **10**. Strips **215** are electrically connected to strips **216** by tapered pins **218** which in this embodiment take the place of pin **212** as shown in FIGS. **9** and **10**. Pins **218** fit in corresponding tapered holes **219** through st rips **215** and **216** and through plastic **217**. Pins **218** may fit snugly in holes **219**.

Strips **215** form the lower grid and are connected, for example, to the leads from strips **24**, **25** and **26** as shown in FIG. **6**.

The present invention may be constructed of relatively simple and uncomplicated parts and will operate easily. Further, the cards **15** may be provided with advertising or with magazine premiums and the system may be used for setting out radio or television programs each week or month so that thereafter one need not pay any attention to the selection of a program.

Although only a few specific embodiments of the present invention have been described and illustrated herein, many changes therein and modifications thereof will of course suggest themselves to those skilled in the art. These few embodiments have been selected for this disclosure of the purpose of illustration only. The present invention should therefore not be limited to the embodiments so selected, the true scope of the invention being defined only in the appended claims.

I claim:

1. Control card apparatus selectively modifiable to produce a plurality of predetermined circuit paths therethrough, comprising:

a sheetlike insulative layer having a plurality of openings arranged in rows and columns;

a first set of conductors arranged in rows on one side of said layer in registry with associated layer row openings, said conductors being constructed of a material which maintains a deformed shape;

a second set of conductors arranged in columns on the other side of said layer and in respective registry with the column openings whereby each column conductor has a portion disposed over an opening communicating with each row conductor, said conductors being constructed of a material which maintains a deformed shape;

selected portions of the conductors lying opposite the openings being deformed through said openings to make electrical contact with conductors on the opposite side of the layer;

said selected interconnections between the sets of row and column conductors providing the desired predetermined circuit paths.

2. Control card apparatus as in claim **1**, in which those portions of conductors deformed through the openings for contacting associated conductors at the other side of the insulating layer are deformed a sufficient extent to deform those portions of the conductors which they contact.

3. Control card apparatus as in claim **1**, in which each set of conductors is provided onto a sheetlike insulative substrate which, in turn, is adhered to the insulative layer with openings, the entire assembly forming a laminate.