Aug. 9, 1949. R. R. HARRIS 2,478,482

ELECTRONIC TIMING DEVICE

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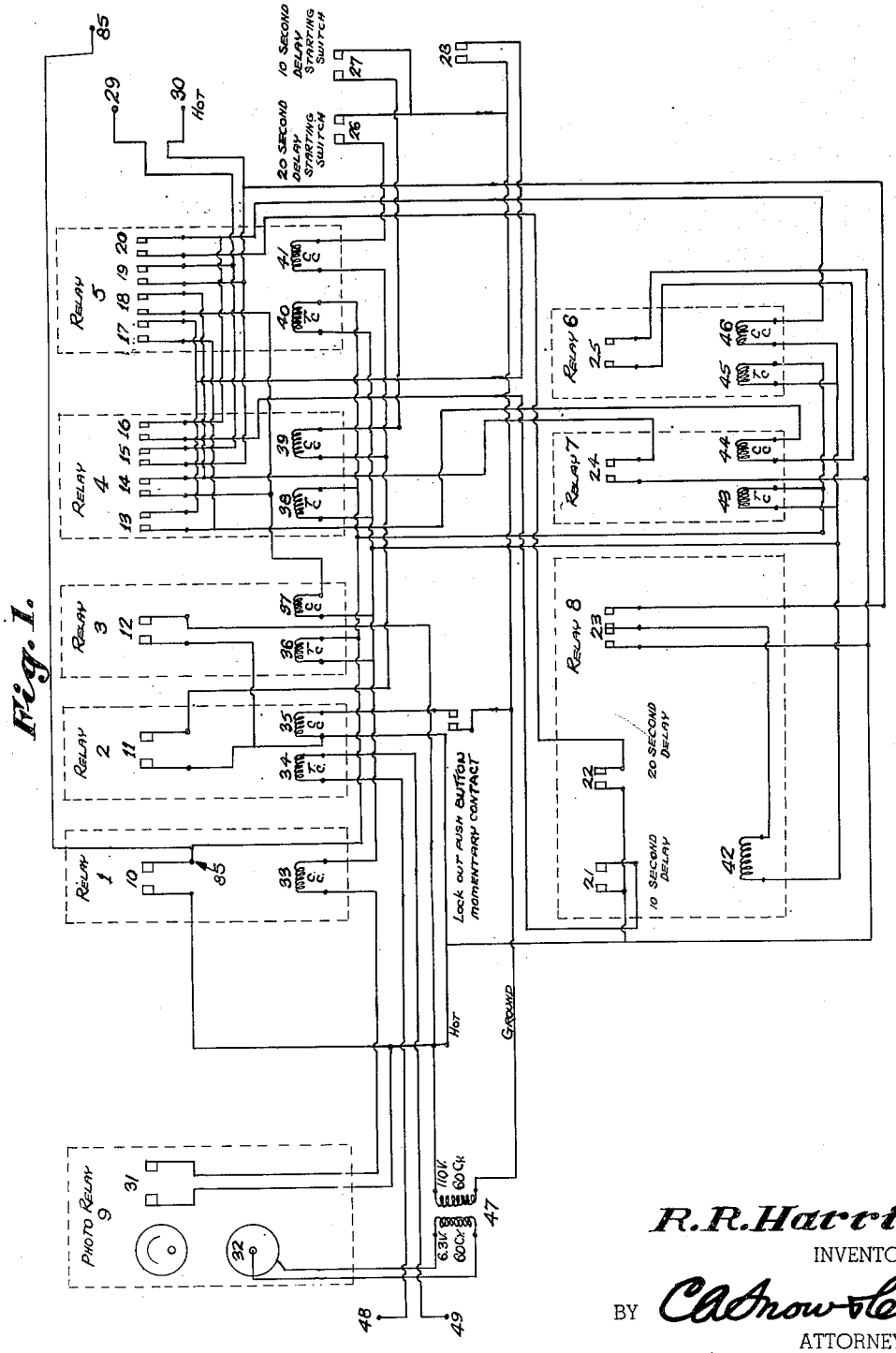



Fig. 1.

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BY C. A. Snow & Co.
ATTORNEYS

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ELECTRONIC TIMING DEVICE

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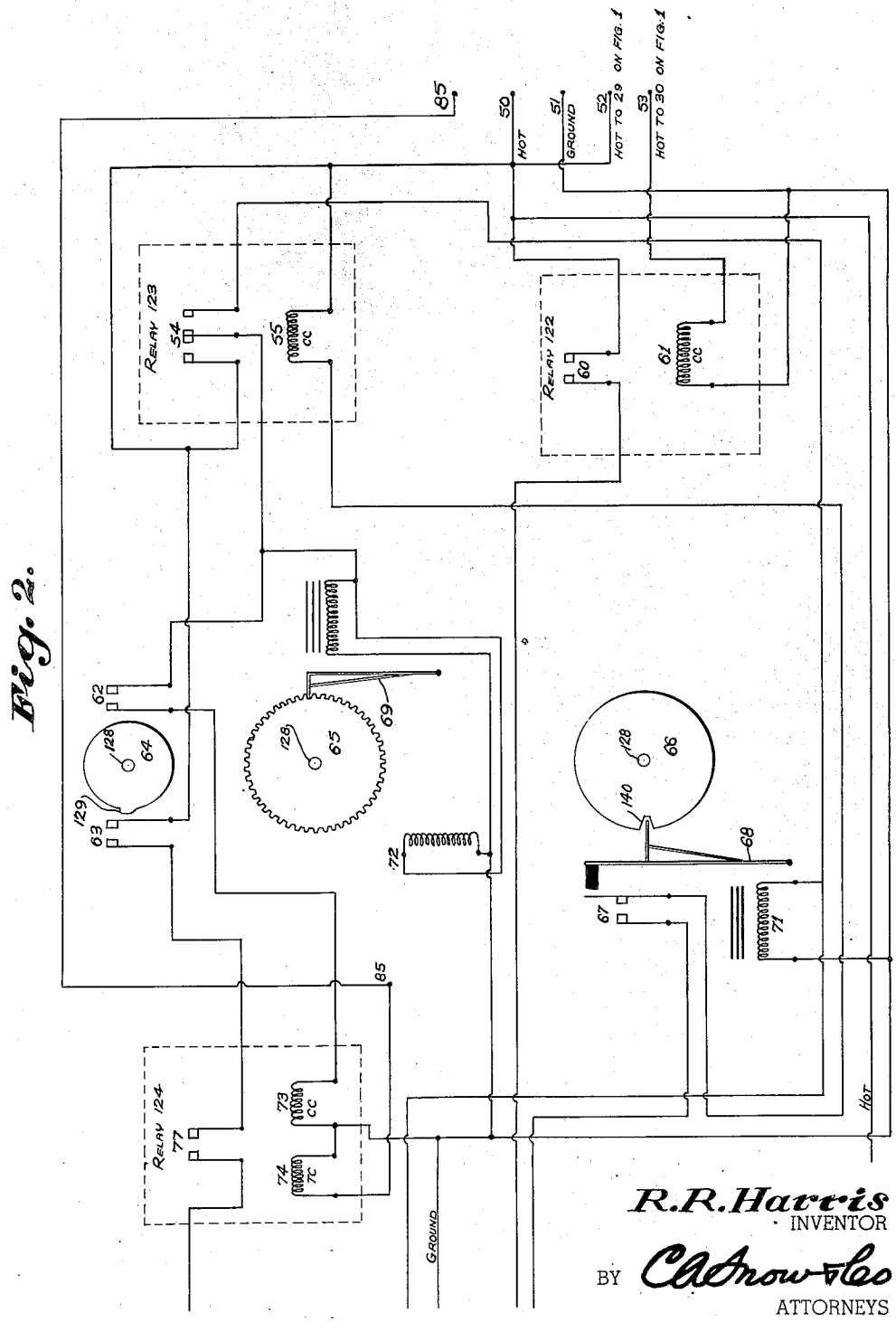



Fig. 2.

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ELECTRONIC TIMING DEVICE

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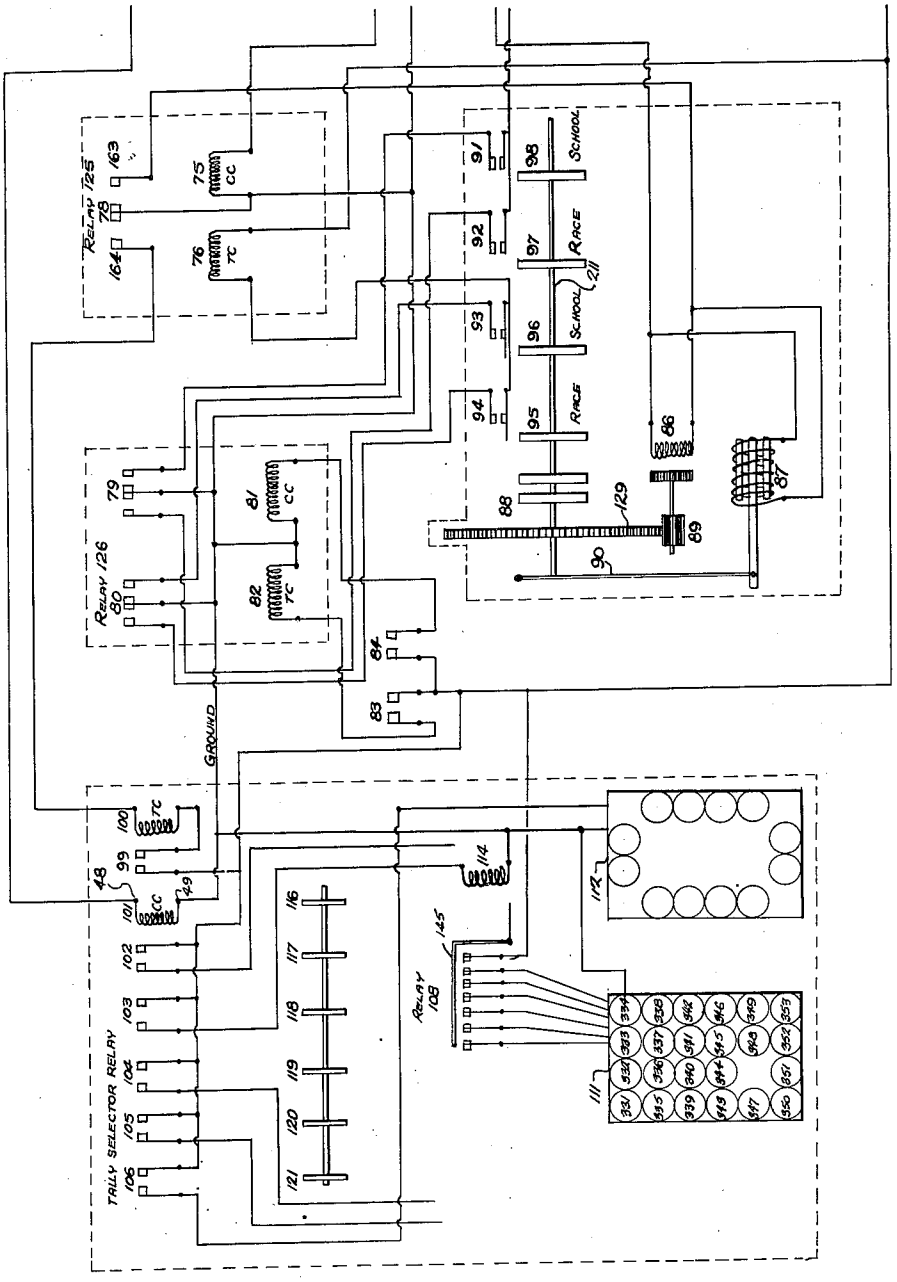



Fig. 3.

R.R.Harris
INVENTOR

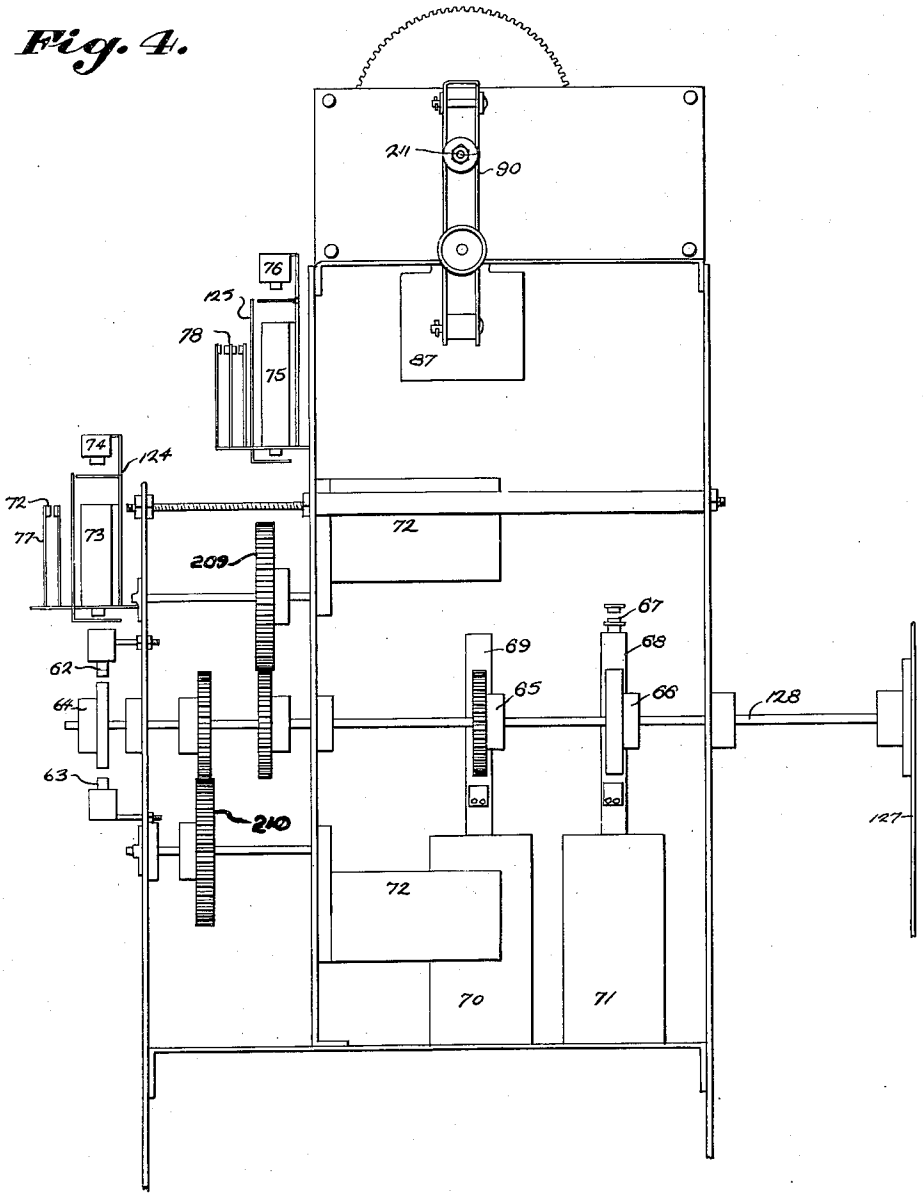
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Aug. 9, 1949. R. R. HARRIS 2,478,482

ELECTRONIC TIMING DEVICE

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Fig. 4.




R.R.Harris
INVENTOR

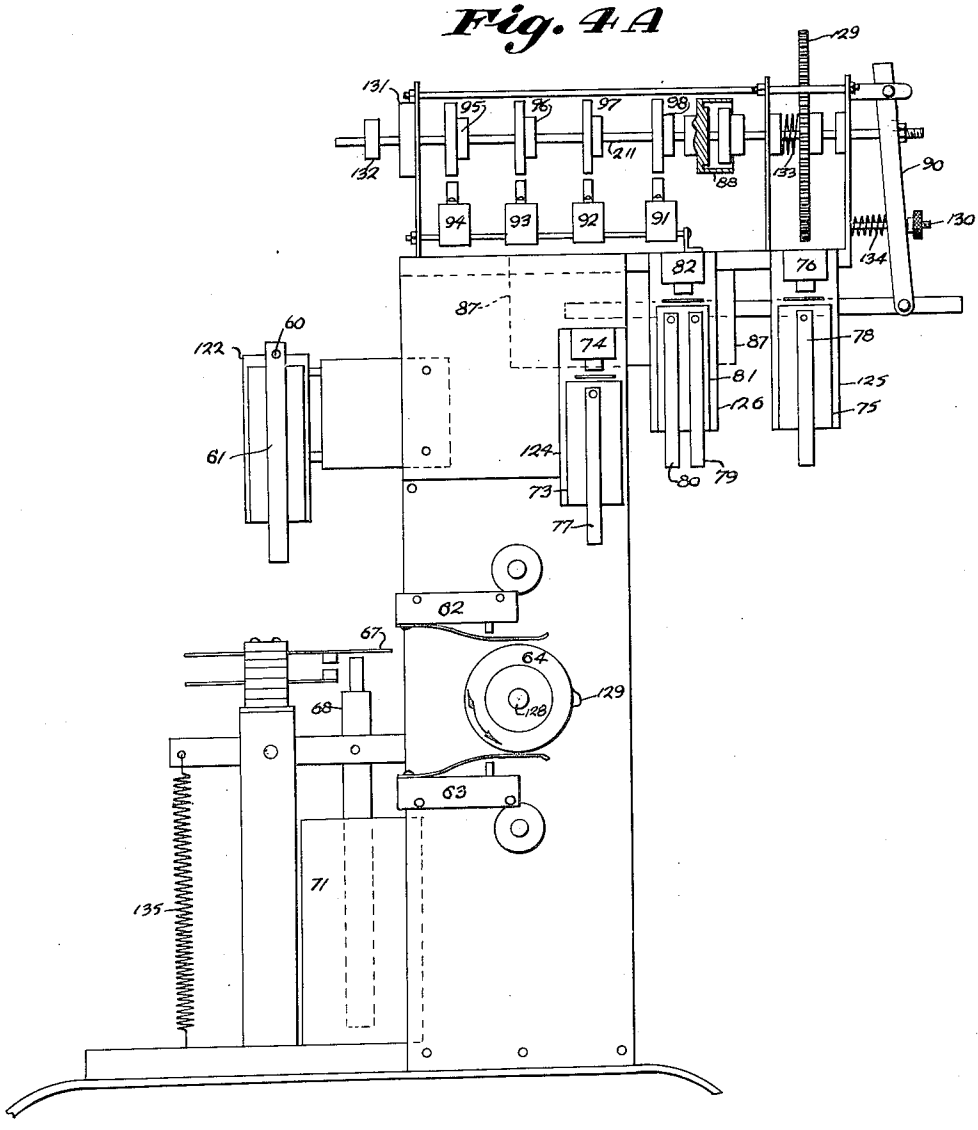
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Fig. 4A




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Fig. 5.

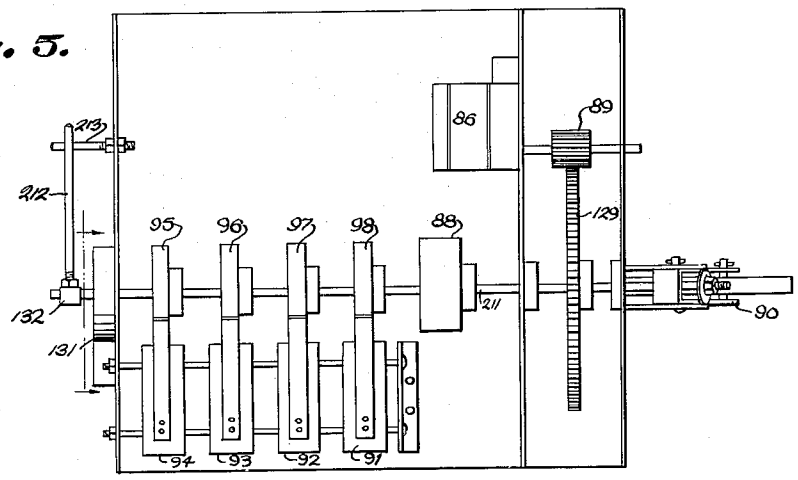
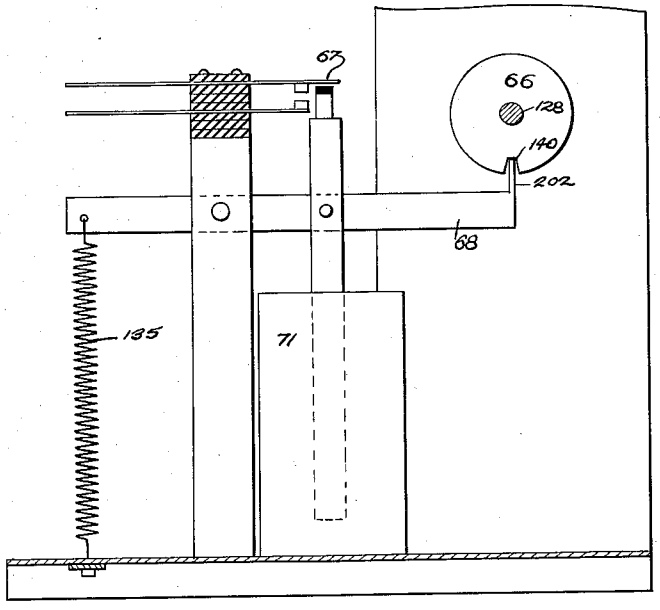



Fig. 6.



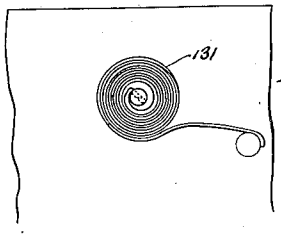




Fig. 16.

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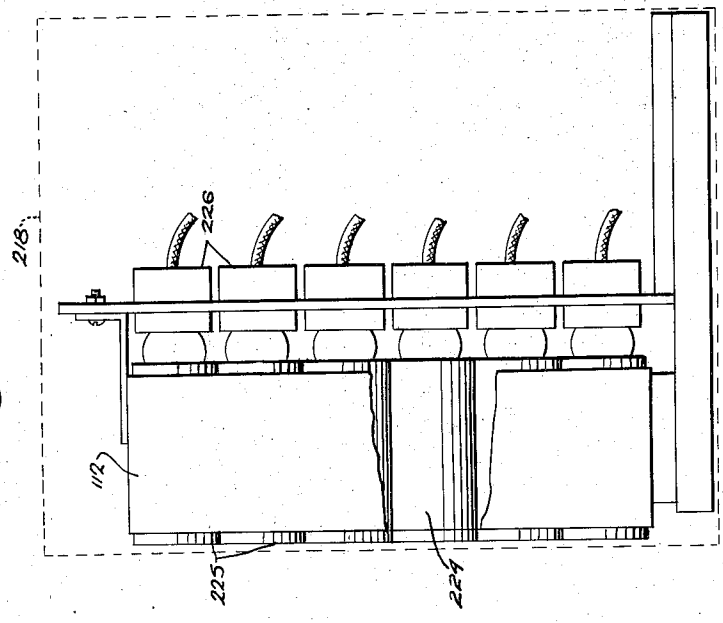



Fig. 8.

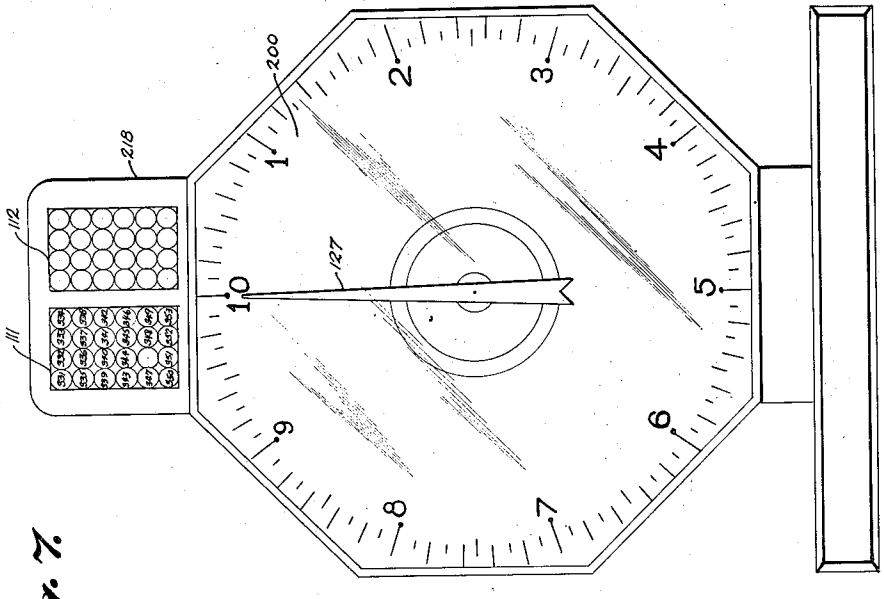



Fig. 7.

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ELECTRONIC TIMING DEVICE

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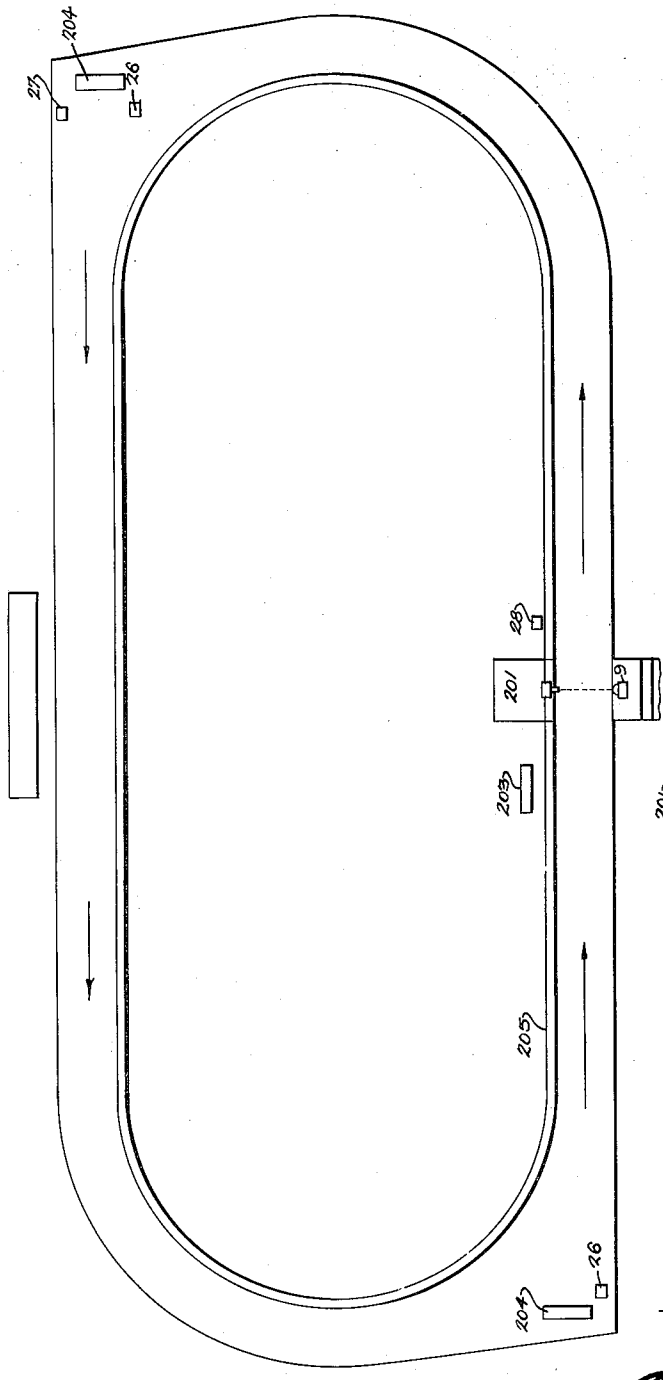



Fig. 9

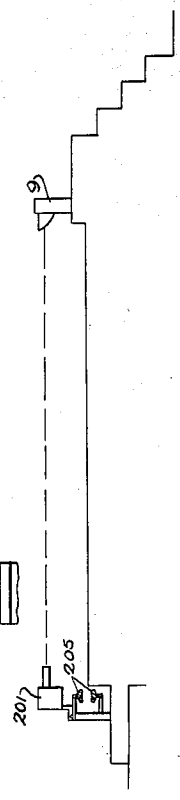



Fig. 10

R. R. Harris
INVENTOR

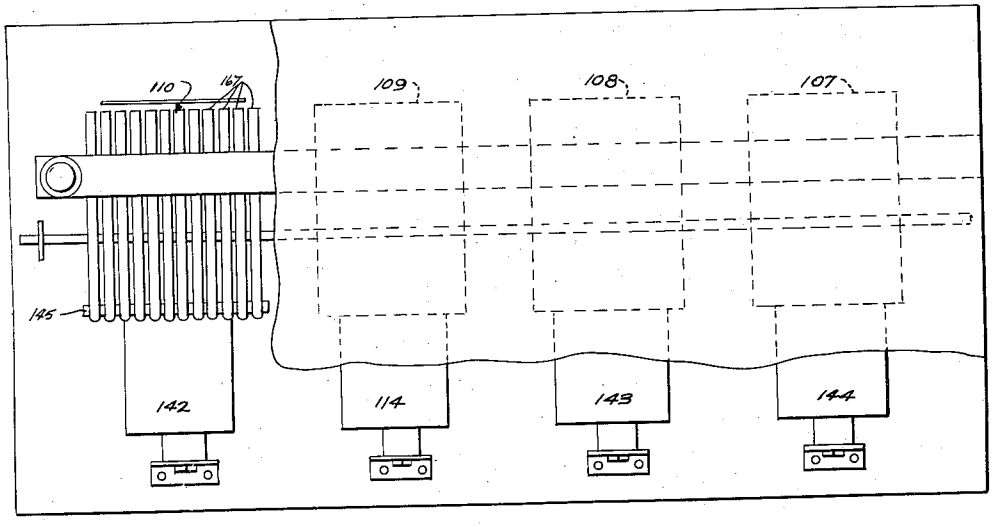
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ELECTRONIC TIMING DEVICE

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Fig. 17.



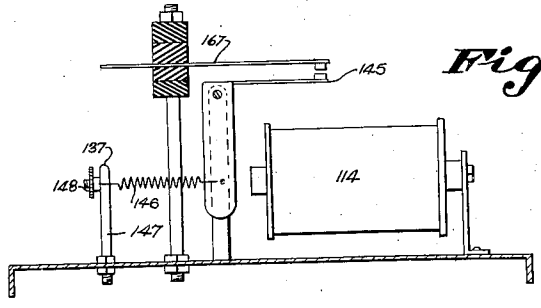




Fig. 18.

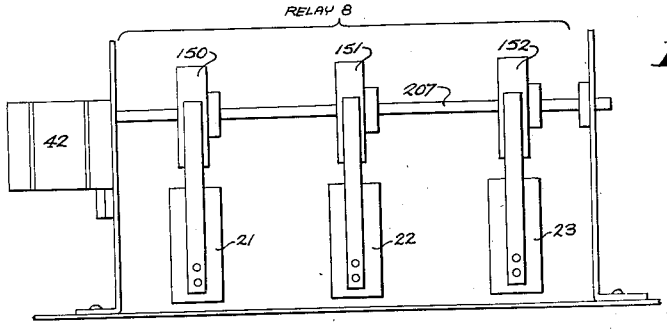



Fig. 11.

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ELECTRONIC TIMING DEVICE

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Fig. 12.

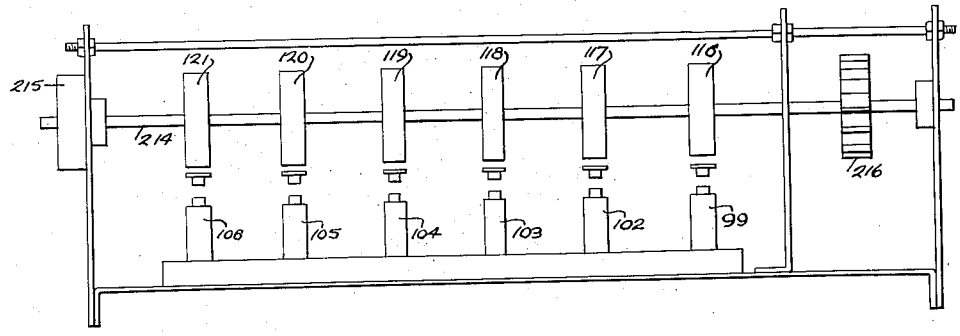
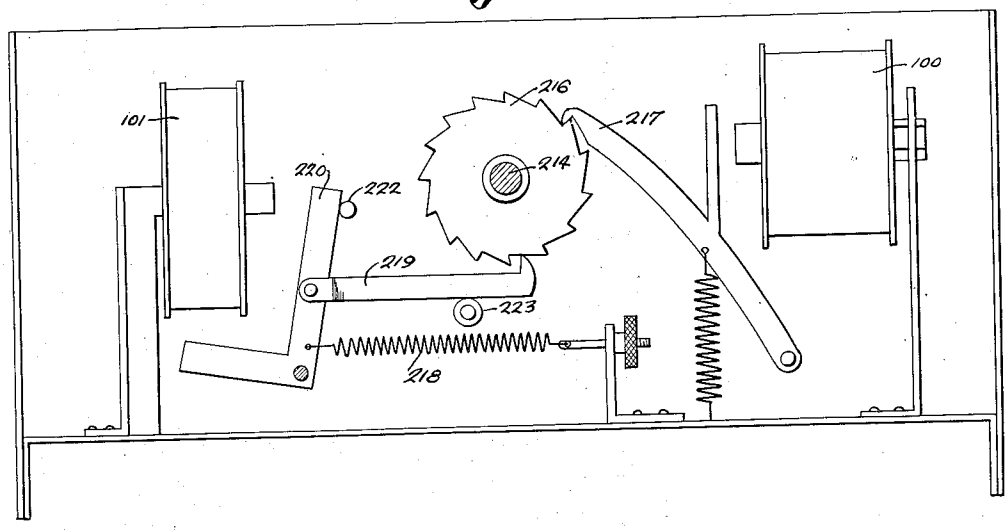



Fig. 13.




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ELECTRONIC TIMING DEVICE

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Fig. 15

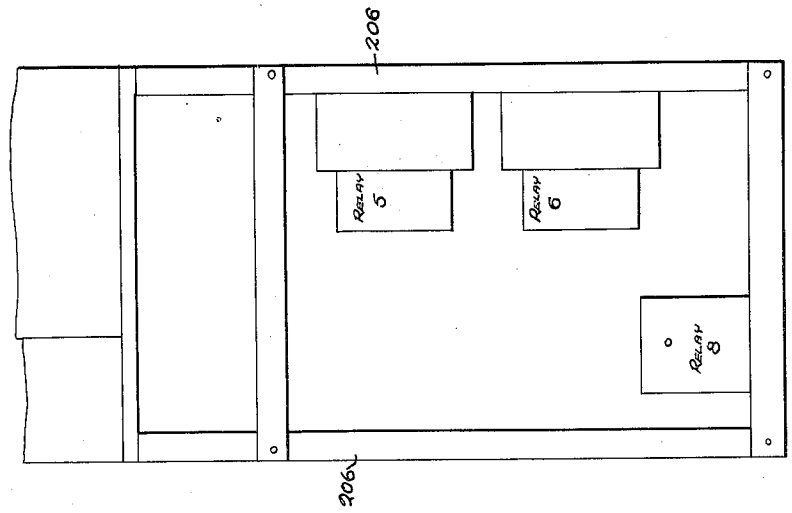
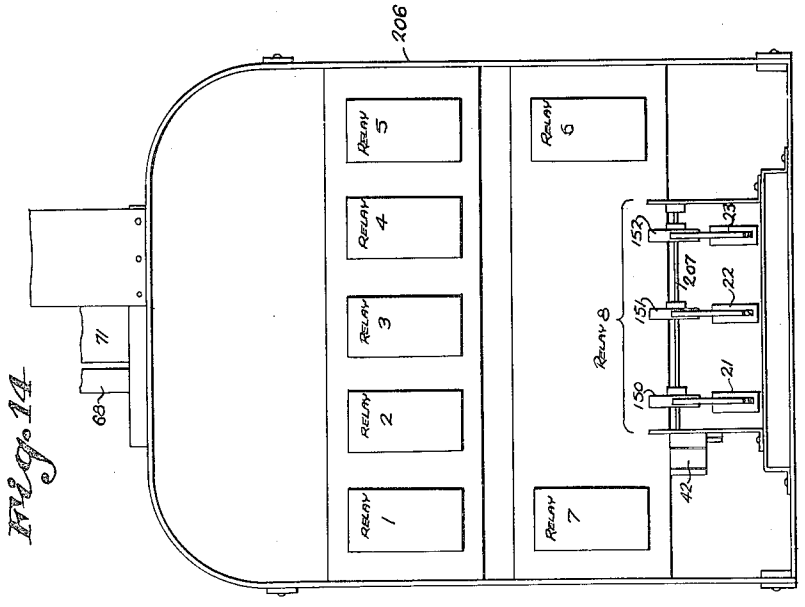



Fig. 14




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Patented Aug. 9, 1949 2,478,482

# UNITED STATES PATENT OFFICE

2,478,482

## ELECTRONIC TIMING DEVICE

Richard R. Harris, Ojus, Fla.

Application August 1, 1947, Serial No. 765,427

3 Claims. (Cl. 161—18)

1

This invention relates to improvements in timing devices, and more particularly to the provision of a timing device of the electronic type for timing sporting events such as dog and horse races, and the like.

Devices heretofore provided for timing races have been objectionable in that they were not automatic and required manual control which made them subject to errors due to the human factor. Also, the marking on dials used by such devices were crowded and close together rendering them illegible at great distances and difficult to read at short distances. Also, the photoelectric relay used in such devices will operate to stop the timer at any time the light beam is broken during the period of operation, and thus stopping the timer before the end of the event being timed. Further, such timers are capable of registering a time lapse no lower than 1/5 second, which is not close enough for accurate timing.

The device is truly automatic in that after the power is turned on by pushing a button, the device will time a race, stop for a predetermined interval, and reset itself for the timing of the next race. The timing operations and resetting will continue as long as the power is on.

An object is to provide an electronic timer which cannot be stopped until the end of a race. This is accomplished by placing a small auxiliary lamp in a photoelectric cell housing, which lamp constantly directs rays to the photo cell in addition to the rays from a second light across the race track, which second light has no effect on the small lamp rays until the lamp within the housing has been extinguished by the closing of a switch or the light by a lure, in the case of rabbit and greyhound races, and the second light takes control. When a dog passes the finish line, the beam from the second light across the track is interrupted and the photoelectric relay operates to instantly stop the timer. Thus, the operation of the timer cannot be stopped until the lure, which is the rabbit moving on a track, has closed the switch.

A further object is to provide a timing device which can be readily adapted and adjusted to accommodate peculiar and special incidents of racing competition between men, boats or aircraft, animals, vehicles, so that the winning speed by time-for-distance can be accurately determined and authoritative records established.

In greyhound racing where the competing animals are enticed and paced to greatest effort by electrically propelled and controlled lures, such as

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stuffed rabbits, the timer can be adjusted so that the forerunning lure or pace setter will not interfere with the timing of the competing dogs, irrespective of the number of times around the track that the particular race may be run.

These and other objects are attained by the novel construction and arrangement of parts hereinafter described and illustrated by the accompanying drawings, forming a part hereof and in which:

Fig. 1 is a schematic wiring diagram of a section of a timing device embodying the invention.

Fig. 2 is a further schematic wiring diagram tieing in with the diagram shown in Fig. 1.

Fig. 3 is a further schematic wiring diagram tieing in with the diagram shown in Fig. 2.

Fig. 4 is a side view diagrammatically showing the arrangement of parts in the device.

Fig. 4a is an end view of the device shown in Fig. 4.

Fig. 5 is a side view showing the arrangement of parts of a motor driven time relay.

Fig. 6 is a view showing the arrangement of certain parts of a relay used in the device.

Fig. 7 is a front view of a dial used in the device.

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 7.

Fig. 9 is a view showing the positioning of the timing apparatus on a race track.

Fig. 10 is a view showing the arrangement of a light source and a photoelectric relay relative to a track.

Fig. 11 is a view showing the arrangement of parts of a timing motor device used in the apparatus.

Fig. 12 is a view showing the arrangements of contacts of a tally used in connection with an indicating dial.

Fig. 13 is a view of a step by step ratchet device used in connection with the arrangement shown in Fig. 12.

Fig. 14 is a front view of the timing device.

Fig. 15 is a side view of the device of Fig. 14.

Fig. 16 is a view of a spiral spring used on a reset relay.

Fig. 17 is a diagrammatic view of sections of a tally indicator.

Fig. 18 is a view of an electro-magnet and contact making device for use with a section of the indicator.

In accordance with the invention, a photoelectric relay is mounted at the finish line of a race track, and is connected with a timing device having a dial as shown in Fig. 7, which is traversed

by a hand 127, made of Balsa wood or the like. The dial 200 which is a complete circle of 360° is divided into 10 sections, each of which is divided into 10 parts. The hand or pointer 127 makes 6 revolutions per minute, so that each small division on the dial represents $\frac{1}{10}$ second. The dial is preferably five feet in diameter and preferably made of sand blasted plate glass with the divisions marked in black, and the dial is illuminated from the rear enabling it to be read at a distance of 500 feet. The dial is unique in that a dial of 5 feet in diameter with the timing mechanism described herein enables spacing that would require a dial of 30 feet in diameter with other timing devices. The number of revolutions of the hand 127 can be increased from 6 per minute to any desired number.

Referring to Figs. 9 and 10, the arrangement of the apparatus on a track is shown. The photoelectric relay 9 is positioned on the side of the track opposite the lure car rail. A small lamp 32 located inside the photoelectric relay housing is so placed as to direct its light rays on to the photoelectric tube. This lamp keeps the photoelectric tube energized which causes it to generate a small electric current which is amplified and passed through the coil of a sensitive relay. As long as light falls on the photoelectric tube the relay remains open. Another light source 201 is located across the race track and so placed that the light from it is directed on to the same photoelectric tube. So long as the small lamp 32 inside the photoelectric relay housing is sending forth light rays and shines on the photoelectric tube, the second light 201 located across the race track has no effect on the operation of the photoelectric relay. At the end of a race when the lure car passes the finish line and arrives at a point 5 feet past the finish line, it does either one of two things; it closes a track switch or passes through the light beam of a separate photoelectric relay. This causes a relay on the timer to open and remove or turn off the power to the small lamp 32 located inside the housing. Immediately as this lamp is extinguished the light source 201 is in control of the finish line photoelectric relay 9.

The relay remains open because the light from the light source located across the track keeps the photo tube energized. When the dog or other contestant passes in front of the light from source 201, it blacks out the light to the photo relay 9 and the tube is deenergized, current to the relay is decreased to the drop out point and the relay closes and applies power to relay 1 on the timer which trips relays 3, 4, 5, 6, 7 and 125 on the timer, as hereinafter explained. The timer stops and the reset relay starts and will reset the timer back to the home position in the time it is set for. When the light beam across the track was interrupted power to the small lamp 32 inside the housing was restored and it took control of the relay and will remain in control so long as it remains in a light emitting condition. There are two lamps 32 in this device so that the possibility of both burning out at one time is remote.

The apparatus comprises a photoelectric relay mounted on the outside of the track and connected by suitable wires to the timer 203 which is mounted on the inner side of the track. A light source 201 is positioned on the inner side of the track between the track and the rail 205 for the lure car. The light source 201 is positioned directly opposite the relay 9 so that its rays are directed on the photoelectric cell of relay 9, and a track switch 28 is mounted on the rail a short distance from the light source 201. The starting box 204 from which the dogs or other contestants leave is arranged so that when the box is opened it closes switch 26 or switch 27, depending upon the timing desired, that is the time delay before the switch 28 will be able to be effective. Micro-switch 28 is connected to the timer by suitable wires.

The timer is contained in a housing 206 (Fig. 14) and has mounted in the lower part thereof a motor 42 having a shaft 207 to which are fixed cams 151, 152, 150 arranged to respectively engage micro-switches 22, 23, 21 (see Fig. 11). Relays 1, 2, 3, 4, 5 are mounted in the housing above the relay 8. Above the main housing 206 are mounted the motors 72 which are connected by gears 209 and 210 to shaft 128, which carries cam 64 and detent members 65 and 66 and the hand 127, the latter moving behind the dial 200.

Mounted above shaft 128 is a shaft 211 of the reset relay which is connected by gears 129 and 89 to the motor 86. Mounted on the shaft 211 are cams 95, 96, 97, 98 and a clutch 88, the latter being controlled by an arm 90 and a spring 133. An electromagnet 87 tends to move the arm 90 to clutching position and a spring 134 tends to normally move the arm to clutch release position. The cams on the shaft are arranged to engage contacts 91, 92, 93, 94 and are adjustable on the shaft. At one end of the shaft 211 is a collar 132 having an arm 212 adapted to engage a stop 213 to limit the movement of the shaft, and connected to the shaft is a spiral spring 131 to return the shaft to its initial position (see Fig. 5).

The tally mechanism comprises a shaft 214 upon which are mounted 116, 117, 118, 119, 120, 121 respectively engaging micro-switches 99, 102, 103, 104, 105, 106. Attached to the shaft 214 is a ratchet wheel 216 engaging a pawl 217 connected to a spring and controlled by coil 100. The teeth of the wheel 216 are engaged by an arm 219 attached to a bell crank 220 connected to a spring 218, the movements of the arm and bell crank being limited by stops 222 and 223. The ratchet is moved step by step by the impulse relay 101 (see Figs. 12 and 13).

106 and 121 close on the first impulse, and remain closed until relay is returned to its home or initial position by a spring 215. Cam 117 closes 102, a micro-switch, on the first impulse, 118 closes and 117 opens on the second impulse, 119 closes and 118 opens on third impulse, 120 closes and 119 opens on the fourth impulse. 116 opens on the first impulse and remains open until the relay returns to its home position.

The structure shown in Figs. 12 and 13 control circuits to the tally device which comprises two windows in a housing 218 mounted above the dial, and in which the 10 second intervals of time are recorded. The housing 208 has a plurality of metal tubes 224 with glass windows 225, through which pass light from incandescent lamps mounted in keyless lampholders 226 (see Figs. 7, 8). The lamps are included in a plurality of circuits to produce a plurality of numerals, the circuits being controlled by the tally selector relay shown in Figs. 12 and 13, and hereinafter explained.

In operation, the button 50 is depressed (Fig. 1). This rings a buzzer at the lure operator's position and is the signal for him to start the lure. It also applies power to coil 35 of relay 2 and close contacts 11 shown on the schematic dia-

gram, Fig. 1, which in turn closes the hot side of line to coils 39 and 41 of relays 4 and 5. The timer is now connected to switches 26 and 27 on the starting boxes. When the timer starts and makes one revolution or ten seconds, it will apply power to coil 34 and relay 2 and open contacts 11. This will remove power from coils 39 and 41 of relays 4 and 5. This prevents false starts or over runs caused by accidental closing of switches 26 or 27. Power is applied to coil 34 of relay 2 by connecting it in parallel with coil 101 of tally selector relay.

Starting from the box 204, Fig. 9, switch 26 or switch 27 will close when doors of starting box are opened. This will complete the circuit through coils 39 or 41, depending on whether 26 or 27 was the switch closed. If 26 is closed, contacts 17, 18, 19, and 20 of relay 5 will close. Contacts 17 will connect one side of coil 44 of relay 7 to track switch 28. Contacts 18 will connect one side of coil 37, relay 3 to one contact 24 of relay 7. Contacts 19 close a circuit 29 and 30 which is connected to 52 and 53 (Fig. 2). Contacts 20 connect coil 46 of relay 6 to contacts 22 of the time relay 8. When contacts 19 of relay 5 close they apply power to coil 61 of relay 122 and contacts 60 open. Power to coil 71 pulls down stop lever 68, against the action of spring 135, and removes pawl 202, from slot 140 of cam 66 and contacts 67 close. Power is applied to relay 123, through the center of contact 54 to coil 70 which pulls lever 69 down and out of mesh with gear 65. Power is applied to timing motor 72 and the time hand 127 starts to rotate. As the timer main shaft 128 turns, cam 64 turns with it. In five seconds from the start, projection 129 engages 62 and close contact which applies power to coil 73 of relay 124 and close contacts 77 and locks them in closed position. As shaft 128 continues to revolve, projection 129 of cam 64 engages 63, closing the contacts momentarily and applies power to coil 101. The tally selector relay makes one impulse, closes contacts 102 by cam 117, 106 by cam 121, and opens contacts 99 by cam 116. This is 10 seconds, and 10 seconds appears on the tally indicator. As the hand continues to revolve, projection 129 engages 63 at 20 seconds, applies power to 101 and the tally relay makes another impulse, cam 117 moves forward, opens 102, cam 118 closes 103 and 20 seconds appears on the tally indicator. This continues until the timer is stopped.

When contacts 19 of relay 5 are closed, they also apply power to motor 42 of relay 8. This is a one minute maximum delay relay. On relay 5 the delay is 20 seconds, on relay 4 the delay is 10 seconds. As the description is concerned with relay 5, the delay will be 20 seconds. At 20 seconds contacts 22 will close, and power will go from 22 on 8 to 20 on 5 to coil 46 on 6, which will close and lock in, close 25 and complete the circuit through coil 44 of relay 7 to contacts 17 of relay 5 to track switch 28. When the lure car passes the switch 28 at the end of the race, it will make momentary contact by closing the switch. This will contact 24 by applying power to coil 44 of relay 7. When contacts 24 closed they completed the circuit of coil 37, relay 3, through contacts 18 of relay 5. This causes contacts 12 of relay 3 to open and remove power from transformer 47 which in turn removes power from by-pass lamp 32 in photo relay 9. This allows main light source 201 to take control. When this light beam is interrupted contacts 31 of photo relay 9 will close and apply power to coil 33 of



relay 1. This will close contacts 10 and apply power to coils 36, 38, 40, 43, 45, 74. This will trip relays 3, 4, 5, 6, 7 and 125, and the timer will stop. Relay 122 will close and contacts 60 will apply power to motor 86 and coil 87 of the reset relay. The arm 87 will pull in the clutch 88, and the motor 86 will start the shaft to revolve. As cams 95, 96, 97 and 98 travel forward they will close contacts 91, 92, 93, 94. Cams 98, 96 cause the machine to reset after 2 minutes and cams 97, 95 cause the machine to reset after 5 minutes to 15 minutes, the cams being adjustable. When cams 98, 96 close contacts 91, 93, the contact 91 will close 15 seconds before 93 and apply power to coil 55 of relay 123 through contacts 67 on arm 68 held closed by cam 66. Contacts 54 will make contact with 162 and apply power to coil 70 and pull down the lever 69, apply power to motor 72 and the hand 127 will revolve until the pawl on arm 68 drops into the slot 140 on cam 66. This will open 67 and remove power from 70 and 72. The hand will be stopped at zero position. 15 seconds later cam 96 will close contact 93. This will apply power to coil 76 of relay 125. Contact 78 will move from 163 to 164, apply power to coil 100, and trip tally selector relay to allow cams 116, 117, 118, 119, 120, 121 to return to off position. Contacts 106, 105, 104, 103, 102, 101 will open. Contact 99 will close. When relay 125 opened 78 and 163, it removed power from motor 86 and coil 87, clutch 88 springs open and cams 95, 96, 97, 98 return to off position by the action of spring 131. The timer now is completely reset and ready for the next race.

The same operating procedure can be employed where pace-setters are used instead of lures; however, the timer can be adjusted to accommodate races or exhibitions in which neither lures or pace-setters are used.

As stated above the tally selector has a housing 218 with two windows which are associated with compartments 111 and 112. The tube 224 prevents the light from the several lamps interfering with each other. Compartment 111 has 23 lamps 331, 332, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353 and 333. The compartment 112 has a plurality of lamps arranged to form a zero. The function of the tally relay is to change the connections to the lamps in compartment 111 to form the numerals 1, 2, 3, and 4.

Referring to Fig. 17, the selector is shown to comprise four sections, 108, 107, 109 and 110 each of which has twelve bronze spring wire contacts 167, insulated from each other.

Associated with the four sections of contacts 167 are electromagnets 143, 144, 114 and 142, respectively, Since the structure of the four sections and magnets are identical, one only will be described. The contacts are connected to the lamps.

Referring to section 109 and electromagnet 114, see Figs. 17 and 18, the contacts 167 are engaged by a cross bar 145 attached to an arm of an angle lever 168, the other arm of which is attracted by an electromagnet 114 to cause the cross bar 145 to engage the contacts 167. A spring 146 tends to move the lever 168 to a disengaging position, the tension of the spring being adjustable by a nut 148, which abuts a post 147 through which one end of the spring passes. The lamps in compartments 111 and 112 are grounded as indicated in Fig. 3, and the contacts of the four sections are arranged in circuits to form the numerals 1, 2, 3, or 4.

In operation, as the timer starts to turn, the projection 129 on cam 64 closes switch 63 to apply power to coil 101. This occurs 10 seconds after the shaft carrying the cam 64 started to turn. This produces an impulse to cause shaft 214 to turn and cause cam 117 to move forward (see Figs. 1, 12, 13) and close contact 102, one element of which is connected to a live wire and the other element connected to the electromagnet 142, which is grounded. One of the wire contacts 167 is connected to a live wire (see Fig. 1) and the current is conducted to the other contacts by the bar 145, the lamps in compartment 111 being grounded to complete the circuit. Magnet 142 is associated with section 110, and when the bar 145 engages the contacts 167, a circuit is completed through the indicator lamps 333, 337, 341, 345, 348 and 352 to form the numeral one. At the same time cam 121 closes switch 106, one element of which is connected to compartment 112, which is grounded, and the other element of switch 106 is connected to a live wire (see Fig. 1). This lights the lamps in compartment 112 to form a zero.

Contacts 102 remain engaged until the timer main shaft 128 has completed the second revolution, which is 20 seconds from the start, at which time power is again applied to coil 101 and cam 117 moves forward and opens switch 102, removing power from magnet 142 and spring 146 pulls the bar 145 clear of the wire contacts 147 of section 110, and the lamps showing the numeral one are extinguished. Cam 118 has now moved to close the switch 103 and power is delivered to magnet 114 to cause the bar 145 associated with 114 to engage the contacts 147 of section 109 and form a circuit through lamps 332, 333, 335, 338, 341, 344, 347, 350, 351, 352, and 353 to produce the numeral two, on the indicator.

When the main shaft 128 makes another revolution, cam 119 closes switch 104 to produce numeral three by means of the circuit resulting from the arrangement of the contacts 167 in section 108. Similarly, another rotation of the main shaft will cause cam 120 to close switch 105 to produce the numeral four by means of section 107.

The operation of the timer has been hereinbefore described for a 20 second delay when switch 26 is closed. When a 10 second delay is desired, switch 27 is closed. Switches 26 and 27 are micro-switches controlled by the opening of the starting gate or box 204. When switch 27 is closed, contacts 13, 14, 15, 16 of relay 4 are closed. Contact 13 connects one side of coil 44 to switch 28, which is a micro-switch. Contacts 14 connect one side of coil 37 of relay 3 to one contact of switch 24 of relay 7. Contact 15 closes circuit 29, 30, which is connected to terminals 52, 53 of Fig. 2. Contacts 16 connect one side of coil 46, relay 6, to contact 21, relay 8 (10 second delay). Terminals 48 and 49 connect coils 34 and 101 in parallel, and terminal 85 connects one element of switch 10, Fig. 1, to one side of coil 74, Fig. 3.

Referring to the reset mechanism, coil 75 is energized to close contacts 78 and 163. Contacts 54, and 154, of relay 123 are normally closed.



Referring to the reset relays, as cam 98 rotates, switch 84 is closed energizing coil 81 to close contacts 79 to complete the circuit through coil 55 to ground when switch 91 is closed. Similarly, rotation of cam 96 closes switch 83 to energize coil 82 to close contacts 80 to close a circuit through coil 76 and switch 93 to ground. See relay 126.

From the above description it will be seen that there has been provided an effectively operating device for automatically timing a dog race in which a lure is used, or other races. The device automatically resets itself, and when once started, no further manual operations are required.

The above description is to be considered as illustrative and not limitative of the invention of which modifications can be made without departing from the spirit and scope of the invention as set forth in the appended claims.

The invention having been described, what is claimed is:

1. In combination with a race track having a rail upon which a lure moves, a photoelectric relay having a photo tube, said relay being positioned at the finish line of the track, a light source positioned at the finish line across the track from the relay and having its rays directed on the photo tube, a lamp mounted in the relay and having its rays directed on the photo tube, means controlled by the lure after passing the finish line to extinguish the lamp, and a timing device controlled by the relay.

2. The structure set forth in claim 1 further characterized by the means controlled by the lure comprising a switch mounted on the rail.

3. In combination with a race track having a movable lure associated therewith, a micro-switch adapted to be momentarily closed by the lure, starting boxes for the contestants adapted to be simultaneously opened, a switch arranged to be closed by the opening of the boxes, a timing device adapted to be set in operation by the closing of the switch, a photoelectric relay positioned at the finish line of the track, a lamp near the relay and having its rays directed on the photo tube of the relay, a light source having its rays directed on the photo tube of the relay, said lamp being extinguished when the microswitch is closed, said timing device being stopped when the lamp has been extinguished and the rays from the light source are interrupted, and a time delay relay in the time device to cause the microswitch to be effective after a predetermined delay.

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