United States Patent [19]

Kleimeyer

[11] **3,858,222**

[45] **Dec. 31, 1974**

[54] **TAPE PROGRAMMER FOR TIME RECORDERS**

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[22] Filed: **Sept. 19, 1973**

[21] Appl. No.: **398,689**

[52] **U.S. Cl.** **346/17,** 200/46

[51] **Int. Cl.** **G07c 1/00,** H01h 43/08

[58] **Field of Search** 346/17, 20, 25; 200/46

[56] **References Cited**

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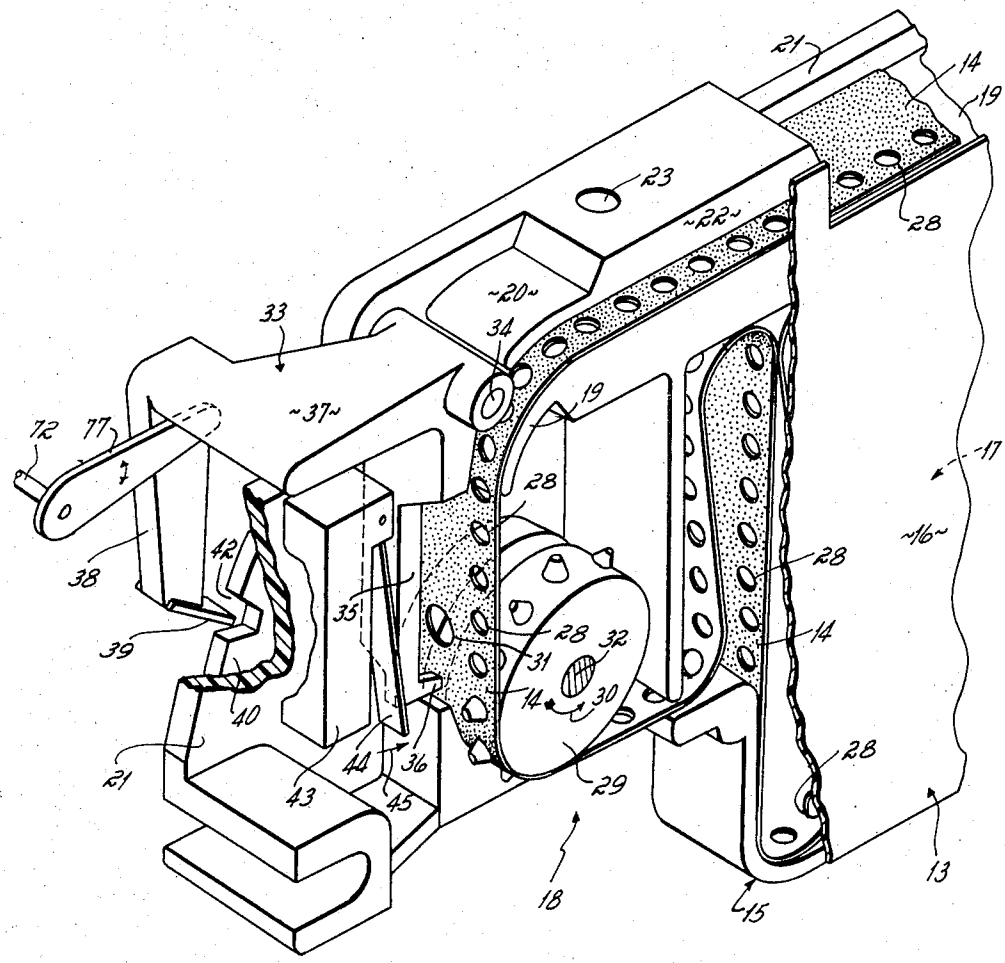
Primary Examiner—Joseph W. Hartary

Attorney, Agent, or Firm—Wood, Herron & Evans

[57] **ABSTRACT**

A tape programmer for time recording devices for providing electrical control signals to activate electrically responsive mechanisms. The tape programmer includes a tape cartridge housing a continuous loop of tape which includes a plurality of timing holes spaced longitudinally along the length of the tape. An intermittent drive interconnects the time recorder motor and a tape advance sprocket in the tape cartridge to incrementally advance the tape. A timing hole detector senses the presence or absence of timing holes along the tape and actuates a switch to provide an electrical signal when a timing hole is sensed. The timing hole detector is restrained from sensing movement except when permitted by the concurrent operation of two controls. One control permits movement of the detector 1 minute out of every 5, and the second control permits movement of the detector for a predetermined number of seconds out of every minute. In combination, they permit actuation for a predetermined number of seconds every fifth minute.

9 Claims, 5 Drawing Figures



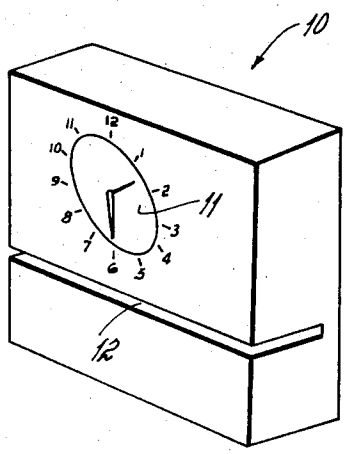


Fig. 1

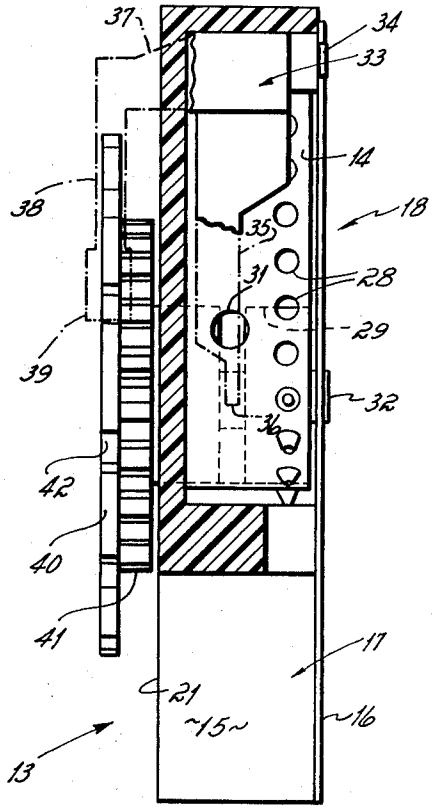


Fig. 5

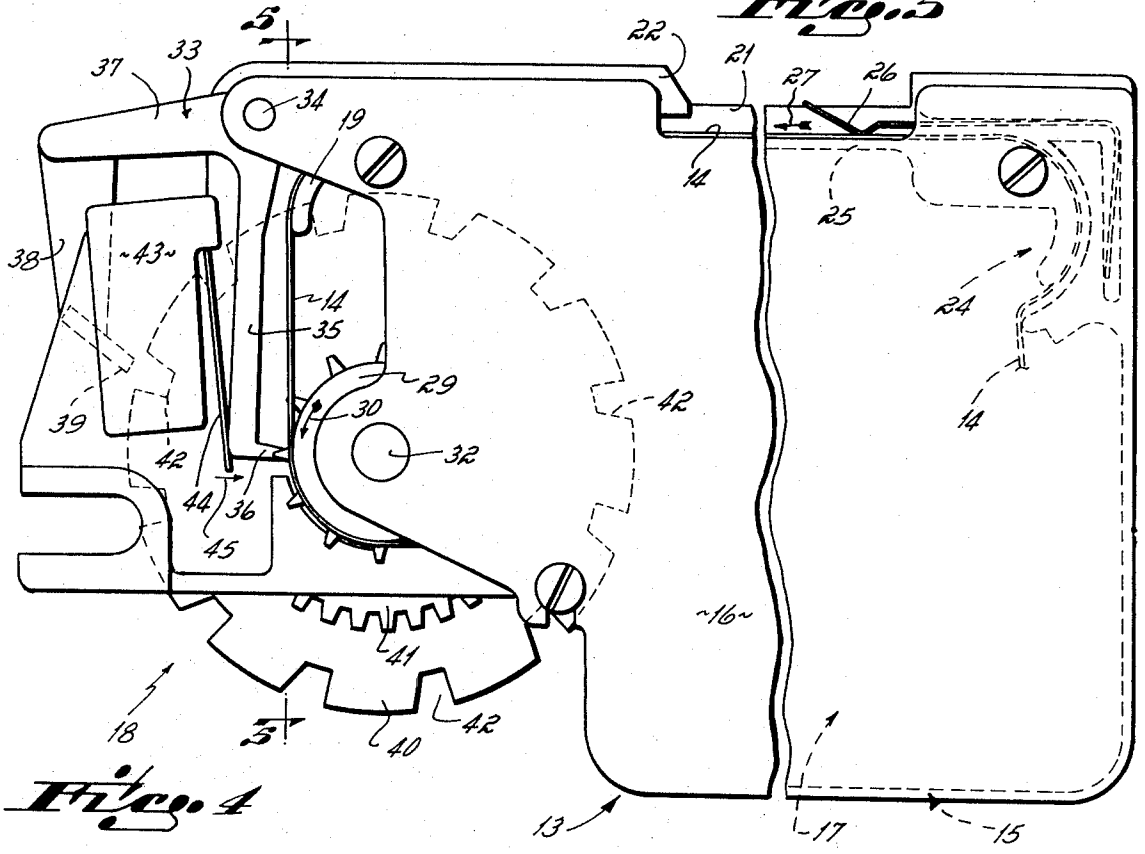


Fig. 4

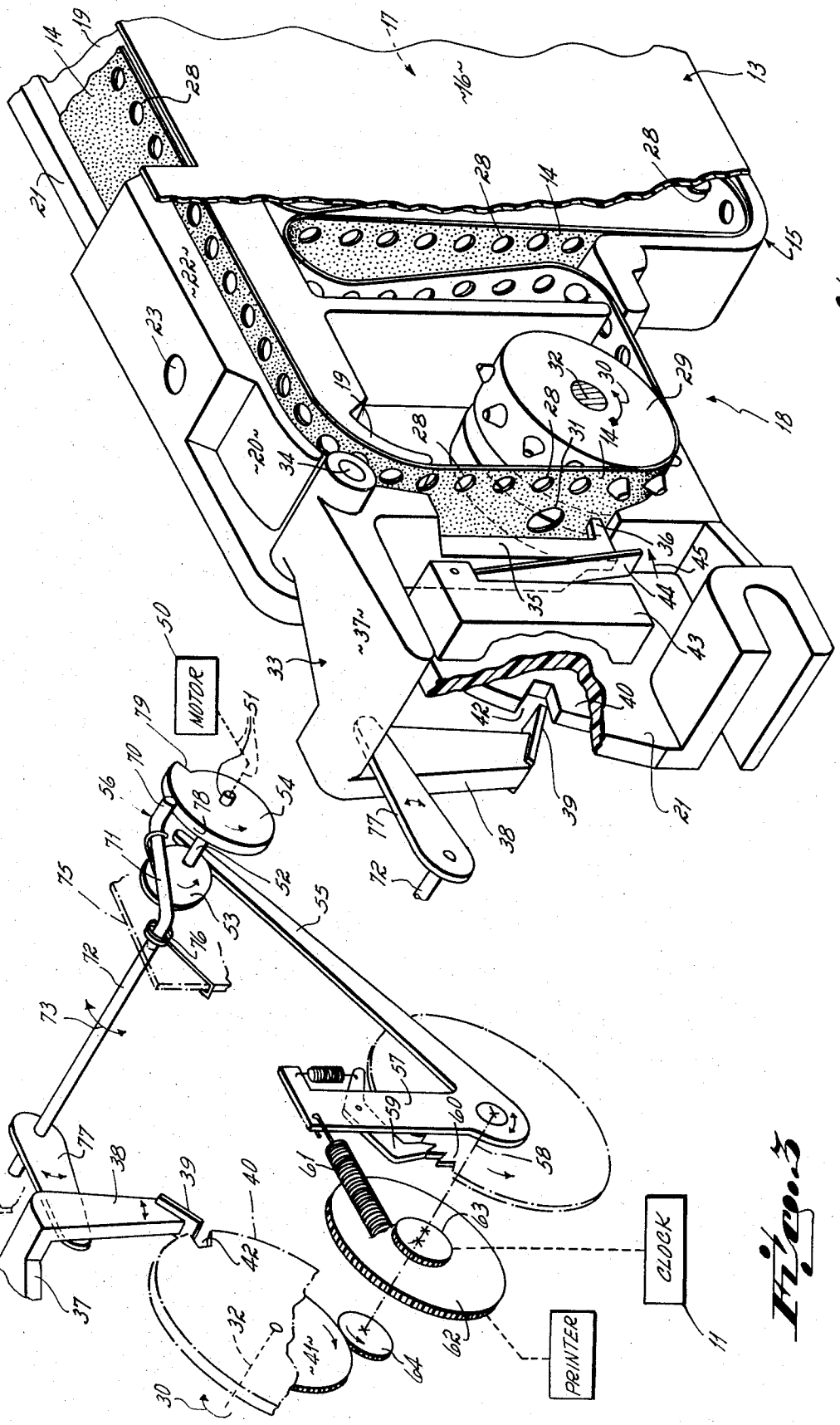


Fig. 2

Fig. 3

TAPE PROGRAMMER FOR TIME RECORDERS

BACKGROUND OF THE INVENTION

This invention relates generally to time recording devices and, more particularly, to time recording devices which also include a preprogrammed mechanism for activating externally electrically operable devices, such as bells, buzzers, relay controls or the like at predetermined times during the day.

Time recording devices of the type in which the present invention may be incorporated are well known in the prior art. These devices are generally compact and are conventionally utilized for printing time information on worker's time cards, job cards and the like. The time recorders include a timing motor for driving a clock and the time wheels of a printing mechanism for printing the time of day on a time card or the like. The printing wheels are incrementally advanced by the timer motor to a printing position adjacent the card to be imprinted. The printing mechanism also includes a hammer actuated upon insertion of the card to force the card against a ribbon and the printing wheels so that the current time and, in many cases, the date is printed on the card.

Prior art recorder devices of this type have been principally utilized for printing time information and have not been generally employed for controlling other devices, such as bells. The control of these other devices has been accomplished by separate, relatively expensive programmers. Previously, attempts have been made to combine the functions of both a programmer and recorder into one unit. However, these attempts have not been totally satisfactory either because of the relatively high cost or because of unreliability.

It is the principal objective of this invention to provide a low cost and highly reliable tape programmer which can be incorporated into a time recorder for controlling other devices on a time schedule; and thus enable the time recorder to perform a dual function, i.e., of imprinting time and of controlling other devices.

The present tape programmer utilizes a novel construction which provides high reliability in obtaining electrical signals at the selected times. Yet the programmer requires a minimal number of parts which can be molded of plastic or other suitably inexpensive material. The programmer utilizes a punched tape in which the programming holes can be made utilizing a simple low cost tool. The positions of these holes are subject to a large tolerance without adversely affecting the precision of the timed signals generated by the programmer.

Another advantage of the present time recorder is that it is compact and can be incorporated in the spaces available in a time recorder without increasing the overall size of the recorder. Moreover, the programmer can be positioned so that it is easily accessible to the user.

A still further advantage of the present programmer is the simplicity of its construction in which a single switch is effective to establish the output signal including both the initiation and duration of such signal.

It is the further objective of this invention to provide a tape programmer which can be programmed by the user without removing the tape from the programmer or the programmer from the timer itself.

These and other objects and advantages of the present invention will be more readily apparent from the following detailed description of the drawings illustrated a preferred embodiment of the invention.

DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a perspective view of a time recording device incorporating the tape programmer of this invention;

FIG. 2 shows a perspective view partially cut away of the tape cartridge and the timing hole detector;

FIG. 3 shows a schematic view of the intermittent drive mechanism for the minute disc and the signal duration control;

FIG. 4 is a side elevational view of the tape cartridge and timing hole detector; and

FIG. 5 is a vertical sectional view taken along section lines 3—3 of FIG. 4.

DETAILED DESCRIPTION

One form of time recording device **10** embodying a tape programmer of the present invention is shown in FIG. **1.** The time recording device **10** generally includes a clock **11** for indicating the actual time of day, and a printing mechanism for imprinting this time. Disposed generally below the clock **11** is a card-receiving slot **12** into which a time card or the like can be slidably inserted. Disposed within this slot **12,** although not shown, is a trip lever for activating a time printing mechanism (not shown).

The construction of the time printing mechanism is conventional and constitutes no part of the present invention. In general, such a mechanism includes a plurality of printing wheels containing numerals corresponding to the hour, minutes and date. The wheels are driven by a timer motor so that the numerals corresponding to the actual time and date are disposed adjacent to a card in position for imprinting. The mechanism also includes a hammer which is activiated to force the card against an ink ribbon and the time wheels. Kleimeyer U.S. Pat. No. 3,116,102 discloses one form of print wheel and hammer construction. It will be appreciated that when the card or the like is inserted into slot **12** upon engagement with the trip lever, a hammer solenoid is energized to actuate the hammer and cause a time imprint to be made on the card.

The present tape programming device is adapted to be incorporated into such a time recorder for controlling external electrical devices, such as bells, buzzers, and the like. Specifically, the tape programmer is operable to generate electrical signals for operating bells, or the like, for predetermined intervals at predetermined times in accordance with a schedule set up on a punched tape.

Referring now to FIGS. **2, 4** and **5,** the tape programmer includes a tape cartridge **13** for housing a program tape **14.** The tape cartridge includes a body **15** and cover **16.** Together they define a rearward tape storage compartment **17** and a forwardly extending tape readout and coding section **18.** Program tape **14** is preferably stored within the storage compartment **17** in a serpentine fashion. The tape extends forwardly into the section **18** along a channel formed in part by a support wall **19.**

Disposed above the tape support wall **19** is an upper tape protector **20** integrally formed with the rear wall **21.** Extending vertically through the thicker portion **22** of the tape protector is a cylindrical hole **23** which, as will become more clear later, serves as a punch guide

when the user programs the tape 14 to set up the desired signal schedule.

Details of the storage compartment 17 are best shown in FIG. 4. As there shown, tape 14 enters a tape guide indicated generally at 24 and is held against this portion 25 of the support wall 19 by a tape retaining bar 26 made of a spring-like metal disposed in recesses of the tape cartridge. Consequently, as the tape 14 is advanced in a direction indicated generally by the arrow 27, the tape retainer 26 provides a frictional force to maintain the tape under tension.

The tape 14 is preferably made of Mylar or similar flexible material and is formed in an endless loop. The tape has sprocket holes 28 spaced in equispaced relationship along the length of the tape so that the sprocket holes 28 will be engaged by the teeth of a sprocket gear 29 as the gear is rotated in the direction indicated by the arrow 30. The sprocket holes 28 are preferably located adjacent to one edge of the tape 14, leaving a wide area through which the user can punch timing or signal holes 31 at locations which will correspond to the times at which an external electrically operable mechanism is to be activated.

Sprocket wheel 29 is carried by shaft 32 which in turn is rotatably mounted between the wall 21 and cover 23 of cartridge 15. Shaft 32 is incrementally advanced so that it will rotate by 30° every 5 minutes. Hence, the sprocket wheel 29 will rotate one complete revolution every hour. Since the sprocket wheel 29 has 12 equally spaced tape-engaging teeth, the sprocket holes 28 along the programming tape 14 are located in positions corresponding to locations 5 minutes apart as the tape is advanced past any fixed position in the system. The endless tape 14 preferably has a length exactly equaling that length required to completely pass through the cartridge and over the sprocket wheel 29 once every 24 hours.

The signal holes 31 punched in the tape are detected by means including a switch actuating member 33 which is pivotally supported as at 34 between the cartridge cover 16 and the rear wall 21. The switch actuator 33 includes a vertically disposed and downwardly extending arm 35 which carries at its free end a tape-engaging finger 36. The switch actuator 33 also includes a horizontally disposed lever arm 37. Depending downwardly from the extreme outermost end of the lever arm 37 is a second vertical arm 38 which has a minute disc-engaging finger 39 located at the lowermost end thereof.

Minute disc 40 is mounted on the same shaft 32 as the sprocket wheel 29 and is connected to the gear 41 and disposed behind the rear wall 21 of the tape cartridge 15 as viewed in FIGS. 4 and 5. The minute disc 40 has a gear portion 41 formed therein which is driven by the timer drive mechanism to advance both the minute disc and the axially connected sprocket gear 29 one-twelfth of a revolution every 5 minutes.

Disposed around the circumference of the minute disc are 12 timing notches shown generally as 42. These timing notches 42 are dimensioned and equally spaced around the circumference of the minute disc to provide timing notches of approximately 1 minute duration spaced at 5 minute intervals around the minute disc when this disc is driven at a speed of 1 revolution per hour.

The tape programmer mechanism further includes a microswitch 43 having a spring biased arm 44 which is in engagement near its lowermost end with arm 35 of the switch actuator member 33. The spring bias of the arm 44 forces both arm 42 and the arm 35 generally in the direction indicated by the arrow 45. When tape finger 36 is disposed out of engagement with a timing hole 31 (in the position as shown in FIG. 4), switch 43 provides an open circuit across an electrical switch contact. However, when the switch arm 44 is displaced to the right from the position shown in FIG. 4, the microswitch 43 closes a circuit to power an external mechanism, such as a bell, buzzer, light or the like. The external mechanism will be energized for the period of time in which the microswitch 43 provides a closed electrical circuit. The general operation of the microswitch 43 in connection with the other elements of the tape programmer mechanism will become more clear from the detailed operational description included below.

Referring now to FIG. 3, the mechanical drive system for the time recording device and tape programmer is shown. The drive system includes a schematically shown motor 50 which preferably synchronously drives the output drive shaft thereof at a rate of 1 rpm.

The drive motor 50 is connected by a drive shown schematically as a dotted line 51 to a rotatable cam support shaft 52. Two eccentric cams 53 and 54 are rigidly connected to the cam support shaft 52 for rotation at the same rotational frequency as the output shaft of motor 50. Both eccentric cams 53 and 54 have camming surfaces disposed generally about the circumference of these cams which are in sliding engagement with cam followers 55 and 56 respectively.

Eccentric cam 53 is effective to produce an incremental advancing force for powering the time recorder printing wheels, clock and tape programmer. As viewed in FIG. 3, the cam follower 55 is displaced downwardly by the camming surface of the eccentric cam 53. As the lever arm 55 moves downwardly, the upwardly extending lever arm 57 is rotated about pivot 58 in a clockwise direction. When this occurs, the tooth-engaging pawl 59 which is carried by arm 57 is disengaged from one tooth of ratchet wheel 60 and brought into engagement with the next tooth.

A tension spring 61 is provided for urging arm 57 in a counterclockwise direction to advance the ratchet wheel 60 as soon as the contact between arm 55 and cam 53 permits. When the lever arm 57 is moved in a counterclockwise direction, the pawl 59 will impart counterclockwise rotation to the ratchet wheel 60. This will in turn produce a stepwise counterclockwise movement to shaft 58 and gears 62, 63 and 64 which are rigidly connected to the shaft. The counterclockwise motion of gear 62 is utilized to drive the printing wheels, while gear 63 drives the mechanism of clock 11. Gear 64 provides power for operating the programmer.

More particularly, pinion 64 is advanced incrementally once a minute and similarly advances gear 41 which is connected to minute disc 40 and shaft 32. Thus, incremental rotary motion is also imparted to shaft 32 and the tape drum sprocket gear 29. By properly selecting the gearing ratio between gear 64 and gear 41, each incremental advancement of the shaft 58 will provide a clockwise rotation of the minute disc 40 of 6°. Thus, the minute disc 40 makes one complete revolution each hour.

The cam follower 56 includes a cam contacting portion 70, a lever arm portion 71, and a shaft portion 72

which is reciprocated by the camming action in a direction indicated generally by the arrow **73.** The shaft **72** is supported for rotary motion by two frame portions **74** and **75.** A coiled spring **76** is wound around the shaft portion **72** and has one end secured to the frame portion **75.** The other end of the coiled spring **76** engages the lever arm portion **72** so that spring **76** is effective to urge the cam follower **56** in a clockwise direction to maintain it in contact with eccentric cam **54.**

A control lever **77** is secured to the shaft portion **72** and is positioned so that it contacts the undersurface of lever arm **37** of switch actuator **33** when the control lever **77** is in its most elevated position. When the control lever **77** is disposed in this position, the minute disc-engaging tooth **39** will be held away from the circumference of the minute disc **40** and, therefore, the finger **39** cannot enter one of the timing notches **42** in the circumference of the minute disc. Similarly, finger **36** is held away from tape **14** and cannot enter a timing hole **31** in the tape.

Cam **54** is configurated to include a surface **78** of gradually increasing radius and a sharp drop-off or radial shoulder **79.** The cam is dimensioned so that when shoulder **79** moves past the follower portion **70,** the follower drops down, and lever arm **77** is disengaged from horizontal arm **37** of the switch actuator member **33.** This allows the finger **39** of the actuator member to enter one of the slots **42** in minute disc **40** if such a slot is aligned with the finger. Also, finger **36** is free to enter a timing hole **31** if such a hole is positioned in alignment with the finger. This in turn permits switch arm **44** to move to the right (FIG. **2**) closing the switch to energize a bell or the like. The sharp shoulder of cam **79** thus provides control over initiation of the signal at a precise time, even though the hole **31** in the tape are not accurately positioned so as to correspond exactly to a minute position.

The slope of cam surface **78** is such that after a predetermined interval, usually of from 7 to 10 seconds, the follower **70** is shifted outwardly far enough to bring arm **77** into engagement with horizontal arm **37** of actuator member **33.** Thus, arm **37** is raised, finger **39** is withdrawn from slot **42** in the minute wheel, and finger **36** is withdrawn from timing hole **31.** At the same time, switch arm **44** is shifted toward the switch to open the switch contact and deenergize the bell. Thus, cam **54** also controls the duration of the signal.

As indicated generally above, the user is provided with an unprogrammed system and he can select the times at which he desires an external electrical device, such as a bell, to be operated. With the preferred form of programmer disclosed herein, the user can select signals at any 5 minute interval over a 24 hour period. Each signal will have the same duration, e.g., 7 seconds. In order for the user to establish the desired program, he must punch holes **31** through the tape **14** corresponding to the specific times of the day when signals are desired. This is accomplished by setting the time reading for the mechanism of clock **11** to correspond to a time 1 hour prior to the time when he desires the externally controlled mechanisms to be activated. For example, if a signal is desired at 10:15, the clock is set to 9:15. This is accomplished by manually advancing the mechanism by rotating a conventional time setting knob (not shown) interconnected to shaft **58.** When this is done, the operator then passes a tape punch through the hole **23** in the plate **22** to punch a hole in the tape **14.** The hole **23** thus formed is located a distance from the tape-engaging finger **36** which corresponds to 1 hour of travel for the tape **14.** Consequently, after the passage of 1 hour, tape **14** is advanced to a point such that the hole **31** which was punched is disposed in registry with finger **36.** To program the remainder of the tape, the user advances the mechanism to the time corresponding to 1 hour before each desired signal and at such time punches a hole in the tape **14.**

In operation, motor **50** is effective to rotate cams **53** and **54** at a rate of 1 revolution per minute. The rotation of the eccentric cam **53** causes lever arm **55** to reciprocate to cause incremental counterclockwise movement of the ratchet wheel **60.** Each stepwise counterclockwise advance of the ratchet wheel **60** is operative to advance the gears **62, 63** and **64** in a counterclockwise direction. Incremental advancement of the gear **63** is operative to advance the hands of the clock unit **11.** Gear **62** advances the time wheels of the printing mechanism. Advancement of gear **64** advances the driven gear **41** on shaft **32.** By choosing a proper gearing ratio between gears **64** and **41,** each incremental advance of the shaft **32** can be made to be 6°. Therefore, minute wheel **40** and sprocket wheel **29** are advanced stepwise a rate of 1 revolution per hour.

At the beginning of each minute, cam follower **56** will displace the control **77** in a counterclockwise direction (FIG. **3**) out of contact with the horizontally disposed lever arm **37** for a duration period of from 7 to 10 seconds. The spring bias of arm **44** of the microswitch **43** urges finger **39** towards the circumference of the minute disc **40** and finger **56** toward tape **14.** Finger **39** can enter a timing notch **42** only at times when such a notch is disposed in alignment with the finger. The 12 timing notches **42** are disposed uniformly around the circumference of the minute disc **40** at 30° intervals, each notch extending slightly over 6° of circumference. Consequently, finger **39** can enter a timing notch **64** only during 1 minute out of 5 at 5 minute intervals.

The switch actuator member **33** is biased by the switch arm so that finger **36** contacts tape **14** when the control lever **77** is disengaged from horizontal lever arm **37** and finger **39** is aligned with a notch **42.** If a hole **31** in the tape **14** is not located in registry with finger **36,** the finger **36** will simply contact the surface of the tape **14** and the arm **44** of the microswitch **43** will not be displaced a sufficient distance to close the switch **43.** On the other hand, if finger **36** does enter a hole **31,** the switch arm **44** is displaced a sufficient distance to close microswitch **43.** The switch remains closed until it is opened by the action of duration cam **54,** follower **70,** lever **77** and actuator member **33** as explained above.

It will be appreciated that the programmer requires coincidence of position for three different elements before microswitch **43** is closed. The first of these three position coincidences is that a hole **31** on the tape **14** must be positioned in registry with finger **36.** Secondly, follower **77** must be rotated in a clockwise direction as viewed in FIG. **2** so that it is disengaged from horizontal lever arm **37.** The third condition is that the minute disc **40** must be positioned so that a timing notch **42** is in registry with finger **39.** Absent the coincidence of position of all three elements outlined above, the arm **35** will not be displaced at any time by a sufficient dis-

tance to allow the switch arm **44** to be shifted far enough to close switch **43.**

From the above disclosure of the general principles of the present invention and the preceding detailed description of a preferred embodiment, those skilled in the art will readily comprehend various modifications to which the invention is susceptible. Therefore, I desire to be limited only by the scope of the following claims.

Having described my invention, I claim:

1. In a time recorder of the type including a printing mechanism, a drive motor for said printing mechanism, the novel feature which comprises:

a programmer for providing electrical control signals for controlling electrically operable devices at predetermined times, said programmer comprising:

a continuous loop of tape for receiving timing holes at predetermined locations along its length;

tape drive means connected between said motor and said continuous loop of tape for intermittently advancing said continuous loop of tape to present said predetermined locations to a detector position at predetermined time intervals of a first duration;

a timing hole detector at said detector position movable relative to said tape for mechanically detecting the presence or absence of timing holes, said timing hole detector providing an electrical control signal when a timing hole is detected;

a first means in operable contact with said timing hole detector for periodically restraining said detector in spaced relationship from said tape and preventing movement of said timing hole detector toward said tape to thereby prevent detecting the presence or absence of timing holes on said continuous loop of tape except during predetermined time intervals of a second duration, said time intervals of said second duration being substantially shorter than the time intervals of said first duration;

a second means in operable contact with said timing hole detector for preventing movement of said timing hole detector toward said tape to thereby prevent detecting the presence or absence of said timing holes except during predetermined time subintervals of a substantially less duration than the duration of the time intervals, said time subintervals occurring more frequently than said predetermined time intervals of said second duration;

said timing hole detector being operative to detect the presence of timing holes only at times corresponding to the coincidence of said predetermined time intervals and said time subintervals.

2. The time recorder of claim **1** wherein said timing hole detector comprises a pivotable switch actuator member having a timing hole engaging finger, said member being pivotally movable between a position wherein said finger does not engage said continuous loop of tape to a second position wherein said finger enters a timing hole in said continuous loop of tape when the timing hole is in registry with said finger.

3. The time recorder of claim **2** wherein said first means comprise a disc driven by said motor and having spaced timing notches disposed around its periphery, said actuator member having a second finger adapted to enter one of said timing notches when said notch is aligned therewith, said last named finger engaging the periphery of said disc to maintain said timing hole-engaging finger spaced from said tape except when said second finger is received in a notch.

4. The time recorder of claim **3,** wherein said second means comprises a second lever engageable with said switch actuator member for maintaining said first finger spaced from said tape during periods of time other than said time subintervals.

5. In a time recorder of the type including a printing mechanism, a drive motor for said printing mechanism, the novel feature which comprises:

a programmer for providing electrical control signals for controlling electrically operable devices at predetermined times, said programmer comprising:

a continuous loop of tape for receiving timing holes at predetermined locations along its length;

intermittent tape drive means connected between said motor and said continuous loop of tape for advancing said continuous loop of tape;

an electrical switch for establishing said electric control signals, said switch including a shiftable arm for closing said switch when said arm is displaced;

a switch actuator member having a first finger adapted to detect the presence or absence of timing holes;

said switch actuator including a portion in engagement with said switch arm and adapted to displace said arm;

a minute disc having a plurality of spaced recesses disposed about its periphery;

said actuator member having a second finger adapted to engage the periphery of said minute disc and to enter one of said recesses aligned with said finger;

means for intermittently rotating said disc to alternately bring said notches and portions of said periphery into alignment with said finger;

said actuator member first finger being held spaced from said tape when said second finger is engaged with a peripheral portion of said disc and being free for movement into engagement with said tape when said second finger is received within one of said notches;

a duration cam rotated by said motor;

a follower in engagement with said cam, said follower being shifted by said cam and including an abutment portion in engagement with said actuator member, said abutment portion being effective to restrain said actuator member with said first finger disengaged from said tape during a portion of the rotation of said cam, said abutment portion being shifted away from said actuator member during the other portion of rotation of said cam to free said actuator member for movement into engagement with said tape.

6. The time recorder of claim **5** in which said continuous loop of tape further includes a plurality of equispaced sprocket-engaging holes and said intermittent tape driven means includes a sprocket in engagement with said holes, said sprocket and said minute disc being advanced in synchronism.

7. The time recorder of claim **5** in which said duration cam is rotated at a rate of one revolution per minute and said abutment portion is shifted away from said

actuator member for a period of the order of 10 seconds for each minute.

8. The time recorder of claim **6** in which said duration cam is rotated at a rate of one revolution per minute and said abutment portion is shifted away from said actuator member for a period of the order of 10 seconds for each minute, said minute disc being advanced at a rate of 1 revolution per hour, the recesses in said disc extending over the order of 6° of the periphery, whereby said second finger is in registry with any one recess for only 1 minute.

9. The time recorder of claim **5** further comprising a clock mechanism connected to said tape drive means for providing a visual indication of time and a tape punch guide disposed adjacent to said continuous loop of tape to thereby permit time holes to be punched in said continuous loop of tape at desired predetermined locations correlated with predetermined times as observed on said clock.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,858,222 Dated December 31, 1974

Inventor(s) Vernon T. Kleimeyer

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, lines 1 and 2 change "illustrated" to --illustrating--; line 37, change "activiated" to "activated".

Column 5, line 35 change "hole" to --holes--.

Column 8, line 62 change "driven" to --drive--.

Signed and sealed this 18th day of February 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334

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