Oct. 12, 1965 F. L. DODD 3,210,924

ELECTRONIC SHIP'S CLOCK

Filed Aug. 2, 1962 2 Sheets-Sheet 1

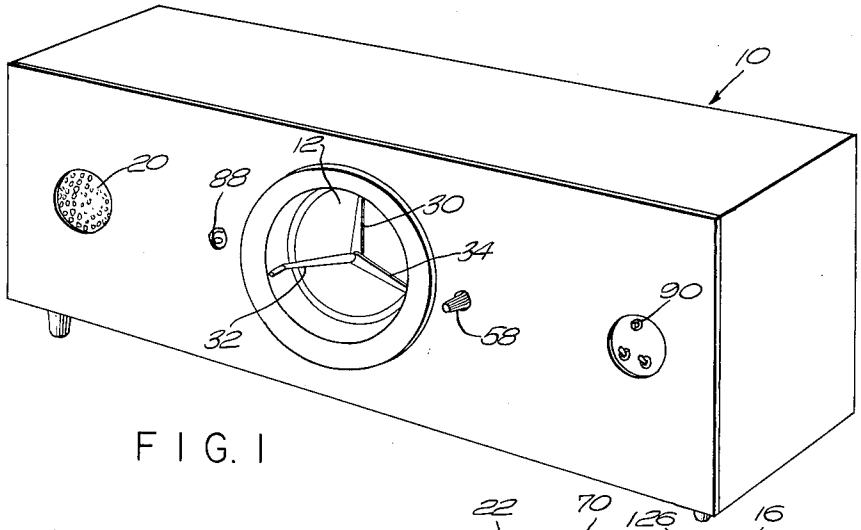

FIG. 1

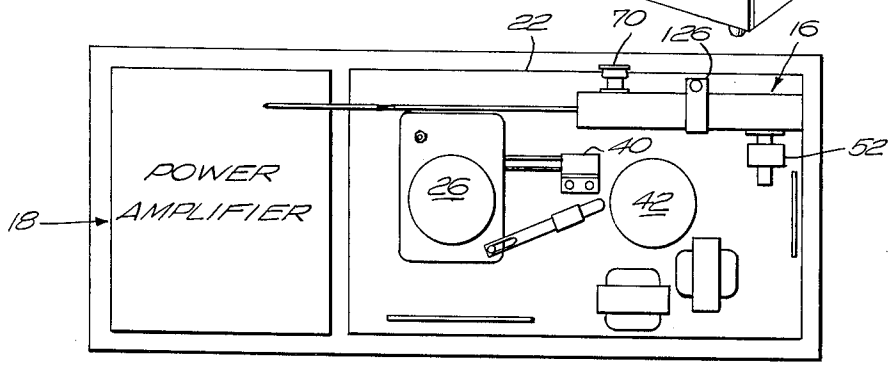

FIG. 2

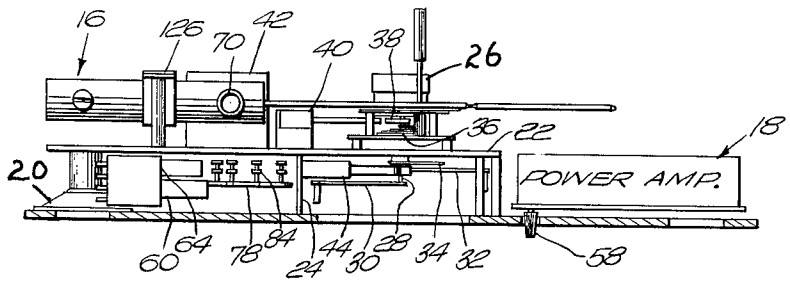

FIG. 3

INVENTOR.
FRANCIS L. DODD
BY Morse & Altman
ATTORNEYS

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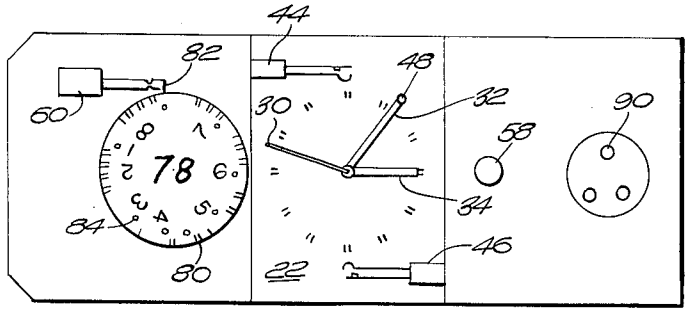

FIG. 4

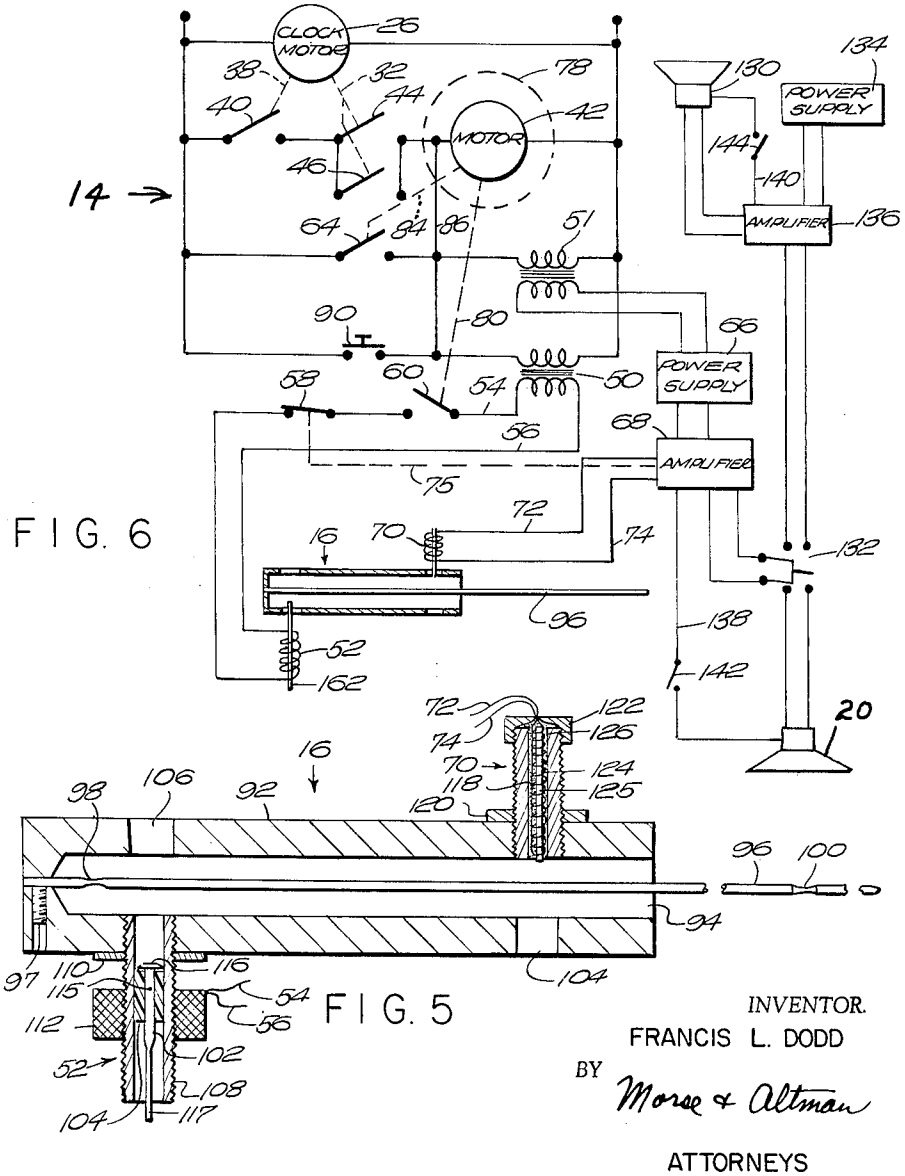

FIG. 6

FIG. 5

INVENTOR.
FRANCIS L. DODD
BY Morse & Altman
ATTORNEYS

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3,210,924

ELECTRONIC SHIP'S CLOCK

Francis L. Dodd, Areys Lane, Orleans, Mass.

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4 Claims. (Cl. 58—38)

This invention relates generally to electronic time signalling devices and more particularly concerns a novel apparatus for generating programmed tone signals corresponding to a ships' bell system.

By custom shipboard time is indicated by "bells" rather than by conventional clock time and, according to this system, from 1 to 8 bells or tone signals are sounded in half-hour intervals every four hour period. For example, one bell corresponds to 12:30 o'clock, two bells corresponds to 1 o'clock, and so forth up to 8 bells which corresponds to 4 o'clock.

Ships clocks have, of course, been employed for years to produce time signals which follow the ships bell system, but the signals from these clocks can be heard only over a relatively small area and the tone produced is usually quite different from that of an actual ships bell. While various amplifying systems could be connected to a ship clock to increase its volume, the quality of the signal would still be lacking and, in addition, the background noise, produced by the clock's running mechanism, would also be amplified. Conventional ships clocks have enjoyed a wide popularity among ship owners as well as among nautically minded land-locked sailors, however, for reasons stated above, these clocks have had rather limited utility.

Accordingly, it is an object of the present invention to provide improvements in ships clocks.

Another object of this invention is to provide a ship's clock which is capable of faithfully reproducing the tone of a ship's bell in the proper timed sequence of a ship's bell system.

Still another object of this invention is to provide an integrated time signal and amplification system capable of generating a pure tone signal substantially free of background noise.

Yet another object of this invention is to provide a novel programming system for operating a time signal device.

A still further object of this invention is to provide a tone generator of improved construction and design.

More particularly, this invention features a time signal system comprising a clock, a programming device operatively associated with the clock, a tone generator actuated in response to signals from the programming device and an amplifying system which under the control of programming device, is energized only during periods of operation of the tone generator and which is adapted to amplify only the tone generator signal. As another feature of this invention, the system is adapted to include one or more remote speakers which may function as microphones to form an intercom system. Yet another feature of this invention involves an adjustable output tone generator employing an adjustable striking device.

But these and other features of this invention, along wtih further objects and advantages thereof, will become more readily apparent from the following detailed description of the invention, with reference being made to the accompanying drawings in which;

FIG. 1 is a view in perspective of an electronic ship's clock made according to the invention,

FIG. 2 is a view in rear elevation of the clock with the housing removed,

FIG. 3 is a top plan view of the clock shown in FIG. 2,

FIG. 4 is a front elevation of the FIG. 2 clock,

FIG. 5 is a sectional view in side elevation of the tone generator, and,

FIG. 6 is a schematic diagram of the circuit for operating the clock.

Referring now to the drawings, the reference character **10** generally indicates a box cabinet housing an electric clock **12**, a programming system **14**, a tone generator **16**, an amplifying system **18** and a speaker **20**. The dial of the clock **12** appears through an opening formed in the front panel of the cabinet **10** while the clock itself is supported on a frame **22** located within the cabinet and attached in spaced parallel relation to the front panel by supporting rods **24**.

As best shown in FIGS. 3 and 4, the clock comprises a motor **26** mounted to the frame **22** and having a rotor **28** carrying a sweep second hand **30**, a minute hand **32** and an hour hand **34**. The second hand **30** is rotatable with the rotor **28** while the minute and hour hands are separately driven through reduction gearing **36**. The rotor **28** also carries a finger **38** which is adapted to close the contacts of a normally open switch **40** for a few seconds once every minute and just prior to the second hand **30** reaching 12 o'clock. The switch **40** is mounted to the frame **22** and serves to open and close a circuit to a motor **42** which drives the programming system **14**.

Mounted also to the frame **22** and about the periphery of the clock dial are normally open switches **44** and **46**. Both switches are actuated by the minute hand **32** which is provided with a right angular insulated extension **48** for engaging the switch contacts.

With the closing of the switch **40** and either of the switches **44** and **46**, a circuit is completed both to the motor **42** and to a pair of transformers **50** and **51**. The secondary of the transformer **50** is connected to a solenoid **52** for the tone generator **16** by a pair of leads **54** and **56**, with the lead **54** being interrupted by a two-way manual control switch **58** for silencing purposes and a normally open solenoid-actuating switch **60**. A normally closed switch **64** is also included in the control circuit to provide a parallel circuit to the motor **42** and transformers **50** and **51**. The transformer **51** is provided to energize a power supply **66** which, in turn, feeds an amplifier **68** and both of which employ semi-conductor components for instantaneous, low voltage response. A tone signal pickup **70**, which will be described in detail below, is connected by leads **72** and **74** to the amplifier **68** so that the signal produced by the tone generator **16** may be amplified and fed to the speaker **20**. For convenience, the control switch **58** may be connected by a linkage **75** to the amplifier to regulate its output.

Both switches **60** and **64** constitute part of the programming system **14** which also includes a programming wheel **78** drivingly connected to the motor **42**. Preferably, the wheel is fabricated from a rigid plastic material such as lucite, or the like, and is formed with a plurality of radial notches **80** about its periphery. It will be noted in FIGS. 3 and 4 that the contacts of the switch **60** are arranged generally tangential to the periphery of the wheel **78** so that the upper contact (FIG. 4), which is formed with a depending leg **82**, will move in and out of the notches **80** as the wheel **78** is rotated. This will open and close the switch **60** and thereby actuate the solenoid **52** causing the tone generator **16** to produce a signal.

Mounted to the wheel **78** and extending outwardly from its back surface are a number of pins **84** which, on rotation of the wheel **78**, are adapted to open and close

the contacts of the switch **64** mounted adjacent to the switch **60**. The notches **80** are arranged in groups, ranging progressively from one to eight notches per group, with each group having an associated pin **84**. These pins are adapted to open the switch **64** after a group of notches has passed under the switch **60**, opening and closing switch **60** as many times as there are notches in the particular group.

In practice, the clock is initially set at the correct time, with the finger **38** set to close switch **40** at the same time that the minute hand **32** closes either switch **44** or switch **46**. When the clock has been properly set, its operation will then be automatic. Assuming the clock to be in the position shown in FIG. 4, it will be seen that with the hands having just passed three o'clock, switches **40**, **44**, **46**, **60** and **64** will be open while switch **58** will normally be kept closed. Switch **60** will be kept open by reason of the fact that the wheel **78** is at rest in a position where the switch contact **82** will be bearing against the outer peripheral edge of the wheel. Switch **64** at the same time will be held open by a pin **84**. As the minute hand **48** subsequently approaches and closes the switch **46** at 3:30 o'clock, the finger **38** will close switch **40** for a few seconds as the second hand **30** passes top dead center. This will complete a circuit to the motor **42**, and through a lead **86**, to the transformers **50** and **51**, thereby energizing the power supply **66**, the amplifier **68** and the pickup **70**. It will be appreciated that by using a transistorized circuit in the power supply and amplifier, there is no need for a preliminary warming up period and the system will be responsive almost immediately upon energization.

As the motor **42** starts to run and the programming wheel **78** starts to rotate, the pin **84** that had been holding switch **64** open will move out of engagement with the pin, permitting the switch to close. With switch **64** closed, a parallel circuit will be completed to both the motor **42** and the transformers **50** and **51**, thereby permitting these components to continue operation after the switches **40** and **46** open as the finger **38** and the hand **48** respectively, move out of contact with them. As the programming wheel rotates further, the depending leg **82** of the switch **60** will drop into the first of a group of seven notches **80**. This will close switch **60** so that the solenoid **52** will be energized, and the tone generator **16** will be sounded. The wheel will continue to advance so that the leg of the switch will ride up out of the first notch, opening the switch **60** and deenergizing the solenoid and then dropping down into the next notch to again close the switch, energize the solenoid and sound the tone generator a second time. This will be repeated in fairly rapid succession until the seven "bells" have been sounded. When the last notch of the group moves beyond the switch **60**, a pin **84** will engage the switch **64**, opening the switch and thereby deenergizing the system. It will, of course, be understood that the signals produced by the tone generator **16** will be detected by the pick-up **70**, amplified and delivered to the loudspeaker **20**. It will also be understood that as the hands advance to 4 o'clock, the cycle will be repeated with the exception that the switch **44** will be closed instead of the switch **46** and that eight "bells" will be sounded rather than the previous seven.

For convenience in keeping track of the "bells" and for use when initially setting the clock and programmer, the wheel **78** is provided with Arabic numerals from 1 to 8 appearing on the front face thereof and each successively visible through an opening **88** formed in the front panel of the clock. As shown, the numeral **6** is in register with the opening **88** indicating that six "bells" was the previous time signal sounded.

Also included in the circuit, for convenience, is a reset switch **90** which may be employed to separately energize the transformers and the motor **42** as when first setting the clock.

Referring more particularly to FIG. 5, the tone generator **16** will now be described in detail. As shown, the tone generator is comprised of a cylindrical body or mass bar **92** having an elongated cylindrical, axial recess **94** to accommodate an elongated tone bar or reed **96**. The reed **96** is mounted by its inner end to the body **92** at the base of the recess **94** and extends coaxially outward from the body. A set screw **97** may be employed to secure the reed in place. The reed is formed with a pair of reduced portions **98** and **100** spaced along the length of the reed. The position of these reduced portions determines the quality of the tone signal generated when the reed is hit sharply along its length, as by a striker **102** mounted for axial movement in the solenoid **52**. It will be understood that by selectively locating the reduced portions **98** and **100** in relation to the nodes of the reed that a variation in the tone of the reed may be obtained. Typically, the reed is fabricated from ⅛" oil-tempered steel of circular cross-section and generally about 12" in length.

Two pairs of opposed openings **104** and **106** extend radially through the body **92**, one pair near either end with the lower opening of the pair **106** receiving in threaded engagement the solenoid **52** and the upper opening of the pair **104** receiving the tone pickup **70**, also in threaded engagement.

The solenoid **52** includes a threaded tubular sleeve or nipple **108** which is screwed into one of the openings **106** and locked by means of a nut **110**. The sleeve **108** carries a coil **112** connected by the leads **53** and **56** to the transformer **50**, as previously indicated. Mounted within the tubular sleeve is an annular collar **114** loosely supporting the striker **102** which is formed with a nonferrous tubular head portion **115** flanged at **116** to engage the collar **114** and having a tapered shank portion **117** of ferrous material at its lower end. It will be understood that when the coil **112** is energized, by closing the switch **60**, the striker **102** will fly up, off the collar **104** and hit against the reed **96**, causing it to vibrate at its natural frequency. When the coil **112** is deenergized by opening the switch **60**, the striker will drop back under the force of gravity to the collar **104**. By turning the sleeve **108** and nut **110**, the rest position of the striker can be adjusted to or away from the reed **96** to compensate for differences in available voltages and to vary the force of impact against the reed.

The tone pickup **70** includes a tubular steel nipple **118** screwed into one of the openings **104** and locked by a nut **120**. A cap **122** closes the outer end of the nipple **118** and is provided with a small aperture to accommodate the leads **72** and **74**. Disposed within the sleeve **118** is a coil **124** and magnetic core **125** embedded in a suitable potting material **126**. As the reed **96** vibrates, it will induce a current in the coil **124**, which current will be fed to the amplifier through the leads **72** and **74**. The sensitivity of the pick-up may be adjusted by moving it closer or further from the reed, as desired, and it will be appreciated that the further the pickup is from the read, the less will be its sensitivity. This adjustment may be made by merely turning both the nipple **118** and the nut **120** in the appropriate direction.

The entire tone generator assembly is mounted to the frame **22** by means of a semi-rigid plastic strap **126** (FIGS. 2 and 3) that prevents loading of the mass and damps out any spurious vibrations developed by the rest of the system. The strap **126** engages the tone generator at its node point to prevent damping since it will be appreciated that if the connection were made elsewhere the vibrations of the tone bar would decay rapidly. The mass bar **92** may be considered as a modification of a tuning fork stem which has been made symmetrical and extended around the tine anchored in its base. This permits the mounting of accessories such as the striker and pickup without damping out the signal. It will be appreciated that with a conventional tuning fork such ac-

cessories if mounted on an extension arm would damp out the vibrations.

Normally, the amplified tone signal is fed to the local loudspeaker **20** which is housed in the cabinet **10**. However, in some installations, it may be desired that the tone signal be delivered to a remote speaker **130** and for this purpose a single double throw switch **132** is provided for switching the output of the amplifier **68** from the local speaker **20** to the remote speaker **130**. As shown in FIG. 6 the remote speaker may be provided with its own power supply **134** and amplifier **136**.

As an added feature, the two speakers **20** and **130** may be employed as an intercom system with both speakers being provided with amplifier input leads **138** and **140**, each interrupted by paging switches **142** and **144** respectively. It will be understood that by closing the switch **142** and throwing the switch **132** so as to connect with the remote speaker **130** a person may talk into the local speaker **20** and be heard over the remote speaker. The remote speaker, of course, may be used for conversation or the like by closing the switch **144**.

The apparatus that has been described herein is extremely efficient and versatile in that the amplifier system normally functions only during a short period of time every half-hour, drawing very little current. In view of the fact that it functions only for short periods, the system may be safely overloaded during periods of operation to provide maximum amplification without damaging the unit. This permits a substantial reduction in the requirements of the amplifier components so that the cost of the amplifying system is considerably less than that of other systems having a comparable amplification factor and which are run continuously. The output volume may be easily regulated and the striker may be disconnected entirely without otherwise affecting the system. Furthermore, the bells sound precisely on the hour and half-hour, regularly and automatically with a tone that is substantially identical to that of a ship's bell.

While the invention has been described with particular reference to the illustrated embodiment, it will be understood that numerous modifications thereto will appear to those skilled in the art. Accordingly, the above description and accompanying drawings should be taken as illustrative of the invention rather than in a limiting sense.

Having thus described my invention, what I claim and desire to obtain by Letters Patent of the United States is:

1. An electronic ship's clock, comprising

(a) a timing clock having hour, minute and second hands,

(b) power means for driving said clock,

(c) a motor,

(d) a programming wheel drivingly connected to said motor,

(e) said wheel being provided with at least two programs,

(f) a tone generator responsive to operation of said wheel,

(g) an amplifying system connected to said tone generator for amplifying the output thereof,

(h) control means cyclically actuated by said timing clock for starting said motor and energizing said amplifying system according to one program,

(i) first actuating means responsive to operation of said programming wheel for intermittently actuating said tone generator according to another program,

(j) second actuating means responsive to operation of said programming wheel for separately operating said motor and said amplifying system after said motor and said system have been initially started by said timing clock,

(k) stop means connected to said wheel for stopping said motor and de-energizing said amplifying system upon completion of operation of said tone generator according to said other program.

2. An electronic ship's clock, comprising

(a) a timing clock having hour, minute and second hands,

(b) power means for driving said clock,

(c) a motor,

(d) a programming wheel drivingly connected to said motor,

(e) said wheel being provided with at least two programs,

(f) a tone generator responsive to operation of said wheel,

(g) a transistorized amplifying system connected to said tone generator for amplifying the output thereof,

(h) first switch means connected to said motor and amplifying system and cyclically actuated by said minute hand for starting said motor and energizing said amplifying system according to one program,

(i) second switch means connected to said tone generator and responsive to operation of said programming wheel for intermittently actuating said tone generator according to another program,

(j) third switch means connected to said motor and amplifying system and responsive to operation of said programming wheel for separately operating said motor and said system have been initially started by said timing clock,

(k) stop means connected to said wheel for said third switch means to stop said motor and de-energize said amplifying system upon completion of operation of said tone generator according to said other program.

3. An electronic ship's clock, comprising

(a) a timing clock having hour, minute and second hands,

(b) power means for driving said clock,

(c) a motor,

(d) a movable programming device drivingly connected to said motor,

(e) a signal generator responsive to operation of said device,

(f) a transistorized amplifying system connected to said signal generator for amplifying the output thereof,

(g) first switch means connected to said motor and amplifying system and cyclically actuated by said minute hand for initially starting said motor and energizing said amplifying system,

(h) second switch means connected to said signal generator and responsive to operation of said programming device for intermittently actuating said signal generator,

(i) third switch means connected to said motor and amplifying system and responsive to operation of said programming device for independently completing a circuit to said motor and said amplifying system after said motor and said system have been initially started by said minute hand,

(j) stop means connected to said device for reversing said third switch means to said motor and de-energize said amplifying system upon completion of operation of said signal generator.

4. An electronic ship's clock, comprising

(a) a timing clock having hour, minute and second hands,

(b) power means for driving said clock,

(c) a motor,

(d) a movable programming wheel drivingly connected to said motor,

(e) a signal generator responsive to operation of said wheel,

(f) a transistorized amplifying system connected to said signal generator for amplifying the output thereof,

(g) first switch means forming part of a circuit in said motor and amplifying system and cyclically actuated by said second hand,

(h) second switch means forming another part of a circuit to said motor and amplifying system and cyclically actuated by said minute hand for starting said motor and energizing said amplifying system,

(i) third switch means connected to said signal generator and responsive to operation of said programming wheel for intermittently actuating said signal generator,

(j) fourth switch means connected to said motor and amplifying system and responsive to operation of said programming wheel for independently completing a circuit to said motor and said amplifying system after said motor and said system have been initially started by said second and minute hands, and,

(k) stop means connected to said wheel for opening said fourth switch means to stop said motor and deenergize said amplifying system upon completion of operation of said tone generator.

References Cited by the Examiner

UNITED STATES PATENTS

1,048,987	12/12	Mauthe	58—19
1,096,680	5/14	Clement	58—38
1,521,600	1/25	Crowe	58—19
1,695,087	12/28	Carlson	29—177
1,837,462	12/31	Mazur	58—13
2,224,085	12/40	Norton	58—38
2,288,933	7/42	Ager-wick	58—38
2,582,441	1/52	Kunz	340—384
2,587,026	2/52	Beiser	200—38
2,665,544	1/54	Rowe et al.	58—38
2,708,337	5/55	Leach	58—38
2,834,180	5/58	Tyler	58—38
2,915,872	12/59	Maas	58—38
2,971,187	2/61	Marr et al.	340—384
2,974,473	3/61	Kramer	58—9
3,081,594	3/63	Atkins et al.	58—50

LEYLAND M. MARTIN, *Primary Examiner.*

JOSEPH P. STRIZAK, *Examiner.*