

June 2, 1964

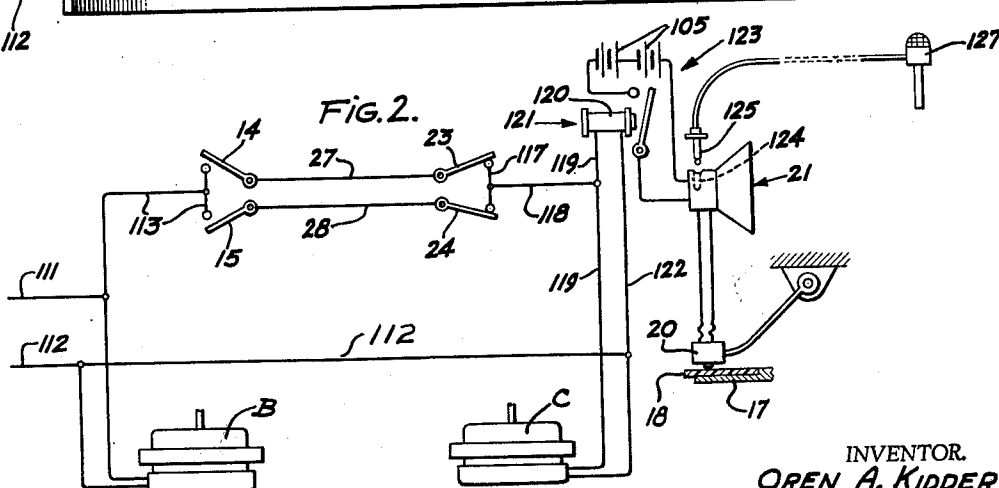
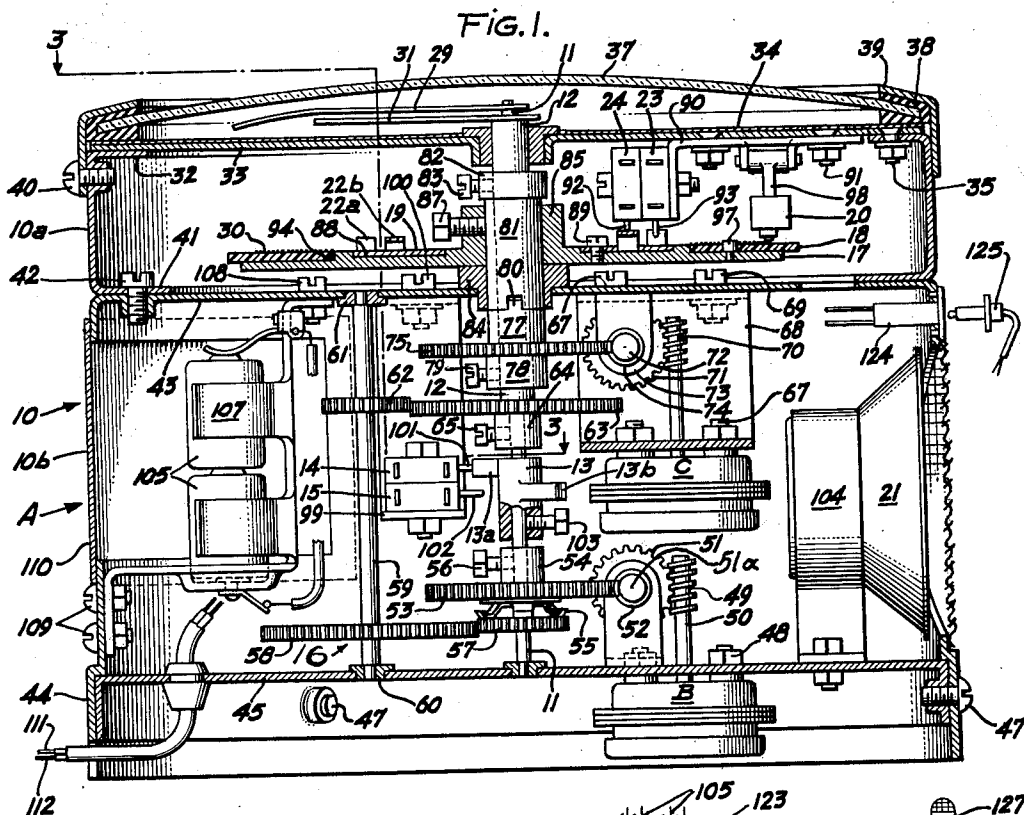
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3,135,084

TALKING CLOCK

Filed April 29, 1963

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

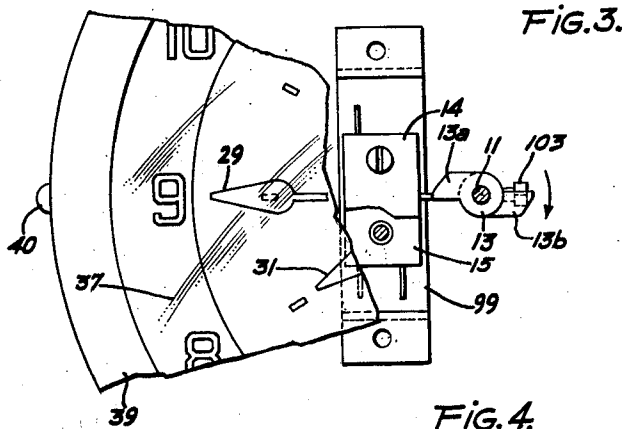


FIG. 4.

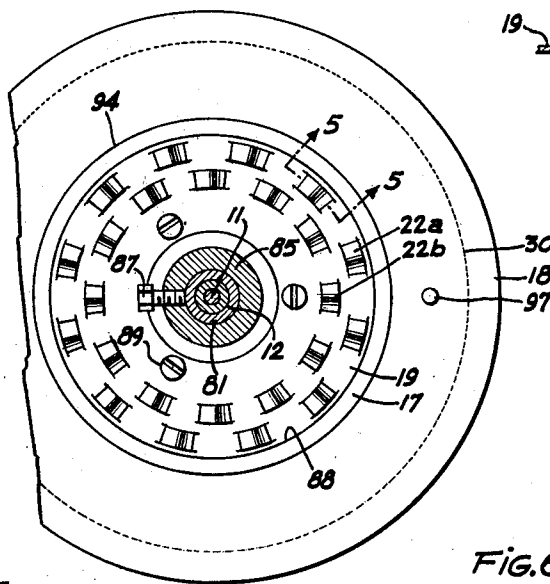


FIG. 5.

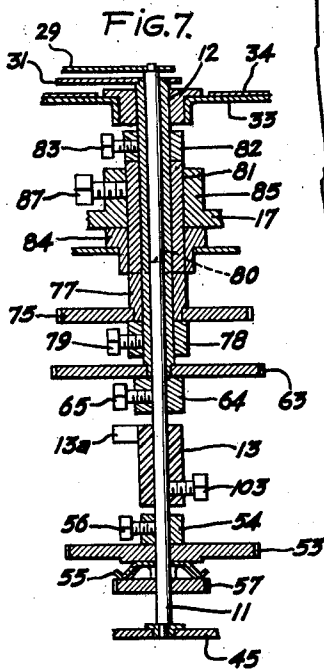
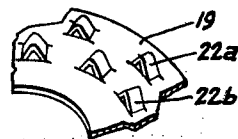


FIG. 6.



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3,135,084

TALKING CLOCK

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7 Claims. (Cl. 58-14)

The present invention relates to a clock wherein pre-recorded announcements are made at regular intervals during each complete circuit of the hour hand of such clock.

In the past various types of talking clocks have been developed which announce the hours and half hours by playing recorded time messages. Many of such prior art mechanisms have, however, been quite intricate, difficult to operate or service, and frequently quite expensive.

An object of the present invention is to make an improved talking clock, which will play recorded messages at selected time intervals during each circuit of the hour hand around the face of a clock.

Another object of the invention is to provide a talking clock comprising a recording medium having recorded thereon a required number of announcements, and means operatively interconnected with the clock mechanism for playing such recorded announcements at timed intervals during the circuit of the hour hand around the face of such clock.

A further object of the invention is to control actuating mechanism for a recording medium by means of the minute hand of a clock, so as to move the recording medium relative to a transducer at selected, timed intervals during the circuit of the hour hand around such clock for playing recorded sound at each such timed interval.

These, and other objects and advantages of the invention, will be apparent from the following description and the accompanying drawings, wherein:

FIG. 1 is a sectional view through a talking clock embodying the invention, taken axially of the hour and minute hand shafts.

FIG. 2 is a schematic circuit diagram for the clock shown in FIG. 1.

FIG. 3 is a fragmentary, sectional view taken along line 3-3 of FIG. 1.

FIG. 4 is a top, plan view of the rotary disk having an annular recording medium and a multiple cam ring mounted co-axially thereon.

FIG. 5 is a fragmentary, sectional view of the cam ring taken along line 5-5 of FIG. 4.

FIG. 6 is a fragmentary, perspective view of a portion of the multiple cam ring.

FIG. 7 is a fragmentary, sectional view taken axially of the assembly of parts on the hour and minute hand shafts.

Briefly, the illustrative embodiment of the invention comprises a talking clock A having a housing 10 with a minute hand shaft 11 and a tubular hour hand shaft 12 driven, through gearing 16, by a conventional electric clock motor B. A sound initiating member 13 is mounted on the minute hand shaft 11 to rotate therewith, and alternately closes one of two, normally open, sound initiating micro-switches 14 and 15 at half hour intervals.

A disk 17, having an annular recording medium 18 and a multiple cam ring 19 mounted co-axially thereon is driven by a motor C upon each closing of the sound initiating switches 14 and 15. A transducer 20 picks up from the recording medium 18 messages which have been previously recorded thereon and broadcasts these messages through a loudspeaker 21.

Twenty four sound-shut-off cams 22 are provided on the cam ring 19, and are arranged in two concentric rows, 22a and 22b, of twelve cams each. The cams of the two rows 22a and 22b are arranged in symmetrically staggered, or rotatively alternately offset, relation, and the

2

cams of each row thereof are operatively aligned with one of two, normally closed, sound-shut-off switches 23 and 24. One terminal of the sound initiating switch 14 is connected by a conductor 27 to one terminal of a normally closed sound-shut-off switch 23, while a terminal of the other sound initiating switch 15 is similarly connected by a conductor 28 to a terminal of the other sound-shut-off switch 24.

As the minute hand 29, mounted on its shaft 11, arrives at each successive hour and half hour position, a pair of axially offset arms 13a and 13b of the sound initiating member 13 alternately actuate the normally open sound initiating switches 14 and 15. Each actuation of each of the latter switches closes a circuit through its associated normally closed sound-shut-off switch 23 or 24, as the case may be, to thereby energize the sound circuit and the sound motor C to drive the disk 17 through an angle of 15° or one-twenty-fourth of a revolution. During such movement of the disk 17, the transducer 20 picks up, from the portion of the sound track 30 which it traverses, the message recorded thereon, for example, "The time is twelve o'clock," and broadcasts this message from the loudspeaker 21.

Upon completion of each such twenty fourth revolution of the disk, the associated cam-actuated, sound-shut-off switch 23 or 24, as the case may be, is opened by being engaged by the next successive cam 22a or 22b with which it is aligned to thereby de-energize the disk drive motor C the transducer 20, and the loudspeaker 21. This action is repeated by alternate interconnected switches 14, 23 and 15, 24 (FIG. 2) at half hour intervals throughout the entire circuit of the hour hand 31.

The terms "bottom," "top," etc., as employed in the present description refer only to the position of the parts as illustrated in FIGS. 1 and 7, since obviously the clock is intended for mounting in usual axially horizontal position on a wall or table.

Referring to the drawings in greater detail, the clock A comprises the housing 10 (FIG. 1) which consists of two cylindrical housing portions 10a and 10b of equal diameter. The upper housing portion 10a has an intumed flange 32 at its upper end, and a top plate 33 with a usual, numbered dial 34 thereon, is secured to the flange 32 by bolts 35. A clock crystal 37 is seated in a bezel 38, which may be of plastic material, and is secured in place by a rim 39. The latter fits over the bezel and is secured to the housing by screws 40. The upper housing portion 10a is also provided with an intumed flange 41 at its lower end, and is secured by screws 42 co-axially to the integral top plate portion 43 of the lower housing portion 10b.

The lower housing portion 10b is of inverted cup-shape, and is formed with a slightly enlarged bottom portion 44 into which a flanged bottom plate 45 is fitted. The latter seats against the shoulder formed by the enlarged bottom portion 44, and is secured in place by screws 47.

The clockworks motor B may be of a type conventionally employed in electric clocks, and is secured by bolts 48 to the housing bottom plate 45. A worm pinion 49 on the drive shaft 50 of the clock motor B is in mesh with a worm gear 51 secured to a countershaft 51a having a second worm pinion 52 thereon. This second worm pinion 52 is in mesh with a worm gear 53 journaled on the minute hand shaft 11 of the clock A. The upper side of this worm gear 53 has bearing support against a collar 54 affixed by a set screw 56 to the minute hand shaft 11. Means for driving the minute hand shaft 11 comprises a spring finger clutch member 55 secured to the worm gear 53 to rotate therewith. The ends of the spring fingers on the clutch member 55 bear with suitable frictional engagement against the upper surface of a spur gear 57, which is secured co-axially to the minute hand shaft 11.

The gear 57 meshes with a larger gear 58 mounted on a countershaft 59, which is journaled in co-axial bearings 60 and 61 mounted in openings provided therefor in the bottom plate 45, and top plate 43, respectively, of the lower housing portion 10b. A second, smaller gear 62 on the counter shaft 11 is in mesh with a larger gear 63 secured, as by means of a press fit (see FIG. 7) to the lower end of the tubular hour hand shaft 12. The latter is journaled co-axially on the minute hand shaft 11, and has endwise bearing support at its lower end on a collar 64, which is secured by a set screw 65 to the minute hand shaft 11. The net reduction of the combined gears 57, 58, 62 and 63 is, of course, one to twelve, so that for each twelve rotations of the minute hand 29, the hour hand 31 will rotate once.

The disk drive motor C is mounted, by bolts 67, on the under side of a bracket 68, which in turn is secured by bolts 69 to the housing top plate 43. A worm pinion 70 on the drive shaft of the disk drive motor C drives a worm gear 71 on a countershaft 72 journaled in bearing brackets 73 secured to the under side of the top plate 43 of the lower housing portion 10b. A worm pinion 74, also provided on the countershaft 72, drives a worm gear 75, the hub 77 of which is journaled on the tubular hour hand shaft 12, and has endwise bearing support on a collar 78 secured by a set screw 79 into the hour hand shaft 12.

The gear hub 77 has endwise, keyed interconnection at 80 with a sleeve 81, also journaled on the hour hand shaft 12, and is retained against upward displacement thereon by a collar 82 secured by a set screw 83 onto the hour hand shaft 12. The sleeve 81, is also journaled in a bearing 84 fitted into a hole provided therefor centrally of the top plate 43 of the lower housing portion 10b.

The cam and sound track disk 17 has an integral hub portion 85, which is fitted onto the sleeve 81 and is secured thereon by a set screw 87.

The upper face of the disk 17 is provided with a co-axial, annular recess 88 into which is fitted the multiple cam ring 19 having the twenty four sound-shut-off cams 22 thereon. As illustrated, these cams 22 are severed from the material of the cam ring 19, and are offset upwardly therefrom in any suitable manner, as by conventional die forming mechanism.

The cam ring 19 is secured to the disk 17 by screws 89. As mentioned previously herein, the cams 22 are arranged in symmetrically staggered relation in two concentric rows 22a (outer) and 22b (inner), of twelve cams each.

The two normally open, sound-shut-off micro-switches 23 and 24 are mounted on a bracket 90, which is secured by bolts 91 to the plate 33 on top of the upper housing portion 10a. The radially innermost switch 24 is provided with a usual actuating plunger 92, which is mounted in the path of movement of the inner row of cams 22b, while the outermost switch 23 is provided with a similar plunger 93, which is mounted in the path of movement of the outer row of cams 22a.

The recording medium 18 comprises an annular plate of suitable non-magnetic material, such as, for example, sheet plastic or aluminum, and is coated on its upper or exposed side, in a conventional manner for such recording media, with suitable magnetic material, such as, for example, ferric oxide. The annular recording medium 18 is fitted into a concentric, rabbeted recess 94 provided therefor in the disk 17, and a locating pin 97 on the disk 17 fits into a hole provided therefor in the recording medium 18 to index the latter on the disk.

The magnetic transducer 20, which may be of a conventional type, preferably is of the read-write type, and is mounted on a suitable support arm 98, which, in turn, is suitably mounted on the bracket 90. By means of conventional circuitry, such as that shown diagrammatically in FIG. 2, the transducer 20 may be used in a well known manner to either record messages or other material on the recording medium 18, or to pick up recorded messages

therefrom. Since the details and circuitry of such sound recording and pick-up mechanisms are well known, and since the details thereof form no part of the present invention, it will be unnecessary to describe or illustrate them herein.

The two normally closed, sound initiating micro-switches 14 and 15 are mounted on a bracket 99 secured to the top plate 43 of the lower housing portion 10b by bolts 100. The actuating plungers 101 and 102 of these switches 14 and 15 are aligned, respectively, with the paths of movement of the arms 13a and 13b of the sound initiating member 13. The latter is secured in rotatively adjusted position on the minute hand shaft 11 by a set screw 103.

Elements of the sound circuit, such as transistors, capacitors, etc. may be mounted in a housing 104 provided on the base of the loudspeaker 21. Dry cell batteries 105 for energizing the sound circuit are mounted in a conventional battery clip 107, which may be of molded plastic, and is secured by bolts 108 and 109 to the clock housing 10. The batteries may be replaced as required by means of an access door 110 provided in the lower housing portion 10b.

A preferred circuit for the clock A is shown in FIG. 2, wherein a pair of line conductors 111 and 112 may be the conductors of a conventional, two-conductor extension cord as shown in FIG. 1. The line conductors 111 and 112 are connected directly to the clockworks drive motor B, so that the clock A will run continuously as long as suitable electric current is supplied to these conductors. For the purpose of the present description this current is assumed to be 115 volt, alternating current of the type generally supplied by electric utility companies in the United States for home and office lighting and small appliance operation.

From the line conductor 111, a common conductor 113 is connected to one terminal of each of the two, normally open, sound initiating switches 14 and 15. From the other terminals of these switches 14 and 15 the conductors 27 and 28 are connected one to a terminal of each of the normally closed sound-shut-off switches 23 and 24. From the other terminals of both of these latter switches a common conductor 117 is connected to a conductor 118, which in turn is connected to a conductor 119, which is connected to one terminal of the coil 120 of a loudspeaker circuit relay 121, and also to one terminal of the disk drive motor C. A conductor 122 is connected from the other terminals of the relay coil 120 and of the disk drive motor C to the other line conductor 112. Actuation of the relay 121 energizes the battery powered sound circuit 123.

The operation of the talking clock A is as follows:

Where standard time announcements only are required, it is contemplated that the recording medium 18 will have the appropriate time announcing messages recorded thereon at the factory. In such case it will only be necessary for a purchaser of the clock to connect the line conductors to a suitable source of electric current and then to set the clock to the proper time as explained later herein. However, assuming that an owner desires to record his own messages on the recording medium 18, such as, for example, advertising messages; a jack socket 124 of a conventional type may be provided to permit the owner to insert a jack 125 therein for disconnecting the loudspeaker 21, and connecting a microphone 127 into the sound circuit in order to record such messages as may be desired on successive portions of the recording medium 18. Since the structure and operation of such sockets and jacks, and other switching means for operatively connecting a microphone into a loudspeaker circuit are well known, it will be unnecessary to illustrate or describe the details thereof herein.

Assuming that the clock A is assembled as shown in FIG. 1, and that the recording medium 18 is blank; with the line conductors 111 and 112 energized, the clock

hands 29 and 31 are set by manually rotating the minute hand 29 clockwise to a desired initial position, for example, to indicate eleven thirty.

The set screw 103 is then loosened, and the sound initiating switch actuating member 13 is rotatively adjusted in a clockwise direction on the minute hand shaft 11 until one of the switch actuating arms on the member 13, for example the arm 13a (FIG. 1) actuates the plunger 101 to just close the normally open, sound initiating switch 14 associated therewith. When this occurs, if the plunger 93 of the normally closed sound-shut-off switch 23 associated with the sound initiating switch 14 is supported by one of the cams 22a in its raised, or open, position, the circuit to the relay 121 and the disk drive motor C remains open and no action is initiated by such closing of switch 14.

On the other hand, if the switch plunger 93 of normally closed sound shut-off switch 23 is clear of any of the cams 22a when its associated sound initiating switch 14 is closed, a circuit will thereupon be closed from line conductor 111, through conductor 113, switch 14, conductor 27, switch 23 and conductors 117, 118 and 119 to the sound circuit relay coil 120 and the disk drive or sound motor C, thereby energizing the sound circuit 123 and the sound motor C until the next successive sound-shut-off cam 22a actuates the plunger 93 and thereby opens the sound shut-off switch 23 to de-energize the sound circuit 123 and the sound motor C. The set screw 103 is then tightened to secure the switch actuating member 13 in such rotatively adjusted position on the minute hand shaft 11.

It is further assumed that the transducer 20 is in the "write" or "record" condition, and that the jack 125 is plugged into the socket 124 to operatively connect the microphone 127 into the sound circuit 123, and to disconnect the loudspeaker 21. Suitable batteries 105 are assumed to be properly installed in their clip 107.

The minute hand 29 is then swung clockwise from its assumed initial eleven thirty position to its hour or twelve o'clock position. As the minute hand 29 arrives at its hour or twelve o'clock position, the other arm 13b of the sound initiating member 13 will thereby be swung to actuate the plunger 102 of, and thereby to close, the other normally open sound initiating switch 15.

Since, as explained in the second preceding paragraph, the disk 17 is positioned at this stage of operation with a cam 22a holding the sound-shut-off switch 23 in its open position, the plunger 92 of the other sound-shut-off switch 24 will, in that case, be located midway between two of the cams 22b, and will, therefore, be in its unactuated, or normally closed, condition. Thus, the closure of the other sound initiating switch 15 closes a circuit (FIG. 2) from line conductor 111, through switch 15, alternate conductor 28, switch 24 and conductor 119 to the relay coil 120 and sound motor C in the same manner as that described previously herein upon the closure of switch 14.

As soon as the disk drive motor C starts, thereby driving the disk 17 through the pinion 70, gear 71, pinion 74 and gear 75, a desired message for the one-twenty-fourth, or 15°, segmental portion of the sound track 30 on the recording medium 18 is spoken into the microphone 127, for example "Try our lunch room, the time is twelve o'clock." Upon completion of this one-twenty-fourth segmental transit of the disk 17, the sound-shut-off cam 22b next in line actuates the plunger 92 and thereby opens sound-shut-off switch 24, thereby opening the parallel circuits to the relay 121 and the sound motor C.

The minute hand 29 is then manually swung clockwise to its next half hour, or twelve-thirty position, thereby causing the arm 13a of the member 13 to close the other sound initiating switch 14. Since the sound-shut-off switch 23 associated with switch 14 is then in its between-cams, or unactuated, normally closed condition, the relay 121 and sound motor C are again energized

through the alternate conductor 27. Here again, as soon as the sound motor C starts, a desired message for this position of the clock hands is spoken into the microphone 127, for example "The time is twelve thirty, remember our hourly bargains." This procedure is repeated with appropriate messages until each one-twenty-fourth segment of the sound track 30 has had its required message recorded thereon, at which time the hour hand will have completed its circuit of the face of the clock. The jack 125 is then removed to disconnect the microphone 127 and to operatively connect the loudspeaker 21 into the sound circuit 123, and the transducer 20 is placed in its "read" or "pick-up" condition, whereupon the clock A is ready to repeat its recorded messages at half hour intervals.

In setting the clock A, the line conductors 111 and 112 are connected to a suitable source of electricity, and the minute hand 29 is moved clockwise in half hour increments, sufficient time being allowed at each successive hour and half hour position of the minute hand for the disk drive motor C to rotatively advance the disk 17 its required one-twenty-fourth of a revolution. Otherwise, the disk 17 and the messages recorded on the recording medium 18 will not be synchronized with the positions of the hands so as to announce the appropriate message for each such half hour position of the hands. This setting procedure is similar to that required by many striking clocks, wherein it is necessary to allow the clock to strike completely in each successive striking position of the hands.

The present invention provides a simple and effective talking clock, the operation of which will be readily understood by those familiar with older striking type clocks. The mechanism is simple and rugged, which permits it to be easily serviced and repaired by personnel familiar with other types of electrical clocks. Aside from the necessity of replacing the batteries at infrequent intervals, and changing the recorded messages if desired, the clock of the present invention requires no attention, and should give long and trouble free service.

While I have illustrated and described a preferred embodiment of the present invention, it will be understood, however, that various changes and modifications may be made in the details thereof, such as for example the use of other well known circuit control means and sound recording and reproducing means, without departing from the scope of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desire to protect by Letters Patent is defined in the following claims.

1. A talking clock comprising, in combination with a clockworks having an hour hand and a minute hand:

- (a) a pair of switch actuating elements rotating synchronously with the minute hand,
- (b) a pair of normally open sound initiating switches positioned for alternate closing, one by each switch actuating element upon each half revolution of the minute hand,
- (c) a sound motor,
- (d) sound reproducing mechanism,
- (e) a pair of alternate electric circuits through the sound motor and the sound reproducing mechanism, each of the alternate circuits including one of the sound initiating switches for energizing the sound motor and the sound mechanism upon the closing of alternate sound initiating switches, and
- (f) timing means controlled by each operation of the sound motor for limiting each operation of the sound motor and the sound reproducing mechanism.

2. A talking clock comprising, in combination with a clockworks having an hour hand and a minute hand:

- (a) switch actuating means moving synchronously with the minute hand,

- (b) a plurality of normally open sound initiating switches positioned for successive closing by the switch actuating means upon each revolution of the minute hand,
 - (c) a sound motor,
 - (d) sound reproducing mechanism electrically connected for energization simultaneously with the sound motor,
 - (e) a pair of alternate electric circuits through the sound motor and the sound reproducing mechanism, each of the alternate circuits being controlled by alternate closing of the sound initiating switches for energizing the sound motor and the sound mechanism, and
 - (f) timing means controlled by each operation of the sound motor for limiting each operation of the sound motor and the sound reproducing mechanism.
3. A talking clock comprising, in combination with a clockworks having an hour hand and a minute hand:
- (a) a pair of switch actuating elements rotating synchronously with and co-axially of the minute hand,
 - (b) a pair of normally open sound initiating switches positioned for alternate closing by alternate ones of the switch actuating elements upon each half revolution of the minute hand,
 - (c) a sound motor,
 - (d) a recording medium in driven relation with the sound motor,
 - (e) a transducer and amplifier mounted to pick up and amplify sound impulses from the recording medium,
 - (f) a pair of alternate electric circuits through the sound motor, transducer and amplifier, one of the alternate circuits being controlled by each sound initiating switch for energizing the sound motor and the sound mechanism upon the closing of each sound initiating switch, and
 - (g) timed circuit opening means controlled by each energization of the sound motor for limiting each operation of the sound motor, transducer and amplifier.
4. A talking clock comprising, in combination with a housing having a clockworks mounted therein with an hour hand and a minute hand mounted co-axially of each other;
- (a) a pair of switch actuating elements mounted co-axially of the hands for rotation synchronously with the minute hand,
 - (b) a pair of normally open sound initiating switches mounted on the housing, and
 - (c) positioned one in the path of movement of each of the switch actuating elements for alternate closing by their respective switch actuating elements upon each half revolution of the minute hand,
 - (d) a sound motor,
 - (e) a cam ring driven by the sound motor,
 - (f) two sets of cams on the cam ring,
 - (g) a pair of normally closed sound shut off switches, one thereof operatively aligned with each set of cams on the cam ring,
 - (h) sound reproducing mechanism actuated by the sound motor,
 - (i) a pair of alternate electric circuits through the sound motor and the sound reproducing mechanism,
 - (k) one of the alternate circuits being controlled by each sound initiating switch, for energizing the sound motor and the sound reproducing mechanism upon the closing of each sound initiating switch,
 - (l) one of the sound shut off switches being incorporated in each alternate circuit for actuation by the next successive cam aligned therewith for opening the circuit and thereby limiting the duration of

- operation of the sound motor and the sound reproducing mechanism upon each operation thereof.
5. A talking clock comprising, in combination with a housing having a clockworks mounted therein with an hour hand and a minute hand mounted co-axially of each other;
- (a) a pair of rotary switch actuating elements driven by the clockworks,
 - (b) a pair of normally open sound initiating switches mounted on the housing, and
 - (c) positioned one in the path of movement of each switch actuating element for alternate closing by their respective switch actuating elements upon each half revolution of the minute hand,
 - (d) an intermittently actuated sound motor,
 - (e) a pair of cam elements driven by the sound motor,
 - (f) a normally closed sound shut-off switch operatively positioned in the path of movement of each cam element,
 - (g) sound reproducing mechanism actuated by the sound motor upon each energization of the latter,
 - (h) a pair of alternate electric circuits through the sound motor and the sound reproducing mechanism,
 - (i) one of the sound initiating switches being operatively incorporated in each alternate circuit for energizing the sound motor and the sound reproducing mechanism upon the closing of each sound initiating switch,
 - (j) each sound shut off switch being operatively incorporated in one of the alternate circuits for actuation by its respective cam element after the completion of a timed movement of such cam element, thereby to open the alternate circuit in which the sound shut-off switch is incorporated and thereby de-energize the sound motor and the sound reproducing mechanism.
6. A talking clock comprising, in combination with a housing having a clockworks having an hour hand and a minute hand mounted therein:
- (a) a pair of movable switch actuating elements driven by the clockworks synchronously with the minute hand,
 - (b) a pair of normally open sound initiating switches mounted on the housing, and
 - (c) positioned one in the path of movement of each switch actuating element for alternate closing by their respective switch actuating elements upon each known, fractional revolution of the minute hand,
 - (d) an intermittently actuated sound motor,
 - (e) sound reproducing mechanism energized concurrently with each energization of the sound motor,
 - (f) a recording medium driven by the sound motor during each energization thereof and operatively connected to the sound reproducing medium,
 - (g) a pair of alternate electric circuits, each thereof including the sound motor and the sound reproducing mechanism,
 - (h) one of the sound initiating switches being operatively incorporated in each alternate circuit for energizing the sound motor and the sound reproducing mechanism upon the closing of each sound initiating switch,
 - (i) and sound shut off switching means moving synchronously with the recording medium and controlling each of the alternate circuits for de-energizing the sound motor and the sound reproducing mechanism upon the completion of a timed movement of the recording medium.
7. A talking clock comprising, in combination with a housing having a clockworks with an hour hand and a minute hand mounted co-axially therein;
- (a) a pair of switch actuating elements moving synchronously with the minute hand,
 - (b) a pair of normally open sound initiating switches mounted on the housing, and
 - (c) positioned one in the path of movement of each switch actuating element for alternate closing by

9

their respective switch actuating elements upon each half revolution of the minute hand,

- (d) a sound motor,
- (e) a cam ring rotatably driven by the sound motor,
- (f) two concentric rows of cams on the cam ring,
- (g) the cams of one row thereof being offset rotatively from those of the other row,
- (h) a pair of normally closed sound shut-off switches,
- (i) one thereof operatively aligned with each row of cams on the cam ring,
- (j) a recording medium driven synchronously with the cam ring,
- (k) sound reproducing mechanism including a transducer operatively mounted over the recording medium and sound amplifying means,
- (l) a pair of alternate electric circuits through the sound motor and the sound reproducing mechanism,

10

- (m) one of the alternate circuits being controlled by each sound initiating switch, for energizing the sound motor and the sound reproducing mechanism upon the closing of each sound initiating switch,
- (n) one of the sound shut-off switches being incorporated in each of the alternate circuits, whereby upon each closing of one of the sound initiating switches having the sound shut-off switch in the same circuit closed, that alternate circuit will remain closed until the next successive cam in the row thereof aligned with the sound shut-off switch of the closed circuit actuates the latter switch to thereby open such circuit, thereby leaving the sound shut-off switch in the other alternate circuit in its unactuated closed condition.

No references cited.