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3,376,700

TAPE RECORDED CHIME CLOCK

Filed Oct. 21, 1965

2 Sheets-Sheet 1

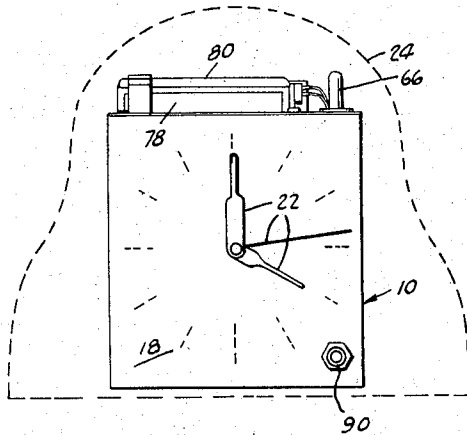


FIG. 1

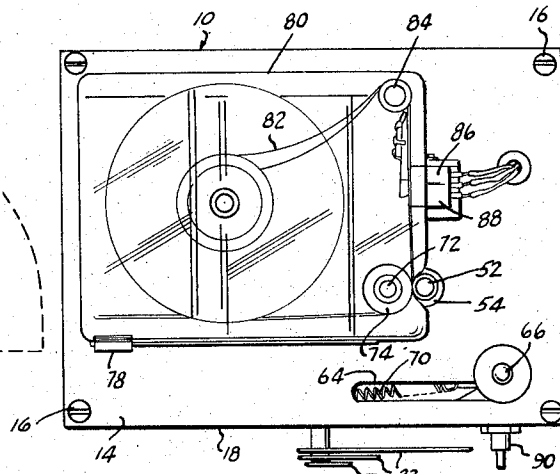


FIG. 2

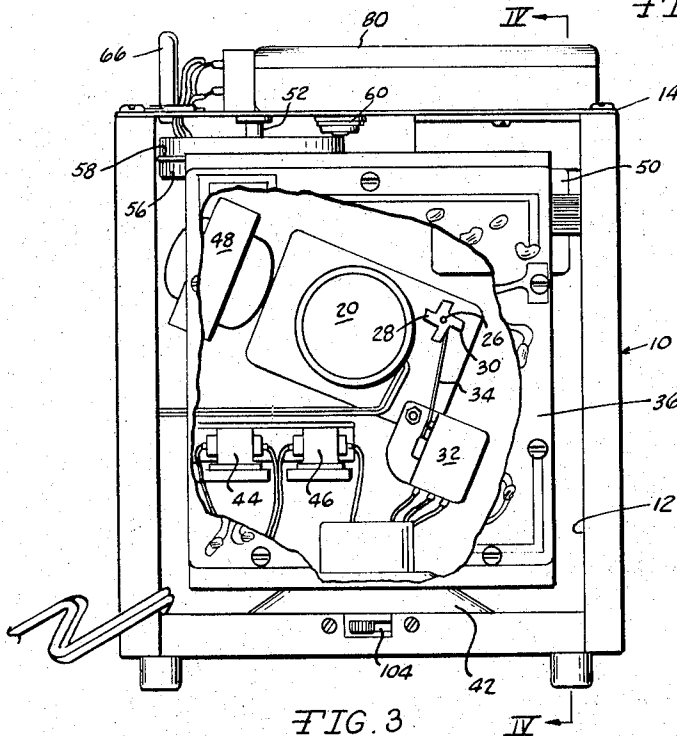


FIG. 3

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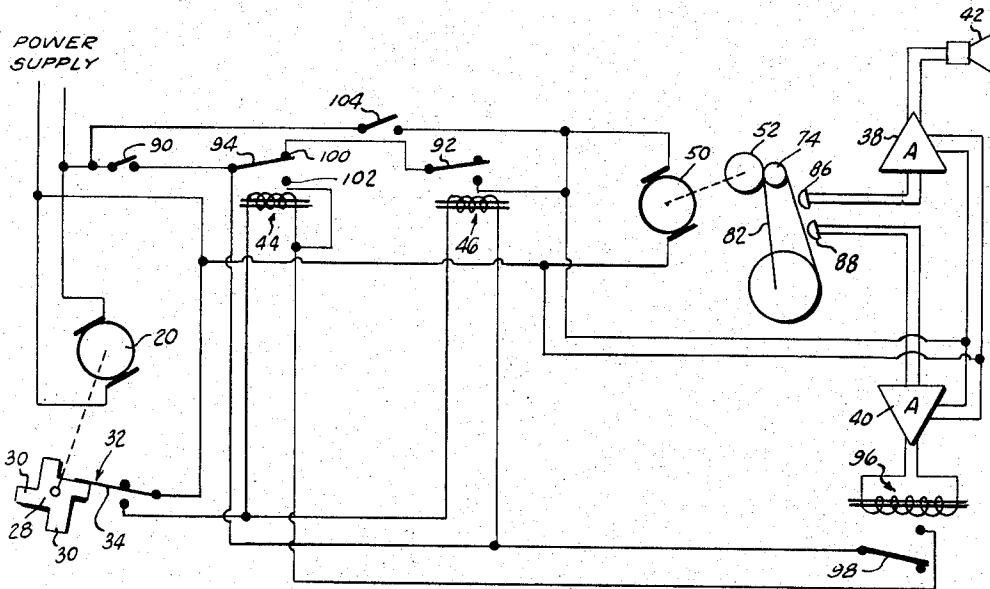


FIG. 6

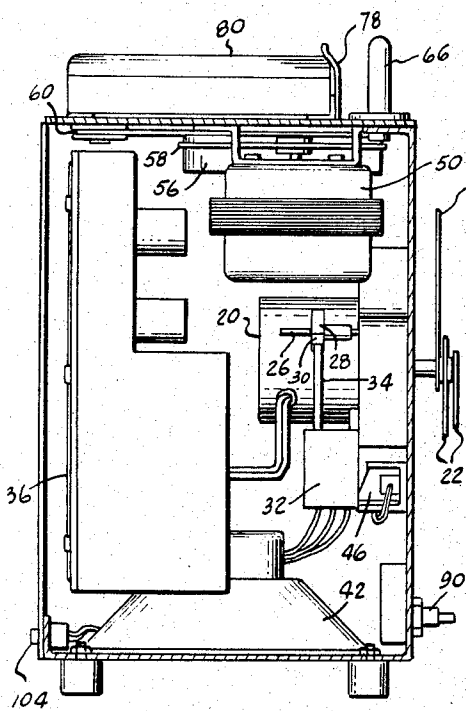


FIG. 4

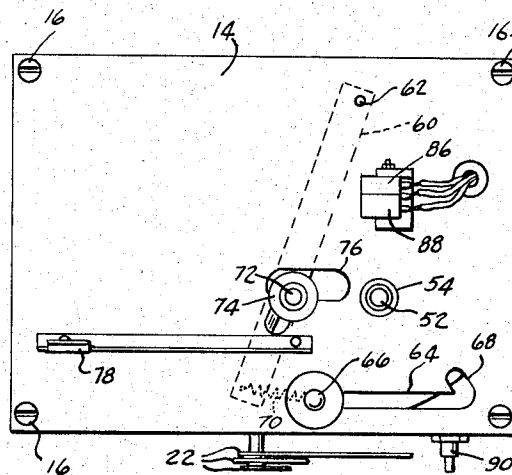


FIG. 5

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TAPE RECORDED CHIME CLOCK

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2 Claims. (Cl. 58—14)

ABSTRACT OF THE DISCLOSURE

A chiming electric clock wherein chiming is produced from signals upon a two-track magnetic tape. One of the tape tracks includes a pulse signal for controlling the duration of the tape operation, and the circuit includes three relays, one of which includes a holding circuit to permit resetting intermediate operation of the tape.

Chimes have long been employed in conjunction with timepieces to indicate the hour, half-hour, and often the quarter-hour. Throughout many years, the ingenuity and craftsmanship of watchmakers has been employed to make timepieces both attractive in appearance and pleasing in sound. Perhaps, the best known timepiece available for domestic use which combines appearance and sound is the so-called "grandfather" clock. Such clocks are often six or seven feet tall to accommodate the length of chime required, and complicated mechanisms are employed with this type clock to produce pleasing sounds to indicate the hour, half-hour and quarter-hour.

One disadvantage of the "grandfather" type clock lies in the necessary size of the timepiece and the very high cost thereof. It is an object of the invention to provide a low-cost and concise combination clock and audio device wherein a timepiece may be combined with an audio mechanism for producing chimes or other melodies in accordance with the time which are of a very high quality nature. The apparatus of the invention is producible at a fraction of the cost of the more expensive timepieces of conventional construction.

Another object of the invention is to produce a clock-audio apparatus capable of high fidelity reproduction of chime melodies of world famous chime clocks such as "Big Ben" in London, England.

A further object of the invention is to provide a clock-audio apparatus which utilizes a dependable audio circuit and the reliability of an electric clock mechanism, and wherein the apparatus is rugged, may be readily shipped and does not require special installation.

An additional object of the invention is to provide a clock-audio apparatus which is of a low cost, automatic in operation, dependable and very versatile. For instance, as the audio signals employed with the clock of the invention are stored upon a magnetic tape, it is possible to place upon the tape signals which will convey a spoken message, music, or operate electrical apparatus to function as a master time control center.

Another object of the invention is to produce a clock-audio apparatus employing a dual track magnetic tape wherein one of the tracks of the tape contains the audio signals to be amplified and transmitted and the other track contains a control signal for regulating the operation of the audio system.

These and other objects of the invention arising from the details and relationships of the components of an embodiment thereof will be apparent from the following description and the accompanying drawings wherein:

FIG. 1 is a front, elevational view of a clock-audio apparatus in accord with the invention, the apparatus casing being shown in dotted lines,

FIG. 2 is a plan view of the clock-audio apparatus housing,

FIG. 3 is a rear view of the invention, portions of the circuit board being cut away for illustrating the components within the housing,

FIG. 4 is an elevational, sectional view taken along section IV—IV of FIG. 3,

FIG. 5 is a plan view of the clock-audio apparatus housing similar to FIG. 2 with the tape cartridge removed, and

FIG. 6 is a schematic view of the electrical circuit employed in the practice of the invention.

In the illustrated embodiment, the entire apparatus, except for the tape cartridge and the pickup heads, is located within a rectangular housing 10 having an opening 12 defined in the back, FIG. 3. A top plate 14 is screwed to the sides of the housing by screws 16 to form the top of the housing.

The front face of the housing is indicated at 18 and a conventional electric clock motor 20 is mounted on the inside of the front face and located within the housing, FIGS. 3 and 5. Clock hands 22 are associated with the electric motor 20 in the usual manner and the conventional clock numerals will be located on the housing face 18, or on the exterior casing 24 of the clock, as represented by the dotted lines in FIG. 1.

The clock motor 20 is provided with a shaft 26 extending toward the rear of the housing. The shaft 26 rotates once every hour and has a cam 28 affixed thereto. The cam 28 is provided with four "high" points 30 related at 90° with respect to each other. A normally closed switch 32 is mounted on the clock motor mechanism and includes an actuating leaf 34 which engages the cam 28 for operation thereby.

An electronic circuit board 36 is located within the housing 10, preferably adjacent the rear opening 12. The disclosed circuit board is of the printed circuit type and the preferred circuits employ transistors to minimize the "warm up" time of the circuits and to provide maximum dependability and ruggedness. The circuit board contains a conventional audio amplifier system 38 of the type used in tape recorders wherein the signal is received from a pickup head and amplified through a loud speaker. Also, the circuit board includes a pulse signal amplifier circuit 40 of any known type wherein a tape pickup head is employed to receive a pulse signal from a tape and the circuit utilizes a relay adapted to be actuated upon the pulse signal amplifying circuit receiving a pulse signal from the magnetic tape through the associated pickup head. Separate pickup heads are employed with the audio amplifier system and the pulse signal amplifier system.

A loud speaker 42 is affixed to the lower regions of the housing 10 and the floor of the housing is provided with an opening, or a grille, whereby sound emitting from the loud speaker may be readily transmitted from the housing. A pair of switch relays 44 and 46 are located within the housing, and a transformer employed with the circuit systems appears at 48.

The top plate 14 of the housing comprises a tape deck of the type usually employed with tape cartridges. The plate 14 has an electric motor 50 mounted on the underside thereof and a tape drive shaft 52 is journaled in a bearing 54 mounted on the plate. The shaft 52 includes a heavy fly wheel 56 mounted on the lower portion thereof adapted to be driven by the electric motor 50 through the belt 58. The upper portion of the shaft 52 forms a tape drive roller, as will be apparent from FIG. 2.

A lever 60 is pivotally mounted on the underside of the plate 14 at 62. A slot 64 is formed in the plate 14 in which a pin 66 is movably supported. The slot 64 includes an offset portion 68 in which the pin 66 may be received. The pin 66 is attached to the end of the lever 60 by a

spring 70, and a shaft 72 having a resilient roller 74 is also mounted on the lever. The shaft 72 extends through an opening 76 as to be located above the plate 14. A tape cartridge guide 78 is mounted on the upper surface of the plate.

The magnetic tape holder employed is, preferably, in the form of a conventional continuous loop cartridge. The cartridge 80 contains a wound magnetic tape 82 located on a reel wherein the tape is removed from the tape coil at the center and rewound on the periphery of the coil. A plastic guide 84 guides the tape 82 past an opening, not shown, formed in the cartridge to receive the pickup heads. An opening is located in the lower portion of the tape cartridge to permit the roller 74 to be received within the cartridge that the tape may be "squeezed" between the roller 74 and the tape drive shaft 52.

The pickup heads 86 and 88 of the audio amplifier system and the pulse signal amplifier system, respectively, are mounted on the upper surface of the plate 14, and the conductors associated therewith extend through a hole in the plate to the circuit board within the housing.

In operation, the tape cartridge 80 is placed on the plate 14 adjacent the guide 78 so that the roller 74 extends through the opening in the lower portion of the tape cartridge. The operator moves the pin 66 to the position shown in FIG. 2 which tensions spring 70 and biases the roller 74 to the right, FIG. 2. This action squeezes the tape between the roller 74 and the drive shaft 52 wherein rotation of the shaft 52 by the motor 50 will pull the tape past the pickup heads 86 and 88.

The operation of the clock-audio apparatus will now be described.

Referring to FIG. 6, if it is desired that the audio system be operative, the switch 90 will be closed. As the switch leaf 34 will always be in engagement with the cam 28, the switch 32 will open and close four times each hour. The cam 28 is oriented on the clock shaft 26 so that the high points 30 of the cam maintain the switch 32 open until the occurrence of the hour, quarter-hour, half-hour or three-quarter-hour.

At the time of the occurrence of the quarter-hour, for instance, the switch leaf 34 passes over a high point of the cam 28 and permits the switch 32 to close. This operation energizes relay 46 to close the normally open relay switch 92. As relay 44 includes switch 94 which is of the normally closed type and in series with the relay switch 92, closing of the switch 92 will simultaneously energize the tape drive motor 50, the audio amplifier and the pulse signal amplifier circuits 38 and 40. Energization of the motor 50 pulls the tape 82 past the pickup heads 86 and 88. The track of the tape 82, being sensed by the audio amplifier pickup head 86, will contain appropriate chime notes to indicate the quarter-hour, and the signals are amplified and emitted through the loud speaker 42.

After the quarter-hour chimes have occurred, a pulse signal retained in the second track of the tape 82 is sensed by the pulse signal amplifier circuit pickup head 88. This pulse signal, when amplified, operates a sensitive relay 96 to momentarily close the normally open relay switch 98. Closing of relay switch 98 energizes relay 44 to open relay switch 94 relative to switch terminal 100 and engage the switch 94 with the terminal 102 to produce a "holding" circuit for maintaining the relay 44 energized. The opening of switch 94 relative to terminal 100 immediately de-energizes the tape drive motor 50 and the amplifier circuits.

As the time required for the tape to run through the necessary chime signals is relatively short, the switch 32 has remained closed during the aforescribed operation. As the following high point 30 of the cam 28 approaches and moves the switch leaf 34, the switch 32 will be opened thereby. Opening of the switch 32 de-energizes both relays 44 and 46, and the switches 94 and 92 thereupon return to their normal positions. The circuit is now reset and ready for the next cycle.

Of course, the signals on the audio track of the tape are such that sequentially the proper chime signals appear whereby quarter-hour, half-hour, three-quarter-hour and hour chimes are transmitted. To "set" the apparatus, the minute hand 22 of the clock is turned to the proper time. The operator then closes the switch 104 which bypasses relays 44 and 46 and energizes tape motor 50 and the amplifier circuits 38 and 40. The tape mechanism is permitted to run until the proper chime signal portion of the tape is reached. Of course, it is necessary to have only a "twelve-hour" cycle on the tape and when left on continually, the tape can run through its complete cycle rather quickly.

If it is desired to deactivate the audio apparatus, the switch 90 is opened. Preferably, volume and treble controls are also provided for varying the audio characteristics.

By employing different shape cams 28, actuation of the audio and tape mechanisms may be predetermined to occur during any time of the hour, and by mounting the cam on other shafts of the clock mechanism, energizing of the audio circuit at minute intervals, twelve-hour intervals, or other intervals, can be readily achieved.

The utilization of a tape cartridge permits a wide variety of chimes to be employed with a given clock-audio device of the type of the invention. If desired, the audio tape may contain a message, sales promotion or the like. Additionally, the tape audio track could contain signals for energizing relays or switches of controlling or programming lights, machinery, conveyors, etc. In such an application, appropriate relay operating circuits would be substituted for the audio circuit 38.

As a high fidelity audio circuit is employed, the apparatus is capable of faithfully reproducing chimes of world famous renown, such as those of "Big Ben" in London, England. The clock-audio apparatus of the invention provides a versatility, ruggedness and economical construction not heretofore known in timepieces of this type.

It is appreciated that modification to the invention may be apparent to those skilled in the art without departing from the spirit and scope thereof, and it is intended that the invention be defined only by the scope of the following claims:

1. A tape recorded chiming clock comprising, in combination,
 - (a) a clock motor,
 - (b) a cam driven by said clock motor,
 - (c) a dual track continuous loop magnetic tape, said tape having a first track including chime producing signals and a second track including pulse control signals,
 - (d) tape drive means including a tape drive motor circuit, an electric motor and a tape drive roller adapted to be rotated by said electric motor to drive said tape,
 - (e) an audio amplifier system including a first signal pickup head disposed adjacent said first tape track and a speaker,
 - (f) a pulse signal amplifier system including a second signal pickup head disposed adjacent said second tape track and a first relay,
 - (g) said amplifier systems being connected in parallel with said tape drive motor circuit whereby said systems are energized only during energization of said tape drive motor,
 - (h) said tape drive motor circuit including said first relay, a second relay, and a third relay and a switch operated by said cam,
 - (i) power supply means adapted to be connected to said tape drive motor circuit and said amplifier systems,
 - (j) actuation of said switch by said cam energizing said second relay which energizes said tape drive motor to drive said tape to permit said audio amplifier sys-

5

tem to pick up and transmit the chime producing signal retained on said first track, upon a pulse signal retained by said second track being sensed by said pulse signal amplifier system said first relay being actuated, actuation of said first relay energizing said third relay which de-energizes said tape drive motor circuit and said amplifier systems.

2. In a clock-audio apparatus as in claim 1 wherein:

(a) said third relay includes a holding circuit whereby upon said third relay being energized by said first relay said third relay maintains the circuit to said tape drive motor open until said switch has opened due to movement of said cam to return said second relay to an open condition.

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