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RECORDING APPARATUS WITH PLURAL INDEPENDENT
RECORD-REPRODUCE DEVICES
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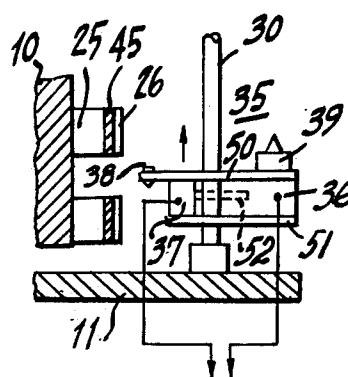
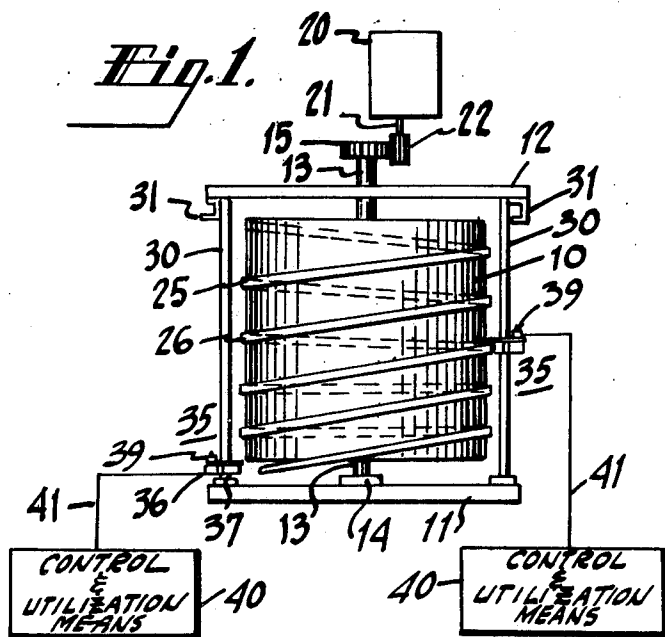


Fig. 2.

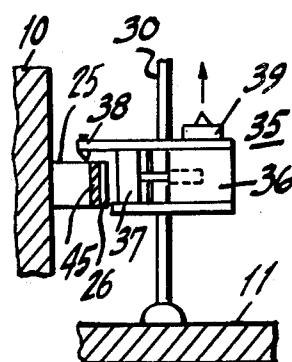


Fig. 3.

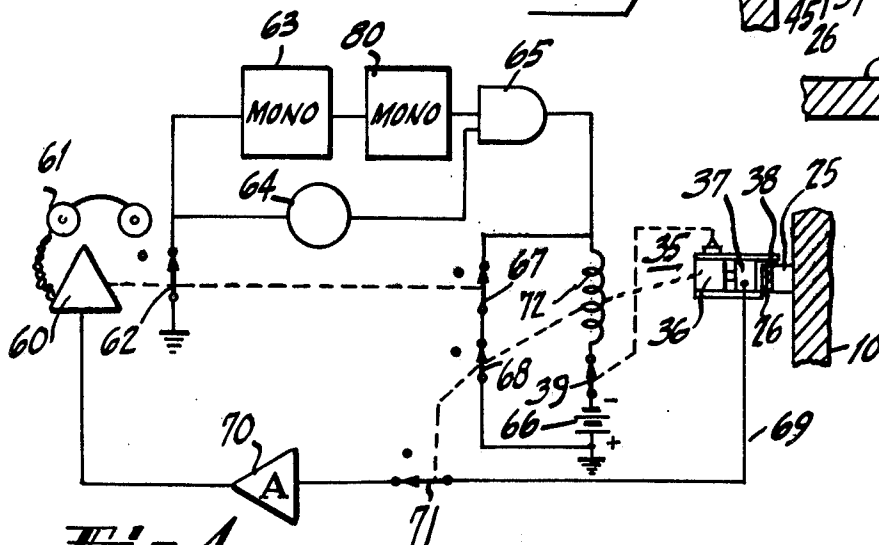


Fig. 4.

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RECORDING APPARATUS WITH PLURAL INDEPENDENT RECORD-REPRODUCE DEVICES

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3 Claims

ABSTRACT OF THE DISCLOSURE

There is disclosed a recorder-reproducer which can be utilized to provide reproduction of a recorded message to a plurality of output terminals such that any one of the several output terminals upon the initiation of a playback request at that output terminal always receives the reproduced message from the beginning thereof independent of the status of the other output terminals. A recording medium is placed on a helical or other track which track is located on the external surface of a rotating drum in a manner to protrude therefrom to form a guiding ridge. The playback devices ride on separate means which may be shafts fixed parallel to the drum's main axis and spaced at convenient intervals around its periphery. When an output terminal requests playback, the corresponding playback device is forced into a message transfer relationship with the medium and simultaneously is forced along the shaft by mechanical action through the coacting of the playback device with the guiding ridge, the playback device being made in effect to follow the medium on the rotating drum and thus reproduce the message recorded thereon. The playback devices are operated to reproduce the complete recorded message, each playback device operating entirely independently of the others.

There are at present many uses for a unit which is capable of playing back a recorded message to a plurality of individuals or terminals upon their completely random request. For example, in an exposition, trade show or in an exhibit open to the public in general, there are displays which require the conveyance of information to a large number of individuals who may desire such information at different times. When such a display is approached, the means of conveying information may be ear phones or switch-controlled speakers which are distributed about the display. A message is repeated through the earphones or speakers, conveying the information to the listener which is pertinent to the display. In the operation of such units prior to the present invention, the practice has been to constantly feed the message to the earphones or speakers. Hence, when an earphone is picked-up or a speaker is turned on, the message may be at its middle or somewhere near its termination, requiring the listener to hold on until the message terminates and wait until the message begins again, whereby he can then clearly understand the message. To avoid this problem, some prior art units use a plurality of recorders, each one associated with an individual earphone or speaker. Each recorder is responsive only to the earphone or output terminal with which it is associated. The need for a single, simple, rugged, recorder-reproducer unit which is capable of playing back a single recorded message always from the beginning to each of a plurality of subscribers upon a random request therefor is wide spread. Uses of such a device include automatic telephone answering systems, automatic back-up for displays and exhibitions, and brief information at inquiry or information booths.

It is therefore an object of the present invention to provide an improved recorder-reproducer apparatus for

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playing back a message on a recording medium to a plurality of utilization circuits.

Another object is to provide an improved recorder-reproducer apparatus for playing back a message recorded on a medium to a plurality of terminals with the message always commencing at each terminal at the beginning independent of the status of the other terminals.

These and other objects are accomplished in one embodiment of the present invention by taking a magnetic tape with a message recorded thereon and affixing the tape to a raised track which is in the form of a circular helix. The track is affixed to a rotating cylindrical drum's external surface. Magnetic heads ride on separate shafts fixed parallel to the drum's main axis and spaced around the periphery of the drum. The magnetic heads are free to move only along these shafts parallel to the cylindrical drum's main axis. Each of the magnetic heads is coupled to a separate output terminal. Upon request from an output terminal, the corresponding magnetic head is caused to come into contact with the tape and is simultaneously forced to follow the circular helix. A magnetic head will always contact the tape at the start of the recorded message. At the end of the message the magnetic head returns to its start position on the shaft by gravity or other suitable means providing rapid reset.

A more detailed description of the invention will now be given in connection with the accompanying drawing in which:

FIGURE 1 is a diagrammatic side view of a recorder-reproducer according to one embodiment of this invention.

FIGURE 2 is a diagrammatic view of a magnetic head and associated apparatus in a reset position as used in the embodiment of FIG. 1.

FIGURE 3 is a diagrammatic view of a magnetic head and associated apparatus in an activated position as used in the embodiment of FIG. 1.

FIGURE 4 is a partial schematic and partial diagrammatic view of one example of an output terminal and associated circuitry useable with each of the magnetic heads shown in FIGS. 1-3.

If reference is made to FIGURE 1, there is shown a side view of a cylindrical drum 10 which is rotatably mounted on fixed base plates 11 and 12. The drum 10 has a shaft 13, one end of which is mounted to a bottom base plate 11 by means of a ball bearing assembly 14 or some other suitable mechanism allowing the shaft 13 and drum 10 to exhibit rotational movement. The other end of shaft 13 is inserted through the top base plate 12 in a manner to again allow rotational movement. As the shaft 13 emerges from base plate 12, there is a gear 15 coupled to it. Numeral 20 references a motor which may be either an alternating current or direct current type and whose rotor is coupled to a shaft 21 which is in turn coupled to another gear 22. Gear 22 and gear 15 are mounted in a manner causing them to coact with each other, thus, imparting the desired rotational speed to the drum 10 which speed is a function of the desired angular velocity needed to be compatible with the message recorded on the recording medium to be described.

A track 25 is provided in the form of a circular helix affixed to the exterior surface of the cylindrical drum 10. The width of the helical track 25 is a function of the width of the recording medium it is adapted to support. The circular helix 25 extends outward from the surface of the drum 10 forming a continuous ridge about the drum's surface. The surface of the helix 25 is further adapted to support a recording medium 26 which may be magnetic tape, paper tape, dielectric tape or some other suitable material having the property of being permanently or semi-permanently altered to store audio or other types of information. Also shown in FIG. 1 are two shafts 30. The shafts 30 are firmly secured to and between

the base plates 11 and 12 parallel to the main axis of the cylindrical drum 10. An assembly 35 is shown mounted on each shaft 30. The assembly 35 comprises a solenoid member 36 which is coupled to a playback device 37 which, for present purposes, is assumed to be a magnetic head usable with the recording medium 26 in the form of a magnetic tape. A finger 38 is mechanically mounted to the solenoid 36 and playback device 37, and a push-button type switch 39 is affixed to the top portion of the assembly 35.

As seen in the view of FIGURE 1, the left most head solenoid assembly 35 is in an inactive position, while the other head solenoid assembly 35 is in an activated position. Both assemblies 35 are shown coupled to respective control and utilization means 40. While a single wire or lead 41 is shown, the wire 41 is meant to represent any necessary number of leads needed in a given application to complete the electrical connections between the assembly 35 and the control and utilization means 40.

In operation, the drum 10 is caused to rotate about its main axis due to the action of gears 15 and 22 and to the coupling afforded by said gears to the rotor of the motor 20. Hence in this manner the drum 10 may be driven at a constant rotational speed. Each of the head solenoid assemblies 35 is mounted in such a manner on a shaft 30 that it cannot move in a plane perpendicular to the shaft but is free to move in either direction along the shaft, namely up or down in the view of FIG. 1. The magnetic head 37 is attached to an armature or moving part of the solenoid 36 in such a manner that the activation of the solenoid 36 by the control and utilization means 40 allows the head 37 to move into close contact with the magnetic tape 26 on the helical track 25. Initially the head solenoid assembly 35 is located by gravity at one end of its respective fixed shaft 30, namely, at the bottom thereof. This is shown by the position of the unit 35 affixed to the shaft 30 at the left of drum 10. Upon initiation of a request for playback (by lifting a telephone receiver or depressing a switch for example), the solenoid 36 is activated from the control and utilization means 40, and the head 37 is thrust closer to the tape track 25. The pick-up finger 38 is also thrust forward and beyond the protruding end of the track 25. Within one drum revolution, this pick-up finger 38, which may be attached to the head 37 or to the shaft of the solenoid 36, comes into contact with the upper surface of the tape track 25 which extends as a ridge beyond the surface of the drum 10. The pressure of the rising tape track 25 on the pick-up finger 38 lifts the head solenoid assembly 35 along the shaft 30. The force of the solenoid 36 insures this contact, and also presses the head 37 against the tape 26 which now passes under the head 37. A message recorded on the tape 26 is read and amplified by means of the utilization apparatus 40. When the head solenoid assembly 35 reaches the top of the shaft 30, and hence the end of the message, a U-shaped member 31 mounted on the plate 12 contacts the toggle of the switch 39. The switch 39 is pressure actuated to deactivate the solenoid 36, thus, withdrawing the head 37 from contact with the recording medium while simultaneously disengaging the pick-up finger 38. The head solenoid assembly 35 is free of the track 25 and returns down the shaft 30 to its start position due to the force of gravity. The exact nature of this operation will be described in greater detail later on.

If reference is now made to FIGURE 2, there is shown the head solenoid assembly 35 in closer detail. There is shown a portion of the drum 10 and shown affixed to the drum 10 is a portion of the circular helical track 25. Numeral 45 references a protective backing which is used to protect the tape 26 and keep it from scratching against the hard surface of the track 25. The backing 45 may be of suitable insulating material such as plastic or fiber glass. On the surface of the backing 45 there is shown the magnetic tape 26. The portion of the track 25 shown in FIGURE 2 represents the beginning portion

of the circular helix 25 or that portion closest to the bottom base plate 11 of FIG. 1. The solenoid head assembly 35 is shown affixed to the shaft 30 by means of a hole or suitably shaped aperture through the head solenoid assembly 35 which hole allows the unit 35 freedom of movement in a path parallel to the axis of rotation of the cylindrical drum 10 or actually parallel to the vertical axis of the shaft 30. The solenoid 36 is held in place between two metal walls designated as 50 and 51. The exact means for securing the solenoid 36 to the shaft 30 and further supporting the solenoid 36 in the manner previously described can be accomplished using any known technique. The plunger or armature 52 of the solenoid 36 is shown in FIG. 2 in the inactive position. Coupled to this plunger 52 is the recording head 37. Also coupled to the plunger 52 of the solenoid 36 through an appropriate extension is the pick-up finger 38. The pick-up finger 38 is slidably mounted in the top supporting plate 50. Hence the method of mounting the pickup finger 38 allows it to move the same distance as the head 37 moves with respect to the shaft 30. The pick-up finger 38 of the unit 35 can be glued or secured by some suitable means to the head assembly 37 instead of being directly coupled to the arm 52 of the solenoid 36. Also shown fastened and firmly secured to the top plate 50 is the normally closed switch 39. The switch 39 can be normally closed, single-pole-single-throw switch which is pressure actuated. The two terminals of the switch 39 are wired so that a normally closed contact of the switch is in series with the coil of the solenoid 36.

FIGURE 3 shows the solenoid head assembly 35 in its activated position. One can now see that the head 37 is in close proximity to the tape 26, enabling the head to respond to information recorded thereon, and that the pick-up finger 38 is in contact with the top ridge of the helical track 25, thereby, imparting motion to the assembly 35 in the direction of the arrow drawn adjacent to shaft 30 or upward from base plate 11.

If reference is now made to FIGURE 4, assume that the recorder shown in FIGURE 1 is to be used to convey audio messages concerning information on display at a museum, such information being recorded on the recording medium 26. For this purpose, many earphones are supplied as a means of relating the single message recorded on the tape 26 of FIGURE 1. It is also further assumed that each person interested in obtaining such information, by using an earphone, desires to receive the message from its beginning independent of how many other earphones are then in use and further independent of what portion of the message these other units are playing back. As shown in FIG. 4, the person picks-up the hand set 61 of a telephone 60. The picking up of the hand set 61 activates or closes a switch 62. The switch 62 is normally in an open position (shown by dashed line) when the hand set 61 is on the cradle of the phone 60 and therefore not in use. The closure of the switch 62 places a ground or other suitable reference potential at the inputs of a monostable multivibrator 63 and an inverting gate 64. The output of the monostable 63 is coupled to the input of a monostable 80. The output of the monostable 80 and of the inverter 64 are both coupled to respective inputs of an AND gate 65. The output of the AND gate 65 is connected to one terminal of the solenoid 36's coil 72. The other terminal of the coil 72 is coupled to a terminal of the pressure actuated switch 39. The other terminal of the normally closed pressure activated switch 39 is coupled to one side of a source of unidirectional potential 66. Also shown coupled to the output of the AND gate 65 is one terminal of a switch 67 which switch is also activated by the lifting of the hand set 61 from the cradle of the phone 60. Hence there is shown a dotted line through switch 62 and switch 67 which line terminates at the phone 60, indicating that these switches are mechanically or otherwise operated by the lifting of the hand set 61 from the cradle of the phone 60. The other

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terminal of switch 67 is coupled to a set of contacts 68 which are closed or activated upon energization of the solenoid coil 72. The contacts 68 are commonly referenced in the art as holding contacts. Hence there is shown in FIGURE 4 a dotted line drawn from solenoid 36 through the coil 72 and through contacts 68 to emphasize that they are driven as a part of the solenoid 36. The other terminal of the contacts 68 is returned to a reference point or ground side of the source of potential 66. Also shown in the figure is an output lead 69 which is connected to the playback head 37. The lead 69 serves to carry the transduced information present on the tape 26 when the head 37 is in close proximity with the tape 26 due to the activation of the solenoid 36 via its coil 72. The lead 69 may be coupled directly to an amplifier device 70 which serves to amplify the signal from the playback head 37 to a level sufficient to drive the receiver of the telephone 60. The input to the amplifier 70 is shown coupled through a switch 71 which switch is also shown to be controlled from the solenoid 72.

As one lifts the head set 61, switch 62 goes from normally open position to a closed position, imparting a ground on the input of the monostable 63. The monostable 63 produces an output pulse whose width is of a specified duration. The exact considerations for selecting this delay will be described later on. When the monostable 63 completes its delay and goes from on to off at the end of its delay period, it triggers monostable 80. The monostable 80 produces a pulse whose width is of a sufficient duration (say greater than 10 milliseconds) in order to assure that the solenoid's coil 72 will be energized. The same ground at the input of the monostable 63 is impressed on the input of the inverter 64. The output of the inverter 64 goes from ground to a high level enabling one input of the AND gate 65. The other input of the AND gate 65 is enabled by the output of the monostable 80. The circuit configuration just described is an anti-bounce circuit. When the switch 62 goes from one position to another, there is contact bounce associated with it. Hence one does not know if a switch is being opened or closed because during this portion of bounce the switch 62 will be going from open circuit to ground at a fairly rapid rate. The logic circuit shown assures that the direction of the switch is from open to ground and hence indicates a true lifting of the head set 61 or a true request for service. A pulse appears at the output of the AND gate 65 approximately equal in duration to the output pulse of the monostable 80 which pulse is long enough to place a ground on the terminal of coil 72. The coil 72 of the solenoid 36 is operated, causing the head 37 to move into close proximity with the tape 26 and further causing the pick-up finger 38 to contact the top ridge of the helical track 25 at the beginning, therefore, commencing playback and tape scanning as previously described. The pick-up finger 38, of course, due to the mechanical arrangement of the unit will always contact the track 25 at the same point as the drum 10 turns bringing the track 25 up under the finger 38. Hence the playback of the message will always start at the beginning.

Activation of the solenoid coil 72 also energizes and therefore closes contacts 68 and 71. A ground return for the coil 72 is provided through contacts 68 and contacts 67 which causes the coil 72 to remain energized even though there is no longer a pulse at the output of AND gate 65. The coil 72 of the solenoid 36 will remain energized when the hand set 61 is off hook so long as the switch 39 is closed. At the completion of the message, the switch 39 is momentarily depressed as described above, causing the circuit for energizing the coil 72 to open. Holding contacts 68 open, the pick-up finger 38 is withdrawn from the track 25 and the solenoid head assembly 35 is free to descend down the shaft 30 by gravity or other suitable mechanism to assume its normal position. In order for another request for playback

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to be initiated, the party desiring information would now have to hang up the hand set 61 and put in a new request by lifting the hand set 61 at which time the same sequence of events as described above would take place. If the party hangs up the hand set 61 before the completion of the message, contacts 67 open, removing the ground path from the coil 72 and the system is deenergized causing the head solenoid unit 35 to return to the start position. Switch 71 functions to allow the passage of the reproduced message to the phone 60 when the solenoid 36 is energized. Where desired, the amplifier 71 can be directly connected to the head 37 omitting such a switch.

The monostable 80 introduces a controlled delay and thus serves to prevent the possible activation of the solenoid's coil 72 while the unit 35 is descending down the shaft 30. The solenoid 36 is operated only when the unit 35 is in position to reproduce the recorded message from the beginning.

It is to be noted that the head-solenoid unit 35 could contain more than one playback head. In this application a plurality of heads would be stacked and separated from each other by a suitable insulating material, thereby forming a laminated structure. For example, a message might be recorded on the tape in different languages. Each message would be stored on the tape on a separate record track. Each record track would be as wide as required for its associated playback head. Hence the various language messages would be recorded along parallel record tracks on the tape supported by the single raised helix wound about the drum, there being a separate record track for each of the heads in the laminated structure. The telephone would be provided with a selector switch enabling a subscriber to select the desired language by the setting of the switch. The setting of this switch would disable all of the heads except the one selected. When the head-set is taken off hook, the unit would engage the tape as previously described and commence playing the record track on the tape adjacent to the selected head. The operation of the system would remain the same as previously described. Also, while the discussion has been directed to the application of the embodiment shown in reproducing a recorded message, the head assemblies 35 can be operated from the control and utilization circuits 40 to originally record the messages on the storage medium in the same manner. One of the head assemblies might be reserved for recording only with suitable provision for an erase head or other means for clearing the recording medium in front of the record device.

What is claimed is:

1. An apparatus in which a message is stored on a record medium with said message commencing at a predetermined start position, comprising:

- (a) a cylindrical drum rotatably mounted,
- (b) a ridged helical track upon which said medium is supported about the periphery of said drum,
- (c) said helical track having a portion protruding beyond a first end of said drum, said start position for said message on said medium being located at said first end of said drum,
- (d) a plurality of normally disabled entirely independently operated playback means, each of said playback means including normally disabled tracking means energizable for cooperation with said helical track,
- (e) means for separately mounting said playback means about the periphery of said drum in a manner to provide free and independent movement of each playback means from a position adjacent said first end of said drum in a direction parallel to the axis of rotation of said drum, and
- (f) separate means individually coupled to each of said playback means to independently energize them and said tracking means so that when each playback means with said tracking means is energized and

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said drum is rotated, said tracking means is engaged by the protruding portion of said track causing said playback means to traverse said record medium always from said start position regardless of the status of any other playback means.

2. The invention according to claim 1, wherein; said axis of rotation of said drum is vertical, said mounting means for said playback means includes a plurality of shafts rigidly mounted parallel to said drum's axis and means for slideably mounting a single one of said playback means on each of said shafts so that each of said playback means when said tracking means is de-energized is positioned by gravity adjacent said first end of said drum.

3. The invention according to claim 2, wherein; each of said playback means includes further means when actuated for de-energizing said tracking means, and means mounted adjacent said shafts at the other end of said

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drum and adapted to be contacted by said further means to thereupon actuate said de-energizing means.

References Cited

UNITED STATES PATENTS

2,857,476	10/1958	Kleiber	274—41.4	X
2,880,279	3/1959	Nickerson	179—100.2	
2,920,147	1/1960	Sellers et al.	274—41.4	X
661,619	11/1900	Poulsen	179—100.2	X
882,329	3/1908	Lieb	274—20	X
2,573,303	10/1951	Bozoky	274—20	X
2,991,448	7/1961	Diamond et al.		

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179—100.2; 274—4, 41.4