Oct. 25, 1966 D. A. CORLEY 3,281,542

SWITCHING DEVICE

Filed Feb. 20, 1964 2 Sheets-Sheet 1

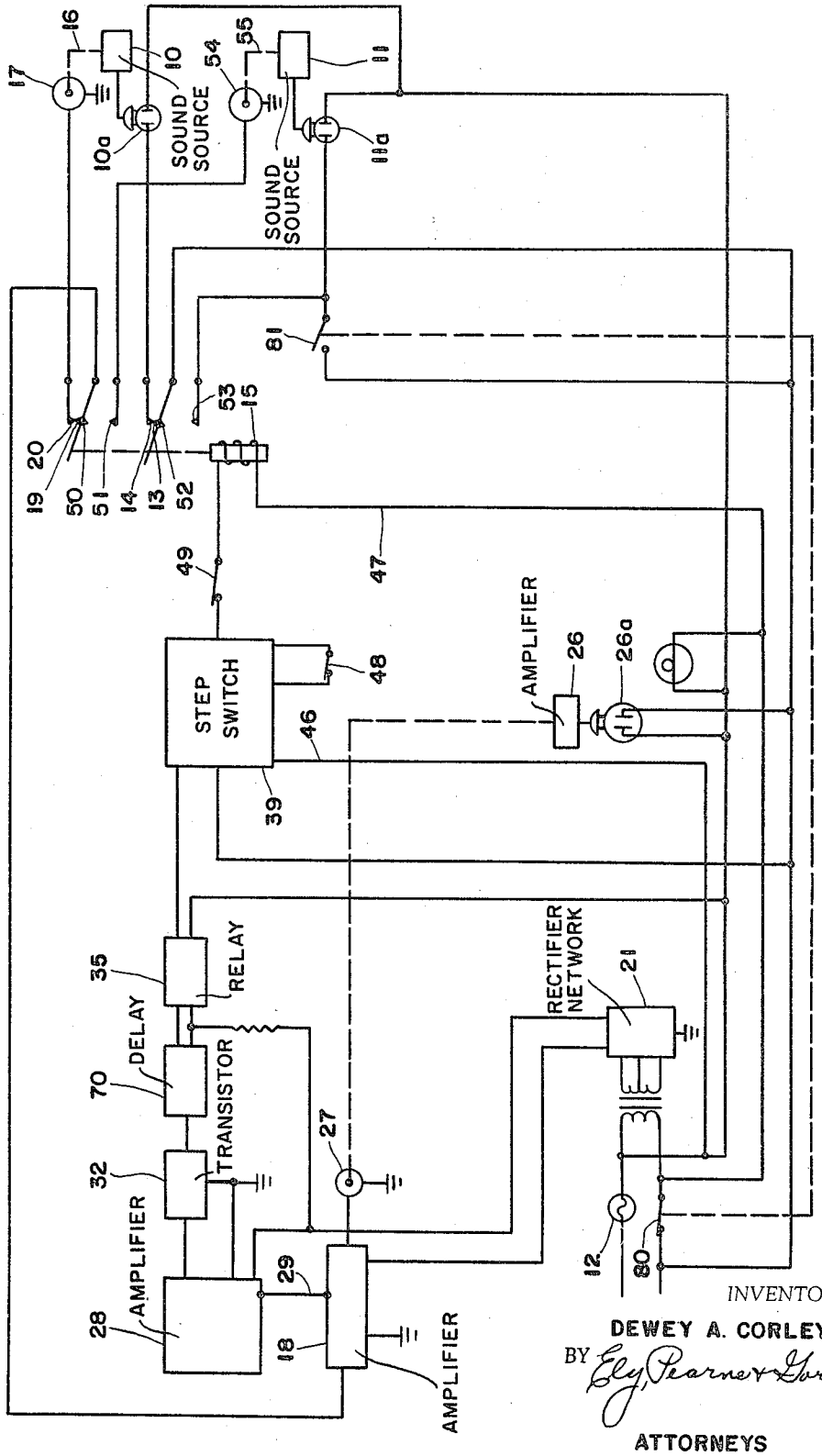


Fig. 1

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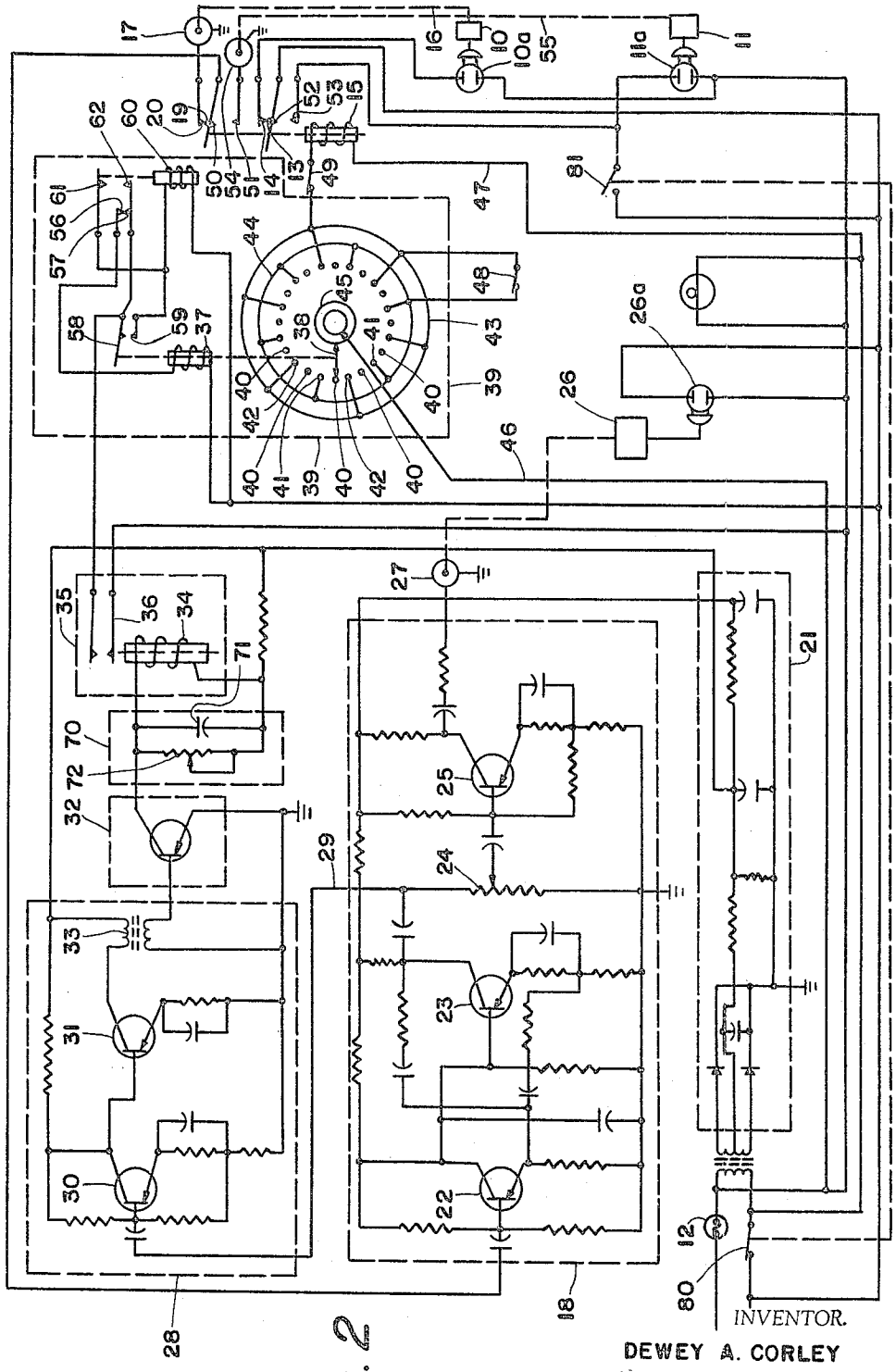


Fig. 2

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3,281,542

SWITCHING DEVICE

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This invention relates to a switching system and, more particularly, to a device for switching from one sound source to another sound source in response to the absence of sound from one of the sources.

This invention is particularly suitable for use as a program alternator to switch from a first sound-reproducing source to a second sound-reproducing source at the end of a recorded message from the first source. As an example, the invention may be employed as a switching device for a commercial broadcasting station where it is desired to alternate recorded advertisements with recorded music. A first disc record player or tape deck would be supplied with a series of recorded commercial messages, such as advertisements, and a second disc record player or tape deck would be provided with a series of musical selections. At the end of each musical selection, the device according to this invention would de-energize the music source and simultaneously energize the commercial message source and, conversely, would de-energize the commercial message source and energize the music source at the end of the commercial message.

Heretofore, switching devices have been proposed to switch from one sound source to another sound source to thereby alternate the recorded selections or to switch from one sound source to another sound source when the first sound source has played all of its selections. These devices, however, are operated mechanically, for example, in response to the position of a sound pick-up tone arm or the action of a timing switch. If the sound-reproducing device was a disc record player, a switch would operate in response to a predetermined increment of travel by the tone arm to deactivate that sound source and simultaneously activate the other sound source. In a similar manner, a timing switch would deactivate one sound source and activate the other sound source after a predetermined time interval. In those devices, the length of recorded music or message, necessarily and undesirably, had to be timed for the particular time interval of the timing switch or the increments traversed by the tone arm of the record player.

Accordingly, it is an object of the present invention to overcome many of the deficiencies of the prior art switching devices.

It is a more particular object of the present invention to provide a switching device that will switch alternately from one sound source to another sound source in response to the absence of sound from one of the sources and to provide such a system with a common audio power amplifier and speaker system.

These and other objects will become apparent from the following detailed description of the present invention and from the accompanying drawings.

In the drawings:

FIGURE 1 is a schematic illustration of the switching device according to this invention.

FIGURE 2 is a more detailed circuit diagram of the invention shown in FIGURE 1.

Referring now to the drawings, two sound-reproducing devices **10** and **11** are schematically illustrated. The devices **10** and **11** may be conventional disc record players or may be conventional tape decks. For illustrative purposes, the following discussion will be directed to a system in which the devices **10** and **11** are conventional disc type record players. Also for illustrative purposes, it

will be assumed that the device **10** is supplied with disc type records having a series of musical selections recorded thereon, and the device **11** is provided with disc type records having a series of commercial announcements recorded thereon.

The circuitry shown in FIGURES 1 and 2 is illustrated with the program alternator in an "On" condition, and with the device **10** plugged into an outlet **10***a* which is connected to a 110-volt A.C. power source **12** through a movable contact **13** and a stationary contact **14**, which are associated with a coil **15**. A connection **16** from the sound pick-up head of the device **10** plugs into an audio input socket **17**. The socket **17** and, therefore, the connection **16** are, in turn, connected to a three-stage amplifier **18** through a movable contact **19** and a stationary contact **20**.

The amplifier **18** receives D.C. voltage from the A.C. source **12** through a rectifier network **21**. The audio signal from the sound pick-up head of the device **10** is amplified by transistors **22** and **23**. This amplified signal is taken off a volume control resistor **24**, further amplified by a transistor **25**, and delivered to an audio power amplifier **26** through an audio output socket **27**. The amplifier **26** is a conventional power amplifier which may be employed to drive suitable speakers (not shown). The audio signal from the device **10** is also supplied from the first two stages of the amplifier to a two-stage amplifier **28** by a connection **29**. The signal is amplified by transistors **30** and **31**, and is applied to the base of a transistor **32** through a transformer **33**. As long as this signal appears at the base of the transistor **32**, there is a low collector-to-emitter resistance of the transistor. This low resistance in the transistor **32** permits current to flow from the rectifier network **21** and energize a coil **34** of a relay **35**. Thus, as long as a signal is present at the base of the transistor **32**, the coil **34** will be energized, and a normally closed switch **36** will be held open.

When the signal is no longer received from the device **10**, i.e., when the stylus is at a silent portion of the sound track between musical selections, there is a high collector-to-emitter resistance in the transistor **32** and the relay coil **34** is de-energized. When the coil **34** is de-energized, the normally closed switch **36** will close and complete a circuit to energize a coil **37**. When the coil **37** is energized, a sliding contact **38** of a step switch **39** will move from a stationary contact **40** to a stationary contact **41**.

The step switch **39** is a conventional device and includes the sliding contact **38**, the coil **37**, and contacts **40**, **41**, and **42**. The step switch **39** further includes an outer wire **43**, an inner wire **44**, and an inner contact ring **45**. The inner contact ring is connected to the A.C. source **12** by a lead wire **46**, and the outer wire **43** is connected to the A.C. source by a lead wire **47** through the coil **15**.

In a manner that will hereinafter become apparent, the coil **37** is energized for a brief time interval. During this brief interval, the sliding contact **38** moves one step in the illustrated contact series comprising the steps **40–41**, **41–40**, **40–42**, **42–40**, etc.

When the sliding contact **38** is moved one step from the open contact **40** to the contact **41**, a circuit is completed from the lead wire **46** to the lead wire **47** through the inner contact ring **45**, the contacts **38** and **41**, the inner wire **44**, a manually operated closed switch **48**, the outer wire **43**, a manually operated closed switch **49**, and the coil **15**. The completion of this circuit energizes the coil **15** and opens the contacts **13** and **14** and the contacts **19** and **20**, and closes a movable contact **50** against a stationary contact **51** and, also, a movable contact **52** against a stationary contact **53**. When the contacts **13** and **14** are opened, the power to the outlet **10***a* is cut off, and when the contacts **52** and **53** are closed, the outlet

11*a* is connected to the A.C. source 12. The closing of the contacts 50 and 51 connects an audio input socket 54 to the three-stage amplifier 18. A connection 55 from the sound pick-up head of the device 11 plugs into the audio input socket 54.

With the coil 15 energized, therefore, the device 10 and its sound pick-up head output are disconnected from the A.C. source 12, and the device 11 and its sound pick-up head output are connected to the A.C. source 12. As was previously indicated, the device 11 may be provided with a series of commercial messages which are recorded on disc type records. The coil 15 will remain energized until the commercial message is completed, since the absence of a signal at the base of the transistor 32 will de-energize the coil 34, close the switch 36, momentarily energize the coil 37, move the sliding contact 38 to an open contact 40, and thereby de-energize the coil 15 to return the contacts 13, 14, 19, and 20 to the positions illustrated in FIGURES 1 and 2 of the drawings.

As was indicated above, the coil 37 is momentarily energized when the switch 36 is closed. The closure of the switch 36 energizes the coil 37 through a pair of normally closed contacts 56 and 57. When the coil 37 is energized, it closes normally open contacts 58 and 59 to energize a coil 60. When the coil 60 is energized, normally open contacts 61 and 62 are closed, and normally closed contacts 56 and 57 are opened to de-energize the coil 37. Although the coil 60 remains energized until the switch 36 is opened, the coil 37 is energized for an instant to move the sliding contact 38 one position.

To prevent premature switching between the devices 10 and 11 during musical or voice pauses, a delay mechanism 70 is provided between the transistor 32 and the coil 34. The delay mechanism 70 comprises a capacitor 71 and a variable resistor 72. The operation of the coil 34 depends on the rate of discharge of the capacitor 71 and this rate is in turn dependent upon the adjustment of the variable resistor 72. Since each musical selection is separated from an adjacent musical selection by a silent portion of the sound track, which lasts from between 10 and 20 seconds, and since the adjacent commercial messages are separated by a similar silent portion of the sound track, the capacitor 71 may be tuned to discharge after a time period that is slightly less than the time it takes the stylus to traverse the silent portion of the sound track.

With the manually operated switch 48 in a closed position, the devices 10 and 11 will be alternately activated to alternate musical and commercial selections. If the switch 48 is opened, however, the device 10 will play three selections to one selection from the device 11. With the switch 48 opened, the contacts 41 become open contacts similar to the contacts 40, and a circuit is completed between the leads 46 and 47 only when the sliding contact 38 is on a contact 42. The device 10, therefore, remains activated as the sliding contact 38 successively engages the contacts 40, 41, and 40, and the device 11 is activated when the sliding contact 38 is stepped into engagement with the contact 42.

The program alternator may be operated on a semi-automatic basis by opening the switch 49. When the switch 49 is opened, the device 10 will operate on a continuous basis, since the coil 15 cannot be energized. If the station operator feels that a commercial message should be played, he may close the switch 49, and, at the end of the musical selection then playing, the coil 15 will be energized to operate the device 11 (assuming that the switch 48 is closed or, if opened, assuming that contact is made between the ring 45 and a contact 42).

The program alternator is operated by connecting the receptacle plugs of the audio power amplifier 26, the device 10, and the device 11 to their respective outlets 26*a*, 10*a*, and 11*a*. The input to the audio power amplifier 26 is plugged into the socket 27, and the connections 16 and 55 are plugged into the sockets 17 and 54, respectively. A switch comprising the elements 80 and 81 is operated so that the element 80 is closed and the element 81 is open, as is indicated in FIGURE 2. The manually operated switches (not shown) of the devices 10 and 11 are then turned on, with each stylus positioned in a silent portion of its sound track.

As soon as the switch comprising the elements 80 and 81 is operated, the coil 60 is energized and, therefore, the coil 37 is momentarily energized to move the sliding contact 38 one position. The coil 60 will remain energized until the stylus that is in operation reaches the sound portion of its track and supplies a signal to the base of the transistor 32 to energize the coil 34 and open the switch 36.

Many modifications and variations of the preferred embodiment of the invention will be apparent to those skilled in the art in light of the above disclosure. Therefore, it is to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically shown and described herein.

What is claimed is:

1. A switching device for alternately connecting the sound output of a plurality of sound-reproducing means to a power amplifier in response to the discontinuance of a signal from one of the sound-reproducing means, comprising a plurality of sound-reproducing means, and means for maintaining a connection between the sound output of one of said sound-reproducing means and a power amplifier while said one sound-reproducing means is transmitting a signal, said connection maintaining means including means for amplifying the sound output of each of said sound-reproducing means, first and second coil means, a multiple contact step switch having contact means for alternately energizing and de-energizing said second coil means, said first coil means being energized in response to the amplified sound output of each of said sound-reproducing means, and being de-energized in response to the discontinuance of said sound output, the contacts of said step switch being operated in response to said first coil means, means responsive to the energizing and de-energizing of said second coil means for alternately and respectively connecting and disconnecting the sound output of a first one of said sound-reproducing means to and from a power amplifier and for substantially simultaneously disconnecting and connecting the sound output of a second one of said sound-reproducing means from and to said power amplifier.

2. A switching device for alternately connecting the sound outputs of a plurality of sound-reproducing means to a power amplifier and for connecting the power inputs of said sound-reproducing means to a power source in response to the discontinuance of a signal from one of the sound-reproducing means, comprising a plurality of sound-reproducing means, and means for maintaining a connection between the sound output of one of said sound-reproducing means and a power amplifier and for maintaining a connection between the power input of said one sound-reproducing means and a power source while said one sound-reproducing means is transmitting a signal, said connection maintaining means including means for amplifying the sound output of each of said sound-reproducing means, first and second coil means, a multiple contact step switch having contact means for alternately energizing and de-energizing said second coil means, said first coil means being energized in response to the amplified sound output of each of said sound-reproducing means and being de-energized in response to the discontinuance of said sound output, the contacts of said step switch being operated in response to said first coil means, means responsive to the energizing and de-energizing of said second coil means for alternately and respectively connecting and disconnecting the sound output of a first one of said sound-reproducing means to and from a power amplifier and for substantially simultaneously disconnecting and connecting the sound output of a second

one of said sound-reproducing means from and to the power amplifier, and means responsive to the energizing and de-energizing of said second coil means for alternately and respectively connecting and disconnecting the power input of said first one of said sound-reproducing means to and from the power source and for substantially simultaneously disconnecting and connecting the power input of the second one of said sound-reproducing means from and to said power source.

3. A switching device for alternately connecting the sound outputs of a plurality of sound-reproducing means to a power amplifier in response to the discontinuance of the signal from one of the sound-reproducing means, comprising a plurality of sound-reproducing means, and means for maintaining a connection between the sound output of one of said sound-reproducing means and a power amplifier while said one sound-reproducing means is transmitting a signal, said connection maintaining means including means for amplifying the sound output of each of said sound-reproducing means, first and second coil means, means responsive to the operation of said first coil means for alternately energizing and de-energizing said second coil means, said first coil means being energized in response to the amplified sound output of each of said sound-reproducing means, and being de-energized in response to the discontinuance of said sound output, means responsive to the energizing and de-energizing of said second coil means for alternately and respectively connecting and disconnecting the sound output of a first one of said sound-reproducing means to and from a power amplifier and for substantially simultaneously disconnecting and connecting the sound output of a second one of said sound-reproducing means from and to said power amplifier.

4. A switching device for alternately connecting the sound outputs of a plurality of sound-reproducing means to a power amplifier in response to the discontinuance of a signal from one of the sound-reproducing means, comprising a plurality of sound-reproducing means, each of said sound-reproducing means being provided with a sound track carrying a series of sound recordings separated by silent track portions, and means for maintaining a connection between the sound output of one of said sound-reproducing means and a power amplifier while said one sound-reproducing means is transmitting a signal, said connection maintaining means including means for amplifying the sound output of each of said sound-reproducing means, first and second coil means, means responsive to the operation of said first coil means for alternately energizing and de-energizing said second coil means, said first coil means being energized in response to the amplified sound output of each of said sound-reproducing means, and being de-energized in response to the discontinuance of said sound output, means responsive to the energizing and de-energizing of said second coil means for alternately and respectively connecting and disconnecting the sound output of a first one of said sound-reproducing means to and from a power amplifier and for substantially simultaneously disconnecting and connecting the sound output of a second one of said sound-reproducing means from and to said power amplifier and including means to delay the operation of said first coil means for a time period that is greater than normal sound transmission pauses but less than the time period of said silent track portions.

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