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DISCRIMINATORY CONTROL NETWORK FOR RECORDING SYSTEMS

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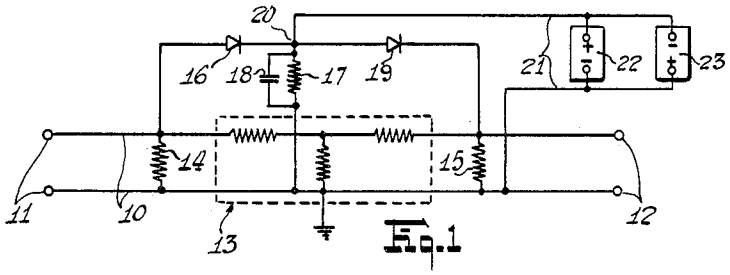


Fig. 1

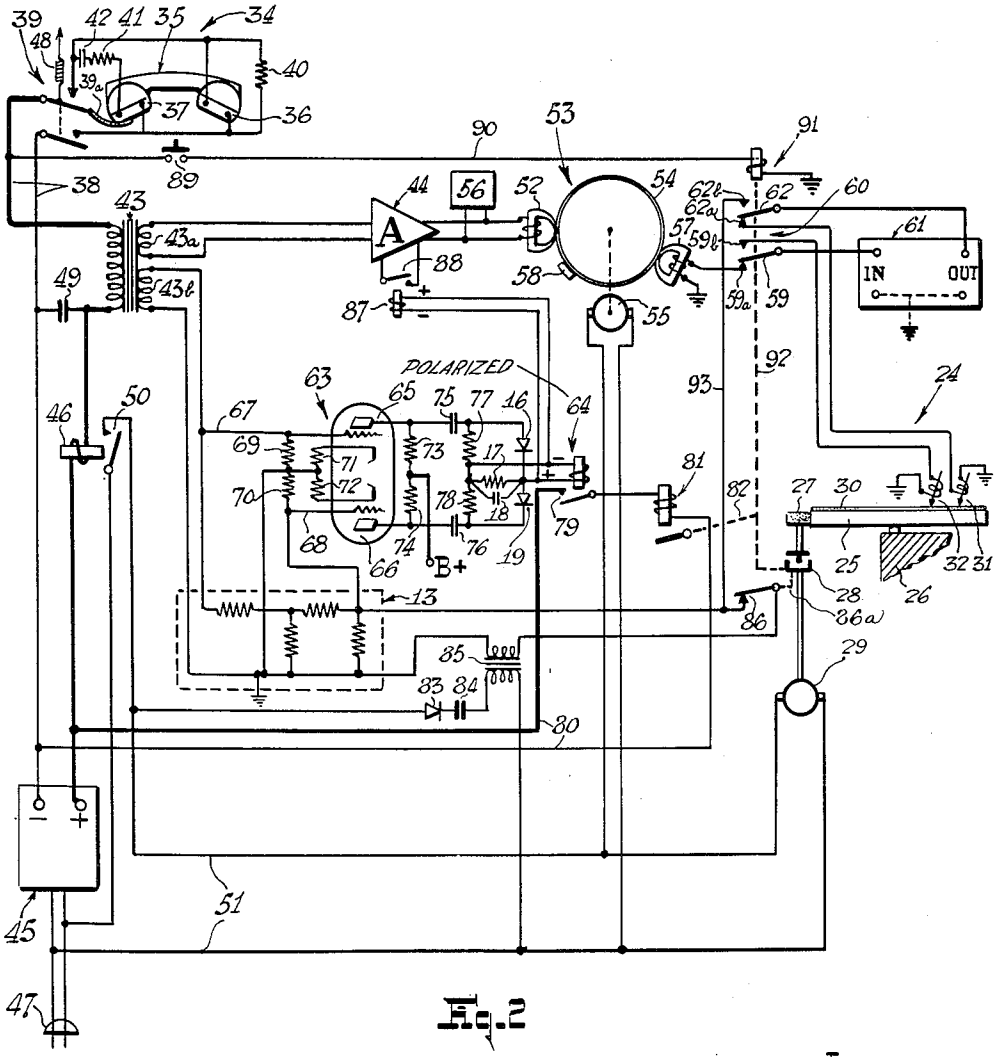


Fig. 2

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DISCRIMINATORY CONTROL NETWORK FOR RECORDING SYSTEMS

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5 Claims. (Cl. 179—100.1)

This invention relates to voice-controlled dictation recording systems wherein a warning signal is fed back to the dictator's receiver to apprise him when the machine is stopped, and particularly it relates to such recording systems which embody a discriminating network in the voice circuit for preventing such warning signals from having any influence on the voice-controlled apparatus of the machine.

This application is a division of applicant's pending application Serial No. 636,991, filed January 29, 1957, now abandoned. In that application Serial No. 636,991, there is described and claimed a particular discriminating network which is especially useful in voice-controlled recording systems. Although the present invention is described in connection with that particular discriminating network by way of preferred illustration, no unnecessary limitation of the present invention thereto is intended.

The advantage of starting a dictating machine by the voice signal energy spoken into the dictator's microphone, and of causing the machine to stop following cessation of spoken energy into the microphone, is that the dictator need not divert his attention to the mechanical control of the machine but can concentrate fully on the subject matter of his dictation. In order to provide the dictator with a feeling of control over such machine, there is desirably provided a stand-by or warning signal, such as a low-frequency audio hum, which is fed back to the dictator's receiver whenever the machine is stopped. Since the dictator's station equipment comprises a telephone type of microphone-receiver connected in the same audio line, such warning signal must be prevented from starting the machine even though voice signals in the same line and of the same frequencies are to be operative to start the machine. In accordance with my invention, such required discriminatory control as between voice and warning signals is accomplished by a discriminatory network which is operative to provide control operations according to the direction of flow of signal energy through the network.

An object of my invention is to provide a discriminatory control system for general use which is operative to provide one or more selective control operations according to the direction of flow of signal current in a transmission line.

A further object is to provide new and improved discriminatory control means for dictating machines by which signal energy from a transducer is effective to control operation of the machine but signal energy fed to the transducer is ineffective to control the machine.

These and other objects and features of my invention will be aparent from the following description and the appended claims.

In the description of my invention reference is had to the accompanying drawings, of which:

FIGURE 1 is a schematic circuit diagram of a discriminatory control network of my invention shown in its most elemental form; and

FIGURE 2 is a schematic circuit diagram of a voice-controlled dictation-recording system incorporating my invention.

The discriminatory network of my invention shown in

FIGURE 1 comprises a signal transmission channel **10** having input-output terminals **11** and **12** at its ends for connection to respective signal sources and/or signal-receiving devices. In the channel **10** there is serially included an attenuator **13** which may be of the resistance T type, and at the ends of the attenuator there may be respective load resistors **14** and **15**. Serially connected in the order here named from the ungrounded to the grounded side of the left end of the attenuator are a rectifier **16** and load resistor **17** paralleled by a filter condenser **18**, and serially connected in the order named across the other end of the attenuator are this same load **17—18** and a rectifier **19**, the two rectifiers being poled in the same direction proceeding from one ungrounded side of the attenuator to the other ungrounded side thereof. Leading from the junction **20** between the two rectifiers and the grounded side of the channel **10** is a control circuit **21**. This control circuit may be connected to one or more D.C.-operable control devices **22** and **23** in parallel which may comprise, for example, respective polarized relays having their operable polarities reverse to each other as indicated.

When an oscillatory signal current is fed into the input end **11** of the channel **10** it will be attenuated by the attenuator **13** and fed out at the terminals **12**. Positive half pulses of this signal current will flow through the rectifier **16** and load resistor **17** to produce a positive voltage across the control circuit **21**. Although the negative half pulses of this signal current have a reverse circuit through the load resistor **17** via the rectifier **19** and the two horizontal resistors of the T attenuator **13**, these pulses are relatively weak and leave therefore a net positive voltage across the load **17—18** dependent on the level of the input signal and the degree of attenuation of the attenuator **13**. Such positive voltage across the load **17—18** will operate the polarized relay **22** but will not operate the reversely polarized relay **23**.

When an oscillatory signal current is fed into the input end **12** of the channel **10**, it will likewise be attenuated by the attenuator **13** and fed out at the terminals **11**. Negative half pulses of this signal current will flow through the load **17—18** and the rectifier **19** to produce a negative D.C. voltage across the control circuit **21**. Although positive half pulses of this signal current will also flow through the load **17—18** via the rectifier **16** and the two horizontal resistors of the attenuator **13**, these positive half pulses are much weaker than the negative half pulses to leave a net negative voltage across the load **17—18** dependent on the level of the input signal and the degree of attenuation of the attenuator **13**. This negative D.C. voltage will be effective to operate the polarized relay **23** but will not operate the reversely polarized relay **22**. Thus, the discriminatory network here described will operate one or more control devices according to the direction of flow of the signal energy in the transmission channel.

As will later appear from the subsequent description of my invention shown in FIGURE 2, an amplifying means may be interposed between the channel **10** and the control circuit **21** so that any degree of control sensitivity can be obtained for a given degree of attenuation in the channel **10**. In this way the attenuator **13** may have a relatively low attenuation and yet the network will have a highly sensitive discriminatory control action.

In the dictation-recording system shown in FIGURE 2 there is a dictating machine **24** (fractionally shown) having a record support in the form, for example, of a turntable **25** journalled at its center in a frame **26**. The turntable is driven at its rim by a friction driving wheel **27** coupled through a clutch **28** to a motor **29**. The turntable carries a disk record **30** which is engaged by the

styli of respective recorder and reproducer translating devices 31 and 32 diagrammatically shown. These translating devices are progressively fed across the disk record, as for example in an outwardly radial direction, with the reproducer trailing the recorder by a small distance. The means for so feeding the translating devices is standard and need not be herein described.

The recording system includes a dictator's station 34 provided with a hand set 35 of the usual telephone type having therein a carbon button microphone 36 and a receiver 37. An audio communication circuit 38 leads from this station through an on-off station switch 39. Connected in this circuit respectively parallel with one another are the carbon button microphone, a resistor 40 and the receiver through a series resistor 41 and blocking condenser 42. In the communication circuit beyond the dictator's station is an audio transformer 43 having a secondary winding 43*a* connected to the input of an amplifier 44 diagrammatically shown. Direct curent is provided to the dictator's station to energize the carbon button microphone from a rectifier-filter 45 through a control relay 46. Alternating current power to the rectifier-filter is provided from a power source as via a line plug 47.

Normally, the station switch is held open by resting the handpiece on an extension 39*a* of one pole member of the switch. When the handpiece is removed, the switch is closed by a spring 48 to start the flow of direct current through the relay 46, primary winding of the transformer 43, and microphone 36 and resistor 40 in parallel. By means of this direct current the microphone is energized to provide an audio signal current in the transmission line 38 whenever the voice is spoken into the microphone. This signal current is by-passed from the relay 46 by a condenser 49. The direct current also operates the relay 46 to close a switch 50 in a power line 51 leading from the plug 47 to the motor 29 to cause the motor to be started as soon as the handpiece is removed from its support.

The audio signals are fed from a secondary winding 43*a* of the transformer 43 through the amplifier 44 to a magnetic recorder head 52 forming a part of a transmission-delay apparatus generally referred to as 53. The recorder head is mounted close to but preferably not in contact with a magnetic drum 54 driven continuously by a motor 55 connected in parallel with the motor 29. Feeding also into the recorder head is a high-frequency bias current from an oscillator 56 (diagrammatically shown) according to usual practice. The drum 54 is provided with a peripheral coating of a magnetizable material so that it will receive a magnetic pattern according to the audio signals fed to the recording head. At about a three-quarter turn around the drum from the recording head there is a reproducer head 57 also mounted close to but out of contact with the drum, and further around the drum between the two heads there is an erasing magnet 58 for removing the magnetic pattern constantly in advance of the recording head 52. The reproducer head is connected through a contact 59*a* and pole 59 of a record-reproduce switch 60 to the input of an amplifier 61, and the output of this amplifier is connected through the contact 62*a* and pole 62 of the switch 60 to the recording head 31 of the dictating machine. The drum is rotated typically at a speed of about one revolution every 200 milliseconds to cause an approximate delay of 150 milliseconds in the transmission of the audio signals from the dictator's station to the dictating machine.

The voice signal energy from the dictator's station is fed also through a secondary winding 43*b* of the audio transformer 43 and a discriminatory amplifier network 63 of my invention to a master start-stop relay 64 for the dictating machine to operate this relay and start the machine automatically when the voice is spoken into the microphone 36 at a level above a predetermined threshold. The network 63 comprises the attenuator 13 in the signal channel and the rectifiers 16 and 19 together with the load 17—18 in the side control circuit. Interposed however between the rectifiers and the signal channel is an amplifier comprising amplifier triode tubes 65 and 66 (permissibly mounted however in one envelope, as indicated) which are connected in push-pull arrangement. The grid of the amplifier tube 65 is connected by a lead 67 to the left end of the attenuator 13 and the grid of the tube 66 by a lead 68 to the right end of this attenuator. The grids of these tubes are connected also through grid leak resistors 69 and 70 to the ground side of the attenuator. Likewise, the cathodes of these tubes are connected through resistors 71 and 72 to the same ground side. The plates of the tubes are supplied with direct current through resistors 73 and 74 from a B supply designated B+. Connected across the plates through respective blocking condensers 75 and 76 are serially-connected load resistors 77 and 78, and connected across these load resistors are the rectifiers 16 and 19 in series. The load 17—18 is connected from the junction between the load resistors 77 and 78 to the junction between the rectifiers 16 and 19. The coil of the relay 64 is connected across the load 17—18.

The operation of the discriminatory amplifier network 63 is the same in principle as that hereinbefore described in connection with the circuit shown in FIGURE 1. For example, a signal from the dictator's station will be fed to the amplifier tube 65 with greater volume than to the amplifier tube 66, and the amplified voltage from these tubes is fed across the rectifiers to provide a D.C. output control voltage to the master relay 64 having the polarity designated in FIGURE 2. Since the relay 64 is polarized to respond to a control voltage of that polarity, this relay will operate to close the contact 79. These contacts are connected serially in a power circuit 80 leading from the rectifier-filter 45 through the coil of an electromagnetic device 81. This device has a coupling with the clutch 28 designated by the tie line 82 to cause the clutch to be engaged to start the motor as the device is operated. This operation of the clutch in response to voice signals spoken into the microphone 36 will occur in much shorter time than the delay time of the apparatus 53—its operate time being typically about 20 milliseconds—to assure that the dictating machine will have been started before any initial voice signals reach the recorder 31 of the dictating machine. In order that any momentary cessation of voice signals spoken into the microphone will not immediately cause the master relay 64 to drop out, the capacity of the filter condenser 18 across the control line is made sufficiently large.

It is customary in voice-controlled dictation-recording equipment to feed a suitable signal power to the receiver of the dictator's handpiece so as to apprise the dictator as to whenever the machine is not running. This is important because it warns the dictator whenever he speaks in too low a voice as well as when the machine may be out of adjustment against continuing to speak dictation into the microphone when the machine may not be running. A positive warning signal for this purpose is derived suitably from the A.C. power line 51 through a rectifier 83, condenser 84 and voltage cut-down transformer 85, the purpose of the rectifier being to break up the 60-cycle voltage into higher frequency components, and of the condenser 84 to aid in reducing the voltage level. From the transformer 85 the warning signal is fed to the receiver 37 through a pair of contacts 86 controlled by the clutch 28 as through a coupling designated by the tie line 86*a*, the attenuator 13 of the discriminatory network 63, secondary winding 43*b* of the audio transformer 43, and the station switch 39. The contacts 86 are normally closed to cause the warning signal to be heard whenever the master relay 64 is not operated—which is when the clutch is disengaged. Conversely, as soon as the electromagnetic device 81 is operated responsive to dictation spoken into the microphone, the warning signal is removed so that it will not be recorded by the dictating machine. However, the warning signal will be fed to the delay apparatus 53

through the attenuator 13, secondary windings 43*b* and 43*a*, and amplifier 44 to cause the warning signal to be recorded on the drum 54 while the dictating machine is stopped. Accordingly, there will occur the following sequence starting with the instant a voice signal is spoken into the microphone above the threshold level required to start the dictating machine; During the first 20 milliseconds representing the delay in the operation of the clutch, the dictating machine is stopped but the voice signal is recorded on the drum 54 together with the warning signal; for the next 130 milliseconds, the dictating machine will receive and record only the warning signal; for the next 20 milliseconds, it will receive and record both the voice signal and the warning signal; and thereafter it will receive and record only the pure voice signal without the warning signal. However, either by a second pair of contacts provided in the master relay 64 (not shown) or by a separate and oppositely-polarized relay 87 having switch contacts 88, the gain of the amplifier 44 may be suitably reduced during the initial period when the warning signal would be recorded, as in the manner described and claimed in the pending application of George W. Esser, Serial No. 597,370, filed July 12, 1956, now Patent No. 2,833,866, issued May 6, 1958, so that the warning signal will not appear in the recorded dictation.

Since the level of the warning signal in the audio line 38 of the dictator's station is comparable to that of the voice signals therein received from the microphone, the warning signal would be operative to operate the master relay 64 were means not provided to prevent it. It is of course necessary to the operation of the present voice-controlled recording system that such warning signal shall not itself be operative to start the machine. In order to prevent the warning signal from so starting the machine, there is provided the discriminatory network 63 hereinbefore described. By feeding the warning signal through the attenuator 13 in the reverse direction from that in which the voice signals are fed, the warning signal provides a D.C. control voltage across the master relay 64 which is of the reverse polarity to that required to operate that relay but which will operate the reversely-polarized relay 87 to cause the gain of the amplifier 44 to be reduced momentarily in the manner abovedescribed.

It is desirable that the dictator have facility to condition the recording system for reproducing and concurrently start the machine so that he can listen back to a last portion of his dictation, at least to the extent represented by the trailing distance of the reproducer behind the recorder, so as to revive the run of his thoughts should he have been interrupted during the course of his dictation. For this purpose a reproduce control switch 89 is provided at the dictator's station. This switch is connected in a line 90 running from the positive side of the audio line 38 through the coil of an electromagnetic device 91 which controls the record-reproduce switch 60. Upon closing the reproduce switch 89, the device 91 is operated to shift the record-reproduce switch to reproduce position and concurrently to engage the clutch 28 through a coupling represented by the tie line 92. The voice signals from the reproducer 32 are then fed through the contact 59*b* and pole 59 to the input of the amplifier 61 and from the output of this amplifier through the pole 62 and contact 62*b* to the line 93 connected to the right end of the attenuator 13 where the warning signals also appear. Were the master relay 64 to be now operated by the reproduced voice signals, it would be an idle operation since the clutch 28 is already engaged by the device 31. However, such idle operation of the master relay is prevented by the discriminatory network 63, the same as when the warning signals are fed into the audio line.

The particular embodiments of my invention hereinabove shown and described are intended to be illustrative and not necessarily limitative of my invention since the same are subject to changes and modifications without

departure from the scope thereof, which I endeavor to express according to the following claims.

I claim:

1. In a dictation-recording system including a dictating machine and a dictator's microphone-receiver: the combination of start-stop means for said dictating machine; an audio circuit for connecting said microphone-receiver to said machine; an electrically operable control device for operating said start-stop means to start said machine; a source of warning signal adapted to be fed into said audio circuit for reproduction by said receiver-microphone to apprise the dictator when said machine is stopped; and a discriminatory network including a two-way transmission channel connected at its ends to said audio circuit and warning source respectively and having an output control circuit connected to said control device, said network including means for causing signal oscillations fed into said audio circuit from said microphone to be effective to operate said control device to start said machine and for causing signal oscillations fed into said audio circuit from said warning source to be ineffective to operate said control device to start said machine.

2. In a dictation-recording system including a dictating machine and a dictator's microphone-receiver: the combination of an audio circuit for connecting said microphone-receiver to said dictating machine, a transmission delay device connected in said audio circuit between said microphone-receiver and said dictating machine for retarding the transmission of all signals fed to said dictating machine by a predetermined period; an electrically-operable device for starting said dictating machine; means controlled by said electrically operable device for feeding an audio warning signal into said audio circuit ahead of said delay device for reproduction by said receiver when said dictating machine is stopped; and a discriminatory network comprising a transmission channel connected between said audio circuit ahead of said delay device and the source of said warning signal and having a control output circuit connected to said electrically-operable device for rendering the latter responsive within said predetermined period to voice energy spoken into said microphone and unresponsive to warning-signal energy fed into said audio circuit via said transmission channel.

3. The combination set forth in claim 2 wherein said discriminatory network comprises an attenuator connected between said audio circuit and the source of said warning signal; a push-pull amplifier having the inputs of its respective amplifier tubes connected respectively to the opposite ends of said attenuator; a pair of rectifiers connected in the same polarity from the plate of one of said amplifier tubes to the other; said control output circuit leading from the junction point between said rectifiers to provide an output voltage of one polarity when voice energy is spoken into said microphone and an output voltage of the opposite polarity when warning signals are fed into said audio circuit via said attenuator; and wherein said electrically-operable device comprises a relay connected in said output circuit and polarized so as to be responsive to the voice energy spoken into said microphone and unresponsive to the warning-signal energy fed into said audio circuit.

4. In a dictation-recording system including a dictating machine having a recording circuit and a drive mechanism, and a dictator's station including a handpiece provided with a receiver and a microphone: the combination of an audio circuit for connecting said microphone to said recording circuit; a polarized electromagnetic start-stop device for said drive mechanism; electric circuit means including a transmission channel connected to said audio circuit and an output control circuit for providing a D.C. voltage of a polarity effective to operate said start-stop device to start position responsive to voice energy spoken into said microphone; means controlled by said start-stop device for feeding a warning signal via said transmission channel into said audio circuit for reproduction by said

receiver whereby to apprise the dictator whenever said drive mechanism is stopped; and means connected in said electric circuit means and forming a discriminatory network adapted to cause a D.C. voltage fed to said start-stop device in response to the warning signal fed via said transmission channel into said audio circuit to be of a polarity opposite to the direction of polarization of said electromagnetic device.

5. The combination set forth in claim 1 including selector means for conditioning said machine for recording and reproducing, means controlled by said selector means for operating said start-stop means to start said machine when said selector means is shifted to reproducing position, and means for feeding the reproduced signals to said audio circuit via the same path that said warning signal oscillations are fed to said audio circuit whereby to cause the reproduced signal oscillations to be also ineffective to operate said control device.

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