

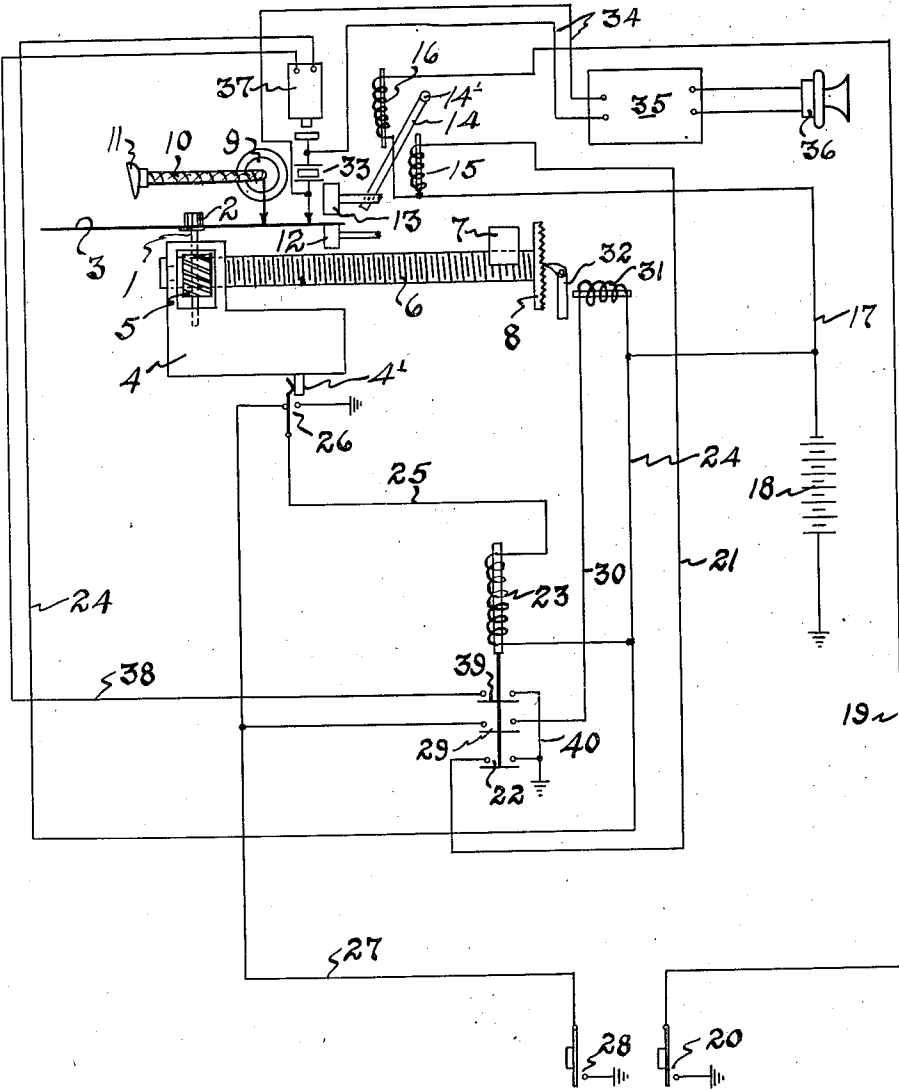
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H. P. CLAUSEN

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SOUND RECORDING AND REPRODUCING MACHINE

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INVENTOR.

INVENTOR:
Henry P. Clausen

Darby & Darby
Atts

BY

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SOUND RECORDING AND REPRODUCING
MACHINEHenry P. Clausen, White Plains, N. Y., assignor to
The Gray Manufacturing Company, Hartford,
Conn., a corporation of Connecticut

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This invention relates to improvements in sound recording and reproducing machines, particularly the type employed for recording and transcribing dictation.

A general object of the invention is the provision of a machine of this type having embodied therein mechanism for electrically recording sounds on a record tablet and mechanical means for acoustically reproducing the recorded sounds.

The more detailed objects of the invention will become apparent from the following description when taken in connection with the attached drawing.

This invention resides substantially in the combination, construction, arrangement and relative location of parts as will be described in detail below.

In the accompanying drawing, the single figure is a diagrammatic view of the combination comprising this invention.

It has been the more common practice heretofore to construct dictation recording and transcribing machines so that the record is made on the record tablet and reproduced therefrom by mechanico-acoustic recording and reproducing units or by electrical recording and reproducing units. The mechanico-acoustic type of equipment does not in many respects meet the modern requirements and operating conditions for machines of this type. On the other hand, the all electrical type of machine tends to be complicated both in construction and operation in part because of the fact that the amplifier, only one of which is commonly used, must be alternatively connected to the recorder and the reproducer. To overcome these difficulties, and thereby render the machine at the same time satisfactory in actual use and less complicated, and therefore less expensive, the herein disclosed invention was devised. The general combination consists of a sound recording and transcribing machine in which the recording portion of the machine may be characterized as of the electrical type, while the reproducing portion is of the mechanico-acoustic type. In such a combination the amplifier is directly connected to the recorder since it is not used in reproduction. The reproducer is of the mechanically operated reproducer sound box type directly connected by a flexible tube to a headset or earphone so designed as to reproduce the recorded sounds in sufficient volume for direct transmission to the ears of the transcriber.

The dictating machine operating with an electrical recording device is a very convenient form for everyday use. The dictator may speak in an

ordinary tone of voice without placing his mouth close to a mouthpiece, and yet obtain an entirely satisfactory recording sufficiently loud upon reproduction for operation of the mechanico-acoustic type of reproducer. Such a machine is considerably simplified as against the all electric type of machine, and is nevertheless the full practical equivalent thereof in use.

Other practical important features are included in the machine, but reference thereto in detail will follow in connection with a full disclosure of one embodiment of the invention. As illustrated in the drawing, the machine is preferably of the type which uses a flexible record tablet preferably made in the form of a thin disc of cellulose acetate smooth on both sides. Such a disc is diagrammatically illustrated at 3. It is mounted by means of a key member 2 on the end of a rotatable spindle 1, so as to be locked thereto for rotation therewith. This spindle is journaled in a carriage 4 in one end of which is rotatably mounted a threaded shaft 6. A worm wheel 5 is mounted on the spindle 1 and meshes with the threads of the shaft 6. This shaft is engaged by a fixed half nut 7. The shaft 6 may rotate with respect to the carriage 4, but must move with it. This carriage is mounted on any suitable form of support, not shown, so that it may have a sliding movement in a direction parallel to the axis of shaft 6. A ratchet wheel or disc 8 is secured to the free end of shaft 6. At 12 is a drive wheel connected to any suitable form of power source such as an electric motor, not shown, and when the machine is in operation it continually revolves. It engages the lower surface of the disc 3, but does not cause the rotation thereof until that disc is gripped from above by means of a friction wheel 13 rotatably supported on an arbor, not shown, so that it may be moved into and out of engagement with the disc 3. A machine of this type is shown in full detail in the copending application of Barton A. Proctor and Ferdinand C. W. Thiede, Serial No. 218,082, filed July 8, 1938.

A mechanical reproducer or soundbox 9 is shown with a stylus adapted to engage the upper surface of the disc 3. It is provided with a diaphragm in accordance with well known practice, and where the sound is recorded on the disc in sufficient volume this diaphragm when properly designed will generate sound waves of sufficient intensity so that they may be easily heard by a transcriber sitting near the machine. When desired, however, the reproducer may be provided with a flexible tube 10 and an earphone

11 or a suitable headset, not shown, so that the sounds generated thereby may be directly conveyed to the transcriber's ears.

As diagrammatically illustrated the friction wheel 13 is pivotally connected to a lever 14 pivoted at 14' on any suitable support so that the lever may be moved up and down to cause the friction wheel 13 to disengage and engage the upper surface of disc 3.

A pair of electro-magnets are associated with the lever 14 so that upon alternative energization thereof the lever 14 may be pivoted downwardly and upwardly. One terminal of each of the electro-magnets 15 and 16 is connected by a wire 17 to a grounded current source 18 of any suitable type. The other terminal of magnet 16 is connected by wire 19 to a normally open grounded switch 20. The other terminal of magnet 15 is connected by wire 21 to one of the fixed contacts of the switch 22. The other fixed contact of this switch is grounded by the wire 40. Switch 22 forms part of an electro-magnetically operated relay of which the solenoid 23 is the operating member. One terminal of this solenoid is connected by wire 24 to one terminal of an electro-magnet 37 forming part of the mechanism for raising the recorder head 33 so that its stylus disengages record tablet 3. Wire 24 also connects to one terminal of an electro-magnet 31 which operates a back spacing pawl 32 cooperating with the ratchet wheel 8. Wire 24 is connected to wire 17 as shown. The other terminal of the solenoid 23 is connected by wire 25 to the movable contact of a single-pole double-throw switch 26. This contact is positioned to be engaged by a lug 4' mounted on the carriage 4. One of the fixed contacts of switch 26 is grounded. The other is connected by wire 27 to ground through a normally open switch 28 and by a wire to one of the fixed contacts of switch 22 operated by the relay. The other contact of this switch is connected to the remaining terminal of the electro-magnet 31. The remaining terminal of the electro-magnet 37 is connected by wire 38 to one of the fixed contacts of switch 39 forming part of the relay 23. The other terminal of this switch is grounded by the wire 40.

The recording head or device 33 may be of any suitable type, but is preferably of the piezo electric crystal type. Its terminals are connected by the wires 34 to the output of a suitable amplifier 35, such as for example a vacuum tube amplifier of proper characteristics. The input terminals of this amplifier are connected to a microphone 36.

Before describing the operation of this system in detail it is to be noted, as set forth in the above mentioned pending application, that the recorder 33 and reproducer 9 are so related with respect to each other and the record tablet 3 that they are at substantially the same radial distance from the center of rotation of the disc 3 at any instant. They have been shown radially spaced in the drawing for the sake of clarity. To put the machine in operation a fresh record disc 3 is impaled upon the end 2 of the spindle 1, the fixed half-nut 7 is raised out of engagement with the threaded shaft 6 and the carriage 4 is then moved to the extreme right so that the stylus of the recording head 33 engages the disc 3 at a point near its center. It will be noted that the disc 3 then projects to the right between the wheels 12 and 13. It is, of course, apparent that the relay 31 and the pawl 32 which

form the back spacing device in conjunction with the ratchet wheel 8 must in an actual machine be mounted for movement with the carriage 4. The shaft 6 is, of course, mounted on the carriage for movement with it, as is the switch 26.

To set the machine in operation the power source for the drive wheel 12 is energized so that this wheel is continuously revolving. With friction wheel 13 raised as shown the drive wheel 12 may slip with respect to the disc 3 so that the disc does not revolve. To put the machine in operation for recording the dictator momentarily closes switch 28 completing its circuit from ground through the switch, wire 27, switch 26 (it being at this time in the position shown) wire 25, solenoid 23, wire 24, wire 17 and current source 18 to ground. The energization of the solenoid 23 closes switches 22, 29 and 39. The closing of switch 22 completes a circuit from ground through that switch, wire 21, electro-magnet 15, wire 17, and current source 18 to ground. The energization of the magnet 15 causes lever 14 to move the friction wheel 13 into engagement with the disc 3. The disc thereupon begins immediately to rotate. Of course, spindle 1 and worm 5 rotate with it. The rotation of the worm wheel causes threaded shaft 6 to revolve, which being engaged with the fixed half-nut 7 is thereupon caused to slowly move along its axis to the left, carrying the back spacing device with it, as well as switch 26. The circuit to magnet 37 is also completed at this time from ground through wire 40, switch 39, wire 38, the winding of the magnet 37, wire 24, wire 17 and current source 18 to ground. Thus the recording head 33 is raised so that its stylus disengages the record disc 3. A circuit is also completed from ground through switch 28 while it was momentarily closed, wire 27, switch 29, wire 30, magnet 31, and wire 17 to ground through the current source 18. This single energization of the magnet 31 operates the pawl 32 so as to cause it acting on the ratchet 8 to move shaft 6 in the reverse direction to back space the carriage 4 a predetermined distance, which in practice is preferably the distance of one sound groove width. Of course, if in positioning the machine as explained above to start a new record the carriage 4 is at the extreme right, the back spacing mechanism cannot move the carriage in a back spacing direction. The energization of the back spacing mechanism under these circumstances does no harm. This motion of the carriage 4 in a back spacing direction allows the movable contact of switch 26 to close on the other fixed contact and maintain the circuit for solenoid 23 so that its switches remain closed. This results even though switch 28 has only been closed momentarily.

Under these conditions with the stylus of the reproducer 9 engaging the disc 3 as it normally may do, the record 3 will continue its advance rotation being driven by the drive wheel 12. Since we have assumed, however, that we have not yet begun to record there will be no sound reproduced as the disc rotates back to its previous position that is for the distance representing the record groove the machine was back spaced. As the disc rotates to return to that initial position carriage 4 will likewise move to the left breaking the circuit to ground at switch 26 just as the record 3 moves back to the point where it was initially. Since switch 28 is open when switch 26 is operated back to the position shown in the drawing the circuit to the solenoid 23 will be

broken so that switches 22, 29 and 39 open. Friction wheel 13 will remain in engagement with the disc 3 because the lever operating mechanism is of the type which remains in the position to which it was operated. The dictator may then proceed to record such dictation as he may wish by speaking into or in the vicinity of the microphone, so that the sound waves will ultimately cause actuation of the recording head 33 through the energization thereof by the electric currents created by the microphone and amplified by the amplifier. At any time the dictator should desire to stop the machine he momentarily closes switch 20 passing current from ground through the switch, wire 19, magnet 16, wire 17 and current source 18 back to ground. The resulting energization of magnet 16 raises lever 14 so that the friction wheel 13 disengages the record tablet 3. The movement of the record tablet thereupon immediately ceases even though the drive wheel 12 continues to rotate.

An important feature of this type of construction is that immediately the application of power to the tablet ceases its rotation ceases because of the form of drive employed and the extremely low mass of the record tablet.

In order to start the machine the dictator will momentarily close switch 28 whereupon the sequence of operations previously described will occur, beginning with the operation of the relay 23. As before, the record carrier will be back spaced one groove, which will occur after the recorder 33 has been lifted from the record tablet as may be readily accomplished by proper timing of the apparatus. At the same time, of course, magnet 15 being energized, the drive wheel will engage the record 3 and the reproducer will reproduce the recorded matter in the last groove (i. e. back spaced groove), so that the dictator may pick up the thought of the dictation at the time he previously interrupted it. It will be seen that it is after dictation has begun that the feature of back spacing one sound groove each time the machine is started is of practical importance as distinguished from the back spacing action that occurs, as described above, at the beginning of the record. At the beginning of the record the back spacing is but an incident to the operation of the machine, which has no real utility, resulting mainly from the nature of the combination disclosed. The reproducer may engage the record at all times without any harm thereto, and for this reason no mechanism is shown for raising it during back spacing.

From the above description it will be seen that the recording and transcribing machine herein disclosed may be made relatively simple by the use of a mechanico-acoustic reproducer since the amplifier may remain connected to the recording head, and as a result complicated switch mechanism is not necessary.

A further advantage of the invention is found in the automatic back spacing a distance of one record groove each time the machine is started, so that the dictator may pick up the thread of previous dictation before proceeding.

It will be clear to those having a skillful knowledge of this art that certain principles of novelty, particularly as defined in the claims are capable of embodiment in other combinations and other physical forms. I do not, therefore, desire to be strictly limited to this disclosure because it is given in an illustrative sense, but rather to the scope of the claims granted me.

What is claimed is:

1. In a sound recording machine a record support, a sound recording head positionable to engage a record when mounted on said support, driving means for causing relative movement between said support and head in a recording direction, means for causing relative movement between said support and head in a back spacing direction, and a control device for simultaneously actuating said driving means and for actuating said back spacing means, whereby back spacing is caused each time the machine is started.

2. In a sound recording machine a movable record support, a sound recording head positionable to engage a record when mounted on said support, driving means for causing said support to move with respect to said head in a recording direction, means for causing movement of said support in a back spacing direction, and manually actuated means for energizing said driving means and for energizing said back spacing means to cause back spacing movement of the support a predetermined amount each time the machine is started.

3. In a sound recording machine a record support, a sound recording head positionable to engage and disengage a record when mounted on said support, driving means for causing relative movement between said support and head in a recording direction, means for causing relative movement between said support and head in a back spacing direction, means for raising said recording head out of recording position, and a control device for simultaneously energizing said driving means, said back spacing means, and said recorder lifting means, whereby the machine is back spaced upon starting and the recording head disengages the record during back spacing.

4. In a sound recording machine a record support, a sound recording head, driving means for causing relative movement between said support and head in a recording direction, means for causing relative movement between said support and head in a back spacing direction, a control device for simultaneously actuating said driving means and for causing momentary energization of said back spacing means, whereby the driving means is energized for causing relative movement of the support and head in a recording direction, but back spacing relative movement is first accomplished, and a sound reproducing device positioned to engage a record mounted on said support.

5. In a sound recording machine a record support, a sound recording head, driving means for causing relative movement between said support and head in a recording direction, means for causing relative movement between said support and head in a back spacing direction, a control device for simultaneously energizing said driving means and for momentarily energizing said back spacing means, and a mechanico-acoustic sound reproducing device positioned to engage a record tablet mounted on said support.

6. In a machine of the type described the combination including a record support on which a record tablet may be mounted, a sound recording head supported to engage the record tablet when mounted on said support, driving means for producing relative movement between said support and head in a recording direction, back spacing means for causing relative back spacing movement between said support and head, means

when energized for raising said recording head

out of recording position, a control device for simultaneously energizing said driving means, said back spacing means and said lifting means, and means operating as a result of the relative movement of the support and recording head for de-energizing said lifting means after the relative movement of the support and recording head in a recording direction has caused a retracting of the back space portion of the record, whereby the recording head returns to recording position.

7. In a machine of the type described the combination including a record support on which a record tablet may be mounted, a sound recording head supported to engage the record tablet when mounted on said support, driving means for producing relative movement between said support and head in a recording direction, back spacing means for causing relative back spacing movement between said support and head, means when energized for raising said recording head out of recording position, a control device for simultaneously energizing said driving means, said back spacing means and said lifting means, a sound reproducing device positioned to engage a record tablet on said support, and means actuated by said carriage for de-energizing said lifting means after said reproducing device has retraced the back space portion of the record.

8. In a machine of the type described the combination including a record support on which a record tablet may be mounted, a sound recording head supported to engage the record tablet when mounted on said support, driving means for pro-

ducing relative movement between said support and head in a recording direction, back spacing means for causing relative back spacing movement between said support and head, means when energized for raising said recording head out of recording position, a control device for simultaneously energizing said driving means, said back spacing means and said lifting means, an electro-acoustic sound reproducing device positioned to engage a record tablet on said support, and means actuated by said carriage for de-energizing said lifting means after said reproducing device has retraced the back space portion of the record.

9. In a sound recording machine a record support, a sound recording head positionable to engage and disengage a record when mounted on said support, driving means for causing relative movement between said support and head in a recording direction, means for causing relative movement between said support and head in a back spacing direction, means for raising said recording head so as to disengage the record, a control device for simultaneously energizing said driving means, said back spacing means, and said recorder lifting means whereby upon actuation of the control device to start the machine the machine is back spaced and the recorder is lifted from the record during the back spacing period, and means for deenergizing said lifting means so the recorder again engages the record at the point from which it was back spaced.

HENRY P. CLAUSEN.