Nov. 7, 1961 H. MATUSCHE 3,007,705

DRIVING DEVICES FOR MOVING THE SOUND HEAD OF DICTATING MACHINES

Filed Nov. 13, 1957

3 Sheets-Sheet 1

Fig. 1

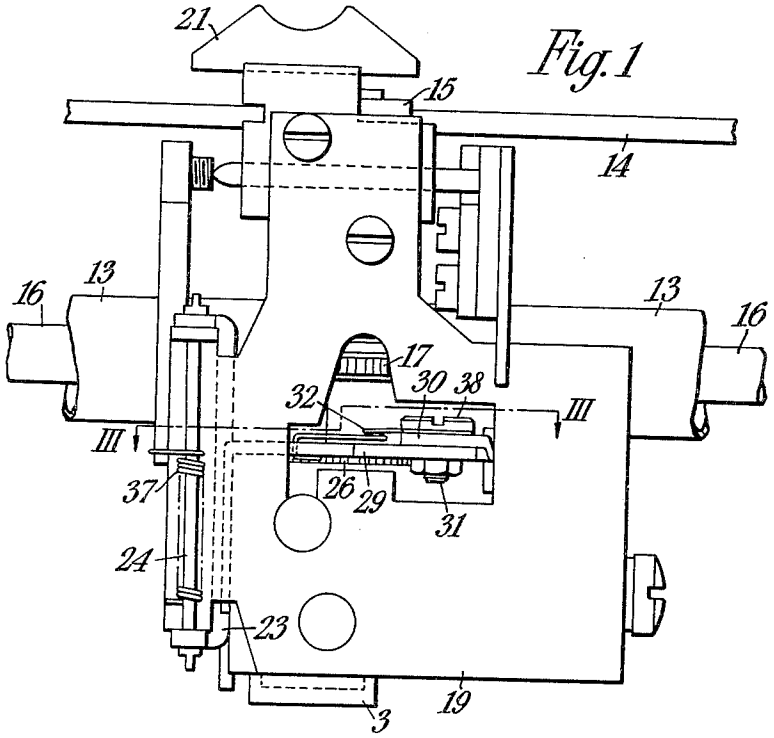

Fig. 3

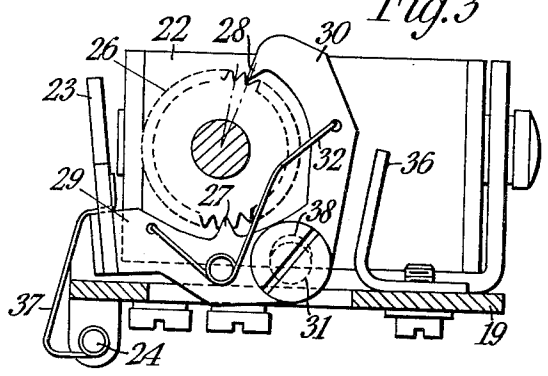

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Fig. 2

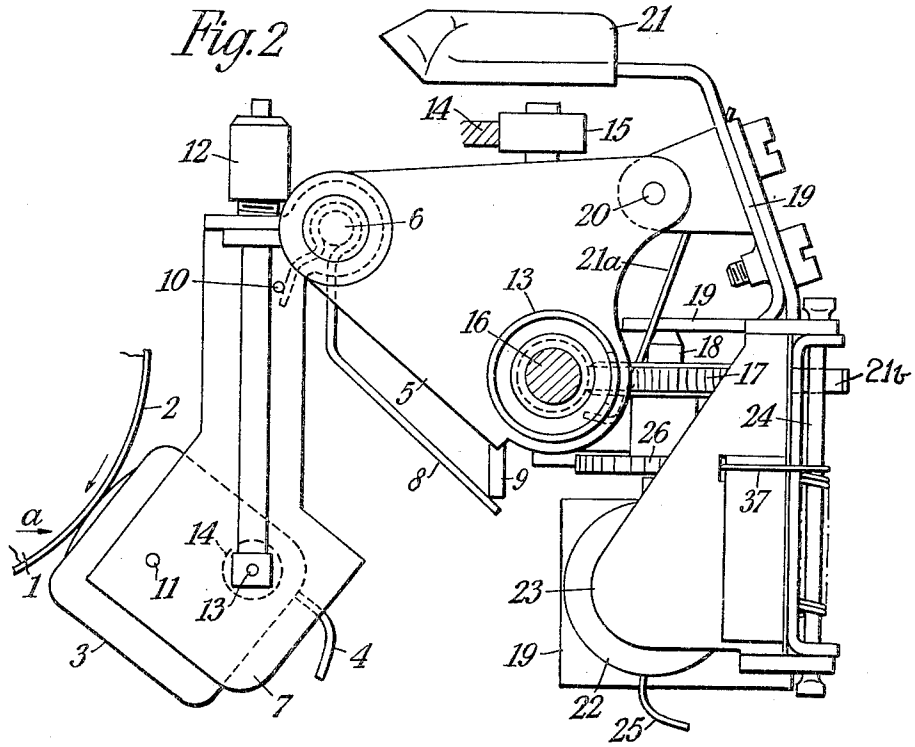

Fig. 4

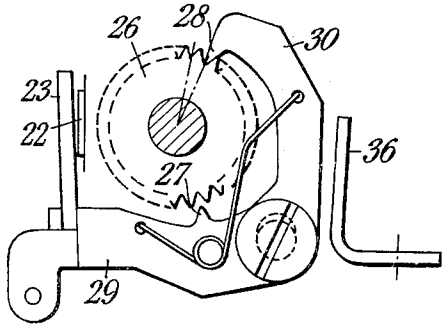

Fig. 5

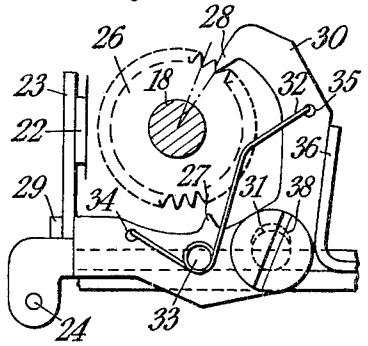

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Fig. 6

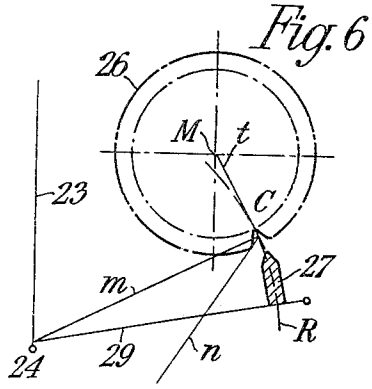


Fig. 7

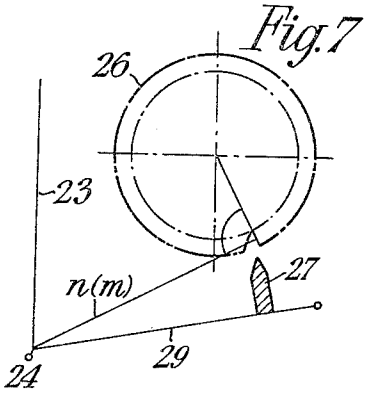


Fig. 8

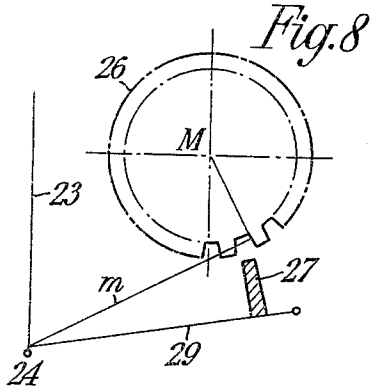


Fig. 9

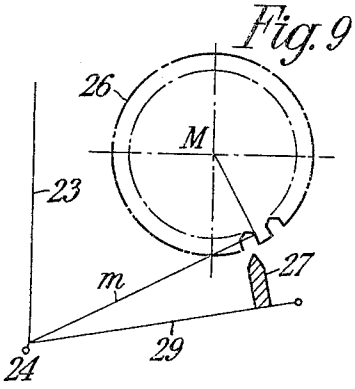
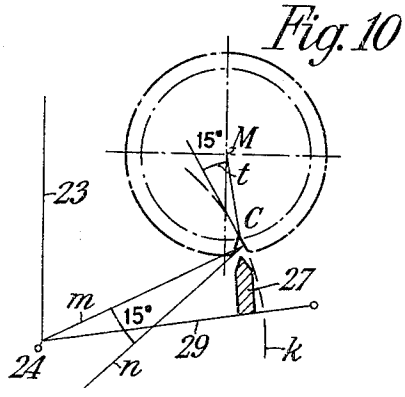


Fig. 10



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3,007,705

DRIVING DEVICES FOR MOVING THE SOUND HEAD OF DICTATING MACHINES

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3 Claims. (Cl. 274—21)

This invention relates to a driving device for moving the sound head of dictating machines or for moving another body continuously in one direction and by stages in the other direction, the continuous movement being effected by a feed screw detachably coupled to a carriage carrying the sound head or other body.

In dictating machines of this kind as at present constructed the carriage is guided by means engageable in the drive feed screw. This has the disadvantage that for the reverse movement of the carriage the guiding means has to be disengaged from the feed screw against the force of the spring loading of the sound head.

The object of the present invention is to provide a repeater device for dictating machines, which ensures positive operation with the minimum possible expenditure of force.

According to the invention, there is provided on the carriage for the sound head drive, a rolling gear wheel in engagement with the feed screw, and a control device which, for the continuous movement of the carriage, locks the rolling gear wheel and, for the step-by-step movement rotates the same in such manner that it rolls on the feed screw in a direction opposed to the direction of transport of the feed screw. Thus with this arrangement only the force for the actual reverse movement of the carriage is required thereby avoiding the necessity of applying additional forces for decoupling guiding means during the repetition.

The accompanying drawings show one particular embodiment of driving device according to the invention for moving the sound head of dictating machines and in which:

FIGURE 1 is a view showing the driving device in side elevation;

FIGURE 2 is an end view partly in section;

FIGURE 3 is a section on the line III—III of FIGURE 1.

FIGURES 4 and 5 are similar views of the control mechanism.

FIGURES 6 to 10 are diagrammatic illustrations of control elements to illustrate the mode of operation of the new device.

In the drawings reference 1 denotes the driving roller of a dictating machine for preferably tubular records, which are slipped, from one end, over the driving roller which is mounted as a cantilever, the record being made to bear on the driven roller by means of contact rollers or the like, so that the roller drives the sound record 2 at its own peripheral speed in the direction of the arrow. At the same time, the record travels past the gap of a sound head 3 in the manner known per se. Said sound head in turn performs a slow movement in the axial direction, so that it has advanced by the width of one groove after each revolution of the record 2. In consequence of these two movements, on the one hand of the record and on the other hand of the sound head, there is produced on the record 2 a spiral magnetic recording of the speech vibrations, which are fed to the coil of the sound head 3 through a flexible electric lead 4. The number of spiral turns or grooves depends on the line spacing provided and on the total length of the record 2.

The sound head 3 is mounted so as to be rockable about

an axis 6 on a carriage 5 which is guided to be slidable parallel to the roller 1. For this purpose, it is carried by a holder 7, which is mounted to be rockable about the axis 6 on the carriage 5. The sound head 3 is constantly pressed against the roller 1 or the record 2 by means of a leaf spring 8. The leaf spring 8 is mounted on the axis 6 and bears with one limb against a nose 9 of the carriage 5, while the other limb bears on an adjusting screw 10 of the sound head holder 7. For accurate adjustment of the sound head gap to the generatrix of the record support roller, the sound head 3 in the holder 7 is mounted to be rockable about an axis 11 and can be adjusted by means of an adjusting screw 12. Said adjusting screw bears upon a pin 13, which passes through an aperture 14 of the holder 7 and is joined fast to the sound head 3.

As already stated above, the carriage 5 is guided parallel to the driving roller 1 of the record 2. For this purpose, a guide tube 13 of circular cross section is provided and a means of securing against turning in the form of a guide bar 14 which is disposed parallel to the roller 1 and on which the carriage bears through a roller 15. The drive for the carriage is provided by a feed screw 16 which is disposed in the guide tube 13 and which is connected by a gear (not shown in the drawing) to the roller 1 and bears on the carriage 5 through a rolling gear wheel 17. Said rolling gear wheel is connected to a control device hereinafter described in greater detail and which, for the continuous movement of the carriage, locks the rolling gear wheel 17 while for the step-by-step movement it rotates said gear wheel in such manner that it moves in a direction opposed to the direction of transport of the feed screw.

In order to enable the sound head or carriage to be returned to the beginning without rolling of the gear wheel 17, especially after the last groove of the record has been passed through, the rolling gear wheel 17 is mounted by its axis 18 in a holder 19, which is suspended to be rockable about an axis 20 from the carriage 5. By pressure on a button 21 the rolling gearwheel 17 with the holder 19 is rocked against the action of a restoring spring 21*a* and hence lifted out of engagement with the feed screw 16 and by lateral pressure on the button 21 the carriage 5 together with the sound head 3 can be moved as desired within the total range of adjustment. The rocking movement of the holder 19 is limited by a stop 21*b* fixed to the carriage 5.

The control device for locking or rolling the gear wheel 17 is actuated by an electromagnet 22 disposed on the holder 19 and provided with the armature 23 rotatable about an axis 24, by means of a flexible lead 25 with the aid of a control button disposed preferably on the microphone of the machine.

The control device comprises essentially a ratchet wheel 26, mounted on the axis 18 of the rolling gear wheel 17, and a locking detent 27 and a pawl 28, which cooperate with said ratchet wheel and are both actuated from the electromagnet 22. The locking detent 27 is disposed on an arm 29 of the armature 23 and hence rigidly joined to the armature. The control gear 26 has teeth having a flank slope of 60°, while the detent 27 and the pawl 28 are of corresponding construction. The pawl 28 is disposed at the free end of a one-arm lever 30, which is mounted at the end of the armature arm 29 so as to be rotatable about an axis 31 and which is subject to the influence of a spring 32 which is held on a pin 33 of the armature arm 29 and bears with one limb in a bore 34 of the armature arm while the free limb bears on the pawl arm 30 in a bore 35 therein and tends to hold the pawl 23 in engagement with the ratchet wheel 26. A stop 36 is also provided on the holder 19 to take the dynamic forces and, when the pawl 28 is lifted, cooperates with

the flank of the pawl lever 30. By means of a return spring 37, which is held on the armature axis 24, the armature 23 is returned into its initial position shown in FIGURE 3, after each actuation of the electromagnet.

On actuation of the magnet 22 by way of the electrical lead 25, the armature 23 is attracted and passes from the position shown in FIGURE 3 through the middle position shown in FIGURE 4 into the attracted position shown in FIGURE 5, from which it returns to the starting position after the electromagnet has been de-energised.

When no current is applied to the magnet, the armature return spring 37 presses the detent 27 into the ratchett wheel 26 and thus locks both the rotation of the ratchet wheel and also of the rolling gear wheel 17, so that the feed screw 16 drives the gear wheel 17 in the axial direction, without turning said gear wheel, and hence also moves the carriage 5 in the direction of the arrow *a* (FIGURE 1). During this, the point of the pawl 28 rests on the upper end of a tooth of the ratchet wheel 26.

If current is applied to the magnet 22, the armature 23 pulls the pawl 28 in the downward direction into the bottom of the tooth gap. At the same time, the locking detent 27 lying on an approximately diametrically opposite side of the ratchet wheel 26, is also drawn in the downward direction and hence disengaged. The idle stroke of the pawl 28 in this movement member is just sufficient to allow the locking detent 27 to disengage from the teeth of the ratchet wheel 26 so that the ratchet wheel can rotate in the clockwise direction during the following working stroke of the pawl 28 and the rolling gear wheel 17 is turned back on the feed screw 16. The axis 18 of the rolling gear wheel 17 and of the ratchet wheel 26 and with said axis the carriage 5 move to the left in the direction opposite to the arrow *a* during this operation.

The stroke of the pawl 28 is so limited by the adjustable stop 36 that the ratchet wheel 26 turns back by exactly one tooth in the anti-clockwise direction. The dynamic forces of the carriage with the magnet, magnet head, and so on, set in motion, are also taken by this stop.

As long as the magnet 22 is energised, the gear wheels 26 and 17 remain locked, so that the carriage 5 is moved to the right by the spindle 16. The length of time for which the magnet is energised therefore in no way affects the mode of operation of the repetition moved by the carriage return.

When the magnet 22 is de-energised, the armature return spring 37 presses the armature 23 back into the starting position, the locking detent 27 falls back into engagement with the ratchet wheel 26 and the pawl 28, which is pressed against the gear wheel 26 by the spring 32, slides up over the next tooth and also comes to lie in its starting position again. The forward movement of the carriage 5 and hence the reproduction of the text recorded on the record 2 is thus practically uninterrupted. The time for the jump of the magnetic head 3 from one groove to the preceding corresponds to the very short time required by the armature 23 to pass from its position of rest (FIGURE 3) into the position of the attracted state (FIGURE 5). This time should be about 25 milliseconds.

The considerations which have resulted in the particular construction for the control mechanism described above and shown in the drawings will be better understood by reference to FIGURES 6 to 10. The described arrangement for the repetition constitutes a stepping mechanism, on which there must be taken a torque acting from outside and in the same direction as that in which the step-by-step mechanism has to be rotated during the working cycle.

Even under such difficult conditions, no frictional forces or other restrictive forces apart from the force to be overcome of the armature return spring 37, are present during the working stroke. The repetition by a groove is, on the contrary, obtained with very small effort. The idle stroke at the beginning of the operation, in which only the force of the armature return spring has to be overcome, enables the path force characteristic of a rotary armature magnet to be fully utilised. The repetition force reserves are, therefore, so great that the repetition still operates even in the event of up to about 40% under voltage of the mains. The structural solution which has led to this result constitutes a compromise between an ideal movement solution and an ideal force solution, as will be described in greater detail hereinbelow.

The ideal movement solution constitutes the most favourable solution for the engagement of the locking detent 27 after the working stroke. This solution is found when the tangent *t* to the circle *k* with point C being the point of contact passes through the centre point M of the ratchet wheel 26 wherein circle *k* is that circlt on which the tip of the locking detent 27 moves about the axis of rotation 24 of the armature 23 and point C is the bottom point of that tooth space being engaged by the locking detent 27 of the ratchet wheel 26. Then and only then can the locking detent 27 penetrate into the ratchet wheel up to its end position, without frictionally sliding along the tooth (FIGURE 6). The aperture angle of the tooth is 60°.

The ideal force solution is obtained when the torque of the ratchet wheel 26 acting in the clockwise direction is so taken by the right-hand surface of the locking detent 27 when engaged that the normal *n* of this surface intersects the rocking axis 24 of the armature 23 (FIGURE 7). If this normal were to pass beneath the armature axis of rotation 24 at 30° as in the ideal movement solution, then there would be a risk of the locking detent being forced out.

The two requirements of the ideal movement solution and of the ideal force solution can be fulfilled only when the ratchet wheel 26 has rectangular teeth, in which the direction of the tooth surfaces corresponds with the tooth radius (FIGURE 8). Under these circumstances, however, there is a risk that the locking detent 27, which also has to be of rectangular form will rest on the edge and not engage in the ratchet wheel. A tooth of the shape shown in FIGURE 9 has been discarded as uneconomical owing to the production costs being too high. In addition, such tooth shape is unsuitable for the return of the pawl 28, so that separate ratchet wheels would have to be used for the detent 27 and for the pawl 28.

For the compromise solution according to the present invention, a symmetrical tooth shape has been chosen with an aperture angle of 60°, and the detent is so arranged that the normal *n* to the surfaces taking the torque, together with the line *m* connecting these surfaces to the armature axis of rotation 24, forms an angle of 15°, and further that the tangent *c* to the circle *k* at the point C with the radius M likewise forms an angle of 15° (FIGURE 10). The detent 27 is then, during the normal forward running, held in its engaged position by the armature return spring 37 and by friction.

In order to secure the exact co-operation of the detent and the pawl with the ratchet wheel, the point of the pawl 28 is adjustable in the upward or downward direction by means of an eccentric 38. It lies against a tooth the surface of which is approximately vertical to the armature arm 29. In consequence, the maximum possible idle stroke required for the disengagement of the locking detent 27 is obtained. The normal to the lower pawl surface, which during the working stroke lies on the tooth surface, passes above the pawl arm axis of rotation, in order that the pawl 28 may not be drawn out of the ratchet wheel. In order to fulfil this condition, the pawl 28 engages by one tooth higher than would be expedient for the maximum torque of the working stroke. The loss of torque thus caused is, however, insignificant.

In the attracted state, the normal to the upper contact

surface of the pawl 28 and the adjacent tooth surface lies below the maximum bearing point of the pawl and of the stop 36, in order that the torque, likewise acting in the clockwise direction, of the dynamic forces may be dependably taken.

Within the scope of the invention many modifications and other constructions are possible. Thus the operation of the control device for locking and rotating the rolling gear wheel may be effected in another manner instead of magnetically, for example mechanically or hydraulically. Moreover, it is possible if desired to use the rolling gear wheel itself as a ratchet wheel. Moreover, other means may also be provided for advancing the rolling gear wheel. The device according to the invention is, finally, suitable not only for repetition in dictating machines, but may advantageously be used whenever a body has to be moved continuously in one direction and by stages in another.

I claim:

1. In a machine for reproducing recorded dictation comprising a rotatable support for a record, a record-cooperative reproducing device mounted for forward and backward travelling movement across the record, a carriage for carrying such reproducing device, a feed screw driven by a motor and driving said carriage in a forward travelling movement for recording and reproducing, a rolling gear wheel rotatably mounted on said carriage and engaging said feed screw, a ratchet wheel mounted on the axis of said rolling gear wheel, a detent functioning as a blocking tooth and lever means functioning as a backspacing tooth, both said teeth being mounted swingable upon said carriage and residing in grooves of said

ratchet wheel, an electromagnet having an armature for operating said teeth, means for securing said blocking tooth and said backspacing tooth to said armature to cause said blocking tooth to release said ratchet wheel and simultaneously cause said backspacing tooth to move from one face of the groove in which it resides to the opposite face to turn back said ratchet wheel by one circular pitch with the idle travel of said backspacing tooth from one face to the opposite face being exactly sufficient to release said blocking tooth.

2. A device in accordance with claim 1 and further comprising, means for rotating said blocking tooth along a circular path to engage the vertex of a V-shaped groove between adjacent teeth of said rolling gear wheel, the angle formed by the radius of said rolling gear wheel to said vertex and the tangent to said circular path at said vertex being substantially one-fourth the angle of said V-shaped groove.

3. Apparatus in accordance with claim 2 wherein the angle of said V-shaped groove is substantially 60°.

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