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SOUND REPRODUCING APPARATUS FOR ENDLESS BAND SOUND CARRIERS

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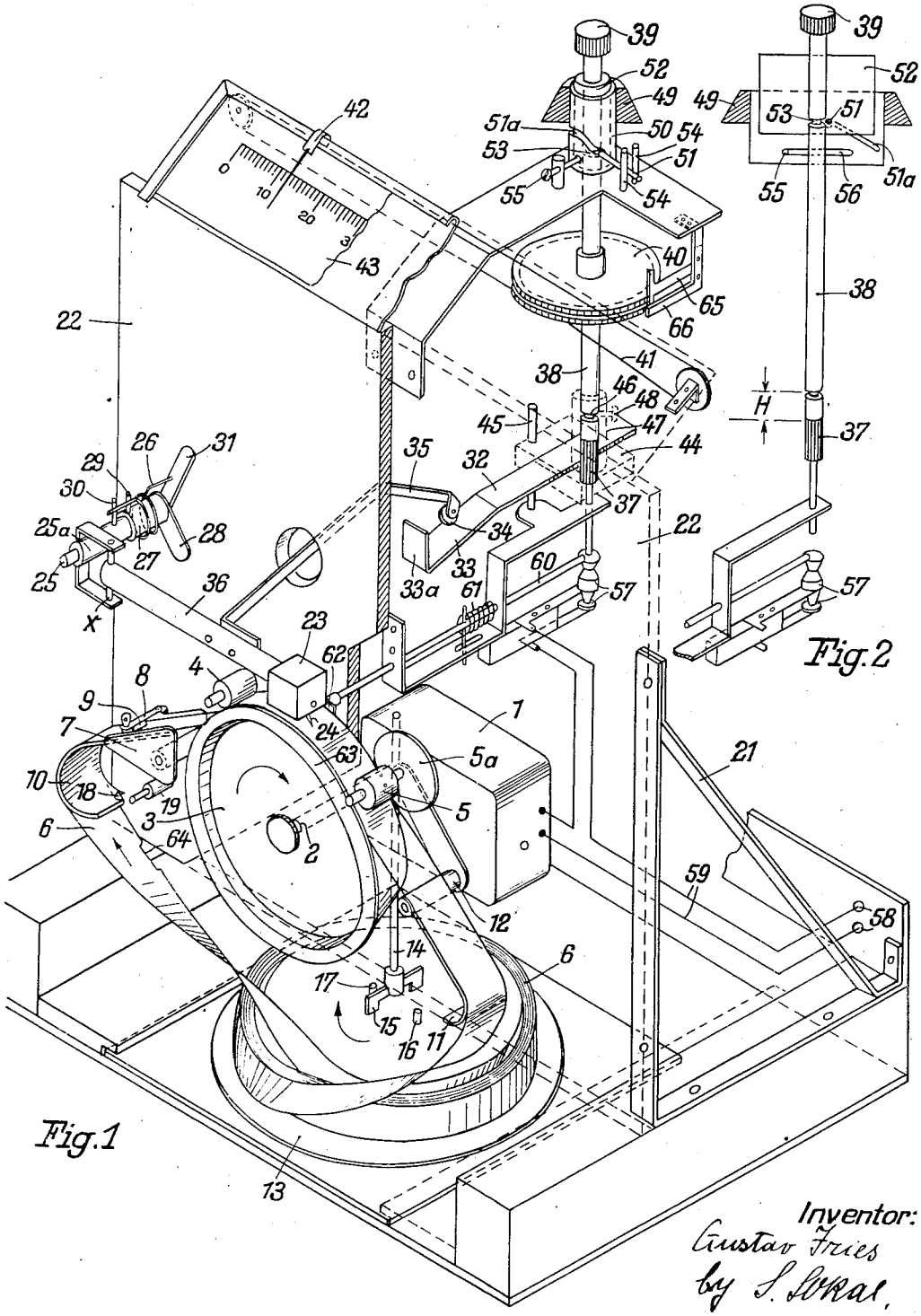


Fig. 2

Fig. 1

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SOUND REPRODUCING APPARATUS FOR ENDLESS BAND SOUND CARRIERS

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This invention relates to a sound reproducing apparatus for endless band sound record carriers of the kind having a plurality of sound recordings running parallel to one another in the longitudinal direction of the carrier. Such apparatus allow of a very long sound reproduction with a single sound carrier so that frequently a plurality of independent sound recordings are present on one and the same sound record carrier.

When it is considered that about one hundred sound lines at a distance from one another of .25 mm. can be produced on film-like sound bands by means of the needle sound method, it is understandable that the guiding of the sound carrier and particularly of the sound pick-up is of great importance. In order, with the above arrangement, to provide as simple as possible an operation of the apparatus, it is necessary to combine devices fulfilling different purposes as far as possible to a technical unit.

This problem is solved to a considerable extent by the present invention.

According to the invention the sound pick-up which, in such apparatus, can be adjusted, not by hand, but mechanically, to any desired sound track, is carried after the manner of a Cardan joint and is limited in its direction of movement on one side by a stop coupled to a sound-line-indicating device and adjustable by hand.

In order that the invention may be fully understood, I shall now describe one embodiment thereof by way of example by reference to the accompanying diagrammatic drawing in which:

Fig. 1 shows a reproducing device embodying the invention in perspective view, and

Fig. 2 shows the construction of the control shaft.

For driving the sound carrier an electric motor 1 is employed on the horizontal shaft 2 of which is arranged a drum 3. The endless film-like sound carrier 6 which is rolled into a coil is pressed, by pressure rollers 4 and 5, resiliently against the drum 3 which drum is covered with rubber. The sound carrier 6 is moved by friction. An oscillating mass 5a is coupled with the pressure roller 5. At the entrance side of the drum 3 is arranged a guide path 7 which the sound carrier traverses lightly tensioned by means of a spring 8 carrying a braking felt 9. Guide strips 10 and 11 are connected to the pressure rollers 4 and 5 which strips guide the sound carrier out of the coil and back into the coil respectively, the latter being arranged on a plate or disc 13. The pressure roller 5 and the guide strip 11 are rotatable around the spindle 12 such that, on movement of the pressure roller away from the sound carrier, the guide strip 11 is simultaneously displaced away from the carrier. Studs 18 are provided on the strips 10 and 11 which, on the disengagement of the rollers 4 and 5, hook behind stationary pins 19.

The disc or plate 13 is driven by the motor 1 through the vertical shaft 14 by means of the member 15 and the pins 16 and 17 provided on the side plate 13. The sound carrier coil is wound in this manner so that the drum 3 shall not have to draw it out of the coil, for which purpose a relatively large expenditure of force is necessary. The motor 1 is thus considerably relieved of load by means of this device so that a weak running or driving mechanism is entirely sufficient for the uniform drive of a very long sound carrier of, for example, 100 m. length.

Owing to the free coupling between the motor 1 and the plate 13, the latter can be drawn out from the apparatus together with the sound carrier coil, and the sound carrier, with the pressure rollers 4 and 5 disengaged, can be withdrawn from the drum 3 and be replaced by a new one.

All the parts of the apparatus are secured to a vertical wall 22 held by an angle bracket 21.

The sound reproduction of the sound carrier is effected by means of an electric sound box 23 and needle 24 which, on account of the long period for which it has to be employed, preferably consists of a ground sapphire. The sound box 23 is carried by an arm 36 which is universally mounted, that is to say, after the manner of a Cardan joint, on a pin 25 secured to the wall 22. For the purpose of relieving the sound box 23 of load, a spiral spring 26 is employed which is coiled around a sleeve 27 which is rotatably arranged on the horizontal rotary shaft 25a of the Cardan joint. A pin 29 is arranged on the sleeve 27, against which pin bears one end of the said spring and which can be adjusted by the lever 28 disposed on the sleeve 27. The other end of the spring is secured to a lever 31 by which the tension of the spring 26 can be varied. A pin 30 is arranged on the shaft 25a which pin engages or bears against the one end of the spring and thus relieves the sound box 23 of load. If, on the other hand, the sound box 23 is raised, the spring 26 cannot follow the pin 30 as it is held fast by the pin 29. Consequently, in its raised position, the sound box 23 is no longer relieved of load by

the spring so that the weight of the sound box 23 can come completely into action. This is of particular importance in connection with the mechanism to be described hereafter.

To the tone arm 36 is connected on angular rod 35 which carries a roller 34 at its free end. Under this roller is disposed an inclined plane 33 to the lower end of which is connected a stop 33a, and to the upper end of which is connected a horizontal rack 32. The rock 32 is in engagement with a pinion 37 which is provided on a vertical control shaft 38 provided at the upper end with a knob 39. A notched wheel 40 is, moreover, arranged on the control shaft 38 around the middle turn of which runs a draw cord 41 which carries a pointer 42 movable over a scale 43. The scale 43 is divided corresponding to the number of sound lines provided on the sound carrier, so that the position of the pointer 42 over the scale 43 indicates over which sound line the sound box has been adjusted.

The rack 32 is guided in a support 44 shown in dotted lines in Figure 1, which support is mounted rotatably by means of a sleeve 47 on the control shaft 38, its rotation, however, being prevented by a pin 45. An axial displacement between the sleeve 47 and the control rod 38 is prevented by a pin 48 arranged in the sleeve 47 and engaging a groove formed in the shaft 38.

The control shaft 38 can, besides its rotary movement, also carry out a rising movement H (Fig. 2). The support 44 of the rack 32 is thus moved also. For effecting the rising movement, two rotatable sleeves 50 and 52, which are inserted into one another, are provided at the upper end of the control shaft, the outer sleeve carrying a knob 49. The outer sleeve 50 is also formed with an inclined guideway or slot in which engages a pin 51 secured to the inner sleeve 52. The pin 51 extends through the inner sleeve 52 and into a groove 53 formed on the control shaft 38. By guiding the pin 51 between two bolts 54 secured to the apparatus frame, the said pin can only be moved in a vertical plane. A pin 55, secured to the framework of the apparatus which engages in a horizontal groove 56 formed in the outer sleeve 50, prevents this sleeve from moving axially. On rotating by means of the knob 49, to the left, the said shaft 38 is raised vertically. The inclined plane 33 is thereby also moved upwardly and takes with it the hitherto freely suspended roller 34 and thus lifts the sound box 23 from the sound carrier. At the same time, the roller 34 rolls downwardly on the inclined plane 33 until it is stopped by the stop 33a whereby the sound box is adjusted over the sound line, in the present example the twelfth,—as shown by the pointer 42 on the scale 43—corresponding to the position of the stop 33a.

The control shaft 38 presses, in its lowest position, against a spring contact 57 which is included in the circuit of the driving motor. The operating current flows from the network 58 over the conduits 59 and the contact 57 to the motor. In the raised position of the control shaft 38, in which the sound box is also raised from the sound carrier, the spring contact 57 is free (as shown in Fig. 2). It can, however, still not be opened as it is held in its closed position by a rod 60 displaceable in the horizontal direction. This rod 60 is pressed by a spring 61 by means of a pressure member 62 lightly against one side edge of the sound carrier, whereby the latter is pressed uniformly against the rim 63 provided at one side of the drum 3. Only when the said member 62 falls into a recess 64 formed on the edge of the sound carrier, is the contact 57 finally freed with the control shaft 38 in the raised position so that the driving motor will not receive any more current and the sound carrier thus is stopped. This arrangement has the following importance:

If a plurality of independent sound recordings are present on a sound carrier, these will begin, and care can easily be taken that this is the case on recording, always at the position of the recess 64. When the sound carrier is inserted in the apparatus, the sound box 23 is raised and the roller 34 runs down the inclined guide path 33 as far as the stop 33a. The contact 57 remains open until the sound carrier is inserted and the control shaft 38 presses it down. Then the control rod 60 springs resiliently over the contact 57. After a particular sound reproduction has been run off, the control shaft 38 is again rotated upwardly, the contact 57 being, however, maintained in its closed position by the rod 60. The sound carrier continues to run until the recess 64 comes into contact with the member 62. The latter falls temporarily into this recess 64, the contact 57 is broken and the circuit to the driving motor is interrupted. This position of the sound carrier thus represents the beginning position for the next sound reproduction. If it is not desired to use the next, but some other part of the sound track, the pointer 42 is moved to the required division on the scale by rotating the control shaft 38 by the knob 39. In this way, the stop 33a is moved simultaneously to the correct position. Then, by rotating the knob 49 to the right, the sound box is again set on the sound carrier. As the contact 57 is thus simultaneously closed, the motor starts to run and the reproducing operation begins again.

In order to prevent the needle from being moved transversely over the sound carrier by hand during reproduction, a fixed pawl 66 is arranged at a height corresponding to that of the operating position in front of the notch engaging spring 65 which engages the wheel 40 whereby the control shaft 38 is locked against rotation in the operating position.

As the sound box 23 carries out a circular movement about its vertical axis and the movement of the stop 33a is a linear one, the latter cannot be made flat but must be shaped according to a special curve, the form of which can be worked out either empirically or mathematically. For the purpose of obtaining a simple curve, it is advantageous to arrange the point of rotation of the tone arm in a vertical plane passing through the longitudinal axis of the sound carrier.

I claim:

1. In a sound reproducing apparatus of the kind referred to, the subcombination of: a frame; a universally movable sound pick-up device carried by said frame; an adjustable stop device associated with said pick-up device for limiting movement of said pick-up device in one direction; a rotatable and axially displaceable control shaft operatively connected to said stop device and a sound-line indicating device operatively connected to said shaft; means for axially displacing said shaft; means operable on displacement of said shaft to move said stop device vertically and thereby also raise and lower said pick-up device; means for rotating said

shaft, and means operable on rotation of said shaft to move said stop device horizontally, whereby said pick-up device is adjusted horizontally for the purpose specified.

2. In a sound reproducing apparatus of the kind referred to, the subcombination of: a frame; a universally mounted sound-pick-up device carried by said frame; a vertically movable support mounted in said frame; a horizontally movable rack carried in said support; an inclined surface, connected to said rack, said surface having a stop thereon; an arm, carrying a roller, connected to said pick-up device, said roller sliding on said surface and being adapted to engage said stop; means for vertically moving said support to raise said pick-up; means for horizontally moving said rack and consequently said stop to cause said pick-up to be displaced horizontally; a sound-line indicating device associated with said rack moving means, and means operable on actuation of said rack-moving means to indicate the position to which said sound pick-up device has been adjusted.

3. In a sound reproducing apparatus of the kind referred to, the subcombination of: a frame; a universally mounted sound pick-up device on said frame; an adjustable stop device associated with said pick-up device; a rotatable and axially movable control shaft operatively connected to said stop device; a sound-line indicating device operatively connected to said control shaft; means for displacing said shaft axially, said means comprising an inner sleeve on said shaft, an outer sleeve surrounding said inner sleeve and a pin on said inner sleeve engaging a slot in said outer sleeve, manual rotation of said outer sleeve thereby causing axial movement of said inner sleeve and said shaft, the arrangement being such that axial movement of said shaft causes vertical movement of said stop device and said pick-up device and rotation of said shaft causes horizontal displacement of said stop device and said pick-up device for the purpose specified.

4. In a sound reproducing apparatus of the kind referred to, the subcombination of: a frame; an endless sound record carrier mounted in said frame; a universally movable tone-arm carrying a sound pick-up device mounted in said frame; an adjustable stop device associated with said tone-arm for limiting movement of said pick-up device in one direction; an electric motor for driving the endless sound record carrier; a contact included in the circuit of said motor; a rotatable and axially raisable control shaft operatively connected to said stop device, said shaft in the normal position thereof engaging and closing said contact; means for vertically displacing said control shaft; means operable on displacement of said shaft to move said stop device vertically and move said pick-up device into and out of operative position with respect to said record carrier; means for rotating said shaft; means operable on rotation of said shaft to move said stop device horizontally to cause said pick-up device to be adjusted to another operating position; locking means for maintaining said contact closed after said control shaft has been vertically displaced upwardly until the record carrier reaches a predetermined position; and a sound line indicating device operatively connected to said shaft for the purpose specified.

5. In a sound reproducing apparatus of the kind referred to, the combination of: a frame; a universally movable sound pick-up device mounted in said frame; an adjustable stop device associated with said sound pick-up for adjusting said device as required; a rotatable and axially displaceable control shaft carried by said frame for actuating said stop device; means for axially moving said shaft; an electric driving motor for moving the sound record carrier; a spring contact included in the circuit of said motor, said contact being engaged and closed by said shaft in the normal position thereof and disengaged therefrom when said shaft is displaced axially to disengage said pick-up device and a spring actuated rod adapted normally to maintain said contact closed and releasable therefrom in a predetermined position of the sound record carrier to allow said contact to open if said shaft is disengaged therefrom.

6. In a sound reproducing apparatus of the kind referred to, the sub-combination of: a frame; a universally mounted tone-arm, carrying a sound pick-up device in said frame; a horizontally and vertically adjustable inclined surface having a stop member thereon carried by said apparatus; an arm carrying a roller mounted on said tone-arm, said roller being associated with said inclined surface; means for moving said inclined surface vertically so as to raise and lower said sound pick-up; and means for moving said inclined surface horizontally so as to adjust said pick-up horizontally; and a sound-line indicating device coupled to said inclined surface for determining the position of adjustment of said sound pick-up.

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