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(54) RECORD-CHANGER

(71) We, PHILIPS ELECTRONIC AND ASSOCIATED INDUSTRIES LIMITED of Abacus House, 33 Gutter Lane, London, EC2V 8AH a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to a record-changer of the kind which operates without a record-stabilising arm and which is also capable of playing single records, comprising a changer spindle which is constructed to be removably mounted in the centre of the turntable of the record changer so as to be replaceable by a spindle for playing single records and which is constructed to support a stack of records and, at each actuation of the spindle, to release the lowermost record from the stack and drop it onto the turntable, and first and second axially movable sleeves arranged beneath and coaxially with the turntable for cooperation with the changer spindle to control the actuation thereof, the first and second sleeves being movable upwardly by a cam disc through first and second levers respectively to actuate the record releasing and dropping mechanism of the changer spindle.

On a record changer a number of records are played consecutively after starting the first playing cycle. After the last record has been played the pick-up arm is returned to its rest position and the apparatus switches off automatically.

Such a record-changer can be converted into a single-record player by replacing the changer spindle. When used as a single-record player the apparatus is manually started. After the record has been played the pick-up arm again returns to its rest position and the apparatus switches off automatically.

If the record-changer has a record-stabilising arm, adaptation of the changer to operation as a single-record player can be effected comparatively easily. However, if the record-changer is of the kind which operates without a record-stabilising arm, it is difficult to achieve with simple means an adaptation from operation as a record-changer to operation as a single-record player.

According to the invention there is provided a record-changer of the kind which operates without a record-stabilising arm and which is also capable of playing single records, comprising a changer spindle which is constructed to be removably mounted in the centre of the turntable of the record changer so as to be replaceable by a spindle for playing single records and which is constructed to support a stack of records and at each actuation of the spindle to release the lowermost record from the stack and drop it onto the turntable, first and second axially movable sleeves arranged beneath and coaxially with the turntable for cooperation with the changer spindle to control the actuation thereof, the first and second sleeves being movable upwardly by a cam disc through first and second levers respectively to actuate the record releasing and dropping mechanism of the changer spindle, a slide which in a blocking position prevents movement of the pick-up arm to the playing position and which is movable from said blocking position to free the pick-up arm for movement to the playing position, and means responsive to upward movement of the first sleeve for moving the slide from the blocking position during a record-changing cycle to free the pick-up arm, the changer spindle being constructed to restrict the upward travel of the first sleeve when the last record of the stack has been dropped and played so that the slide is not moved by such travel of the first sleeve suffi-

ciently to free the pick-up arm, and the second sleeve being capable of increased upward travel in the absence of the changer spindle to allow the second lever to move
5 to a position in which it inhibits the response of the slide-moving means to upward travel of the first sleeve so that the slide is not moved by such travel to free the pick-up arm.

10 If the slide cannot be moved to free the pick-up arm, the latter, after being returned to the next position, cannot pivot back to the playing position. Thus, it is ensured that both after the last record has been
15 played in the case of operation as a record-changer and when a single record has been played in the case of operation as a single-record player, the apparatus is switched off as soon as the pick-up arm has reached the
20 rest position.

A manually operable starting element may be provided for moving the slide from the blocking position to free the pick-up arm when the second lever is in the position in
25 which it inhibits the response of the slide-moving means to upward travel of the first sleeve. The slide-moving means may comprise a tilting lever which is urged by spring means to follow the upward movement of
30 the first sleeve.

In one embodiment of the invention an edge of the slide slides on a fixed member during the movement of the slide, and when the slide has moved through a given distance from the blocking position relative to said
35 fixed member, a recess in said edge of the slide engages with the fixed member to permit lateral movement of the slide to release a blocking member of the pick-up arm control mechanism to free the pick-up arm
40 for movement to the playing position. A further lever may be provided which is rotatable by means of the manually operable starting element about an axis parallel to the axis of the turntable and which is
45 displaceable up and down this axis by the movements of the second lever, the arrangement being such that when the second lever is in the position in which it inhibits the
50 response of the slide-moving means to upward travel of the first sleeve, the further lever is at a level at which, upon rotation by means of the manually operable starting element, this lever engages a projection on
55 the slide and moves the slide from the blocking position to free the pick-up arm, and when the changer spindle is fitted, in all positions of the second lever the further lever is at levels such that in the event of
60 inadvertent rotation of the further lever, this lever does not engage said projection on the slide.

An embodiment of the invention will now be described with reference to the accom-
65 panying diagrammatic drawings, in which

Figs. 1 and 2 are a side view and a plan view, respectively, of the relevant parts of a record-changer according to an embodiment of the invention with the changer spindle fitted, showing the positions occu-
70 pied by these parts at the end of an actuation of the changer spindle,

Fig. 3 is a sectional view taken on the line III-III in Fig. 2 but with the first lever
75 omitted in the interests of simplicity,

Figs. 4 and 5 are views similar to Figs. 1 and 2 showing the positions occupied by the relevant parts prior to an actuation of the changer spindle,

Fig. 6 is a view similar to Fig. 3 taken
80 on the line VI-VI in Fig. 5,

Figs. 7 and 8 are views similar to Figs. 1 and 2 and Figs. 4 and 5 showing the positions occupied by the relevant parts when the changer spindle has been removed and
85 replaced by a plain spindle for playing a single record, and

Fig. 9 is a view similar to Figs. 3 and 6 taken on the line IX-IX in Fig. 8.

In Fig. 1 a vertical changer spindle, which
90 operates without a record-stabilising arm, is designated 1. The lower end of the changer spindle 1 is secured in a sleeve 2 at the centre of the turntable (not shown) by means of a bayonet joint so that the
95 spindle cannot of its own accord rotate or move axially in the sleeve 2. The changer spindle has two functions: one function is to release the lowermost record from the stack of records (not shown) supported on
100 the spindle, and the other function is to drop the released record onto the turntable by gravity. These two functions of the changer spindle are controlled from underneath the turntable through two axially
105 movable coaxial sleeves 5 and 3, respectively, which are provided with end flanges 9 and 7 respectively. The sleeve 5 is movable in the sleeve 3 and projects from the lower end thereof. Below the end flange 9
110 of the sleeve 5 projects a pin 11.

The two sleeves 5 and 3 are pushed up-
wards to actuate the record releasing and dropping mechanism, respectively, of the
changer spindle, in accordance with a
115 specific program which is determined by a cam disc 13. This cam disc, which is of a kind generally used in record changers, serves principally for controlling the pick-up
arm movements. However, in addition the
120 cam disc has other functions, which include the control of the lifting of the sleeves 3 and 5. The control actions of the cam disc 13 are transmitted to the sleeves 5 and 3 by
125 levers 15 and 17, respectively, which at their right-hand end (as viewed in the drawings) are each provided with a roller 19 (only the roller of lever 17 is shown in Fig. 1). The levers can pivot about a horizontal spindle
130 21 at their mid-points and bear upwardly

against the end flanges 9 and 7 of the sleeves 5 and 3 with their left-hand ends 23 and 25 respectively. The levers 15 and 17 are loaded by compression springs 27 and 29, the spring 27 acting on the lever 17 between the spindle 21 and the left-hand end 25 of the lever, and the spring 29 acting on the lever 15 between the spindle 21 and the roller 19 on the right-hand end of the lever.

10 The levers 15 and 17 are controlled by the cam disc 13 through cams 31' and 31, respectively, on the disc, which cams are so constructed that, in the actuation of the changer spindle, first the lever 15 lifts the sleeve 5 and then very shortly after the lever 17 lifts the sleeve 3.

An arm 33 of a tilting lever 35 bears upwardly against the pin 11 on the lower end of the sleeve 5. This tilting lever 35 is pivotable about a horizontal spindle 37 and has two arms 39 and 39' which extend upwardly on opposite sides of the lever 15, which has a U-shaped cross-section, as also has the lever 17. The arms 39' and 39 are formed with laterally projecting pins 41 and 43, respectively, as shown in Figs. 2, 5 and 8. A tension spring 45 continuously urges the tilting lever 35 towards the pin 11.

During a record-changing cycle the levers 15 and 17 push the sleeves 5 and 3 upwards from the positions shown in Fig. 4 to the positions shown in Fig. 1. The tilting lever 35 follows the movement of the sleeve 5. The pin 43 on the lever 35 engages an abutment 47 on a slide 49 and moves this slide to the right from the position shown in Fig. 5 to the position shown in Fig. 2 against the action of a tension spring 51, which is weaker than the spring 45. During the movement of the slide 49 an edge 52 of the slide 49 slides on a fixed pin 53. The travel of the slide 49, which is determined by the movement of the pin 43, is such that during actuation of the changer spindle the pin 53 is engaged by a recess 55 in the edge 52 of the slide 49, as shown in Fig. 2. This allows the slide 49 to move laterally towards the pin 53 and thereby release a blocking member 57 of the pick-up arm control mechanism so that the pick-up arm can pivot over the newly lowered record.

As is shown in Fig. 2, the lever 17 is provided with two laterally projecting lugs 59 and 61. During the record-changing cycle, as is shown in Figs. 1 and 4 the stroke of the lever 15, and hence of the tilting lever 35, is such that the pin 41 on the lever 35 moves over the lug 59 of the lever 17. A lever 63 which is rotatable about a vertical spindle 70 bears continuously on the lug 61 of the lever 17, as shown in Figs. 3, 6 and 9, under the influence of a spring 66 which bears against the head 67 of the spindle 70 and which presses the lever 63 continuously downwards against the lug 61. The height

of the lever 63 is thus determined by the lever 17. As will be described later herein, for single-record playing the lever 63 is rotatable in a clockwise direction from the position shown in Fig. 5 by means of a manual starting element 68. As can be seen from Figs. 3 and 6, the position of the lever 17 at all times during the record-changing cycle is such that the lever 63, if unintentionally rotated by means of the manual starting element 68, can pass freely over a pin 65 which projects upwardly from the slide 49 for cooperation with the lever 63 in single-record playing.

As soon as the slide 49 has released the pick-up arm control mechanism, the slide can return to its initial position. For this it is necessary to disengage the recess 55 in the slide from the pin 53. This is effected by means of a peripheral cam 69 on the cam disc 13. This cam displaces the slide laterally so that the recess 55 is disengaged from the pin 53. The spring 51 then pulls the slide 49 back into its initial position. The lever 35 has by this time been tilted back to its original position (Fig. 4) by the sleeve 5, which follows the downward movement of the left-hand end 23 of the lever 15 when the cam 31' leaves the roller 199 on the right-hand end of the lever 15.

When the cam disc 13 is rotated after the last record on the changer spindle 1 has been dropped and played, the parts of the record changer then occupying the positions shown in Figs. 4, 5 and 6, the changer spindle limits the sleeve 5 to a reduced upward travel such that in the next rotation of the cam disc 13 the lever 15 can pivot through only part of its normal stroke. The tilting lever 35, which follows the sleeve 5, is correspondingly limited in its tilting movement with the result that the slide 49 is not moved by the pin 43 sufficiently far to the right for the recess 55 in the slide to engage the pin 53. Consequently, the slide 49 does not release the blocking member 57 and the pick-up arm cannot move into the playing position. The arm is then positioned on its rest in the conventional manner.

In Figs. 7, 8 and 9, the changer spindle 1 has been removed and replaced by a plain spindle 22 for playing a single record. This replacement permits increased upward travel of the sleeve 3 so that the left-hand end 25 of the lever 17 can be lifted higher by the spring 37 to bring the lug 59 of the lever 17 into the path of movement of the pin 41 on the tilting lever 35. The lever 35 is then unable to move the slide 49 to the right to release the blocking member 57. This movement of the slide is now performed manually by means of the starting element 68 through the lever 63. As can be seen from Fig. 7, the increased upward movement of the left-hand portion of the lever 17 has resulted in

a greater downward movement of the right-hand portion, and with it the lug 61, which has in turn allowed the lever 63 to be depressed by the spring 66 below the level of the upper end of the pin 65 on the slide 49, as shown in Fig. 9. Consequently, when the lever 63 is rotated in the clockwise direction (as viewed in Fig. 8) by means of the manual starting element 68 through an abutment pin 71 on the lever 63, the latter will engage the pin 65 and through it displace the slide 49 to the right to bring the recess 55 in the slide into engagement with the pin 53 so that the blocking member 57 is released to free the pick-up arm for movement into the playing position. After the starting element 68 and the lever 63 have been returned to their initial positions, the slide 49 is subsequently displaced by the cam 69 on the cam disc 13 to disengage the recess 55 in the slide from the pin 53 so that the slide can be returned to its initial position by the spring 51.

When the single record has been played cam disc 13 starts to rotate again. The lever 15 is retained in its lower position (Fig. 4) by the spring 29 until the cam 31' presses the lever 15 downwards at its right-hand end and thereby lifts its left-hand end 23. The tilting lever 35 can follow only the initial part of this movement due to the presence of the lug 59 of the lever 17 in the path of movement of the pin 41 of the lever 35. Consequently, the slide can no longer be moved to the right to release the blocking member 57. The pick-up arm movement consequently remains blocked and the pick-up arm remains on its rest. The apparatus is switched off.

WHAT WE CLAIM IS:

1. A record-changer of the kind which operates without a record-stabilising arm and which is also capable of playing single records, comprising a changer spindle which is constructed to be removably mounted in the centre of the turntable of the record changer so as to be replaceable by a spindle for playing single records and which is constructed to support a stack of records and, at each actuation of the spindle, to release the lowermost record from the stack and drop it onto the turntable, first and second axially movable sleeves arranged beneath and coaxially with the turntable for cooperation with the changer spindle to control the actuation thereof, the first and second sleeves being movable upwardly by a cam disc through first and second levers respectively to actuate the record releasing and dropping mechanism of the changer spindle, a slide which in a blocking position prevents movement of the pick-up arm to the playing position and which is movable from said block-

ing position to free the pick-up arm for movement to the playing position and means responsive to upward movement of the first sleeve for moving the slide from the blocking position during a record-changing cycle to free the pick-up arm, the changer spindle being constructed to restrict the upward travel of the first sleeve when the last record of the stack has been dropped and played so that the slide is not moved by such travel of the first sleeve sufficiently to free the pick-up arm, and the second sleeve being capable of increased upward travel in the absence of the changer spindle to allow the second lever to move to a position in which it inhibits the response of the slide-moving means to upward travel of the first sleeve so that the slide is not moved by such travel to free the pick-up arm.

2. A record-changer is claimed in Claim 1, wherein a manually operable starting element is provided for moving the slide from the blocking position to free the pick-up arm when the second lever is in the position in which it inhibits the response of the slide-moving means to upward travel of the first sleeve.

3. A record-changer as claimed in Claim 1 or 2, wherein the slide-moving means comprise a tilting lever which is urged by spring means to follow the upward movement of the first sleeve.

4. A record-changer as claimed in Claim 1, 2 or 3, wherein an edge of the slide slides on a fixed member during the movement of the slide, and when the slide has moved through a given distance from the blocking position relative to said fixed member, a recess in said edge of the slide engages with the fixed member to permit lateral movement of the slide to release a blocking member of the pick-up arm control mechanism to free the pick-up arm for movement to the playing position.

5. A record-changer as claimed in Claim 2, or Claim 3 or 4 when read as appendant to Claim 2, wherein a further lever is provided which is rotatable by means of the manually operable starting element about an axis parallel to the axis of the turntable and which is displaceable up and down this axis by the movements of the second lever, the arrangement being such that when the second lever is in the position in which it inhibits the response of the slide-moving means to upward travel of the first sleeve, the further lever is at a level at which, upon rotation by means of the manually operable starting element, this lever engages a projection on the slide and moves the slide from the blocking position to free the pick-up arm, and when the changer spindle is fitted, in all positions of the second lever the further lever is at levels such that in the event of inadvertent rotation of the further

lever, this lever does not engage said projection on the slide.

6. A record-changer substantially as herein described with reference to the 5 accompanying drawings.

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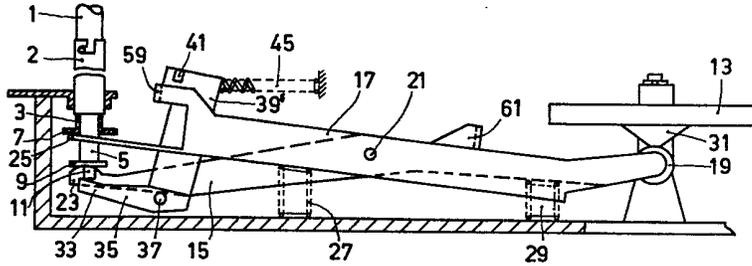


Fig. 1

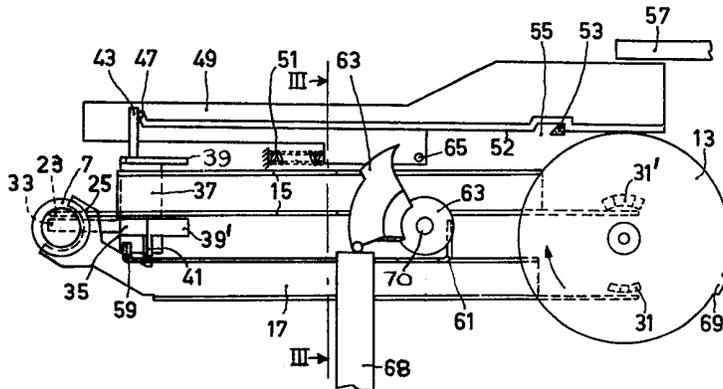
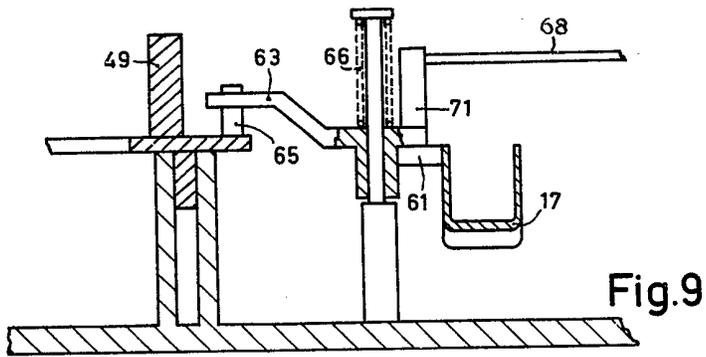
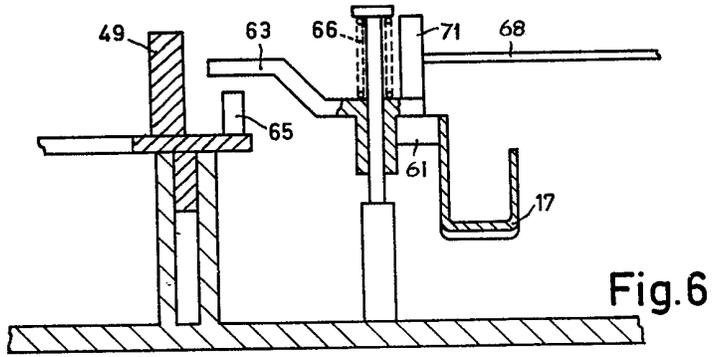
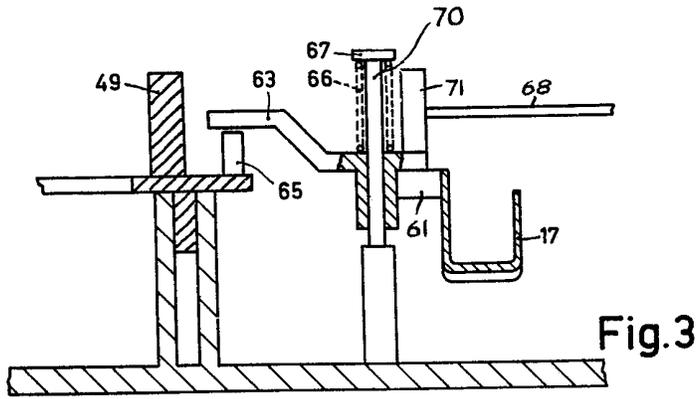


Fig. 2



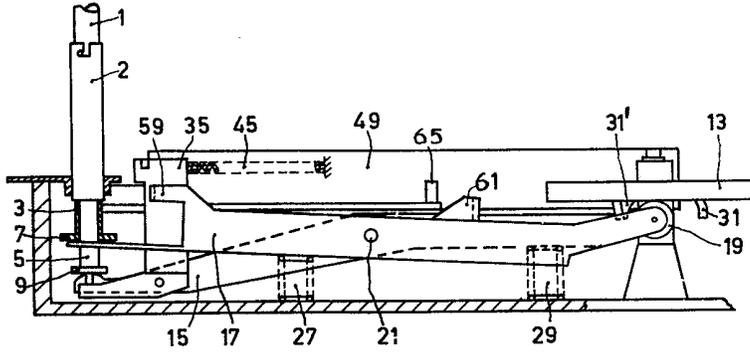


Fig. 4

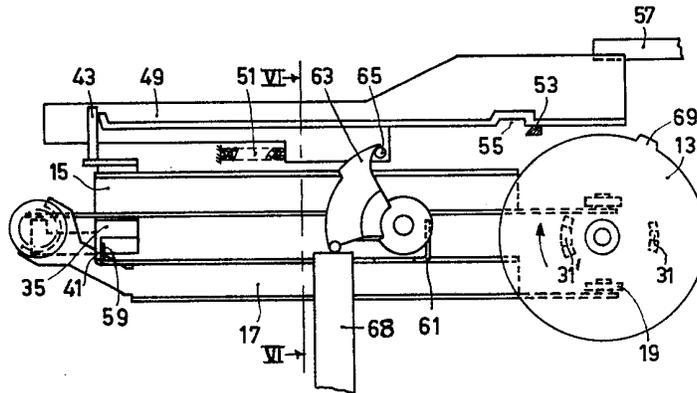


Fig. 5

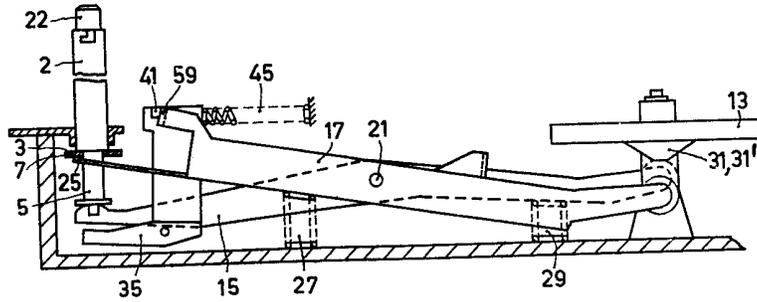


Fig. 7

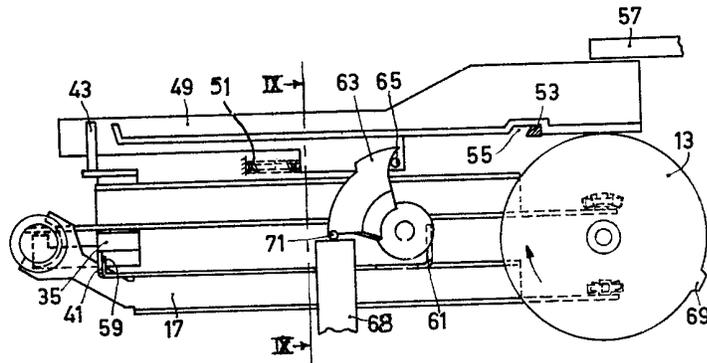


Fig. 8