Dec. 2, 1952 P. A. DE BOER 2,620,194

ARRANGEMENT FOR AUTOMATICALLY CHANGING PHONOGRAPH RECORDS

Filed Jan. 30, 1947 6 Sheets-Sheet 1

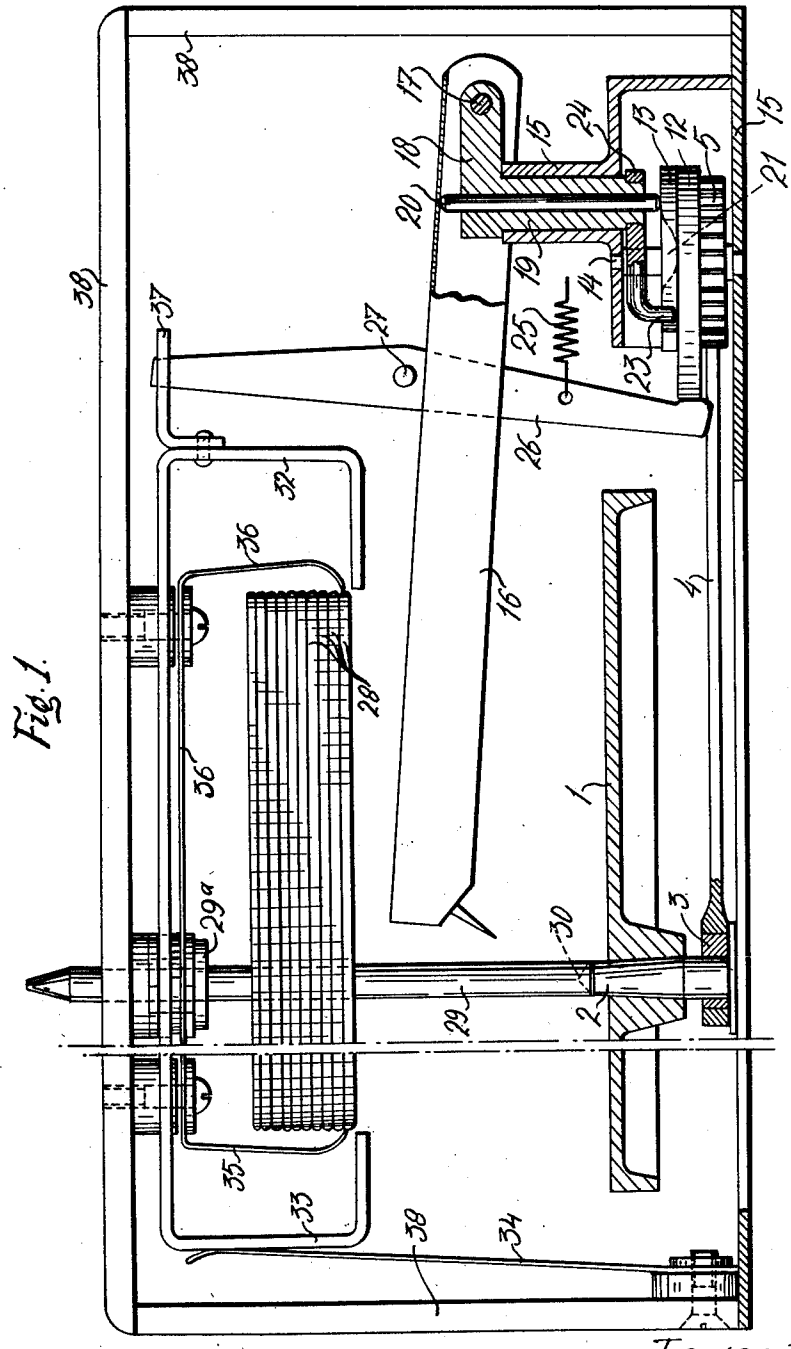


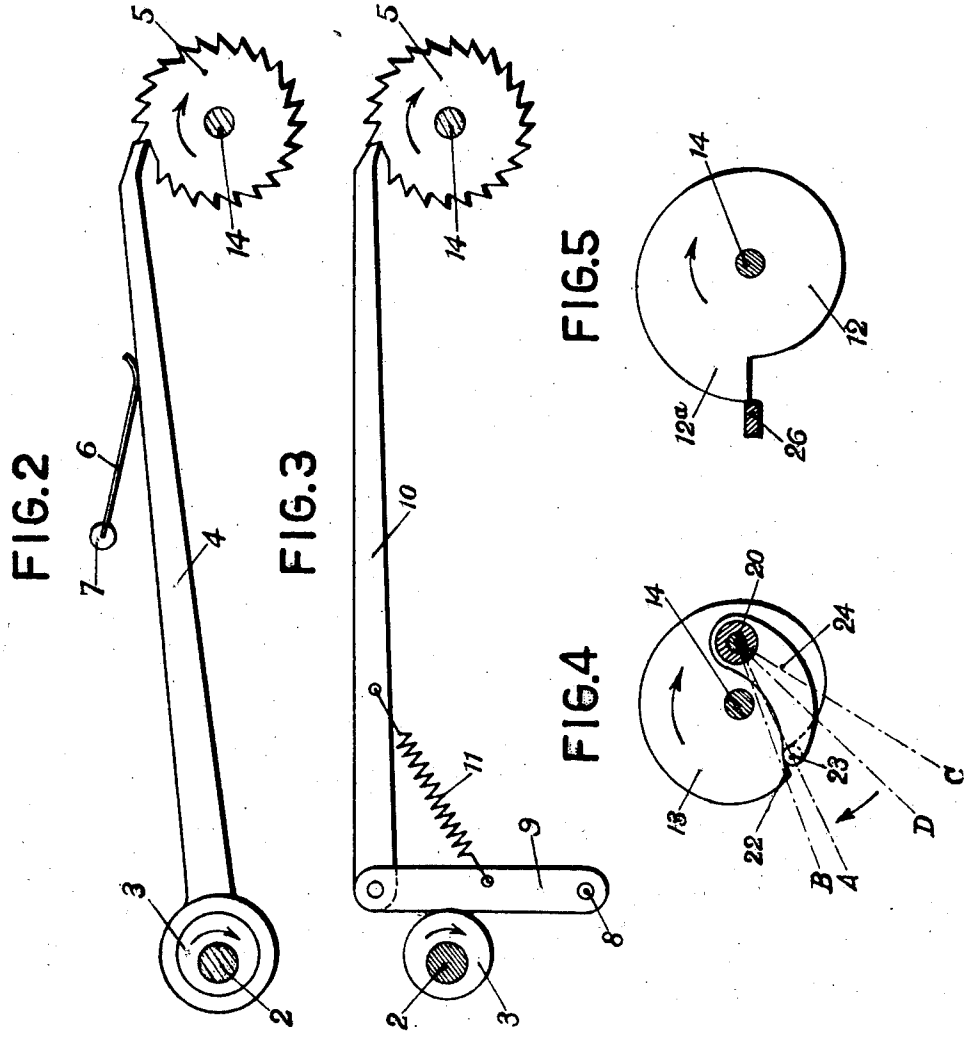
Fig. 1.

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ARRANGEMENT FOR AUTOMATICALLY CHANGING PHONOGRAPH RECORDS

Filed Jan. 30, 1947 6 Sheets-Sheet 2



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ARRANGEMENT FOR AUTOMATICALLY CHANGING PHONOGRAPH RECORDS

Filed Jan. 30, 1947 6 Sheets-Sheet 3

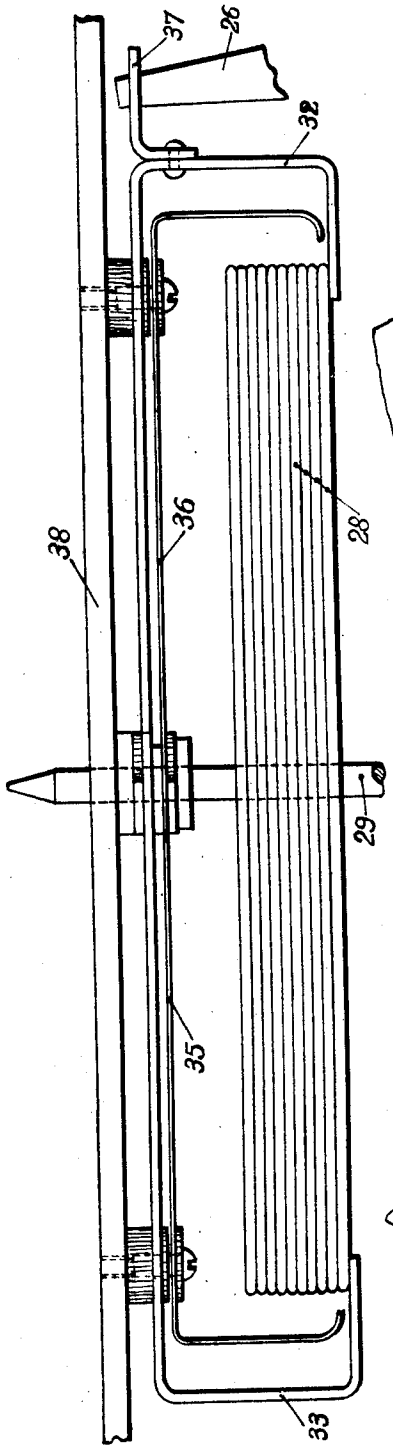


FIG. 6

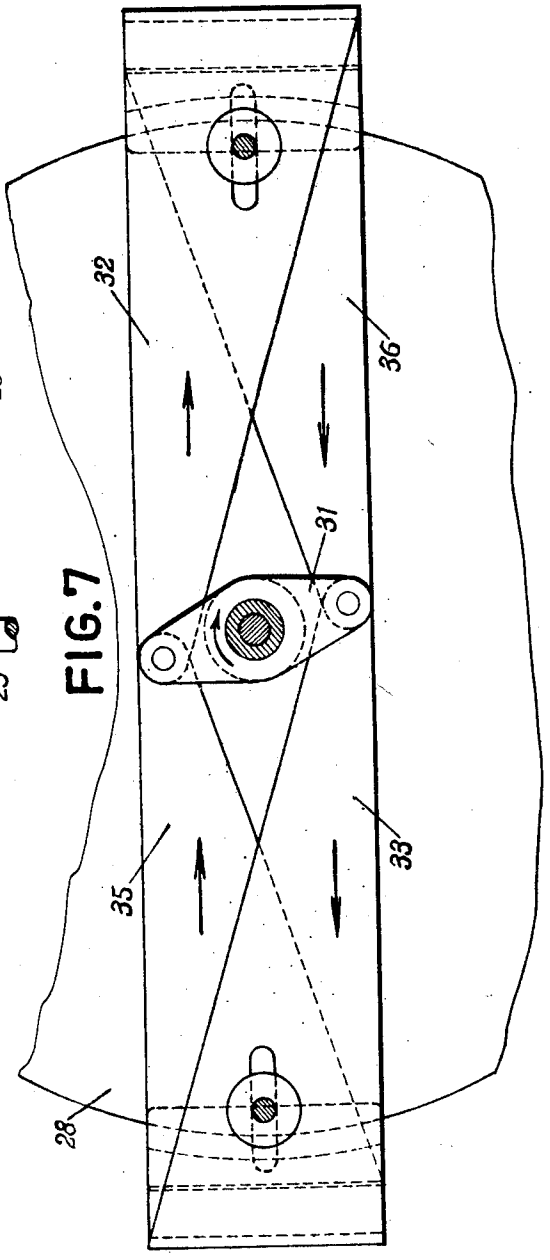


FIG. 7

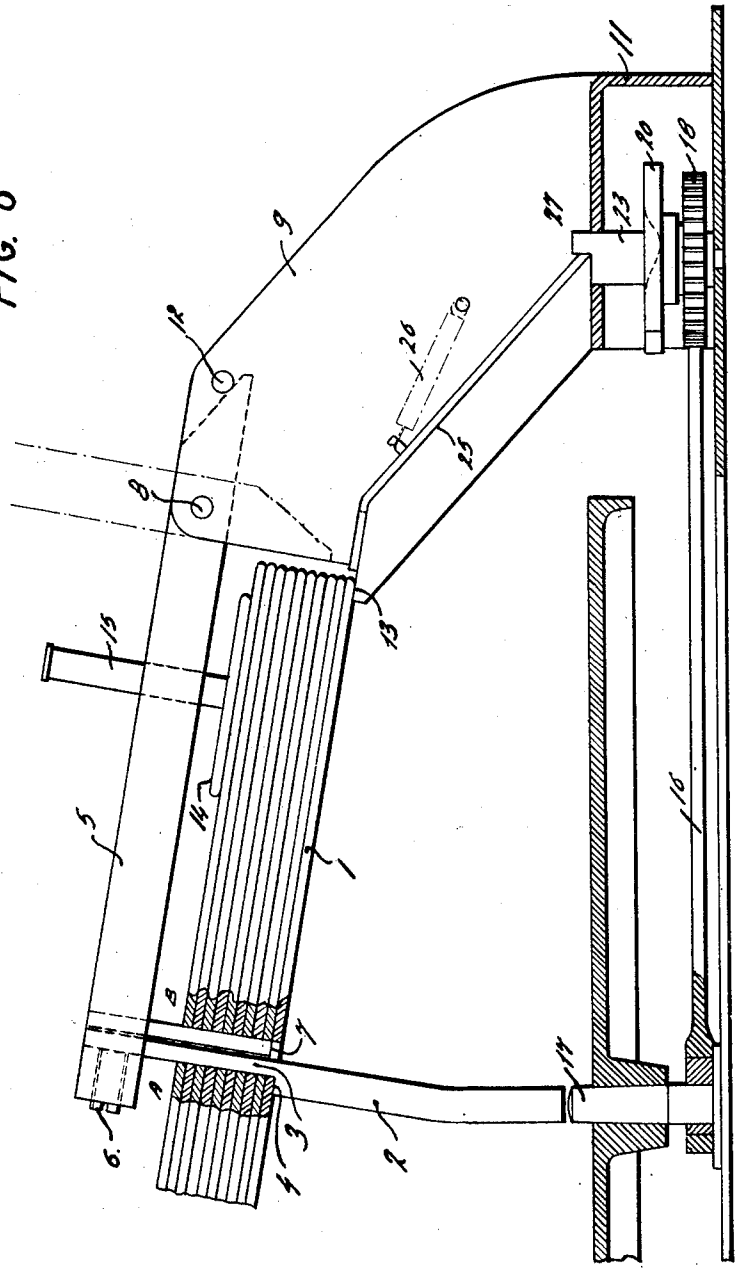
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ARRANGEMENT FOR AUTOMATICALLY CHANGING PHONOGRAPH RECORDS

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FIG. 8



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ARRANGEMENT FOR AUTOMATICALLY CHANGING PHONOGRAPH RECORDS

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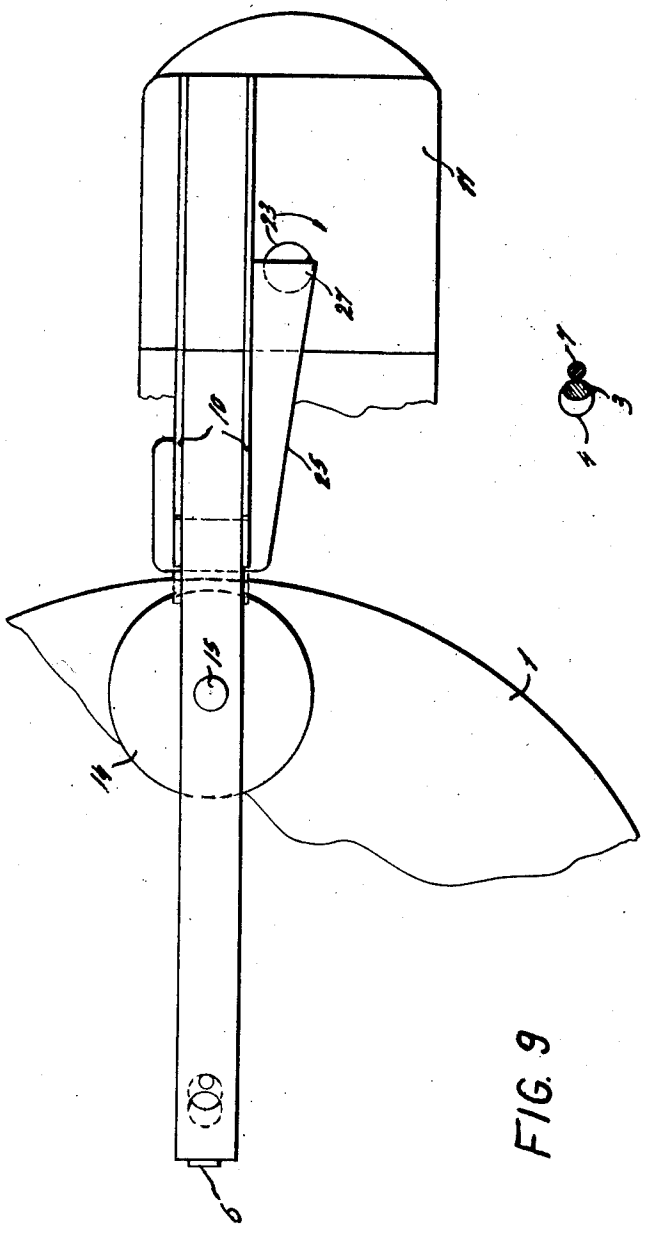


FIG. 9

FIG. 10

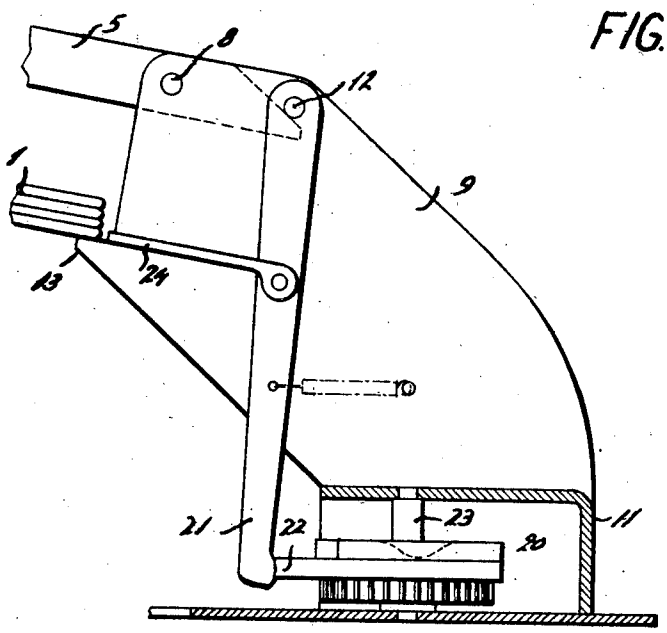
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ARRANGEMENT FOR AUTOMATICALLY CHANGING PHONOGRAPH RECORDS

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FIG. 11



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Patented Dec. 2, 1952

2,620,194

UNITED STATES PATENT OFFICE

2,620,194

ARRANGEMENT FOR AUTOMATICALLY CHANGING PHONOGRAPH RECORDS

Petrus Anthonius De Boer, Amsterdam, Netherlands

Application January 30, 1947, Serial No. 725,233
In the Netherlands October 16, 1944

6 Claims. (Cl. 274—10)

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The invention relates to an arrangement for automatically changing the records to be played on a phonograph by successively freeing the lowest record from a magazine situated above the turntable. In particular, the invention contemplates the production of a simple and practicable arrangement which can be applied to all phonographs without their having to be specially modified, this being itself of an economical structure.

The invention is particularly characterized by a control mechanism connected to the exploring arm (needle arm) and actuated step by step from the pivot of the turntable the mechanism effecting on one hand the movement of the arm for lifting the needle and the movement of the arm by rotation after the playing of a record, and displacing on the other hand an arrangement combined with the magazine in such a manner that the lowest disc of the pile of records is freed in order to be placed in the playing position and at the same time the stack situated above this record is held in its stored position, while the mechanism is maintained in an inactive position during the playing of a record.

According to the invention the mechanism may comprise a ratchet wheel in which engages a pawl rod fixed to the pivot of the turntable, the teeth of this ratchet being however locally interrupted, so that during the playing of a record, the hooked end of the pawl rod operates only on the toothless part of the periphery of the ratchet and that this ratchet itself remains inactive.

Further according to the invention, the exploring arm can towards the end of the played record communicate to the ratchet wheel an angular displacement, such that the pawl rod can then take over the operation of the ratchet and can complete the revolution started.

Moreover, a special characteristic of the invention consists in that the exploring arm is fixed for pivoting in a vertical direction, to a part of the mechanism which allows at the same time a pivotal movement in a horizontal plane, the two movements being derived from a flat nonsymmetrical disc which is connected to the ratchet wheel, while a second cam disc, also connected to the ratchet, operates upon a displacing member which is connected, in its turn, to the device serving to free each time the lowest record in the magazine.

A modification of the invention relates to a very simple and rational mode of execution of the device for changing the records. It relates in addition to the actuation of this device by means of the control mechanism.

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This modification is characterized by the fact that the records in the pile in reserve are slid on a supporting pin, the axis of which is a prolongation of the axis of the spindle of the turntable, of which the lower free extremity is located just opposite this spindle and of which the portion passing through the records of the pile is flattened throughout its whole length in such a manner as to form a supporting face for the pile of records and these records are maintained in the position of engagement on the said pin by means of a second pin which extends along the rear face of the supporting pin, the lower flat extremity of this second pin extending exactly to the upper face of the lowest record in such a manner that this record can be caused to slide laterally with respect to the pile of records until it arrives at i. e. registers with the full unconstricted portion of the supporting pin.

Finally the invention is characterized by various constructive details of which a more precise description will be given below.

The invention will be explained with reference to the drawings of which Figures 1–7 illustrate a first mode of execution and Figures 8–11 a second mode of execution.

Figure 1 shows a vertical longitudinal section, partly in elevation, of the complete apparatus.

Figures 2 and 3 show in plan two examples of the control of the ratchet wheel, whilst:

Figures 4 and 5 show, as seen from above, certain elements of the mechanism for changing a record.

Figures 6 and 7 show views respectively from the front and from above the apparatus proposed for freeing one by one the lowest records from the magazine.

Figure 8 is a front view of the record changing device according to the second mode of execution comprising a partial view in section of the turntable and of the control mechanism.

Figure 9 is a corresponding plan view.

Figure 10 is a fragmentary view in section along the line A—B of Figure 8.

Figure 11 serves to explain the operation of the second mode of execution.

In Figure 1, 1 indicates the turntable of a phonograph of any usual construction, this turntable being mounted in the known manner on a co-axial part 2 of the pivot for the turntable. On this pivot 2 is rigidly fixed an eccentric ring 3 around which one of the ends of a pawl rod 4 is mounted in the manner of an eccentric; a rotary movement of the pivot 2 thus causes a reciprocatory movement of the pawl rod 4. The other extremity of the pawl rod engages a ratchet

wheel 5 in such a manner that the ratchet 5 is rotated by one tooth for each revolution of the turntable or of the phonograph record. A spring 6 (Figure 2) which is attached to a fixed post 7, exerts a pressure on the pawl rod 4 in the direction of the ratchet wheel, so that the end of the rod rests continually against the periphery during the reciprocatory movement. Instead of an eccentric ring, a non-symmetrical disc (Figure 3) could be used, the disc being fixed to the part 2 and moving against the side of the lever 9 of which one end is mounted for rotation about a fixed point 8, while its other end is pivotally connected to the pawl rod 10. A spring 11 serves not only to press the lever 9 continually against the non-symmetrical disc 3, but also to press the pawl rod 10 continually against the ratchet wheel 5.

The ratchet wheel 5 forms a unit, or is joined, in some other manner, with a cam disc 12 and with a flat non-symmetrical disc 13; this assemblage can rotate around a fixed spindle 14 which is mounted in the frame 15.

16 indicates the usual exploring arm of the phonograph; this arm, which is of inverted U section, is mounted to hinge about a horizontal journal 17 and can turn in a vertical direction about this journal. The latter is carried in a bearing 18 which carries a cylindrical part 19 which can in turn rotate in a projection 15 from the frame 15. In this manner the bearing 18 and the exploring arm 16 can also be angularly displaced in the horizontal plane.

This displacement of the exploring arm in a vertical direction is effected by means of a pin 20 which is guided in the cylindrical part 19 of the bearing 18 and which is supported by its upper extremity against the interior of the arm 16, whilst its other end is in contact with the disc 13.

A groove 21 is provided in this disc 13; when the pin 20 falls into this groove the exploring arm 16 occupies its lowest position, that is to say with the needle in contact with the phonograph record.

Moreover, disc 13 is provided, on its periphery with a notch 22 (Figure 4); a stop 23 can fall into this notch and press against the disc, this stop forming the extremity of a lever 24 which is joined to the cylindrical part 19 of the bearing 18.

As shown in Figures 2 and 3 the teeth of the ratchet wheel 5 are interrupted at one point, that is to say one tooth is omitted. As a result, when the end of the pawl rod 4 or 10 is held pressed against the periphery of the ratchet 5 on this untoothed part, the rod does not displace a tooth during the reciprocatory movement, that is to say no angular displacement will be imparted to the ratchet wheel.

The cam disc 12 is furnished with a projecting part 12*a*, as shown specially in Figure 5; under the action of a spring 25 the end of one arm of an oscillating lever 26 is held permanently against the periphery of the disc 12, the said lever being able to move about a fixed point 27. The other arm of this lever is connected with the arrangement serving to free each time a new record from the magazine. This disc magazine is situated above the platform 1 and in such manner, that the center of the records 28 piled-up in the magazine corresponds with the center of the turntable 1. If one retract upwards a retractable pivot 29, a certain number of phonograph records can be slid laterally in the magazine and placed on the supporting surfaces of members 32 and 33 which will be found yet in the position of rest, as is described in the following and as represented in Figure 6. By pushing the retractable pivot 29 into the reverse position by a guiding bush 29*a* through the records 28, the latter are centered in a simple manner by the pointed part of the pivot which threads its way through the central apertures of the records. Then the pivot 29 is replaced into the normal position in the guiding bush 29*a*, so that it is able to support itself by the part 30, shaped like a toadstool, on the pivot 2 of the turntable, thus ensuring a good guiding of the records during their exit from the magazine to the turntable. In order to hold the pile of records and to free each time one record, an arrangement is provided which will be described more in detail in the following (see especially Figures 6 and 7).

A double lever 31 is mounted for rotation about the guiding bush 29*a* of the vertical pivot 29 which passes through the records; each of the free ends of this lever is pivotally connected to a member 32 or 33. These members take the form of flat plates which are guided in the horizontal plane and which are bent at their ends in a right angle downwards and then in an inward direction, the lower edge constituting thus a supporting surface sufficiently large for the stack of records 28. When member 32 is displaced to the right, the member 33 will be displaced at the same time to the left by the double lever 31, and vice versa; in other words for an angular movement of the double lever 31 the two members are displaced either simultaneously inwards or simultaneously outwards. A spring 34 attached at one end to a fixed point on the frame serves to keep the said members as far inwards as possible. At the free ends of lever 31 are also connected the ends of two resilient members, in the form of plates 35 and 36, particularly in such a manner that when members 32 and 33 are outwardly displaced as a result of the angular displacement of double lever 31, the said members 35 and 36 are at the same time, inwardly displaced and vice versa. These members 35 and 36 are also guided during their horizontal movements and are also bent downwards and inwards. The ends of each of the parts which are turned inwards are made in the form of beaks which are approximately at the same height as the plane of separation between the lowest record 28 and the record immediately above the latter. With regard to their horizontal guiding, the members 35 and 36 have a certain play in the vertical direction, so that they can adapt their position according to the thickness of the phonograph records to be freed. The outward or inward displacement of members 32, 33, 35 and 36 is effected by the movement of the upper arm of the oscillatory lever 26, which is connected at 37 to member 32, this movement being derived from the cam disc 12; the return movement is effected by means of spring 34.

The apparatus operates as follows:

Suppose that a record is being played on the turntable; the various elements of the arrangements are then in such a position that the pin 20 engages by its lower end in the groove 21 and thus holds the exploring arm in its lowest position, the needle being lowered on to the record; this can then be displaced in the usual manner along the needle track. Further the ratchet wheel is in a position such that the end of the pawl rod 4 (or 10) falls exactly in the untoothed part of the periphery, in other words this rod is reciprocally displaced during the playing, but it does not actively operate on the ratchet wheel which remains at rest. Finally, the end of the

oscillating lever 26 is in contact with the lower part of the periphery of the cam disc 12 and members 32 and 33 are in the innermost position, under the action of spring 34. The stack of records is resting in the magazine with their lower faces on the large supporting surfaces of these members, whilst the members 35 and 36 are for the present in the outermost position, their beaks not being in contact with the stack of records.

A little before the end of the time of the playing of the record placed on the turntable, arm 24 is, by a movement of the exploring arm to which it is connected, brought from the position A shown in Figure 4 into the position B at the end of the playing of the record. This causes the disc 13 to turn a little in the direction of the arrow (Figure 4) by lever 24, which is connected to member 19 and thus also to arm 16, by means of its stop 23 which is against the inner face of notch 22, the amplitude of this rotation of disc 13 being such that the untoothed part of the ratchet wheel 5 is just turned beyond the end of the pawl rod 4 and which itself now goes into engagement with the teeth of the ratchet wheel. During the further rotation of the turntable the displacement of this ratchet wheel is produced particularly in such a way that for each revolution of the turntable the wheel is moved to the extent of one tooth so as to complete thus the total revolution of this wheel.

During this revolution, the mechanism which automatically changes the record, now comes into action. In the first place the end of pin 29 is disengaged from the groove 21 and is moved upwards on to the upper flat face of the non-symmetrical disc 13; consequently an angular movement in the vertical plane, about the hinge 17, is communicated to the exploring arm 16 and the needle is raised from the record. At the same time the part of the disc 13 which is behind the notch 22 in the direction of the rotation, causes an angular movement of lever 24 and thus of arm 16 in the horizontal plane, causing it to turn outwards for such a distance that the position of the lever 24 connected to the exploring arm corresponds to the position C in which the new record before being played can, during its downward slide pass freely at the side of the exploring arm.

Meanwhile the movement of ratchet 5 has also caused the displacement of the lower arm of oscillating lever 26 to the extent of the raised part of the cam disc 12. From this fact, this end is displaced towards the left and the upper arm of the said lever is displaced towards the right, while the plate-like member 32 which is connected to this arm, is likewise displaced towards the right, that is to say outwards, against the action of spring 34. As has already been shown above, the member 33 is likewise displaced simultaneously outwards, whilst the two members 35 and 36 are moved inwards under the action of double lever 31. The result of this is that in their extreme inward positions the beaks provided on the lower faces of the members 35 and 36 seize and hold the stack at a height of the second lowest record, whilst, because the supporting faces of members 32 and 33 are in their extreme outward position, the lowest record 28 is freed and is completely separated from the stack, this record thus being able to slide down the length of the vertical pivot 29 until it rests on the turntable, or on the record or records already played which are on the turntable. By reason of the shape of cam disc 12 the lower extremity of oscillating lever 26 is now quickly freed. Thus after freeing of the lowest record of the magazine the system of levers is restored quickly to its initial position with the supporting faces of 32 and 33 again in their places, before the stack of records has dropped a distance equal to the thickness of one record. It is seen thus that the return movement of the system of levers does not have to work against the pressure of the stack of records resting on their supporting faces, so that a weak spring is sufficient to effect the movement.

The exploring arm 16 which has its lever 24 in the extreme position C during the discharge of the lowest record, is moved to the position D by the effect of rotation which ratchet wheel 5 makes and under the action of a spring not shown in the drawing, the needle then being above the initial groove of the record. The pin 20 now reaches the groove 21 of cam disc 13. The arm 16 descends now so that the needle comes to rest on the record which can now be played. At this moment the ratchet wheel 5 or the mechanism co-operating with it has exactly finished one revolution, and the end of the pawl rod 4 is again in the non-toothed part of this wheel. Position D indicates thus the position of an exploring arm 16 at the beginning of the playing of a record, all the members being again in the starting position.

As appears from what has gone before the construction of the arrangement is very simple. What is essential, is the control mechanism, which, according to the invention, has thus a double function and of which the principle elements comprise the ratchet wheel and the cam discs. By reason of such an arrangement the number of rotating parts subjected to use, by friction or otherwise, is reduced to a minimum, no wear can be produced in the members connected and co-operating between themselves, so that a reliable operation of the assembly is always assured. Moreover, the construction of a double lever 31 displaced about a pivot passing through the record always ensures a simultaneous freeing at the desired moment of a new record and the holding of the pile at rest.

The arrangement can not only be applied to new phonographs, but it can also be adapted to existing phonographs; by mounting the assemblage in a frame open at the bottom, it can be slipped over the turntable. It goes without saying, that the manner of carrying out the invention described above is given only by way of example, and that it can be modified in its details without departing from the scope of the invention.

Now the second mode of execution of the device according to the invention as illustrated in the Figures 8–11, will be explained below.

In Figure 8 the pile of records 1, placed in the so-called "magazine" with the object of being able to change the records one by one, is slid upon the extremity of a supporting pin 2.

This supporting pin has its axis as a prolongation of the axis of the spindle of the turntable and its lower free extremity is situated just opposite the upper extremity of this spindle. In the example illustrated in the drawings the pin 2 is slightly curved at an intermediate point and terminates in an upper flattened portion 3, in such a manner that the records of the pile can be caused to slide smoothly one by one downwards along the pin. The flattened portion 3 is formed

by partially removing the material of the pin 2 throughout the whole of the length of that portion extending through the records. There is thus formed a supporting face 4 on which rests the pile of records 1, while the upper extremity of the pin 2 penetrates into an opening provided in the extremity of an arm 5 which can be raised, said extremity being fixed in the arm 5 by means of a screw 6. In this same arm is fixed a second pin 7 which likewise extends through the records and is located between the rear face of the portion 3 of the supporting pin 2 and the interior face of the central holes in the records. By this means is effected simultaneously the locking in place of all the records. The supporting pin 2 and the pin 7 can be adjusted relatively to one another in such a manner that the lower flat extremity of the pin 7 extends exactly to the upper face of the lower record. In other words this latter record can be displaced freely in its own plane independently of the other records. This result is effected in a manner which will be described in greater detail below at the moment when a new record is required to be placed on the turntable. It is obvious that the construction described presents the appreciable advantage that the same device can be utilised for records of different thickness. It is sufficient for this purpose, to effect suitable adjustment of the relative positions of the pins 2 and 7.

The arm 5 capable of being raised, is mounted to pivot about a pin 8 in a frame member 9 which—in the example illustrated in the drawing—is constructed of plates 10 which are fixed to the chassis 11 of the control mechanism (see Figure 9). With the object of inserting the phonograph records the arm 5 can be raised by hand and it then moves between the plates 10 into the position shown in dot and dash in Figure 8. In its working position the arm 5 comes to rest at its extremity, which is in the form of a cam, against a fixed abutment which is likewise mounted in the frame 9 and for example may take the form of a pin 12. As a result of this construction the lower extremity of the supporting pin 2 remains free from the spindle 17 of the turntable, which accordingly has no load on it.

The pile of records rests not only on the supporting face 4, but likewise at a place on its periphery on a fixed supporting face 13 which forms part of the frame 9. It is known that the method of manufacture of records in general gives rise to local inequalities in thickness, that is in weight, at various points on the record and the positioning of the record in the manner which has just been described could give rise to the danger that the pile might overturn. In order to avoid this inconvenience a pressure plate 14 is provided which rests freely on the upper face of the pile 1 and is integral with a pin 15 which can be caused to slide in a hole in the arm 5 which can be raised. Should there be any tendency of the pile to overturn, the pressure plate 14 opposes this movement; in fact this plate cannot take part in an overturning movement, because the lateral friction of the pin 15 in the arm 5, which would result, is sufficiently great to prevent movement of this pin and the plate 14.

The control of the device for changing the record is carried out by means of a transmission from the control mechanism of the exploring arm.

This mechanism may correspond to that of the first mode of execution. The step by step operation from the spindle of the turntable is thus obtained by means of a pawl rod 16 the to and fro movement of which is derived from the rotational movement of the spindle 17 of the turntable. During the playing of a record the extremity of the pawl rod is displaced along a non-toothed portion of the ratchet wheel 18 and when the playing of a record is finished the movement of the exploring arm imparts to the ratchet wheel 18 which is linked to the control disc 20, an angular displacement such that the extremity of the pawl rod 16 then comes into contact with the toothed portion of the periphery of the ratchet wheel 18 and thus brings about the step by step actuation of the control mechanism. The control of the device for changing the records is in turn derived from the movement of the control mechanism.

For this purpose and as is the case in the first mode of execution, there can be provided for example a lever 21 (see Figure 11) of which one extremity is pivotally mounted about a fixed point, for example the pin 12, while the other extremity is applied to the edge of the control disc 22 which is fixed on the spindle 23 of the control mechanism. The lever 21 can be articulated to a sliding member 24 which serves to produce the lateral displacement of the lowest record of the stack 1.

The above described second mode of execution, however, contemplates a device which effects the same control from the control mechanism but in a much more simple manner, such that it becomes possible among other things to fulfill the function of one of the control discs by the spindle of the control mechanism and in this way to avoid the existence of this control disc itself.

As shown in Figure 8 which incorporates this improvement, the sliding member is constituted by an element 25 of which one extremity can slide reciprocally over the fixed supporting face 13, while its other extremity is urged against a control cam 27 by means of a spring 26. The cam 27 (see Figure 9) is formed at the upper extremity of the spindle 23 of the control mechanism, particularly by removing for a predetermined height, the material of this extremity of the spindle following a plane surface. During the rotation of the spindle 23, the sliding member 25 is displaced in the direction of the center of the record.

The device operates as follows:

After the playing of a record placed on the turntable and after, as indicated in the first mode of execution, the extremity of the pawl rod 16 has been brought into engagement with the toothed periphery of the ratchet wheel 18 as a result of the movement of the exploring arm, the said ratchet wheel 18 is displaced gradually as is also the control mechanism. During this movement the exploring arm is raised from the record, displaced upwards and is pivoted horizontally above the record. At the same time the sliding member 25 is urged by the flat side of the cam 27 under the influence of the rotation of the spindle 23. On this account the said member is displaced against the action of the spring 26 towards the lowest record of the stack 1. As a result of its displacement the member 25 urges the lowest record until its central hole arrives just above the full portion of the supporting pin 2, said record subsequently sliding downwards along this pin and finally arriving on the turntable. In the meantime the sliding

member 25 has been withdrawn under the action of the tension spring 26 while continuing to follow the movement of the cam 27. As soon as the member 25 becomes disengaged from the stack of records the latter is enabled to descend by a distance corresponding to the thickness of one record and to occupy again a position corresponding to the original position which has been considered as the starting point. Towards the end of the revolution of the ratchet wheel, the exploring arm is finally brought back under the influence of the rotation of the control disc 20 into the starting position for the playing of a record.

By means of the device according to the invention and the method of control of the exploring arm, which has been described in the first mode of execution, a constructive assembly is produced which is very simple and which in addition presents the advantage of being capable of adaptation to any phonograph.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:

1. In a phonograph having a turntable, a tone arm and a record feeding magazine, a control device comprising a rotary element, a ratchet wheel fixed coaxially to said rotary element and having a plurality of ratchet teeth spaced about the circumference of said wheel with the teeth locally interrupted, a pawl having one end positioned to engage the circumferential portion of the ratchet wheel, and a cam driven with the turntable and cooperating with said pawl for reciprocating the latter through a distance corresponding to the distance between two ratchet teeth on the ratchet wheel whereby rotation of the ratchet wheel will terminate when the pawl engages the portion of the circumference of the ratchet wheel having the teeth interrupted, a tone arm carrier mounted for pivotal movement about a vertical axis, means mounting the end of the arm remote from the needle carrying end thereof on said carrier for pivotal movement about a horizontal axis, said rotary element including a cam, and cam following means engaging said cam for shifting said tone arm about its horizontal and vertical pivoting axes.

2. In a phonograph having a turntable, a tone arm and a record feeding magazine, a control device comprising a rotary element, a ratchet wheel fixed coaxially to said rotary element and having a plurality of ratchet teeth spaced about the circumference of said wheel with the teeth locally interrupted, a pawl having one end positioned to engage the circumferential portion of the ratchet wheel, a cam driven with the turntable and cooperating with said pawl for reciprocating the latter through a distance corresponding to the distance between two ratchet teeth on the ratchet wheel whereby rotation of the ratchet wheel will terminate when the pawl engages the portion of the circumference of the ratchet wheel having the teeth interrupted, a tone arm carrier mounted for pivotal movement about a vertical axis, means mounting the end of the arm remote from the needle carrying end thereof on said carrier for pivotal movement about a horizontal axis, said rotary element including a cam flat disc having a peripheral cam surface and a depression in its plane surface, an arm on said carrier engaging the peripheral cam surface for shifting the tone arm carrier about its vertical axis, and a pin extending vertically through the carrier with its upper end engaging the tone arm and its lower end engaging the depression for effecting movement of the tone arm about its horizontal axis.

3. In a phonograph having a turntable, a tone arm and a record feeding magazine, a control device comprising a rotary element, a ratchet wheel fixed coaxially to said rotary element and having a plurality of ratchet teeth spaced about the circumference of said wheel with the teeth locally interrupted, a pawl having one end positioned to engage the circumferential portion of the ratchet wheel, and a cam driven with the turntable and cooperating with said pawl for reciprocating the latter through a distance corresponding to the distance between two ratchet teeth on the ratchet wheel whereby rotation of the ratchet wheel will terminate when the pawl engages the portion of the circumference of the ratchet wheel having the teeth interrupted, a tone arm carrier mounted for pivotal movement about a vertical axis, means mounting the end of the arm remote from the needle carrying end thereof on said carrier for pivotal movement about a horizontal axis, said rotary element including a cam, cam following means engaging said cam for shifting said tone arm about its horizontal and vertical pivoting axes, and means carried by the tone arm and rotary element and operable at the end of playing a record for shifting the ratchet wheel through a circumferential distance to bring the toothed portion of the wheel to a position to be engaged by the pawl.

4. In a phonograph having a turntable, a tone arm and a record feeding magazine, a control device comprising a rotary element, a ratchet wheel fixed coaxially to said rotary element and having a plurality of ratchet teeth spaced about the circumference of said wheel with the teeth locally interrupted, a pawl having one end positioned to engage the circumferential portion of the ratchet wheel, and a cam driven with the turntable and cooperating with said pawl for reciprocating the latter through a distance corresponding to the distance between two ratchet teeth on the ratchet wheel whereby rotation of the ratchet wheel will terminate when the pawl engages the portion of the circumference of the ratchet wheel having the teeth interrupted, a tone arm carrier mounted for pivotal movement about a vertical axis, means mounting the end of the arm remote from the needle carrying end thereof on said carrier for pivotal movement about a horizontal axis, said rotary element including a cam, and cam following means engaging said cam for shifting said tone arm about its horizontal and vertical pivoting axes, said rotary element having a shoulder in the peripheral portion thereof and a stop movable with the tone arm and shiftable by the tone arm, when the latter has been shifted by a record to the centermost position of the turntable to engage said shoulder and rotate the ratchet wheel through an arc equal to the distance between two ratchet teeth to bring the toothed portion of the wheel to a position to be engaged by the pawl.

5. In a phonograph having a turntable, a tone arm and a record feeding magazine, a control device comprising a rotary element, a ratchet wheel fixed coaxially to said rotary element and having a plurality of ratchet teeth spaced about the circumference of said wheel with the teeth locally interrupted, a pawl having one end posi-

tioned to engage the circumferential portion of the ratchet wheel, a cam driven with the turntable and cooperating with said pawl for reciprocating the latter through a distance corresponding to the distance between two ratchet teeth on the ratchet wheel whereby rotation of the ratchet wheel will terminate when the pawl engages the portion of the circumference of the ratchet wheel having the teeth interrupted, means carried by the tone arm and rotary element and operable at the end of playing a record for shifting the ratchet wheel through a circumferential distance to bring the toothed portion of the wheel to a position to be engaged by the pawl, a tone arm carrier mounted for pivotal movement about a vertical axis, means mounting the end of the arm remote from the needle carrying end thereof on said carrier for pivotal movement about a horizontal axis, said rotary element including a cam flat disc having a peripheral cam surface and a depression in its plane surface, an arm on said carrier engaging the peripheral cam surface for shifting the tone arm carrier about its vertical axis, and a pin extending vertically through the carrier with its upper end engaging the tone arm and its lower end engaging the depression for effecting movement of the tone arm about its horizontal axis.

6. In a phonograph having a turntable, a tone arm and a record feeding magazine, a control device comprising a rotary element, a ratchet wheel fixed coaxially to said rotary element and having a plurality of ratchet teeth spaced about the circumference of said wheel with the teeth locally interrupted, a pawl having one end positioned to engage the circumferential portion of the ratchet wheel, a cam driven with the turntable and cooperating with said pawl for reciprocating the latter through a distance corresponding to the distance between two ratchet teeth on the ratchet wheel whereby rotation of the ratchet wheel will terminate when the pawl engages the portion of the circumference of the ratchet wheel having the teeth interrupted, said rotary element having a shoulder in the peripheral portion thereof and a stop movable with the tone arm and shiftable by the tone arm, when the latter has been shifted by a record to the centermost position of the turntable to engage said shoulder and rotate the ratchet wheel through an arc equal to the distance between two ratchet teeth to bring the toothed portion of the wheel to a position to be engaged by the pawl, a tone arm carrier mounted for pivotal movement about a vertical axis, means mounting the end of the arm remote from the needle carrying end thereof on said carrier for pivotal movement about a horizontal axis, said rotary element including a cam flat disc having a peripheral cam surface and a depression in its plane surface, an arm on said carrier engaging the peripheral cam surface for shifting the tone arm carrier about its vertical axis, and a pin extending vertically through the carrier with its upper end engaging the tone arm and its lower end engaging the depression for effecting movement of the tone arm about its horizontal axis.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,883,942	Kincannon	Oct. 25, 1932
1,938,810	Collison et al.	Dec. 12, 1933
2,339,981	Cranmer et al.	Jan. 25, 1944
2,366,858	Knox	Jan. 9, 1945
2,428,258	Alexanderson et al.	Sept. 30, 1947
2,490,387	Thevanez	Dec. 6, 1949
2,490,678	Dale	Dec. 6, 1949