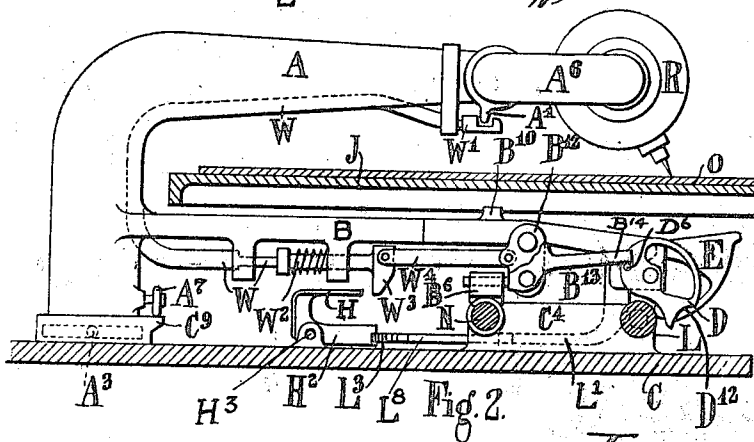
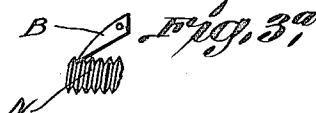
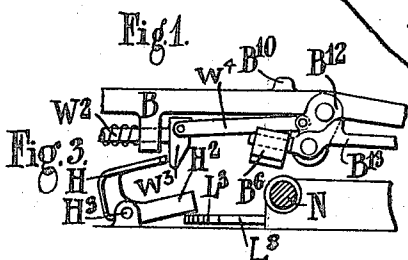


REPEATING AND STOPPING DEVICE FOR TALKING MACHINES AND THE LIKE.

1,429,755.

Patented Sept. 19, 1922.

4 SHEETS—SHEET 1.



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 4 SHEETS—SHEET 2.

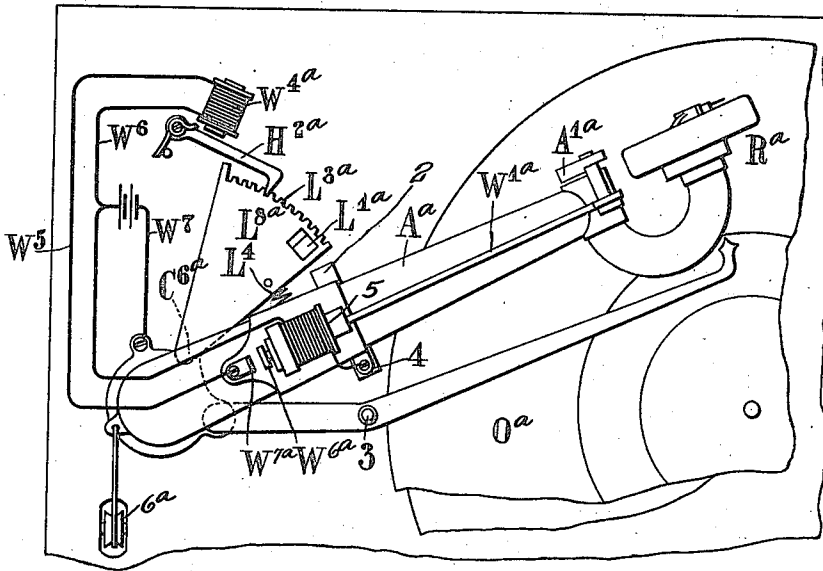


Fig. 4.

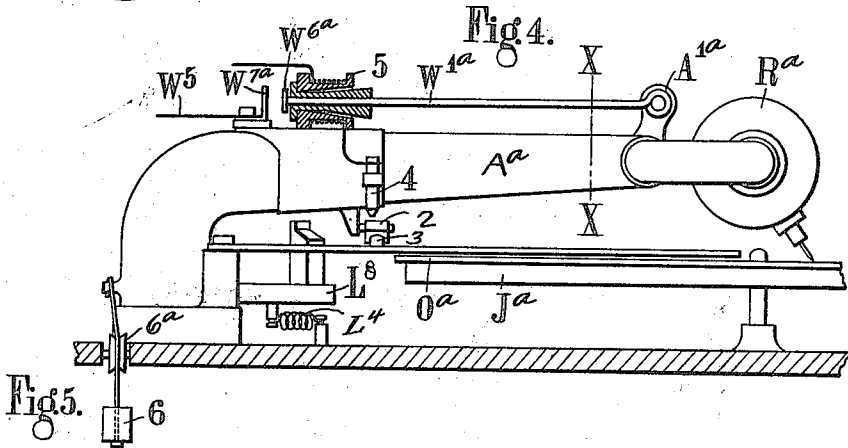


Fig. 5.

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 4 SHEETS—SHEET 3.

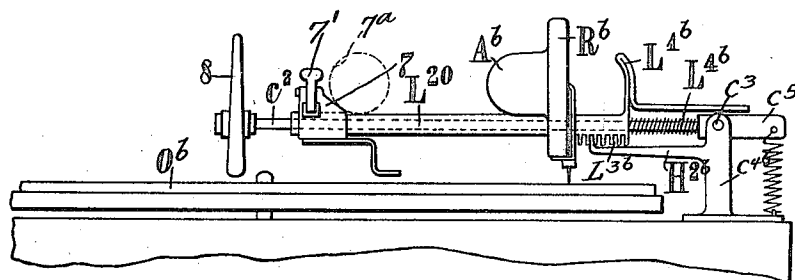


Fig. 7.

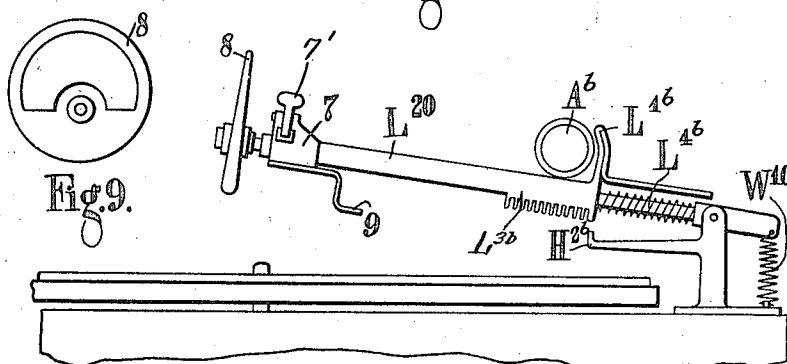


Fig. 8.

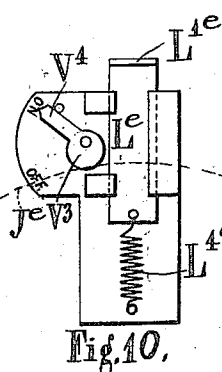


Fig. 10.

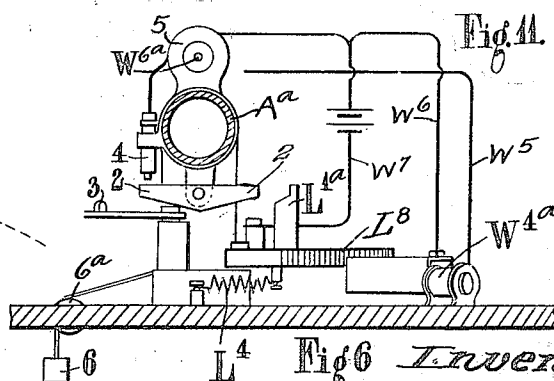


Fig. 11.

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4 SHEETS—SHEET 4.

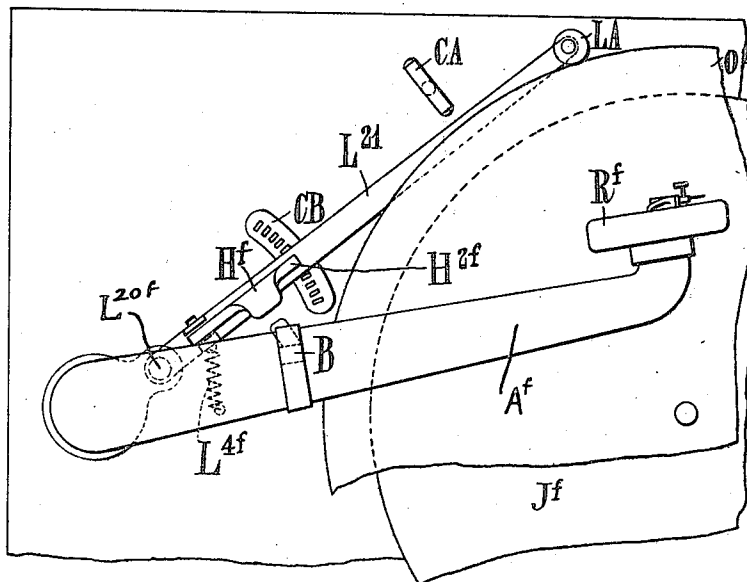


Fig. 11

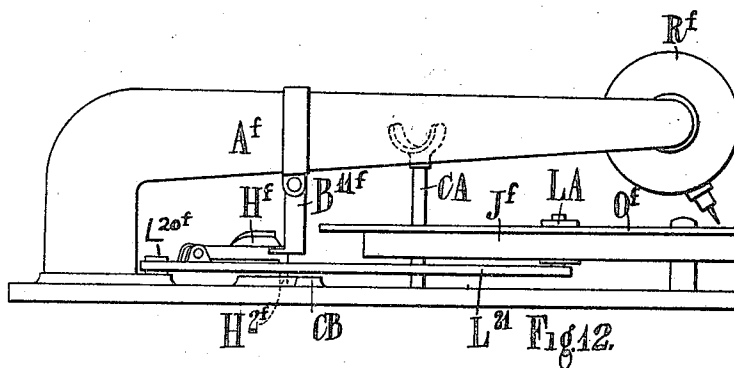


Fig. 12.

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UNITED STATES PATENT OFFICE.

FRANK BOWLEY MITCHELL, OF HOVE, ENGLAND.

REPEATING AND STOPPING DEVICE FOR TALKING MACHINES AND THE LIKE.

Application filed December 12, 1921. Serial No. 521,880.

To all whom it may concern:

Be it known that I, FRANK BOWLEY MITCHELL, a subject of the King of Great Britain and Ireland, and residing at 8 St. Aubyn's, Hove, in the county of Sussex, England, have invented certain new and useful Improvements in and Relating to Repeating and Stopping Devices for Talking Machines and the like, of which the following is a specification.

This invention relates to talking machines and the like of the disc record type with particular reference to automatic repeating apparatus therefor, and has for its object to provide improved means whereby the repeating apparatus may be automatically set to operate with records of varying sizes.

The invention consists in automatic repeating apparatus for disc talking machines and the like applicable to any standard diameter of record disc and extent of phonic record thereon, characterized in that the simple act of manually placing the reproducer on a record automatically sets a limiting device (in a record starting position) to limit the return travel of the reproducer to the position from which repetition is to commence without the necessity of performing any special operation other than the usual starting of the machine.

This invention also consists in apparatus as claimed in the preceding paragraph having means whereby the outward travel limiting device is released for re-setting by the act of manually lifting the reproducer.

The invention still further consists in combination with the above of means whereby the outward travel limit stop is released for resetting by the act of manually lifting the reproducer.

The invention also consists in other details and arrangements hereinafter described or indicated.

The invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a plan view of one form of machine made in accordance with the invention with the tone arm and turntable removed;

Figure 2 is a sectional side elevation on the line X—X, Figure 1;

Figure 3 is a side view of an actuating part;

Figure 3^a is a side elevation detail of the knife edge lever.

Figure 4 shows a plan view of a machine having automatic setting means for locating the outward limit stop;

Figure 5 shows a side elevation of Figure 4 partly in section;

Figure 6 is a section on the line X—X, Figure 5, looking in the direction of the arrow;

Figure 7 is a side elevation showing automatic setting means;

Figure 8 is a similar view showing the tone arm in another position;

Figure 9 is a view of a detail part of the apparatus shown in Figures 7 and 8;

Figure 10 shows a wedge action locking device.

Figure 11 shows a plan view of a further modification of the device;

Figure 12 shows a side elevation of Figure 11.

In carrying my invention into effect in the manner shown in Figures 1, 2 and 3 of the drawings I provide a tone arm A having an arm B solidly joined thereto. The tone arm A is mounted in the usual universal bearing A³, the arms A and B being prevented from falling forward by means of a roller support A¹, riding on the casing at C².

The reproducer R is attached to the tone arm A by means of a "swan neck" swivel connector A⁶ so that when the reproducer is lifted by hand it will not lift the arms A and B, but when the arm B is lifted by the cam D being turned by the spindle L it will lift the tone arm A and the reproducer R, the reproducer being held up by the plunger W¹ pressing on the projection A¹.

The longitudinally adjustable slide L is in the form of a smooth rotating spindle, which can be moved freely to and fro, but is limited in its inward movement by the collar L³⁰ meeting the bearing C⁴ when setting the outward limit stop L¹, it being free to slide through gear wheel L¹¹ and bearings C⁴ and C⁸. The spindle L is rotated by the gear L¹¹ driven by the turntable axis J², and has a shoulder L² and reduced portion L¹² at its outer end.

A slow turning threaded spindle N is also provided, having a reduced portion N¹ being also geared to the turntable axle J² by worm

or other gears N^4 , so that the thread of its screw shall feed toward the axis J^2 at a speed equal to or less than the speed at which the reproducer is moved by the radial feed of the record grooves.

To set the machine, a record O is placed on the turntable J , and the reproducer R is manually lifted to place the stylus on the commencing line of the record. While the reproducer is lifted, the projection A^1 will allow the plunger W^1 to be automatically moved forward by a "Bowden" wire connection W and compression spring W^2 . This in turn moves the parts W^3 , W^4 and link B^{12} from the position shown in Figure 2 to that shown in Figure 3. The lug W^3 will thus press on bar H (pivoted at H^3) and lift the latch H^2 out of toothed quadrant L^3 . Immediately the spring L^4 (Figure 1) will pull the end L^1 of the lever L^8 and shift the fall shoulder L^2 to its innermost position (i. e., for the smallest records). The stylus is then placed in the record commencing line; the act of doing this moves the tone arm A and secondary arm B rigidly secured thereto thereby causing the projection B^{11} secured to the end of the secondary arm B to make contact with the upstanding end L' of the lever L^8 when the latter is moved outwards and sets the fall shoulder L^2 for that particular record. When the reproducer is manually lowered on to the record, the "Bowden" wire W and lug W^3 are returned and the latch H^2 again enters the quadrant L^3 to lock the same.

The above-mentioned automatic mechanism to set the outward travel limit stop will work equally well whether the turntable and record are turning or not.

Repetition takes place as follows:—The tone arm A and arm B are carried toward the axle J^2 by the reproducer and stylus while playing a record. From the link B^{12} on the arm B hangs a knife-edged lever B^6 normally canted towards the bearing C^4 by its own weight, arranged to act as a slipping ratchet pawl on the thread tops of the turning screw N while the arm B is moving inwards. When the stylus runs inward towards the axis J^2 from the last phonic line of the record, the pawl B^6 will meet the cone N^3 and be lifted to rock the lever B^{13} . The end B^{14} of the lever B^{13} will meet the projecting pin D^6 on the cam D and partly rotate same, until the cam meets the rotating spindle L , which will continue the rotation of the cam D until it comes to rest with the recessed portion D^{12} resting on the spindle L . The rotation of the cam D will raise the arms B and A and the reproducer stylus, while at the same time the projection B^{10} will press on the underside of the turntable J and drive the arm to its outward repeating position.

In the event of the reproducer stylus

(when finishing a record) meeting a projecting ridge, deep groove or other obstruction at the end of the phonic line and the arms A and B ceasing to travel inwards, the turning screw spindle N will continue to feed the pawl B^6 towards the axis J^2 and tip the pawl into a vertical position and thus rock the arm B^{13} and rotate the cam D into contact with spindle L . The lifting cam D will then be actuated to lift and return the reproducer as above described.

When the reproducer stylus reaches the reproduction commencement point, the cam D on the arm B will be over the fall shoulder L^2 . This will allow the cam D to swing by its own weight into its normal position (as in Figure 2). At the same time a second cam E (which is weighted to hang with its longest radius down) will swing inwards into position over the reduced spindle L^{12} and will then take the weight of the arms A and B and the reproducer. The continued rotation of the spindle L and L^{12} will then turn cam E outwards and gradually lower the arms A and B and thus gently replace the stylus on the record commencement position, the cam E returning to its normal position (as in Figure 2). The mechanism is thus set to repeat again and again until a repetition control indicator (not shown) has reached the stop position.

It will be seen that when the reproducer is manually lifted to set the outward travel limit stop the Bowden wire or like connections W , W^3 , W^4 and the link B^{12} will lift the pawl B^6 and the lever B^{13} out of contact with the spindle N and cam D , as Figure 3. This is to permit the arm to be moved sideways by hand without actuating the cam D when setting the apparatus.

The tone arm A is mounted in the usual universal bearing A^3 , the arms A and B being prevented from falling forward to move the cam D into contact with the spindle N by means of a roller support A^7 riding on the casing at C^9 .

The spindle N has a reduced portion N' and the pawl B^6 is so weighted as to right itself when commencing a new record.

Figures 4, 5 and 6 show automatic setting means for locating the outer limit stop as applied to electrically operated repeating mechanism.

In this arrangement a quadrant L^{8a} mounted on a pivot C^{8a} is provided with teeth L^{3a} so arranged that the quadrant is held stationary with a latch bar H^{2a} meshing therewith. The quadrant L^{8a} is provided with a pin L^{1a} functioning as a limit stop, projecting from its upper surface, thus preventing the tone arm A^a and reproducer R^a from travelling beyond the desired repeat position when repeating a record.

The outer extremity of the tone arm A^a forms a bearing for a projection A^{1a} whose

lower extremity serves as a pivot for the sound box R^a , and whose upper extremity carries a support for one end of a wire rod W^{1a} whose outer end is provided with a contact member W^{6a} adapted to make contact with another contact member W^{7a} located upon the upper surface of the tone arm by the fact of raising the reproducer and whereby the lowering of the reproducer causes the contact between the members W^{6a} and W^{7a} to be broken. The tone arm is further provided at its lower surface with a lug supporting a rocking bar 2 so arranged as to be tilted by a stop pin 3 adapted to be set in the correct position by hand. Contact is made through wires W^5 and W^6 and wire W^7 thus causing a magnet W^{4a} suitably located upon the base of the machine to withdraw a catch H^{2a} from engagement with the teeth upon a quadrant L^{3a} , the catch H^{2a} being held normally in engagement by means of a spring and a stop pin provided at its pivoted end. The tone arm is further provided upon its upper surface with a solenoid magnet 5 having its winding connected to the contact member 4 so arranged that when the winding is energized by contact between the member 4 and the rocking arm 2, the wire rod W^{1a} is pulled sufficiently to slightly raise the reproducer, a weight 6 working over a pulley 6^a being then arranged to pull the tone arm out to the commencement point, that is to say where the rocking bar 2 meets the stop pin L^{1a} located upon the upper surface of the quadrant member L^{3a} .

The limit stop pin L^{1a} is set in the desired position by lowering the reproducer on the commencing lines of a record as follows:—

The reproducer is raised in the usual way; this turns the projection A^{1a} and pushes the wire rod W^{1a} until it meets the electric contact member W^{7a} thereby closing the electric circuit through the wires W^5 , W^6 and earth wire W^7 thus causing the magnet W^{4a} to withdraw the catch H^{2a} from the quadrant teeth L^{3a} when the spring L^4 immediately draws the quadrant L^{3a} inwards until the stop pin L^{1a} meets the other edge of an end of a rocking arm 2 mounted on the tone arm A^a and forming one extremity of the member 2. The reproducer is then lowered in the desired position; this breaks the electric circuit at W^{6a} and releases the latch bar or catch H^{2a} and locks the quadrant in the correct position in which position it remains during the repetition until again released for a new record. The repeating mechanism operates in the following manner:—

A reproducer traverses the record when playing in the usual way until the rocker bar 2 (Figure 6) meets and is tilted by the stop pin 3 (previously set in the correct position by hand); this closes the electric contact 4 and causes the solenoid magnet 5 mounted on the tone arm A to pull the wire W^{1a} a

short distance and thus slightly raise the reproducer. The weight 6 then pulls the tone arm out to the commencement point where the rocker bar 2 meets the stop pin L^{1a} ; this rocks the bar 2 in the opposite direction and breaks the electric contact 4 and allows the reproducer to fall on the record to repeat the record. The above action goes on indefinitely until the brake is applied unless a controlling quadrant or the like is used.

A further modification showing the automatic setting means for locating the outer limit stop is illustrated in Figures 7 to 9, the construction of this case being such as may be applied to any well-known type of repeating mechanism. In the form shown, a sliding track L^{20} is mounted on a guide bar C^2 pivoted at its outer end C^3 to a pedestal C^{4b} and is so located as to form substantially a chord and the arc formed by the movement of reproducer stylus over the record. The sliding track L^{20} is provided on a part of its lower surface at the end adjacent the pivot with a plurality of teeth so arranged that the track L^{20} is held stationary when a latch bar H^{2b} projecting from the pedestal C^{4b} is in engagement therewith, a limit stop pin L^{1b} projecting upward from the extremity of the track adjacent its pivot, whereby the tone arm A^b together with the reproducer R^b is prevented from travelling beyond the desired repeat position, such position being determined by the relative position of the limit stop pin L^{1b} to the turntable axis. In this connection it is to be observed that the catch H^{2b} even when engaged with one of the teeth L^{3b} is capable of having sliding movement vertically thereof. An extension C^5 is provided on the bar C^2 on the side remote from its pivot having a spring W^{10} , the arrangement being such that on the tone arm A^b being raised in the usual manner to repeat, the guide bar C^2 and sliding track L^{20} are adapted to assume an inclined position in the following manner:—

The producer is raised in the usual manner, thus allowing the spring W^{10} (Figure 8) to lift the track L^{20} and thereby withdraw the teeth L^{3b} from engagement with the latch bar H^{2b} , whereby the spring L^{4b} located between the extension C^5 , the guide bar C^2 and the sliding track L^{20} immediately pushes the track L^{20} towards the turntable axis until the stop pin L^{1b} meets the side of the tone arm A^b . The reproducer is then lowered to the desired repetition commencement position which causes the teeth L^{3b} to engage the latch bar H^{2b} and thereby lock the sliding track L^{20} in the correct position, in which position it will remain during repetition until again released by the act of manually raising the tone arm. When a new record is to be used the sliding track L^{20} is further provided at its extremity adjacent the turntable axis with a wedge member 7, the said member

being adapted to be placed in the correct position upon the sliding track L^{20} through the medium of the finger actuated gripping piece 7', the arrangement being such that

5 when the tone arm A meets the inclined projection 7^a and the track L^{20} together with its supporting wedge member 7, the bar C^2 will be forced in a downward direction due to the weight of the tone arm and reproducer,

10 which normally is carried by the stylus and the sliding engagement of the catch or latch bar H^{2b} and the teeth L^{3b} until a cam member 8, located at one extremity of the guide bar C^2 , meets the phonic record which then

15 rotates the cam member 8 (which is so weighted as to hang the short radius downwards when not in contact with the record as shown in Figure 9), thus raising the bar C^2 and sliding track L^{20} , which is a loose fit

20 upon the bar C^2 , slightly but not sufficient to disengage the teeth L^{3b} from the latch bar H^{2b} and allowing the tone arm A and reproducer to slide downwards to the repeat position limit stop L^{1b} , when the reproducer

25 is again lowered on to the record by the continued rotation of the cam 8 which then assumes its normal position. The wedge member 7 is provided with a pointer 9 to facilitate setting by hand.

30 The repeating mechanism functions in the following way:—

The reproducer traverses the record when playing in the usual manner until the tone arm A^b meets and depresses the wedge member 7, said member having previously been

35 set in the correct position by hand and thus rocks the bar C^2 downwards until the cam 8 (which is weighted to hang short radius downwards—see Figure 9) meets the turning record which then rotates the cam

40 thus raising the bar C^2 and sliding track L^{20} thereby allowing the raised tone arm A^b and reproducer to slide outwards to the repeat position limit stop L^{1b} where the reproducer

45 is again lowered on to the record by the continued rotation of the cam 8 which then hangs ready for re-use.

Figures 10 and 11 show a wedge action means for locking the slide L^c which functions as a flat track to replace the sliding spindle L shown in Figures 1 to 3 and is

50 adapted to be moved into the outward position by means of a member carried upon a secondary arm and corresponding in function to B^{11} , Figures 1 to 3. The device operates as follows:—

Figures 11 and 12 show a plan elevation respectively in a further form of automatically setting outward limit stop which sets itself for the approximately correct outer record commencement position irrespective of the position in which the reproducer is

60 placed on the record.

In this construction a rest C^A is provided,

65 upon which the tone arm A^t is adapted to

rest while a record is being placed in position on the turntable. A downwardly extending projection B^{11t} is provided upon the tone arm, this projection being adapted to meet and lift the latch bar H^t provided

70 upon a lever L^{21} , pivoted at a point L^{20t} adjacent the tone arm pivot and having at its other extremity an eccentrically mounted roller L^A adapted to make contact with the edge of the record O^t when the latter is

75 placed in situ upon the turntable J^t . The latch bar H^t is pivoted at its extremity adjacent the tone arm pivot and is provided at its opposite end with a downwardly projecting latch member H^{2t} adapted to engage

80 with the rack holes C B, provided with a plate or like member secured to the upper parts of the apparatus.

The operation of this device is as follows:—

85

While the record is being placed in position the tone arm is first lifted and placed in the rest C^A . This causes the projection B^{11t} to meet and lift the latch bar H^t and thus disengage the catch H^{2t} on the rack

90 holes C_B thereby allowing the lever L^{21} to be held outwards against the action of a spring L^{4t} to keep the eccentrically mounted rollers L^A free from the edge of the record O^t while the same is placed in position on

95 the turntable J^t .

The reproducer stylus is then placed on the record O^t in any desired position, this action allowing the roller L^A to touch the edge of the record it being understood that

100 phonic lines usually commence about $\frac{1}{4}$ " from the outer edge of the record, thus determining the general relative position of the phonic lines on records of all diameters and the further inward movement of the tone

105 arm thus withdraws B^{11t} from the bar H^t and allows the latch pin H^{2t} to drop into engagement with the rack C_B whereby the lever L^{21} is locked in the required position and thus the lever L^{21} and bar H^t act as an out-

110 ward limit stop for the tone arm when automatically repeating a record and ensure the stylus entering the approximate beginning of a chosen record (which is not necessarily

115 the position in which the stylus was first placed).

The roller L^A is preferably mounted eccentrically so as to clear the edge of the record when the same rotates.

In this case any suitable repetition actuating mechanism may be employed.

120

It will, of course, be obvious that the foregoing examples are given by way of illustration and not of limitation, as various modifications may be made in the details of

125 construction and various mechanical equivalents employed as may be found necessary to meet any particular practical requirements which may have to be fulfilled.

Having now described my invention what

130

I claim as new and desire to secure by Letters Patent is:—

1. Automatic repeating apparatus for disc talking machines and the like applicable to any standard diameter of record disc and extent of phonic record thereon, comprising a reproducer, means for automatically returning the reproducer to the sound commencement position after a sound reproduction has been completed, a limiting device to limit the return travel of the reproducer and means associated with the reproducer and the limiting device for initially setting the limiting device upon the manual raising and initial setting of the reproducer.

2. Automatic repeating apparatus for disc talking machines and the like applicable to any standard diameter of record disc and extent of phonic record thereon, comprising a reproducer, means for automatically returning the reproducer to the sound commencement position after a sound reproduction has been completed, a limiting device to limit the return travel of the reproducer and means associated with the reproducer and the limiting device for initially setting the limiting device upon the manual raising and initial setting of the reproducer said means including two members arranged to engage and be disengaged from each other by the manual movement of the reproducer.

3. An apparatus of the kind defined by claim 2 wherein means is associated with the limiting device for gently replacing the reproducer stylus in the starting position after the reproducer has returned to repeat.

4. Automatic repeating apparatus for disc talking machines and the like applicable to any standard diameter of record disc and extent of phonic record thereon, comprising in combination a tone arm mounted for vertical oscillatory and horizontal swinging movement, a reproducer associated with the tone arm and arranged to swing vertically with respect thereto, a revolving record table, an arm carried with the tone arm and arranged beneath the record table, means mounted on the arm and coacting with the table for automatically returning the reproducer to the sound commencement position after a sound reproduction is completed, a

limiting device to limit the return travel of the reproducer, means associated with the reproducer, tone arm, the second arm and the limiting device for initially setting the limiting device upon the manual raising and initial setting of the reproducer.

5. Automatic repeating apparatus of the kind defined by claim 4 wherein the limiting device includes a slidable and rotatable spindle having a fall shoulder and a recessed cam coacting with the spindle for facilitating the return movement of the reproducer.

6. Apparatus of the kind defined by claim 4 wherein the means for initially setting the limiting device includes a resiliently controlled horizontally swinging segmental lever, a pivotally mounted catch associated with the lever, a slidably mounted releasing member for coacting with the catch, coacting members associated with the tone arm and the reproducer, and a "Bowden" wire connection between the member on the tone arm and the slidable catch releasing member.

7. Apparatus of the kind defined by claim 4 wherein means is associated with the means which sets the limiting device for positively ensuring of the operation of the means for returning the reproducer to the sound commencement position.

8. Automatic repeating apparatus of the kind defined by claim 4 wherein the limiting device includes a slidable and rotatable spindle arranged beneath the table and having a fall shoulder and a reduced portion, a recessed cam operably mounted on the arm carried by the tone arm and coacting with the spindle for facilitating the return movement of the reproducer, a projection also carried by said arm, an adjustable stop member mounted beneath the table for coacting with the projection and another cam associated with the projection for coacting with the reduced portion of the spindle for gently replacing the reproducer stylus in the starting position after the reproducer has returned to repeat.

In testimony whereof I have signed my name to this specification.

FRANK BOWLEY MITCHELL.