Jan. 5, 1943. E. O. THOMPSON 2,307,170

PHONOGRAPH TRIP MECHANISM

Filed Sept. 3, 1941

Fig. 1.

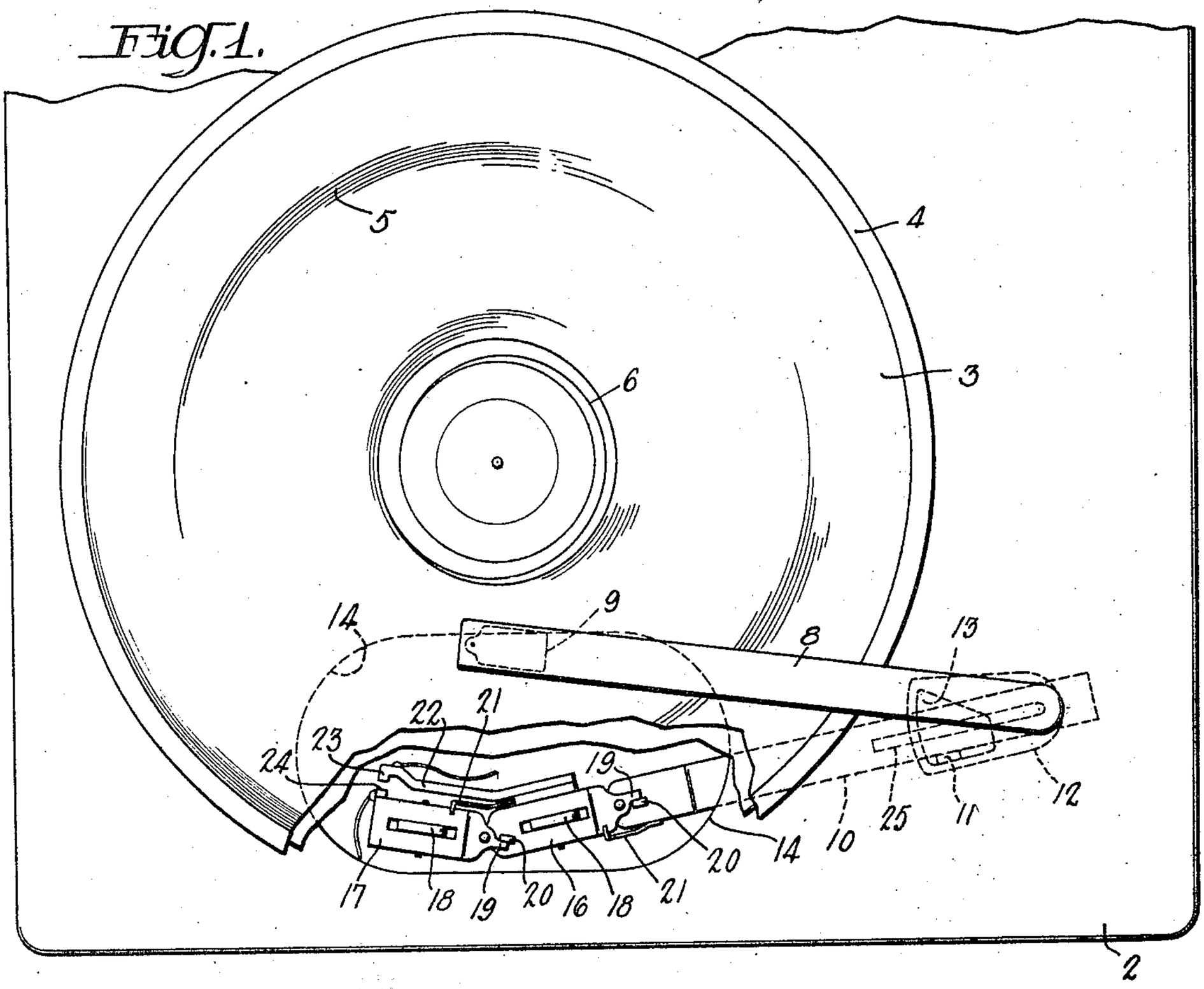
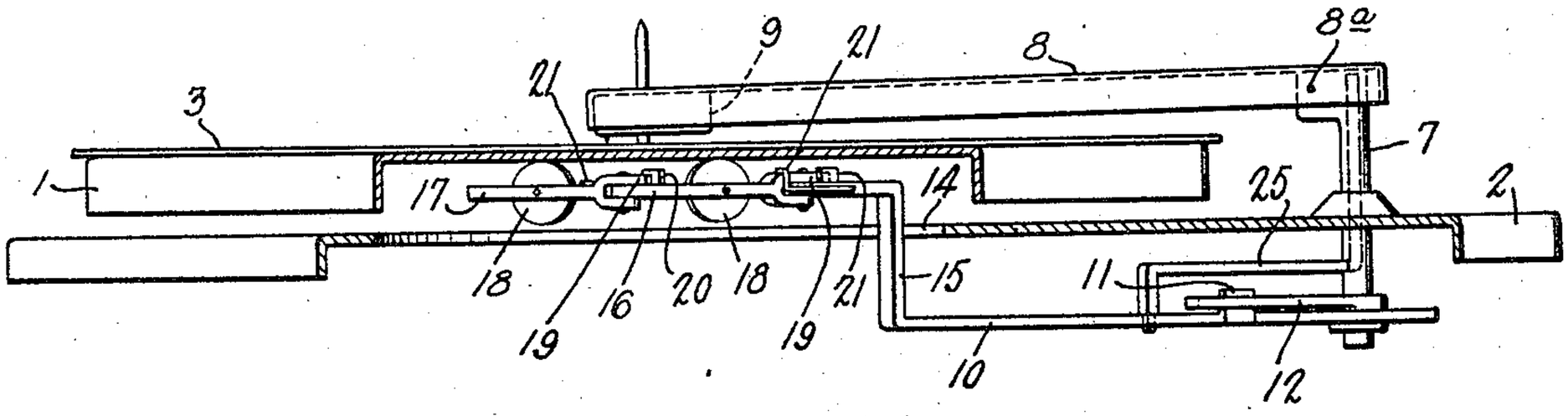


Fig. 2.



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Patented Jan. 5, 1943 2,307,170

UNITED STATES PATENT OFFICE

2,307,170

PHONOGRAPH TRIP MECHANISM

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Application September 3, 1941, Serial No. 409,425

17 Claims. (Cl. 192—118)

This invention relates to automatic phonographs of the type having a trip mechanism for initiating the operation of auxiliary apparatus, such as a relay, at the end of the playing of a record. More particularly, the invention relates to a phonograph wherein the auxiliary apparatus is initiated by a trip mechanism responsive to the rate of movement of the tone arm pickup over the record being reproduced.

A trip mechanism of the above type is adapted to function at the end of a recording as the pickup stylus moves out of the reproducing grooves into a spiral of greater pitch, or an eccentric groove; or in the event that the tone arm moves too rapidly at any time during the playing of a recording. By way of example, the trip itself may be of the type which is triggered by the more rapid than normal movement of the pickup and which, in turn, serves to trigger a suitable mechanism adapted to lift the tone arm and swing it off the record, in order that a succeeding recording may be placed upon the turntable.

The principal object of the present invention is to provide a simplified and improved trip mechanism employing a novel principle of operation.

A more specific object of the present invention is to provide a trip mechanism of the above noted character wherein a contact element is moved by the tone arm in a predetermined path during the playing of a record, a second contact element is caused to move along a path in closely spaced relation to the first contact, and a novel means is provided for actuating said contacts to cause engagement thereof only when the tone arm moves at a greater than normal rate.

The present invention may be fully understood by reference to the accompanying drawing and following description.

In the drawing:

Fig. 1 is a top plan view of a phonograph embodying one form of this invention; and

Fig. 2 is a sectional view of the device of Fig. 1.

The present invention is illustrated as it may be applied to a simple automatic phonograph. A turntable 1 having a smooth undersurface is mounted on a baseplate 2 and is adapted to be rotated by a motor (not shown). On the turntable there is indicated a recording 3 having a clear outer peripheral margin 4, a low pitch spiral sound groove 5 and a high pitch spiral terminating groove 6. Pivotally mounted on the baseplate 2 there is a hollow vertical shaft 7 which extends above and below the baseplate as shown. At its upper end, shaft 7 supports the outer end of a tone arm 8 from a pivot 8a. A reproducing element 9 is carried by the inner end of the tone arm. At its lower end the shaft 7 carries a pivotally mounted arm 10 which is free to rotate on shaft 7. Near its pivotal mounting arm 10 has an upstanding projection 11 which is adapted to be engaged by a yoke member 12 which is fixedly secured to the shaft 7 immediately above the arm 10. As shown, yoke 12 has an opening 13 into which projection 11 extends. Yoke 12 and projection 11 form a lost motion driving linkage between the tone arm 8 and the arm 10, the purpose of which will be made clear hereinafter.

The baseplate 2 has a large opening 14 positioned beneath the turntable, and arm 10 is formed near its free end with an upwardly extending portion 15 which extends through the baseplate opening. On the free end of arm 10 there is pivotally supported an element 16 and at the free end of element 16 there is pivotally supported a second element 17. Both elements 16 and 17 have openings in the center thereof in which there are mounted small wheels 18 which are preferably covered with soft rubber or a like substance. As shown in the drawing, these wheels 18 are normally maintained in engagement with the undersurface of the turntable, preferably by inherent resilience in the arm 10. If desired, however, the wheels 18 could be caused to move over any suitable rotating surface other than the turntable as, for example, a cylindrical drum rotating about a horizontal axis. Both elements 16 and 17 are provided with projecting fingers 19 which extend toward stops 20 mounted on arm 10 and element 16 respectively. Light wire springs 21 are provided to normally maintain the projections 19 against the stops 20 by tending to rotate elements 16 and 17 about their respective pivotal mountings. The element 16 carries an extending finger 22 which terminates in a contact element 23, and element 17 carries a contact element 24. The contacts 23 and 24 are arranged to be in closely spaced relation when the elements 16 and 17 are in the relative position shown in the drawing. These contacts may constitute the switch contacts for a relay (not shown) which is adapted when energized to initiate the actuation of a record change mechanism. Such a relay and mechanism are illustrated in the copending application of R. S. Crammer and C. A. Pittman, Serial No. 407,788, filed August 21, 1941.

In order to flex the arm 10 to lower the wheels

18 away from the undersurface of turntable 1, there is provided a linkage actuable by the tone arm 8. This linkage comprises the angle member 25 which has a portion extending upwardly through the hollow shaft 7 to engage the undersurface of the tone arm rearwardly of the pivot 8a and a second portion parallel to the first portion extending downwardly into fixed engagement with the arm 10 (see Fig. 2).

Having thus described the several components of one form of this device, the operation thereof may now be considered. The tone arm 8 is movable about the pivot formed by the shaft 7 from a position clear of the turntable 1, laterally over the record to the inner terminating groove thereof. The tone arm is also movable about its pivot 8a from a position where the reproducing element 9 engages the recording to an elevated position where element 9 is free of the recording. These movements of the tone arm may be automatically controlled in case the present invention is applied to some form of automatic record changing mechanism. In Fig. 1 the reproducing element is shown on a recording near the center thereof. In this condition the tone arm is being advanced toward the center of the record at a relatively slow rate. Yoke 12 is rotating with tone arm 8 and by virtue of the engagement of yoke 12 with projection 11 which has just taken place, the arm 10 is also being rotated. The turntable 1, running at a steady speed, causes the two wheels 18 to rotate about their axes of rotation, and the elements 16 and 17 initially to assume the positions shown in Fig. 1.

As the tone arm 8 moves toward the center of the record. the arm 10 leads the elements 16 and 17 radially inward across the undersurface of the turntable. As the end of arm 10 moves very slowly through an arc about shaft 7 as a center, the pivotal connection between arm 10 and element 16 draws the wheel 18 of element 16 slowly inward, the element 16 rotating very gradually counter-clockwise about the point of contact of the wheel with the undersurface of the turntable This movement of element 16 causes element 17 to rotate very gradually in a clockwise direction about the point of contact of its wheel with the turntable surface. It should be remembered that the springs 21 are very light, and they permit the above-mentioned movements of elements 16 and 17. These movements tend to bring contacts 23 and 24 toward each other, but since the said movements are very gradual and since arm 10 moves through a small arc, the contacts are not brought into engagement with one another until the reproducer 9 reaches the end of the recording.

When the reproducer 9 enters the spiral terminating groove 6 the arms 8 and 10 are caused to rotate more rapidly and element 16 is caused to rotate more rapidly counter-clockwise about the point of contact of its wheel 18 and turntable 1. Similarly the rapid rotational movement of element 16 causes element 17 to rotate more rapidly clockwise about the point of contact of its wheel 18 with the turntable 1. The rapid opposed movements of elements 16 and 17 cause the contacts 23, 24 to engage one another to initiate operation of a device such as above mentioned.

Assuming that the trip mechanism serves to actuate an automatic record changer, the latter will elevate tone arm 8. This motion will cause link 25 to be moved downwardly so as to flex arm 10 and cause the disengagement of wheels 18 from the turntable 1, whereupon the elements 16 and 17 will assume their normal positions. Thereafter the tone arm 8 may be rotated laterally clear of the recording. During the first portion of this movement, arm 10 will remain stationary while the yoke 12 is rotated until projection 11 is engaged by the opposite face of the opening 13. Opening 13 preferably is so designed that when tone arm 8 has been moved outward to its extreme lateral position, the arm 10 will have been moved to a position just inside the outer margin of turntable 1. Then when a new recording has been placed on turntable 1, the tone arm 8 will be swung laterally inward and placed on the outer edge of the record. During this movement the arm 10 will again remain stationary due to the lost motion connection between yoke 12 and projection 11, and as the tone arm is lowered onto the edge of the record the arm 10 will flex upward to cause wheels 18 to again engage turntable 1, the elements 16 and 17 having assumed the relative positions shown in the drawing under the influence of the springs 21.

Thereafter the tone arm 8 will move across the record toward the inner edge thereof while arm 10 will remain stationary until projection 11 is engaged by yoke 12. From this point, the cycle above described will be repeated.

From the foregoing description it will be seen that the tripping action is effected when the joint between elements 16 and 17 is "broken" sufficiently to cause engagement of contacts 23 and 24 which constitute a trip means. The parts are so constructed that the joint does not "break" sufficiently to operate the trip means 23, 24 until the reproducer 9 enters the groove 6.

In cases where the arm 10 is of reasonable length compared to the radius of turntable 1 or where the angular rotation of the arm 10 during a cycle is very small, it will be possible to eliminate the element 17 by attaching the contacts 23, 24 to the arm 10 and element 16 respectively, but on the opposite sides thereof so that the contacts will become engaged upon more rapid than normal movement of the tone arm. However, it is preferable to use both elements 16 and 17 to insure that the changes in relative angular relation of arm 10 and member 16 as the latter moves slowly in toward the center of the turntable will not effect closure of contacts 23, 24. Also the arm 10 need not be pivotally mounted on shaft 7. Instead, it may be mounted on guides so that the end of the arm carrying element 16 will move radially of the turntable under the control of a flexible cable or other linkage driven by rotation of the shaft 7.

From the above description it will be seen that the present invention provides a novel electrical trip mechanism for automatic phonographs. It will be understood however that the principle disclosed herein is not limited to the single embodiment shown but that other forms, such as above mentioned, may be constructed in accordance with the invention as defined in the appended claims.

I claim:

1. In a trip mechanism for an automatic phonograph having a tone arm including a stylus adapted to move over a recording, a moving surface, a first means engaging said surface, a second means adapted to lead said first means over said moving surface in accordance with the movement of the tone arm over the recording, said first and second means being movable relative to each other in accordance with the rate of movement of

said tone arm, and trip means operable by the relative movement of said first and second means upon movement of said tone arm at a greater than normal rate.

2. In a trip mechanism for an automatic phonograph having a turntable and a tone arm adapted to move over a recording on the turntable, a first means engaging a surface of said turntable, a second means flexibly connected to said first means for guiding said first means across said surface in accordance with the movement of the tone arm over the recording, said flexible connection of said first and second means being such that relative movement of said first and second means will be caused upon movement of said tone arm at a greater than normal rate, and trip means operable by said relative movement.

3. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a first means making rolling contact with said surface, a second means flexibly connected to said first means for guiding said first means across said surface in a direction different from the direction of rotation of said surface in accordance with the movement of the tone arm over the recording, said flexible connection of said first and second means being about an axis normal to the plane of movement of said moving surface at the point of contact of said surface and said first means such that relative rotation of said first and second means will be caused upon movement of said tone arm at a greater than normal rate, and trip means operable by the relative rotation of said first and second means.

4. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a first means making rolling contact with said surface, a second means pivotally connected to said first means for guiding said first means across said surface in accordance with the movement of the tone arm over the recording, said pivot connection of said first and second means being normal to the plane of movement of said moving surface at the point of contact of said surface and said first means, whereby relative rotation of said first and second means will be caused upon movement of said tone arm at a greater than normal rate, and trip means operable by the relative rotation of said first and second means.

5. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a first means making rolling contact with said surface, a second means pivotally connected to said first means for guiding said first means laterally across said surface in accordance with the movement of the tone arm over the record, a first member associated with said first means, and a second member associated with said second means, said pivot connection of said first and second means being such as to permit relative rotation of said first and second means when said tone arm is advanced at a greater than normal rate, said relative rotation of said means being such as to cause coaction of said first and second members to initiate operation of the trip mechanism.

6. In a trip mechanism for an automatic phonograph having a tone arm including a stylus adapted to move over a recording, a moving surface, a first means engaging said surface, a second means flexibly connected to said first means for guiding said first means across said surface in accordance with the movement of the tone arm over the record, a first member associated with said first means, and a second member associated with said second means, said flexible connection of said first and second means being such as to permit relative movement of said first and second means when said tone arm is advanced at a greater than normal rate, said relative movement of said means being such as to cause coaction of said first and second members to initiate operation of the trip mechanism.

7. In a trip mechanism for an automatic phonograph having a turntable and a tone arm adapted to move over a recording on the turntable, a first means engaging a surface of said turntable, a second means flexibly connected to said first means for guiding said first means laterally across said surface in accordance with the movement of the tone arm over the record, an electrical contact on said first means, and an electrical contact on said second means, said contacts being normally adjacent each other but spaced apart, said flexible connection of said first and second means being such as to permit relative movement of said first and second means when said tone arm is advanced at a greater than normal rate to cause engagement of said contacts.

8. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a first means engaging said surface, a second means flexibly connected to said first means for guiding said first means across said surface in accordance with the movement of the tone arm over the recording, said second means comprising a first member engaging said surface and a guide member controllable by said tone arm, said first member and said guide member being flexibly connected, said flexible connections being such that relative movement of said first and second means will be caused upon movement of said tone arm at a greater than normal rate, and trip means operable by the relative movement of said first and second means.

9. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a first means making rolling contact with said surface, a second means pivotally connected to said first means for guiding said first means across said surface in accordance with the movement of the tone arm over the recording, said first means being carried by and maintained in engagement with said moving surface by said second means, said pivot connection of said first and second means being normal to the plane of movement of said moving surface at the point of contact of said surface and said first means, whereby relative rotation of said first and second means will be caused upon movement of said tone arm at a greater than normal rate, and trip means operable by the relative rotation of said first and second means.

10. In a trip mechanism for an automatic phonograph having a tone arm including a stylus adapted to move over a recording, a moving surface, a first means engaging said surface, a first member associated with said first means, a second means adapted to lead said first means over said moving surface in accordance with the movement of the tone arm over the recording, and a second member associated with said second means, said first and second means being movable relative to each other in accordance with the rate of movement of said tone arm, said relative movement of said means being such as

to cause coaction of said first and second members to initiate operation of the trip mechanism.

11. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a first means engaging said surface, a second means adapted to lead said first means over said moving surface in accordance with the movement of the tone arm over the recording, means coupling said tone arm to said second means and including a lost motion connection such that the range of movement of said second means is less than the range of movement of the tone arm, said first and second means being movable relative to each other in accordance with the rate of movement of said tone arm, and trip means operable by relative movement of said first and second means upon movement of said tone arm at a greater than normal rate.

12. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a first means engaging said surface, a second means adapted to lead said first means over said moving surface in accordance with the movement of the tone arm over the recording, said first and second means being movable relative to each other in accordance with the rate of movement of said tone arm, said relative movement of said first and second means serving to effect operation of the trip mechanism upon movement of said tone arm at a greater than normal rate, and means operable upon the disengagement of the tone arm from the recording for disengaging said first means from said surface.

13. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a first means engaging said surface, a second means flexibly connected to said first means for guiding said first means across said surface in accordance with the movement of the tone arm over the recording, said second means comprising a first member engaging said surface and a guide member controllable by said tone arm, said first member and said guide member being flexibly connected, means coupling said tone arm to said second means including a lost motion connection such that the range of movement of said second means is less than the range of movement of the tone arm, and means operable upon the disengagement of the tone arm from the recording for disengaging said first means and said first member from said surface, said flexible connections being such that relative rotation of said first and second means will be caused upon movement of said tone arm at a greater than normal rate, said relative rotation of said means serving to effect operation of the trip mechanism.

14. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a first means making rolling contact with said surface, a second means pivotally connected to said first means for guiding said first means across said surface in accordance with the movement of the tone arm over the recording, said first means being carried by and maintained in engagement with said moving surface by said second means, means coupling said tone arm to said second means including a lost motion connection such that the range of movement of said second means is less than the range of movement of the tone arm, and means operable upon the disengagement of the tone arm from the recording for disengaging said first means from said surface, said pivot connection of said first and second means being normal to the plane of movement of said moving surface at the point of contact of said surface and said first means, whereby relative rotation of said first and second means will be caused, upon movement of said tone arm at a greater than normal rate, to initiate operation of the trip mechanism.

15. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a first means making rolling contact with said surface, a second means pivotally connected to said first means for guiding said first means across said surface in accordance with the movement of the tone arm over the recording, means operable upon the disengagement of the tone arm from the recording for disengaging said first means from said surface, and light spring and stop means tending to maintain a normal angular relation between said first and second mears when said last means is operable, said pivot connection of said first and second means being normal to the plane of movement of said moving surface at the point of contact of said surface and said first means, whereby relative rotation of said first and second means will be caused, upon movement of said tone arm at a greater than normal rate, to initiate operation of the trip mechanism.

16. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a member movable by said tone arm in proximity to said surface, a second member attached to said first member and movable relatively thereto, means tending to maintain a predetermined positional relationship between said members, a roller on said second member engaging said surface and adapted to effect gradual movement of said second member relative to said first member as the roller moves over said surface, and trip means operable by the relative movement of said members upon movement of said tone arm at a greater than normal rate.

17. In a trip mechanism for an automatic phonograph having a tone arm adapted to move over a recording, a moving surface, a member movable by said tone arm, a second member pivotally connected to said first member, means tending to maintain a predetermined positional relationship between said members, a roller on said second member engaging said surface and adapted to effect gradual movement of said second member relative to said first member as the roller moves over said surface, a third member pivotally connected to said second member, means tending to maintain a predetermined positional relationship between said second and third members, a roller on said third member engaging said surface, whereby said third member is gradually moved relative to said second member, and trip means operable by the relative movement of said second and third members upon movement of said tone arm at a greater than normal rate.

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