Oct. 17, 1950 A. C. MATTHEWS 2,525,926

TONE ARM LATCHING MECHANISM

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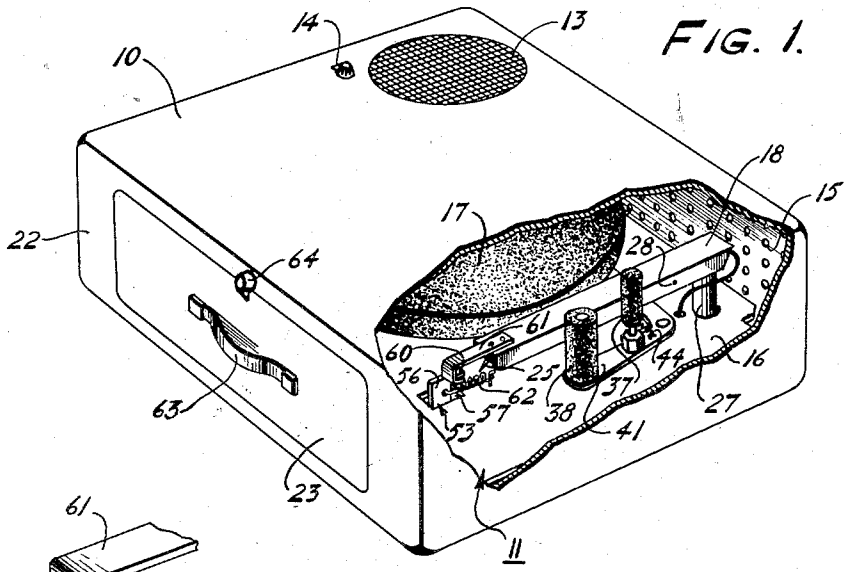


FIG. 1.

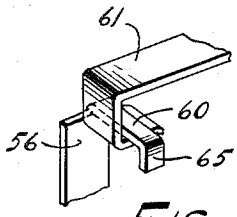


FIG. 6.

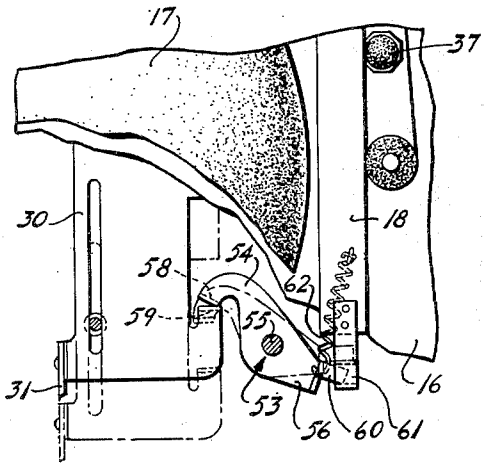


FIG. 4.

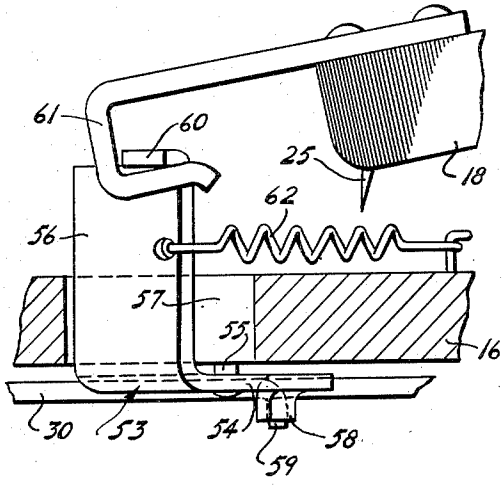


FIG. 5.

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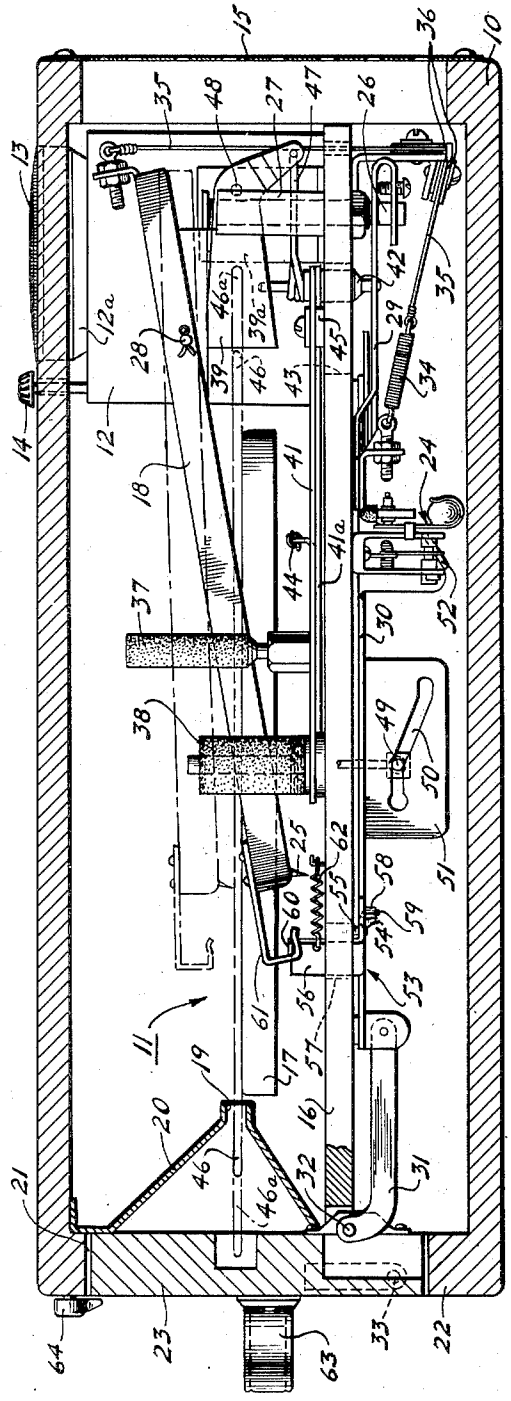


FIG. 2.

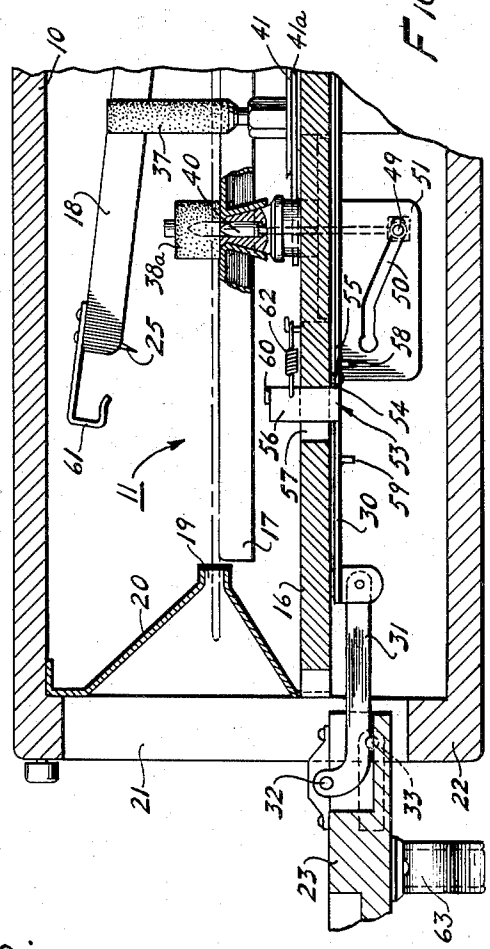


FIG. 3.

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2,525,926

TONE ARM LATCHING MECHANISM

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Application July 1, 1947, Serial No. 758,322

8 Claims. (Cl. 274—2)

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The present invention relates to phonograph apparatus and, particularly, to portable semi-automatic phonographs. More specifically the invention pertains to improvements in a phonograph apparatus of the character disclosed and claimed in a copending application of Emil Harman, Serial #588,924, filed April 18, 1946, now Patent No. 2,508,715, issued May 23, 1950.

Such an apparatus is provided with an opening through which records may be inserted and removed, and with a closure member or door which, when closed, conceals said opening. The user has only to open and close the door, and to insert and remove records. The operating parts are automatically actuated in response to these acts on the part of the user. Opening of the door moves and locates the tone-arm in an operative position so that, when the door is closed, the tone-arm is lowered and the pick-up engages the starting groove of an inserted record. If no record is on the turntable and the door is closed, the tone-arm is lowered to an inoperative position. In this inoperative position, the tone-arm is freely suspended and consequently the pick-up and, particularly, its stylus are subject to injury when the apparatus is moved or transported.

It is, therefore, the primary object of this invention to prevent undue movement of the tone-arm when in the above mentioned inoperative position, and thus, to protect the pick-up and its stylus against breakage or injury while moving or transporting the apparatus. Basically, this object of the invention is obtained by providing means effective, when the closure member is closed, to maintain the tone-arm in its lowermost or inoperative position.

It is also an object of the invention to insure automatic unlocking of the tone-arm when the closure member is opened and, further, to insure automatic and positive locking of the tone-arm when the closure member is closed. To that end, the invention employs a tone-arm latching arrangement cooperatively associated with said member to be actuated in response to movements thereof, the association of said latching arrangement with the closure member being such that latching is effected only when the tone-arm is lowered to inoperative position and the closure member is closed.

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Another object of the invention concerns an arrangement which is effective to latch the tone-arm only if the tone-arm is allowed to reach its inoperative position because of the absence of a record on the turntable. To accomplish this object, the invention employs a tone-arm latching structure which cannot interfere with the normal operation of the tone-arm, although said structure is capable of effecting automatic and positive locking of the tone-arm when the latter is lowered to inoperative position.

Still another and more specific object of the invention has to do with an arrangement whereby latching of the tone-arm occurs during the final closing movement of the door, that is after such closing movement has fully lowered the tone-arm, and whereby unlocking of the tone-arm occurs during initial movement of the door, that is before said opening movement starts to lift the tone-arm. To realize this object, the invention provides means movable into and out of latching engagement with the tone-arm in response to closing and opening movements of the door and in synchronism with the tone-arm lowering and lifting functions of the door. This feature of the invention makes it possible to insure that the tone-arm is at rest in its lowermost or inoperative position before the latching means is moved into engagement with the tone-arm and, further, to insure that the latching means is moved completely out of engagement with the tone-arm before its lifting movement is initiated.

These and other objects of the invention, and the manner in which they are obtained, will be more fully understood from the following description based on the accompanying drawings in which:

Figure 1 is a perspective view of a portable phonograph constructed in accordance with the invention, a portion of the casing being broken away for clarity of illustration;

Figure 2 is an enlarged transverse section through one side of the phonograph casing and illustrating the phonograph apparatus in elevation, with the door closed;

Figure 3 is a fragmentary cross-sectional view of a portion of the structure shown in Figure 2, but with the door open;

Figure 4 is a fragmentary top plan view il-

lustrating the tone-arm latching mechanism and its operation;

Figure 5 is an enlarged detailed view of the tone-arm latch; and

Figure 6 is a perspective view showing, on an enlarged scale, a portion of the structure shown in Figure 1, but with an element added to the latch.

With particular reference to the drawings, the portable phonograph, is illustrated, comprises a casing 10 completely enclosing the phonograph apparatus designated in its entirety by the reference character 11. The casing also conveniently encloses an audio-frequency amplifier, generally indicated at 12 (Figure 2), including the usual loud speaker, power supply and volume control. As shown in Figures 1 and 2, a grille-protected opening 13 is provided in one wall of the casing, the mouth 12*a* (Figure 2) of the loud speaker being disposed to register with said opening, so that emitted sound may be clearly audible. Also, as shown in Figures 1 and 2, a combined power supply switch and volume control knob 14 is accessible from the outside of the casing. Moreover, the casing is provided with a suitable perforated screen 15 which allows circulation of cooling air through said casing.

The phonograph apparatus is supported within casing 10 by means of a shelf or panel 16. The phonograph turntable and tone-arm are shown at 17 and 18, respectively. During operation, the phonograph apparatus is inaccessible to the user, and provision is made for the playing of a record by inserting it into slot 19 (Figures 2 and 3) in a member 20 which is disposed in registry with an opening 21 in side wall 22 of the casing. A manually operable element serves to control the turntable and the tone-arm. As shown in Figures 1, 2 and 3, this element takes the form of a closure member or door 23 which is hingedly mounted, as at 33, on the casing and which, when closed, occupies opening 21.

The turntable is driven, in conventional manner, by means of the usual driving motor unit (not shown) which is controlled through a switch mechanism 24 (Figure 2). The tone-arm which carries a suitable pick-up including a needle or stylus 25, is mounted on a spindle 26 (see Figure 2) which is rotatably supported in a hollow post 27 on panel 16, so that the tone-arm is adapted to move the pick-up stylus in a plane generally paralleling the plane of the record supporting surface of the turntable. Moreover, the tone-arm is pivotally mounted on a pivot 28 so as to move the pick-up in a plane traversing the plane of said surface of the turntable. The tone-arm spindle 26 is provided with an extending arm 29, the purpose of which is to actuate switch mechanism 24 at the end of the playing of a record so as to effect automatic deenergization of the turntable driving motor.

As previously mentioned, the operating parts are controlled by movement of member or door 23. For that purpose, a rectilinearly slidable member 30 is provided on the underside of supporting panel 16. One end of this slide member is pivotally connected with a link 31 (Figures 2 and 3) which, in turn, is pivotally connected with member 23 as shown at 32. Thus, when the door is opened, link 31 is pulled so as to move slide member 30 from the position shown in Figure 2 to the position shown in Figure 3 and, when the door is closed, these parts are moved in the reverse direction to the position shown in Figure 2.

As seen in Figure 2, the other end of the slide member is connected, through a helical spring 34, with a flexible element, such as a cord 35, which rides on pulleys 36 and is attached to tone-arm 18. The cord and pulley arrangement is such that when the door is opened, the tone-arm is subjected to both vertical and horizontal force components which act to lift the tone-arm and to urge it against a stop 37. This stop is adapted to arrest the tone-arm in record starting position so that, upon closing movement of the door, the tone-arm is lowered and the pick-up stylus engages the starting groove of a record on the turntable.

The phonograph apparatus is automatically adjusted to play different sized records, for instance, to play either a conventional 10" or 12" record. The automatic adjustment is accomplished by means of record feeler and centering mechanisms which essentially comprise a pair of side guides 38 and 38*a* (Figures 2 and 3), a pair of back stop members 39 and 39*a* (Figure 2) and a record center-hole engaging spindle 40 (Figure 3). Side guides 38 and 38*a* are relatively disposed on opposite sides of turntable 17 and are carried by pivoted levers 41 and 41*a* connected by means of a pin 42 (Figure 2) which is free to slide in a slot 43 in base panel 16. A spring 44 is connected to both levers and normally urges the same toward one another. This movement, however, is limited by means of an adjustable stop 45 engageable with one of said levers.

One back stop 39 is adapted to cooperate with side guides 38 and 38*a* to determine the approximate centering position of a smaller size or 10" record which is indicated at 46 in Figure 2. The other back stop 39*a* is adapted to cooperate with side guides 38 and 38*a* to determine the approximate centering position of a larger size or 12" record which is indicated at 46*a* in Figure 2. When a larger size record is inserted, it engages the side guides 38 and 38*a* and causes levers 41 and 41*a* to spread. The spreading of the levers causes pin 42 to slide in slot 43 and to pull on link 47 connected with back stop 39 which then swings about pivot 48 and out of the way of back stop 39*a*.

The spindle 40, as shown in Figure 3, is retractably mounted in the center of the turntable and is adapted to effect final centering of either a 10" or a 12" record. For that purpose, the spindle is provided with means 49 (Figures 2 and 3) in engagement with a slot 50 arranged in a plate 51 movable with the door-actuated slide member 30. Slot 50 is so arranged as to cause the spindle to move to its retracted position when the door is open (Figure 3) and as to cause the spindle to move to its projected position when the door is closed (Figure 2).

It is pointed out that the tone-arm stop 37 is mounted on lever 41 of the feeler mechanism, so that the position of the tone-arm is automatically adjusted to start the playing of either a 10" or a 12" record upon closing the door. It is moreover pointed out that closing of the door also actuates switch mechanism 24 to energize the turntable driving motor. This is accomplished by means of a switch actuating finger 52 (Figure 2) on the slide member 30. This finger is also adapted to actuate the switch mechanism to deenergize the motor when the door is opened before actuation of said mechanism by trip arm 29.

The apparatus thus far described is set out in greater detail in the above identified Harman

application to which reference may be had for a more complete description of the construction and operation of the parts of such apparatus. It is to be understood that this apparatus forms no part of the present invention except in so far as it relates to and affects the construction and operation of the characteristic features of the invention, which will now be described.

As particularly appears from Figures 1 and 2, when no record is on the turntable and the door is closed, the tone-arm 18 is adapted to assume an inoperative position in which the pick-up carrying end of said tone-arm lies to the side and below the level of the playing surface of the turntable. In accordance with the present invention, mechanism is provided whereby the tone-arm, when in the mentioned inoperative position, is prevented from moving to injure the pick-up during transportation of the portable phonograph. Broadly, this mechanism functions to maintain the tone-arm in inoperative position when the tone-arm is moved to inoperative position, and when the closure member or door is closed. As shown, the mechanism includes an element 53 which upon closing of the door is actuated to engage and to latch the tone-arm in its inoperative position, and which upon opening of the door is actuated to disengage and to free the tone-arm for subsequent movement to operative position. For that purpose, the latch element is associated with slide member 30 which, as previously indicated, is actuated by movement of the door and serves as the controlling element for lifting, swinging and lowering tone-arm 18, for projecting and retracting record centering spindle 40, and for operating the motor switch mechanism.

In practice, the latch element 53 has a portion 54 which is mounted to swing about a pivot 55 on the underside of supporting panel 16, and has a portion 56 which passes through an aperture 57 in said panel and extends to a point above the upper side of the latter but below the playing surface of the turntable. The size of aperture 57 is such as to allow pivotal movement of element 53 to and from latching and unlatching positions. The portion 54 of latch element 53 is provided with a projection 58 disposed to be engaged by a lug 59 on slide member 30 when said member is moved by closing movement of the door. The extended portion 56 of the latch element is provided with an extension 60 disposed for engagement with a keeper 61 conveniently arranged on the tone-arm. A spring 62 is provided to urge the latch element out of engagement with the latch keeper 61.

The operation of the latching means constructed as above described, will be understood by referring to Figure 4. As illustrated in Figure 4, latching occurs when slide member 30 is moved from the position shown in broken lines to the position shown in full lines, and unlatching occurs when said slide member is moved from the position shown in full lines to the position shown in broken lines. Movement of the slide member from the broken line position to the full line position is in response to the closing of the door. In such movement, lug 59 on the slide member comes in contact with projection 58 on portion 54 of the latch element and causes the same to swing about pivot 55 and against the force of spring 62. When this action takes place, extension 60 on portion 56 of the latch element engages keeper 61 on tone-arm 18. In this connection, it is to be noted that the relationship between the tone-arm movement to inoperative position and the latch movement to latching position is such that latching takes place after the tone-arm has fully reached its inoperative position. Accordingly, the initial closing movement of the door is utilized to lower the tone-arm, and the continued or final movement of the door is utilized to move the latch into engagement with the tone-arm. When latched, the tone-arm is effectively held against undue swinging movement about pivot 23 (Figures 1 and 2). Moreover, the tone-arm and its spindle 23 (Figure 2) are prevented from undue swinging movement in relation to supporting post 27 (Figures 1 and 2), because such movement is limited in one direction by portion 56 of the latch element, and in the other direction by either the stop 37 or the side guide 38, or both. However, if desired, the latch element 53 may be provided with means to prevent movement of the tone-arm in the last mentioned direction. A practicable embodiment of this means is shown in Figure 6 in which the extension 60 is provided with a portion 65 disposed for engagement with keeper 61 to prevent movement of the tone-arm in said direction. Therefore, the apparatus can be transported without danger of breaking or injuring the pick-up or its stylus.

Referring again to Figure 4, the movement of slide member 30 from the full line position to the broken line position is in response to the opening movement of the door. In such movement, lug 59 on the slide member is retracted from engagement with projection 58 on portion 54 of the latch element which is then caused to swing reversely about pivot 55 by action of spring 62. When this action takes place, extension 60 on portion 56 of the latch element moves away from keeper 61 on tone-arm 18. Accordingly, the tone-arm is then free to be lifted to operative position. In this connection, it is to be noted that movement of the latch to unlatching position, and lifting movement of the tone-arm to operative position, are so related that the unlatching occurs prior to the lifting of the tone-arm. For that purpose, the initial opening movement of the door is utilized to move the latch out of engagement with the tone-arm, and the continued opening movement of the door is utilized to lift the tone-arm.

A handle 63 is provided for convenience in carrying and transporting the apparatus. This handle, as shown in Figures 1, 2 and 3, is advantageously mounted on the door 23 and thus serves the additional function of providing convenient means to open the door. A suitable catch 64 serves to lock the door in its closed position and to prevent the door from opening while transporting the apparatus.

From the foregoing, it will be appreciated that the invention provides a simple yet dependable arrangement whereby the tone-arm of a portable phonograph, when not in use, is securely latched in place so that the tone-arm and the pick-up or parts thereof are effectively protected against injury. The use of the invention is particularly advantageous because latching and unlatching of the tone-arm does not require attention on the part of the user, but is accomplished automatically in response to manual movement of a single element. Moreover, the fact that the element which effects latching and unlatching of the tone-arm also controls all of the functions necessary to move the tone-arm to and from oper-

ative and inoperative positions, affords maximum simplicity of the manual operations required in using the apparatus.

Although a specific embodiment of the invention has been described with great particularity, it is to be understood that this has been done by way of example only. Various changes in the details of construction and in the combination of elements may be resorted to without departing from the spirit of the invention which is subject to only such limitations as are specifically called for in the appended claims.

I claim:

1. In a phonograph apparatus, a casing having an opening for the insertion and removal of records, a closure member on said casing adapted, when closed, to conceal said opening, a rotatable record supporting member arranged within said casing to receive an inserted record, sound reproducing means including a tone-arm arranged within the casing and movable to operative and inoperative positions with respect to said record supporting member, means operable in response to closing movement of the closure member to move the tone-arm to inoperative position, and an element movable into engagement with the tone-arm in response to closing movement of said closure member to maintain the tone-arm in inoperative position.

2. In a phonograph apparatus, a casing having an opening for the insertion and removal of records, a closure member on said casing adapted, when closed, to conceal said opening, a rotatable record supporting member arranged within said casing to receive an inserted record, sound reproducing means including a tone-arm arranged within the casing and movable to operative and inoperative positions with respect to said record supporting member, and mechanism in cooperative relation with the closure member and with the tone-arm, and responsive to closing movement of the closure member first to move the tone-arm to inoperative position and then to latch the tone-arm in such position.

3. In a phonograph apparatus, a casing having an opening for the insertion and removal of records, a closure member on said casing adapted, when closed, to conceal said opening, a rotatable record supporting member arranged within said casing to receive an inserted record, sound reproducing means including a tone-arm arranged within said casing and movable to operative and inoperative positions with respect to said record supporting member, means operable in response to closing movement of the closure member to move the tone-arm to inoperative position, and operable in response to opening movement of said closure member to move the tone-arm to operative position, and an element movable into engagement with the tone-arm in response to closing movement of said closure member to maintain the tone-arm in inoperative position, and movable out of engagement with the tone-arm in response to opening movement of said closure member to free the tone-arm for movement to operative position.

4. In a phonograph apparatus, a casing having an opening for the insertion and removal of records, a closure member on said casing adapted, when closed, to conceal said opening, a rotatable record supporting member arranged within said casing to receive an inserted record, sound reproducing means including a tone-arm arranged within the casing and movable to operative and inoperative positions with respect to said record supporting member, and mechanism in cooperative relation with the closure member and with the tone-arm, and responsive to closing movement of the closure member first to move the tone-arm to inoperative position and then to latch the tone-arm in such position, and responsive to opening movement of the closure member first to unlatch the tone-arm and then to move it to operative position.

5. In a phonograph apparatus, a casing having an opening for the insertion and removal of records, a record supporting turntable arranged within said casing to receive an inserted record, a tone-arm arranged within said casing for movement into and out of engagement with a record on the turntable and for further movement into and out of an inoperative position when no record is on the turntable, a latch disposed in the housing to move into and out of engagement with the tone-arm when in said inoperative position, and a manually movable member mounted on said casing and connected with the latch and with the tone-arm to cause movement of the tone-arm to said inoperative position prior to movement of the latch into engagement with the tone-arm, and to cause movement of the latch out of engagement with the tone-arm prior to movement of the tone-arm from said inoperative position.

6. In a phonograph apparatus, a casing having an opening for the insertion and removal of records, a record supporting turntable arranged within said casing to receive an inserted record, a tone-arm arranged within said casing for movement into and out of engagement with a record on the turntable and for further movement to an inoperative position when no record is on the turntable, a manually movable member on said casing, and mechanism including means operable in response to initial movement of said member in one direction to move the tone-arm to inoperative position and other means operable in response to further movement of said member in said one direction to engage the tone-arm and to retain it in said position.

7. In a phonograph apparatus, a casing having an opening for the insertion and removal of records, a record supporting turntable arranged within said casing to receive an inserted record, a tone-arm arranged within said casing for movement into and out of engagement with a record on the turntable and for further movement to an inoperative position when no record is on the turntable, a manually movable member on said casing, and mechanism including means operable in response to initial movement of said member in one direction to move the tone-arm to inoperative position and in response to final movement of said member in the reverse direction to move the tone-arm out of inoperative position, and other means operable in response to further movement of said member in said one direction to engage the tone-arm and to retain it in inoperative position and in response to initial movement of said member in said reverse direction to disengage the tone-arm for movement out of inoperative position.

8. In a phonograph apparatus, a casing having an opening for insertion and removal of records, a record supporting turntable and a tone-arm enclosed in said casing, and mechanism operable from outside of said casing to provide for lifting of the tone-arm to operative position and for lowering of the tone-arm to inoperative position, and further to provide for retention of the tone-arm when lowered to inoperative po-

sition, said mechanism including: a member arranged for sliding movement in said casing, a linking device between said member and the tone-arm to lift and to lower the latter in response to sliding movement of said member, and a latch element pivotally mounted in said casing and disposed in cooperative relationship with said member to be moved thereby out of engagement with the tone-arm in response to sliding movement of said member prior to lifting the tone-arm, and into engagement with the tone-arm in response to sliding movement of said member after lowering the tone-arm.

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