United States Patent

Lumney et al.

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[45] **Sept. 12, 1972**

[54] **ELECTROMECHANICAL SELECTOR UNIT**

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[73] Assignee: The Wurlitzer Company, Chicago, Ill.

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[21] Appl. No.: **619,686**

[52] **U.S. Cl.** .....**274/10 D**

[51] **Int. Cl.** **G11b 17/22**

[58] **Field of Search** ...274/10.1, 10; 194/15; 340/162

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[57] **ABSTRACT**

This invention relates generally to an automatic phonograph, and more particularly to a control apparatus for selecting a predetermined record or a predetermined series of records from a record storage magazine in which a large number of records are stored.

A series of selector pins or levers is arranged in an arc, and a moving electromagnet acts on selected pins corresponding to selected records to move and set the pins while the electro magnet is moving.

11 Claims, 24 Drawing Figures

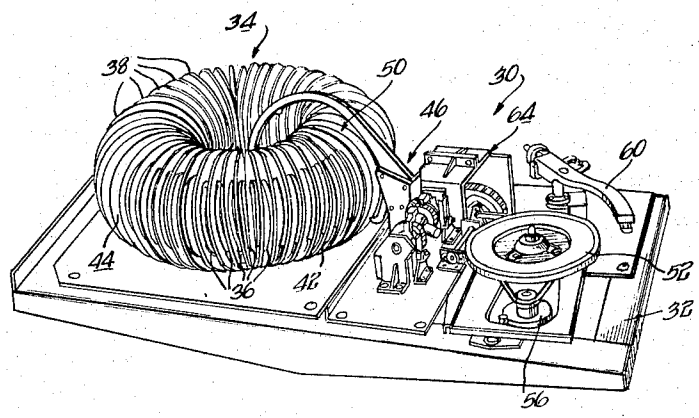

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FIG. 1

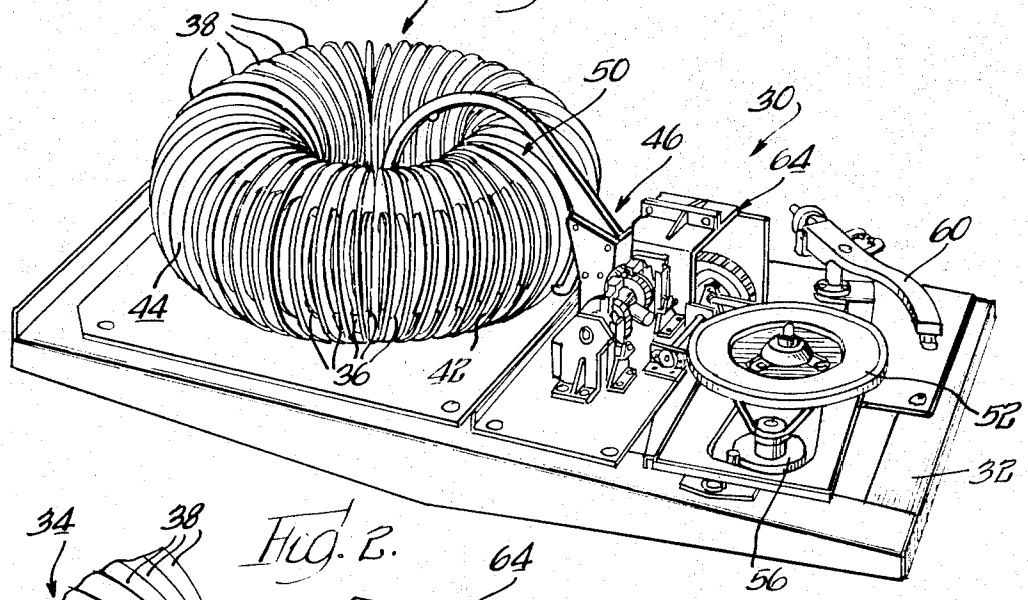
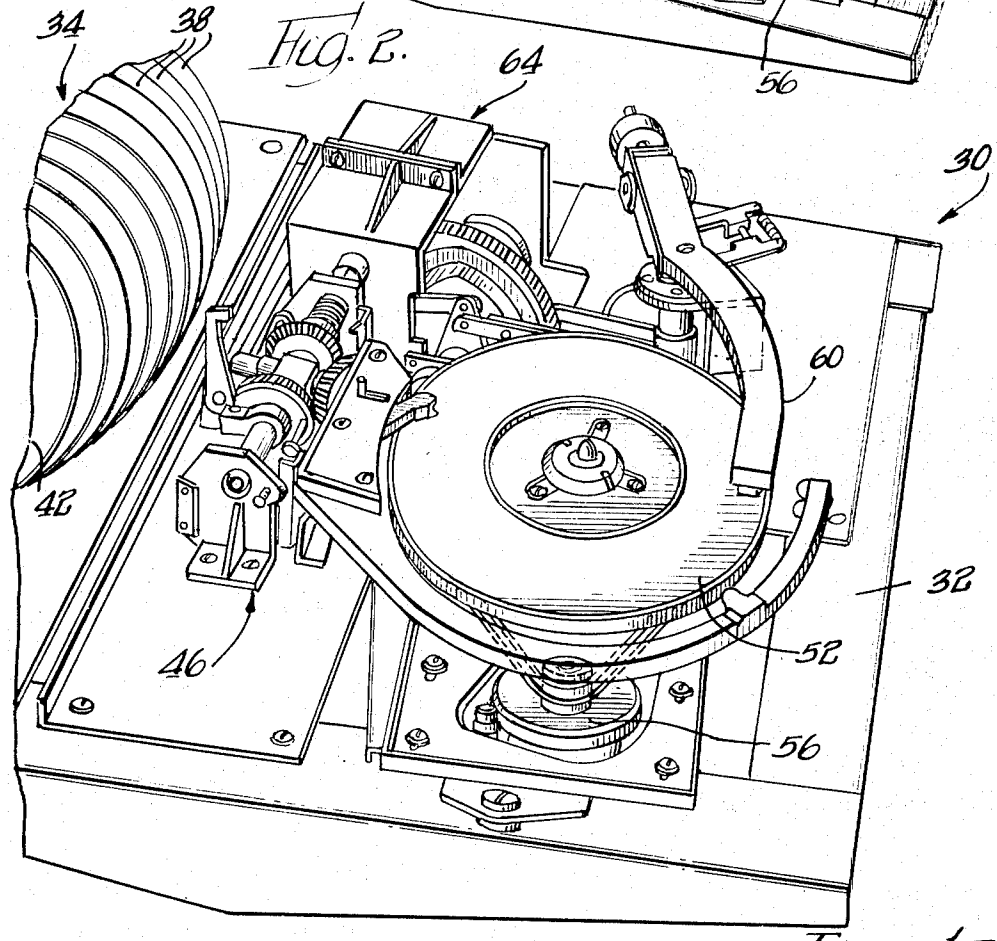


FIG. 2



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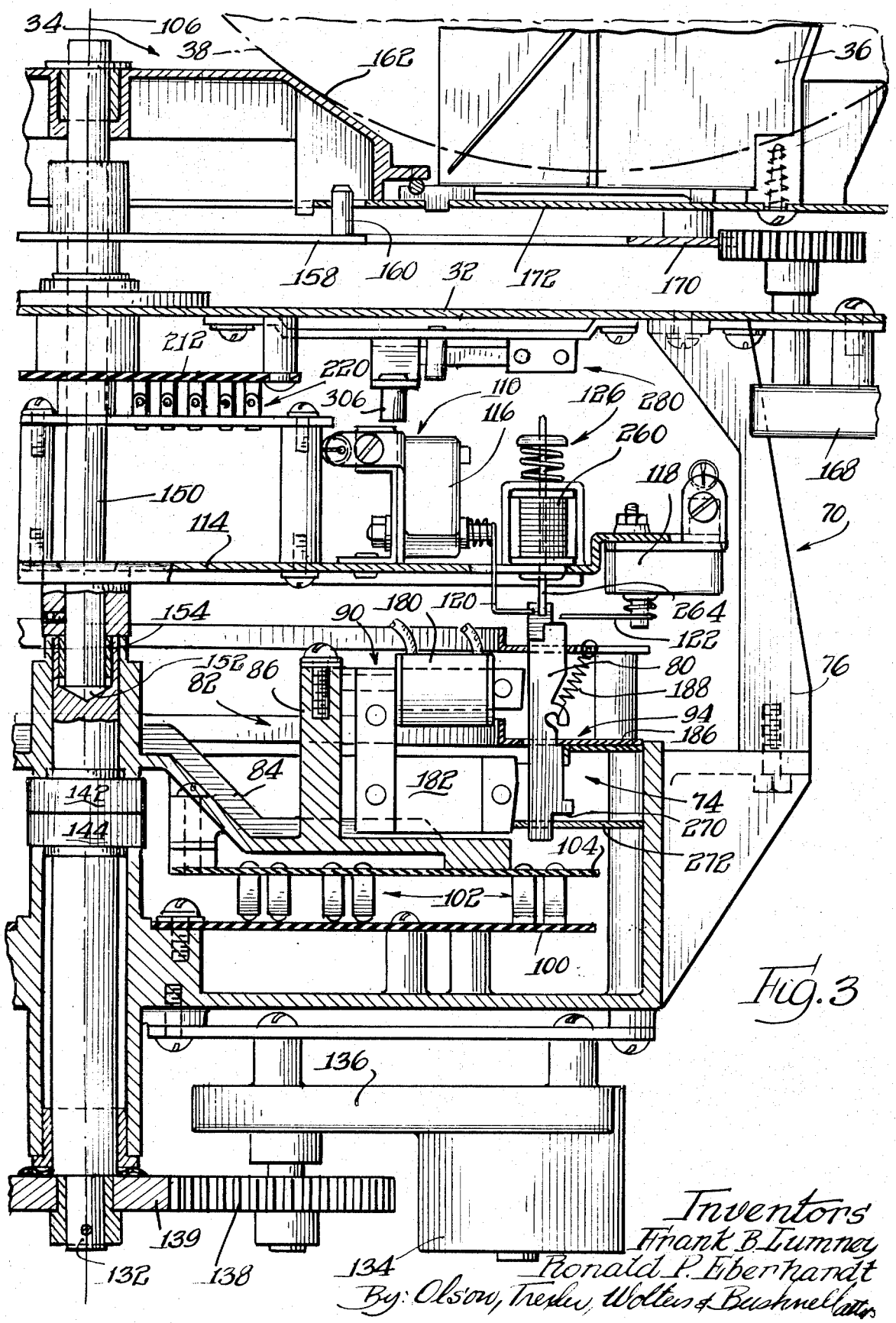

Fig. 3

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Fig. 4.

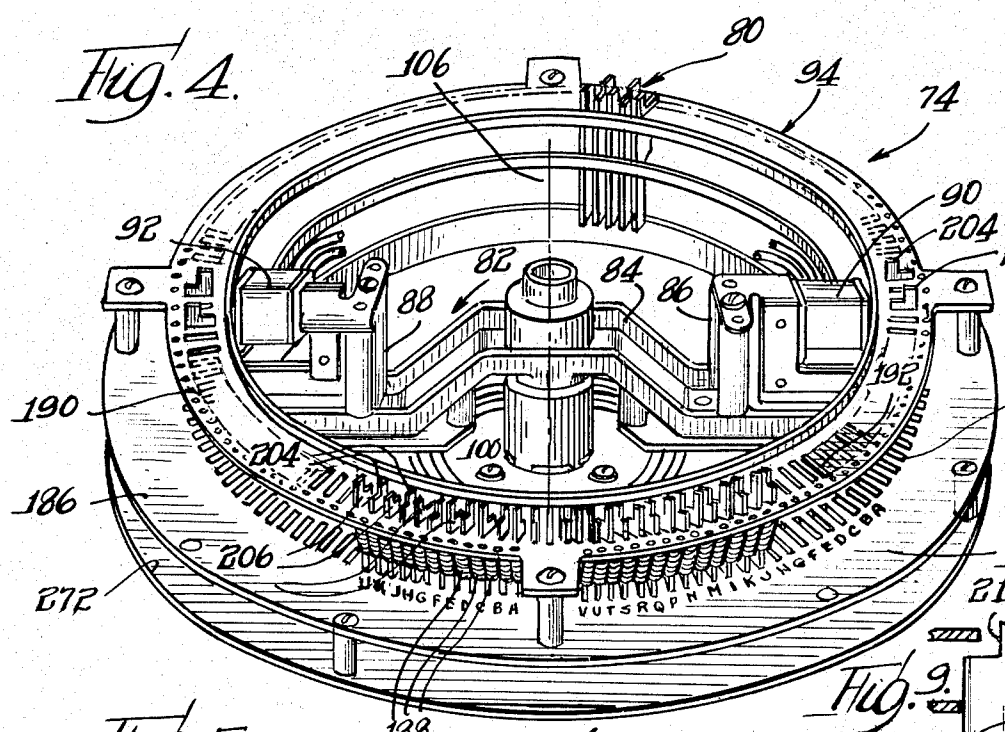


Fig. 5.

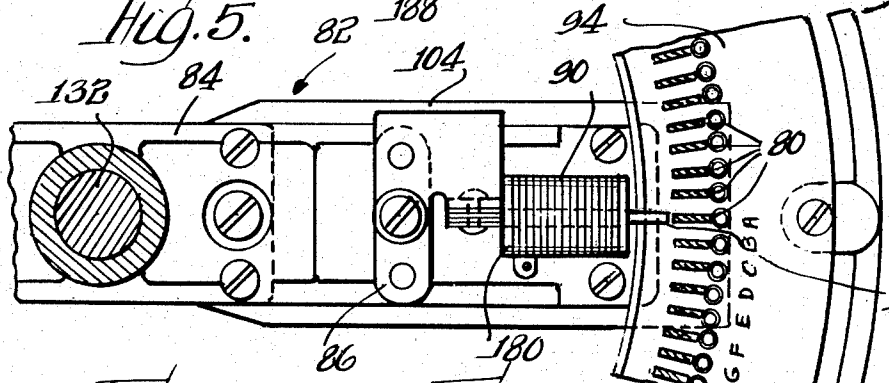


Fig. 9.

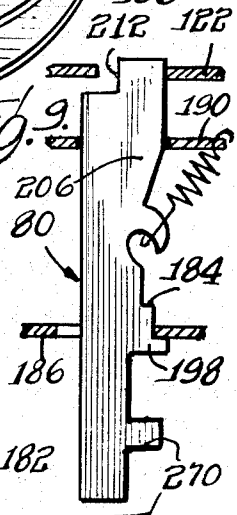


Fig. 8.

Fig. 6.

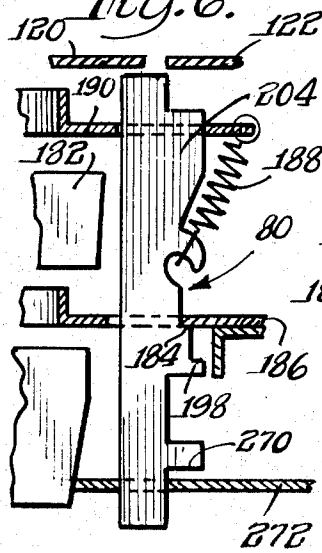
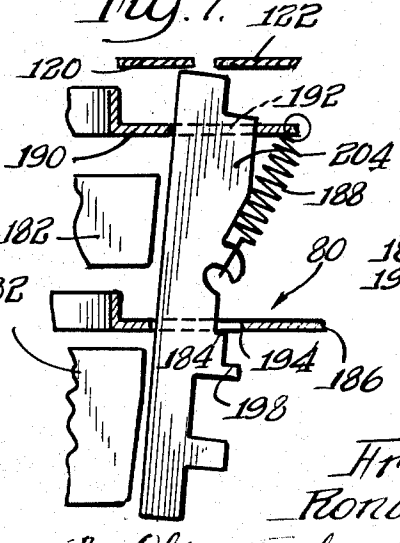


Fig. 7.



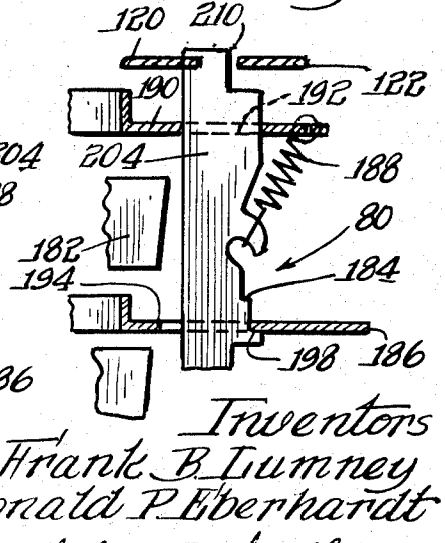


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Fig. 10.

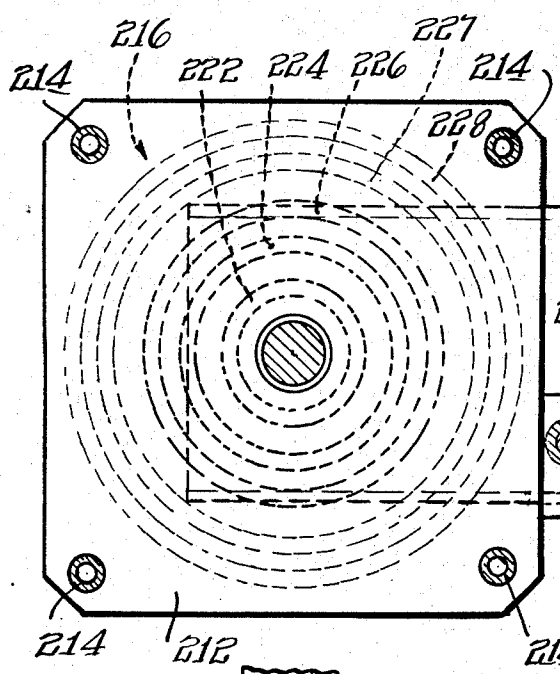

Fig. 12.

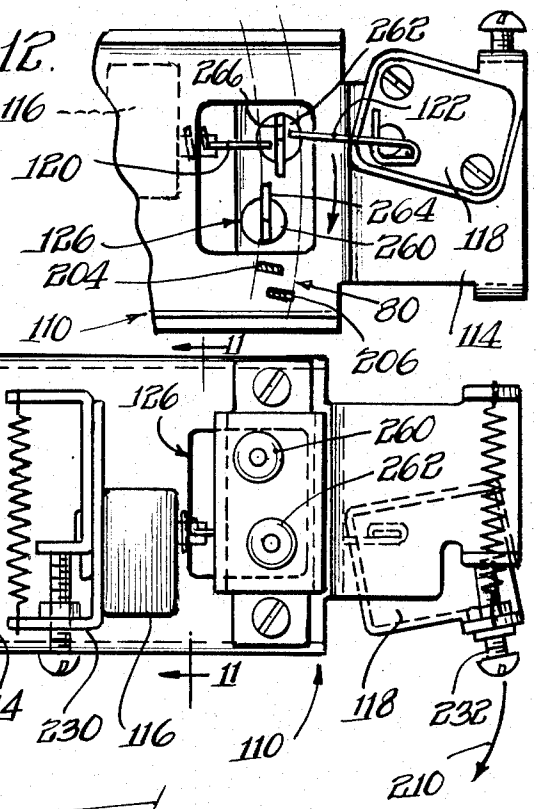

Fig. 11.

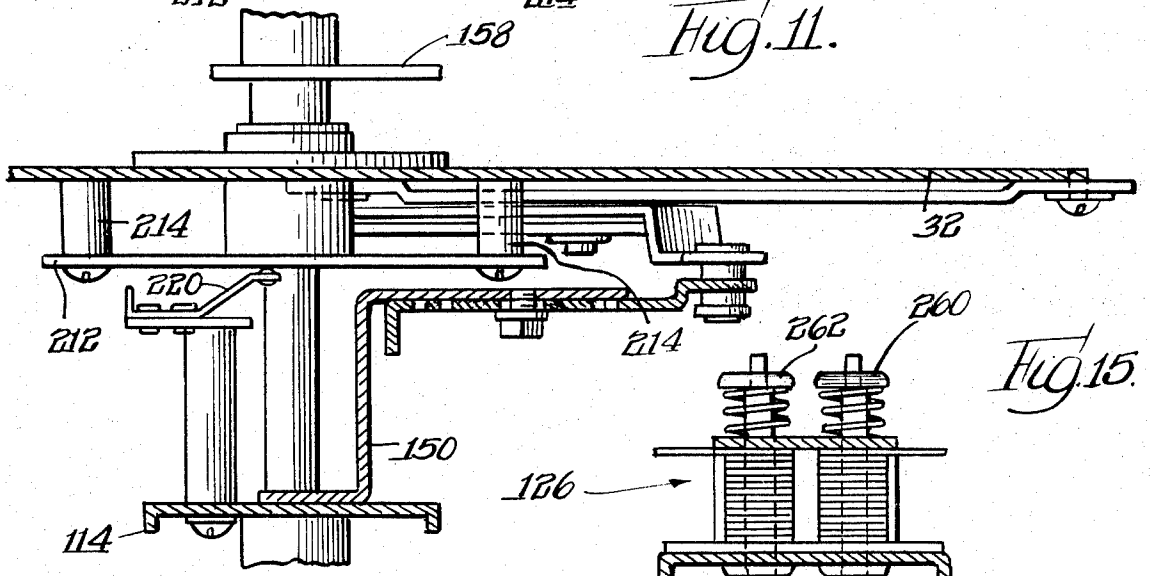

Fig. 15.

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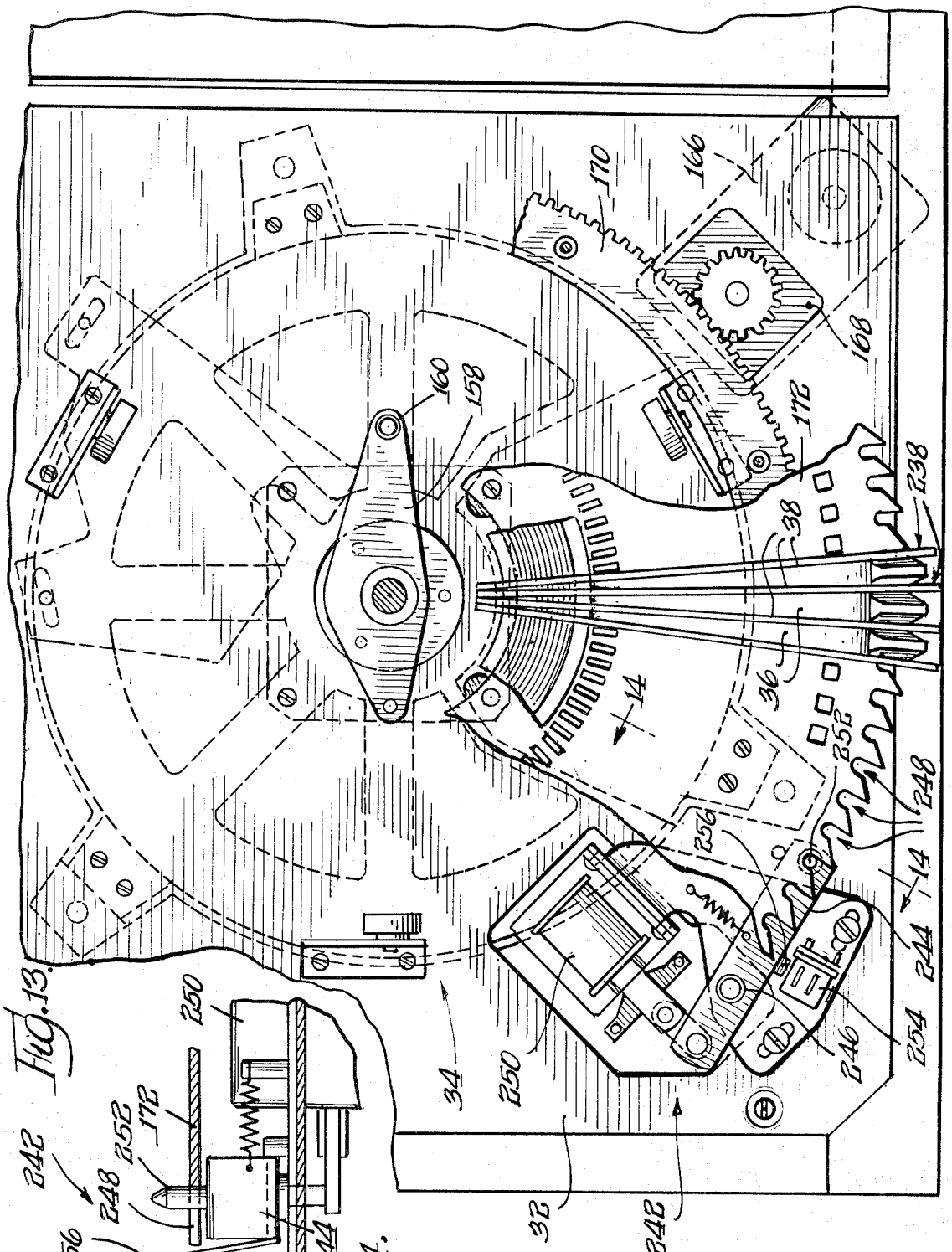

Fig. 13.

Fig. 14.

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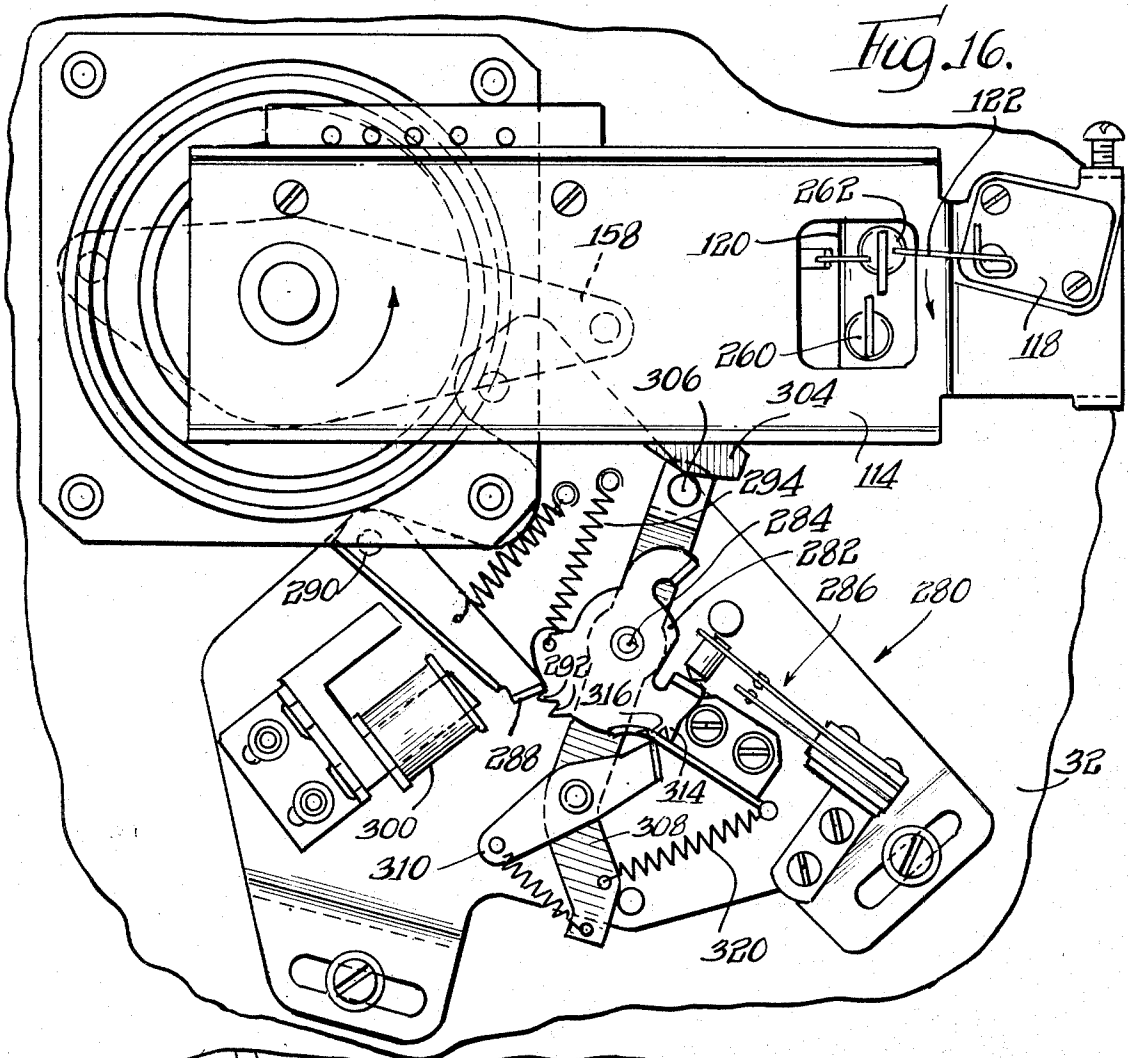
Fig. 16.



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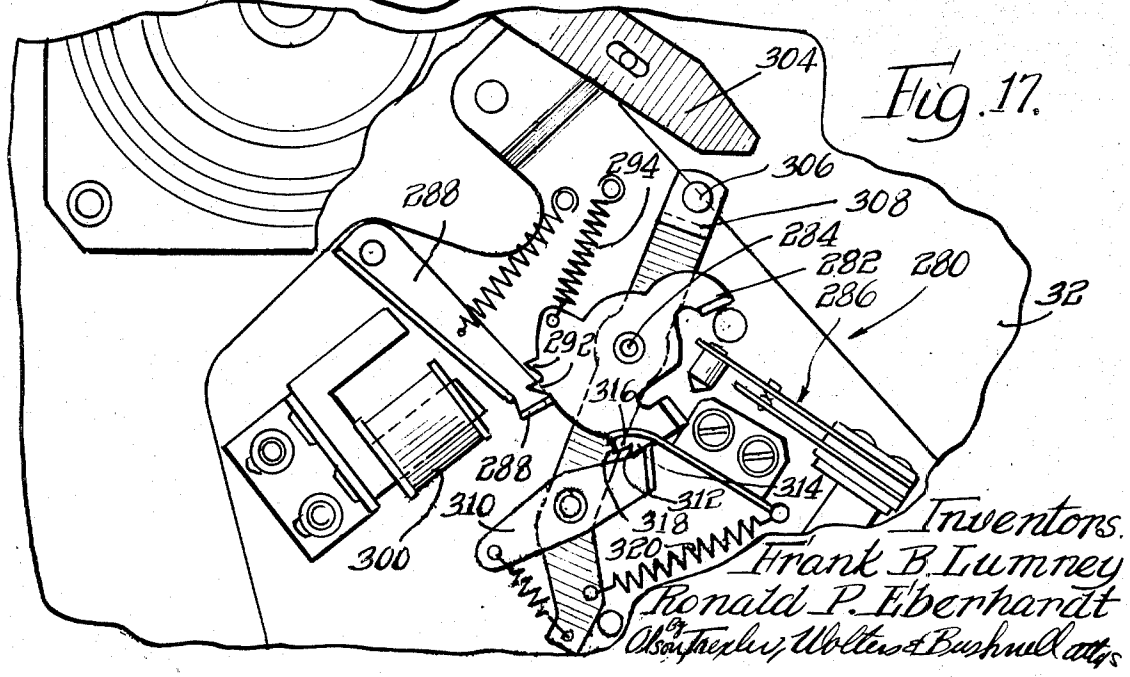

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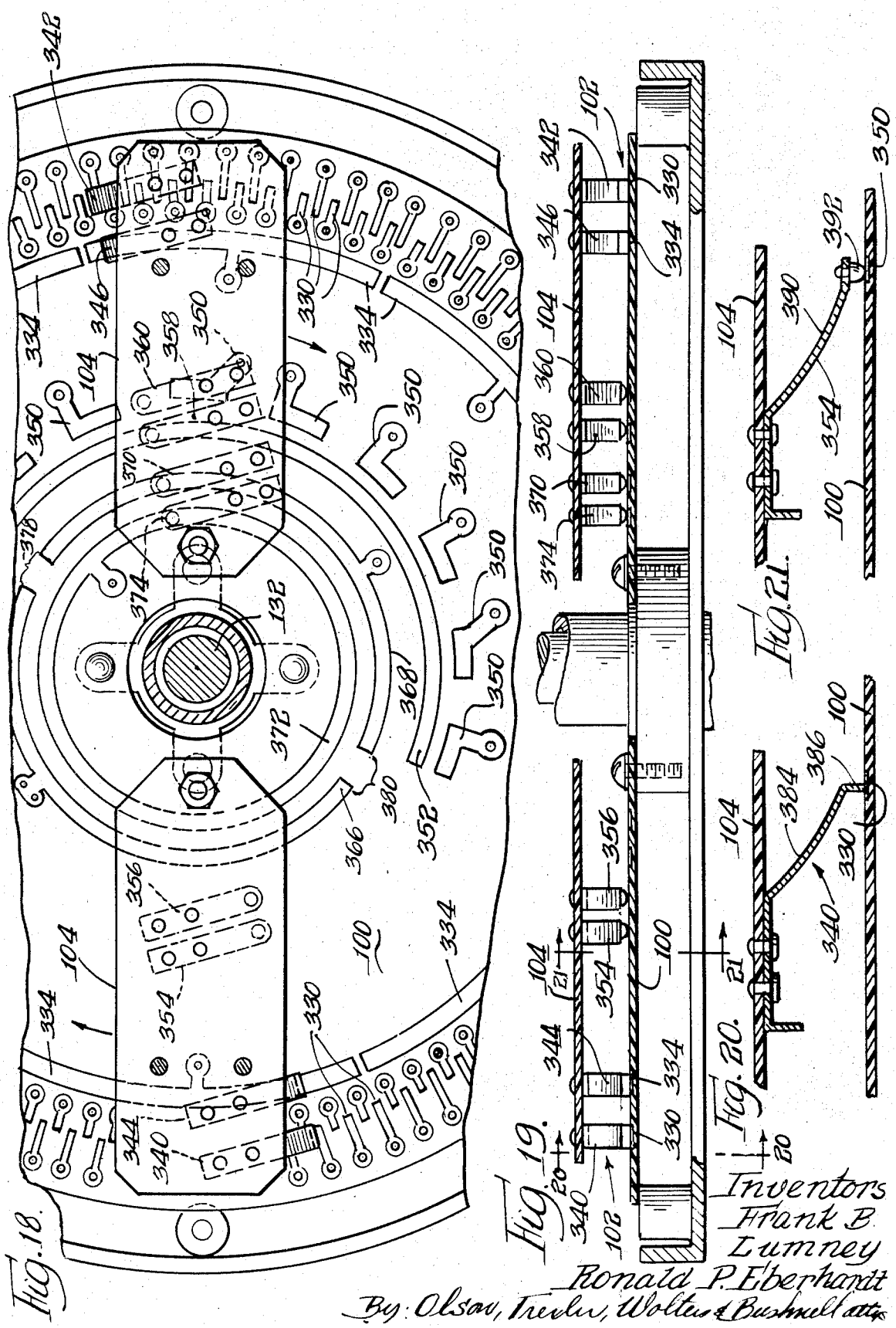

FIG. 18.

FIG. 19.

FIG. 20.

FIG. 21.

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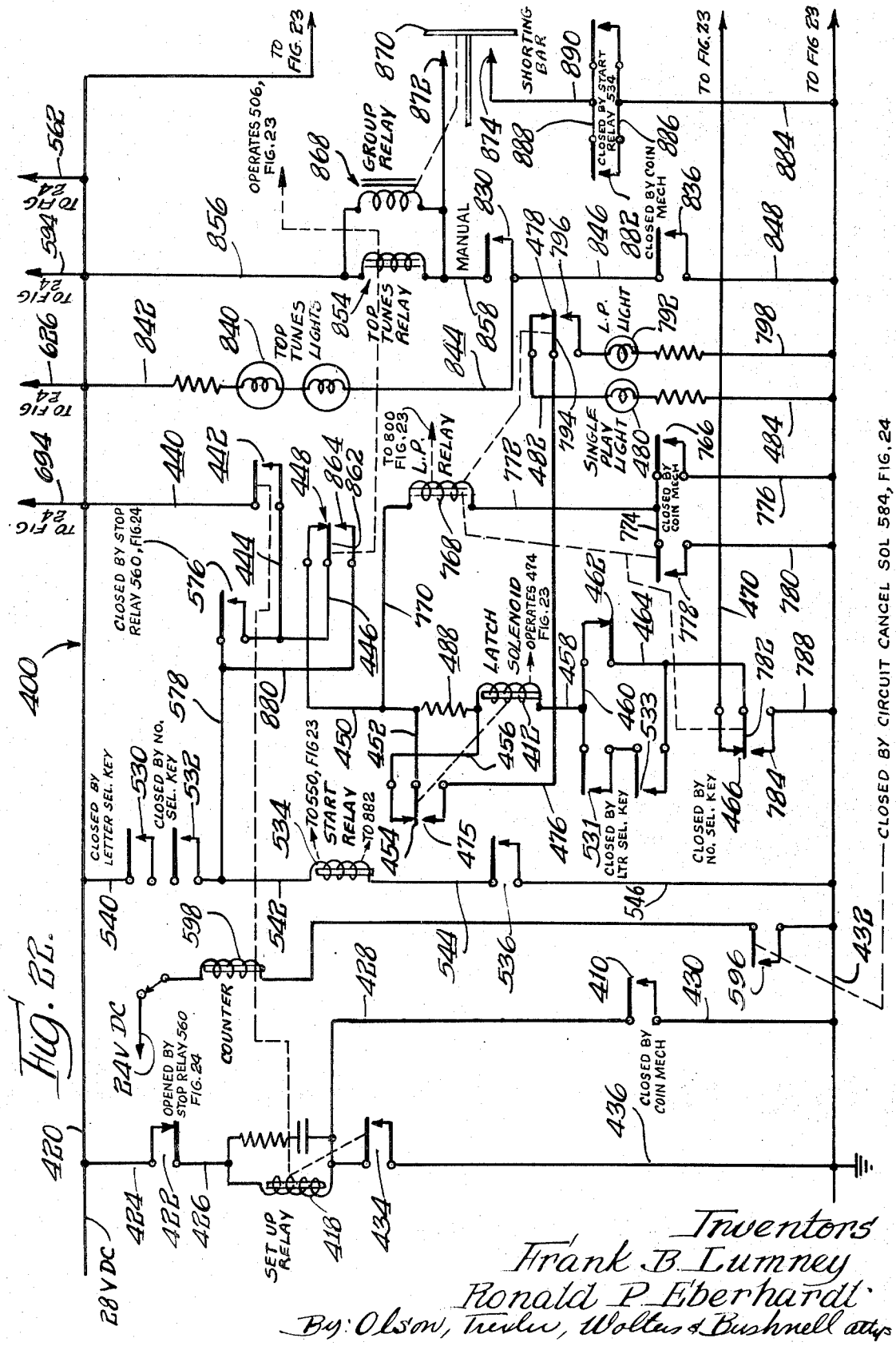

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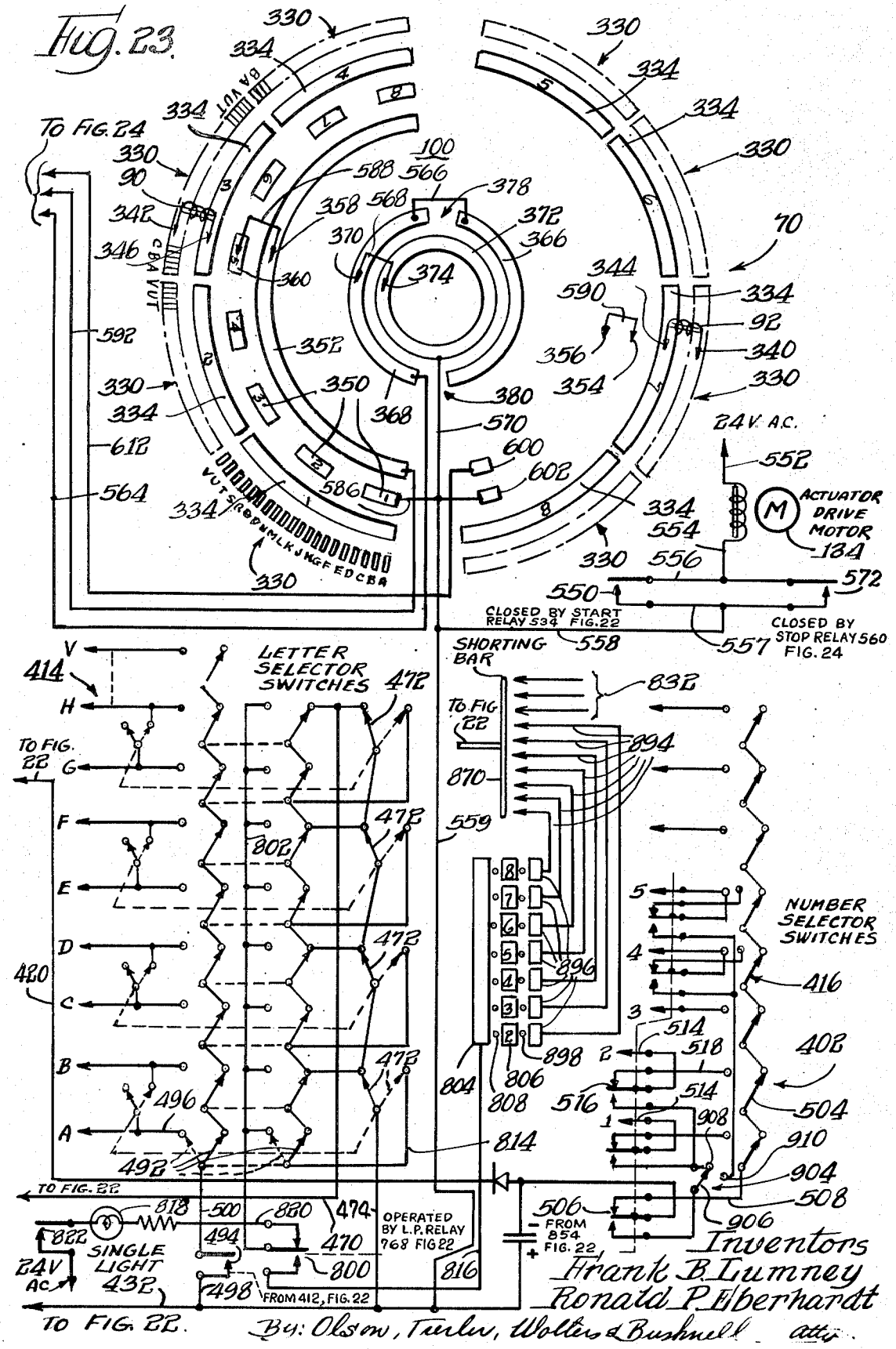
FIG. 23.



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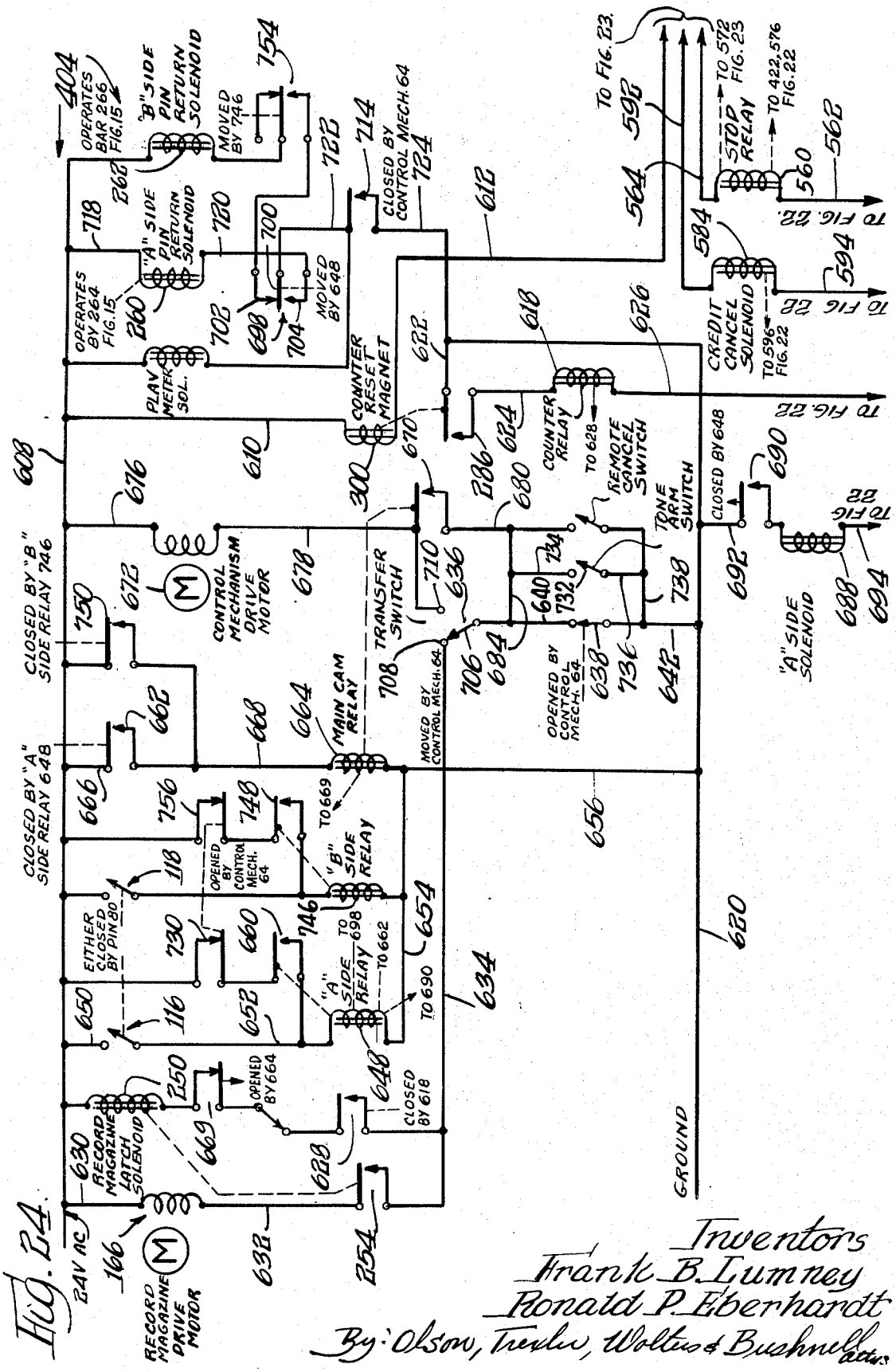

FIG. 24.

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ELECTROMECHANICAL SELECTOR UNIT

Automatic phonographs commonly include a record magazine in which a large number of records are stored. A plurality of keys or switches are usually provided for selecting a particular record for playing on the phonograph. By actuating the key associated with a selected record, control apparatus is energized to position the selected record for playing by the phonograph. The prior art control apparatus commonly includes a selector unit. The selector unit generally includes a plurality of pin members which are moved from a normal position to a projecting position to signal the selection of a particular record associated with the pin.

In order to move a pin from the normal position to the projecting or signalling position, a complex arrangement of relatively movable solenoids is provided in many of the selector units used in automatic phonographs. These prior art selector units, typified by the structure disclosed in U.S. Pat. No. 3,050,309, use a first group of solenoids to index a second group of solenoids and a plurality of actuator levers relative to the pin members. One of the solenoids in the second group is then operated to move the associated actuator lever into moving engagement with a pin member associated with the selected record. The pin member is then moved from the normal position to the projecting position to signal the selection of the record associated with the pin member.

The aforementioned prior art selector units have proven to be reliable in service even though they are relatively complex. However, when an automatic phonograph fails to operate, the proprietor of a commercial establishment loses money and his customers become dissatisfied and go to other establishments. Therefore, reliability is a paramount consideration in the construction of an automatic phonograph. The need for reliability is heightened by the fact that automatic phonographs are used in commercial establishments which are widely dispersed geographically relative to each other. The wide geographic dispersion of the automatic phonographs makes the rapid servicing of a phonograph which fails in service difficult if not impossible.

Since automatic phonographs are commonly used in commercial establishments having a large number of customers, the phonograph must be able to accept and store or remember the record selections of several customers while the record selection of a previous customer is being played. Thus, the selector unit must operate quickly and efficiently to move pin members from the normal position to the projected position. The relatively complex arrangement of solenoids and actuator levers used in prior art selector units limits the speed of operation of the selector unit and the number of record selections which can be made within a given time period.

Therefore, it is an object of this invention to provide a reliable, rapidly operating, control apparatus for use with an automatic phonograph.

Another object of this invention is to provide a selector unit which is relatively inexpensive and easy to manufacture.

Another object of this invention is to provide a selector unit which has relatively few moving parts.

Another object of this invention is to provide a compact selector unit which can be readily installed in an automatic phonograph.

These and other objects and features of the invention will become more apparent upon reading the following detailed description taken in connection with the accompanying drawings, wherein:

FIG. 1 is a perspective view of the record changer assembly, including a record storage magazine, a record transfer assembly, a turntable, and a tone arm;

FIG. 2 is an enlarged perspective view further illustrating the record changer assembly of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view illustrating the relationship of the record storage magazine of the record changer assembly of FIG. 1 to an electromechanical selector unit which forms a preferred embodiment of the invention;

FIG. 4 is an enlarged perspective view of an accumulator having a plurality of readout pin members which are used with the selector unit of FIG. 3, and an actuator assembly for moving the pin members from a first normal position to a second outwardly projecting signaling position;

FIG. 5 is an enlarged plan view illustrating the relationship of the actuator assembly to the pin members of FIG. 4;

FIG. 6 is an enlarged sectional view illustrating the normal position of a pin member associated with a first or "A" side of a record;

FIG. 7 is an enlarged perspective view illustrating the position of a pin member intermediate the normal position shown in FIG. 6, and an outwardly projecting signaling position;

FIG. 8 is an enlarged perspective view of a pin member, similar to the pin members of FIGS. 6 and 7, illustrating the orientation of a pin member in the outwardly projecting or signaling position;

FIG. 9 is an enlarged view illustrating the normal position of a pin member associated with a second or "B" side of a record;

FIG. 10 is an enlarged plan view of a sensor assembly used in the record selector unit of FIG. 3;

FIG. 11 is an enlarged sectional view, taken along the line 11—11 of FIG. 10, illustrating the mounting of the sensor assembly;

FIG. 12 is an enlarged fragmentary plan view illustrating the relationship of the sensor unit of FIG. 10 relative to the pin members;

FIG. 13 is an enlarged plan view illustrating the mounting and drive assembly for the record storage magazine of FIG. 1;

FIG. 14 is an enlarged elevational view taken along the line 14—14 of FIG. 13 illustrating the relationship of a record magazine latch assembly to the record magazine;

FIG. 15 (on sheet 4 of the drawings) is an enlarged elevational view illustrating the relationship of a pin member return assembly to the pin members;

FIG. 16 is an enlarged plan view illustrating the relationship of the sensor assembly to a predetermined counter unit, shown in an end-of-count position, which counts the revolutions of the sensor assembly relative to the pin members;

FIG. 17 is an enlarged plan view illustrating the counter unit of FIG. 16, in a beginning count position, before the sensor unit has rotated for a predetermined number of revolutions relative to the pin members;

FIG. 18 is an enlarged plan view of a contact support panel or surface used in the selector unit of FIG. 3;

FIG. 19 is an elevational view of movable or wiper contacts which engage the fixed contacts of the contact panel of FIG. 18;

FIG. 20 is an enlarged sectional view, taken along the line 20—20 of FIG. 19, illustrating the structure of a moving contact;

FIG. 21 is an enlarged sectional view, taken along the line 21—21 of FIG. 19, illustrating a second moving contact structure; and

FIGS. 22, 23 and 24 are schematic illustrations of control circuitry utilized with the record change assembly of FIG. 1, with FIG. 22 illustrating latching circuitry, FIG. 23 illustrating a selector circuitry and the contact panel of the selector unit, and FIG. 24 illustrating circuitry for controlling the movements of the record magazine, record changer assembly, turntable, and tone arm.

RECORD CHANGER ASSEMBLY

Referring now to the drawings in greater detail, FIGS. 1 and 2 illustrate a record changer assembly 30. The record changer assembly 30 includes a base or support structure or frame 32 upon which a record storage magazine or basket 34 is mounted. The record storage magazine or basket 34 includes a plurality of panels 36 which are positioned in a generally circular or toroidal configuration to define a plurality of record storage locations in which records 38 are stored or filed when they are not being played. The records 38 are of the disk type and have a spiral groove on each side of the record carrying recorded sound for reproduction by a phonograph. Since there is a recording on both sides of the records, the records are said to have a first or "A" side 42 and a second or "B" side 44. The "A" sides 42 are positioned facing in a clockwise direction when the record magazine 34 is viewed from above, while the "B" side 44 faces in an opposite or counterclockwise direction. The record storage magazine 34 is rotatable relative to the base 32 to position a selected record for engagement by the record transfer assembly 46. The record transfer assembly 46 engages a record at a pickup or loading station 50 and transfers the record from the record storage magazine 34 to a turntable 52. The turntable 52 is rotated by a turntable drive motor 56 to rotate the record relative to a tone arm 60. The tone arm 60 engages the spiral recording groove in the upwardly facing or selected side of a selected record on the turntable 52 to pick up the recorded sound on the record in a well known manner.

After the record has been played, the record transfer assembly 46 repositions the record back in its storage location in the record magazine 34. The movements of the record transfer assembly 46, the turntable 52, and the tone arm 60 are coordinated by a control mechanism 64. The record changer assembly 30 is described in further detail in copending application Ser. No. 619,687, Changer and Selector Mechanism, filed in the names of Fred H. Osborne, Robert S. Tuttle, and Michael J. Corbett. Although the record changer assembly disclosed in the aforementioned application is preferred for use in connection with the electromechanical selector unit forming the present invention, it will be apparent to those skilled in the art that other known record changer assemblies can be utilized rather than the preferred record changer assembly 30.

SELECTOR UNIT - GENERALLY

A selector unit 70 forming a preferred embodiment of the invention is illustrated in FIG. 3. The selector unit 70 is mounted on the base 32 immediately beneath the record magazine 34 in a coaxial relationship with the record storage magazine. The selector unit 70 includes an accumulator or selection storage section 74 which is supported by a frame 76 from the base 32. The accumulator 74 includes a plurality of readout or selector protuberances or pin members 80 which are movable from a first normal position to a second signaling or readout position to signal the selection of a record. The pin members 80 are moved from the first position to the second position by an actuator assembly 82. The actuator assembly 82 includes a radially outwardly extending arm 84 having a pair of mounting sections 86 and 88 which are best seen in FIG. 4. A pair of electromagnets 90 and 92 are secured to the mounting sections 86 and 88. When the electromagnets 90 and 92 are energized, a magnetic field emanates from the electromagnets to influence the pins 80. In the preferred embodiment the electromagnets attract the pins 80 to disengage the pins 80 from a combination support and retaining frame 94 on which they are mounted to enable the pins to move from the first normal position to the second outwardly projecting signaling position.

Referring again to FIG. 3, the electromagnets 90 and 92 are energized by means of electrical current or energy conducted from circuitry connected to a fixed contact support plate or surface panel 100. Fixed contacts on the panel 100 are engaged by a plurality of moving contact arms or wipers 102 which are connected to second insulating support plates 104. The contact arms 102 are connected to the electromagnets 90 and 92 to conduct electrical energy from the contact panel 100 to the electromagnets to energize the electromagnets. It should be noted that the electromagnets 90 and 92 are positioned in a spaced apart relationship relative to the pins 80. This spaced apart relationship between the electromagnets 90 and 92 and the pins 80 eliminates friction which would tend to impede the rotation of the actuator arm 84 around a central axis 106 of both the selector unit 70 and the record storage magazine 34 and enables the electromagnets 90 and 92 to be energized while the actuator arm 84 is in motion relative to the pins 80.

In addition to an accumulator 74 and an actuator assembly 82, the selector unit 70 includes a combination sensor and return assembly 110 which is mounted for rotation about the central axis 106 independently of the rotation of the actuator arm 84 about the central axis 106. The combination sensor and return assembly 110 is mounted on a sensor arm 114 and includes a pair of spaced apart switches 116 and 118 which have switch arms 120 and 122 for sensibly engaging the pin members 80. The switch arm 120 engages pin members 80 which are associated with the "A" side of the record in the record storage magazine 34 to sense when the "A" side of a record is to be played. Conversely, the switch arm 122 from the switch 118 engages pin members 80 which are associated with the "B" side of records in the record storage magazine 34. The switch arms 120 and 122 are moved by the rotation of the sensor arm 114 about the central axis 106 into abutting sensing engagement with the pin members 80 which are in the outwardly projecting signaling position. When

either of the sensing switches **116** or **118** is actuated by sensible engagement with a pin member **80** control circuitry (illustrated in FIG. **24**) is energized to enable the record changer assembly **30** to move a selected record from the record storage magazine **34** into position for playing of a turntable **52**. After the sensing switches **116** and **118** have been actuated, the pin members are returned to their normal position by a pin member return assembly **126**.

The actuator arm **84** is fixedly connected to a central shaft **132** which is driven by a motor **134** through a transmission or gear drive **136** and the spur gears **138** and **139**. The actuator arm **84** is mounted for clockwise rotation, when viewed from above, relative to the accumulator **74** on a bearing **142**. A conventional one-way clutch structure **144** is mounted immediately adjacent to the bearing **142**. When the actuator drive motor **134** is energized, the electromagnets **90** and **92** are rotated about the central axis **106** on the shaft **132**. As the electromagnets **90** and **92** are rotated about the central axis **106**, they travel on a generally annular course in a position spaced apart from but adjacent to the pin member **80**. When either the electromagnet **90** or the electromagnet **92** is adjacent to a pin member associated with a selected side of a selected record, the electromagnet is energized and the pin member moves to the signaling position.

The arm **114** is fixedly connected to a second central shaft **150** which is rotatably received in a cavity **152** in the shaft **132**. A bearing **154** is positioned intermediate the shaft **132** and the shaft **150** to enable the shaft **150** to rotate relative to the shaft **132** with relatively little friction. A mounting bracket or arm **158** is fixedly connected to an outer or upper portion of the shaft **150**. The bracket or arm **158** includes on outwardly extending drive pin **160** which engages a central mounting member **162** of the record storage magazine **34**. The central mounting member **162** is rotated relative to the base structure **32** by a record magazine drive motor **166** which is best seen in FIG. **13**. A gear drive **168** transmits the rotation of a drive shaft from the motor **166** to an annular ring gear **170** which is fixedly connected to a base plate **172** of the record magazine **34**. SInce the bracket or arm **158** fixedly engages the record magazine **34** and is fixedly connected to the shaft **150**, the shaft **150** and arm **114** are rotated contemporaneously with the rotation of the record magazine **34**. The accumulator **74** is fixedly mounted relative to the record transfer assembly **46** of FIG. **1**. The sensor arm **114** and sensing switches **116** and **118** are fixedly mounted relative to the record magazine **34**. Therefore, the record magazine **34** and sensor arm **114** are rotated as a unit relative to the accumulator **74**. The actuator arm **84**, on the other hand, rotates relative to the accumulator **74** independently of both the record magazine **34** and the sensor arm **114** to move a pin **80** from a normal position to an outwardly projecting signaling position. By mounting the record magazine **34**, the sensor arm **114**, the actuator arm **84**, and the accumulator **74** in a coaxial relationship about the central axis **106**, a relatively compact structure is obtained for controlling the positioning of the record magazine **34** relative to the record transfer mechanism **46**.

In view of the preceding remarks, it will be apparent that the selector unit **70** includes an accumulator **74** which is fixedly supported by the base structure **32**. An actuator assembly **82** is mounted for rotation by the motor **134** relative to the accumulator **74**. When either electromagnet **90** or **92** is adjacent to a pin member **80** associated with a selected side of a selected record, the electromagnet is energized over a circuit including the contact arms **102** and fixed contacts on the contact panel **100**. Energization of an electromagnet moves the pin member **80**, which is adjacent to the energized electromagnet, from a first normal position to a second signaling position. When one of the pins **80** is in the second signaling position, it is located for engagement by one of two sensor switches **116** or **118** which are rotated independently of the actuator assembly **82** relative to the pins **80** on an arm **114**. Actuation of either of the two sensing switches **116** and **118** energizes control circuitry to move the selected record which is associated with the pin **80** from the record storage magazine **34** to the turntable **52** where it is played. After the sensing switches **116** and **118** have been actuated by the pin member **80** associated with the selected record, the pin member is returned to its normal position by a pin member return assembly **126** which is mounted on the arm **114** intermediate the two sensing switches **116** and **118**.

ACCUMULATOR AND ACTUATOR ASSEMBLIES

Turning now to a consideration of FIG. **4**, the pins **80** are positioned on the frame **94** of the accumulator **74** in a generally annular configuration. The pin members are positioned on radii of the annular frame **94** with their longitudinal axes extending upwardly in a generally parallel relationship. The actuator assembly **82**, as previously explained, is mounted for rotation around the central axis **106** of the accumulator **74**. As the actuator assembly **82** is rotated around the central axis **106**, the electromagnets **90** and **92** are moved on a generally annular course radially inwardly of the pin members **80**. If desired, the electromagnets **90** and **92** can be positioned radially outwardly of the pin members **80**. It should be noted that the annular course followed by the electromagnets **90** and **92** is concentric with the annular configuration of the pin members **80**. On each half revolution of the actuator assembly **82** around the central axis **106**, the electromagnet **92** is moved along a semicircular path past one-half of the pin members **80** while the opposite electromagnet **90** is moved on a semicircular path past the other one-half of the pin members **80**. In this manner an electromagnet **90** or **92** is moved past each pin member **80** on each one-half revolution of the actuator assembly **82**. The provision of a pair of electromagnets **90** and **92** for actuating the pin members **80** enables the speed of rotation of the actuator assembly **82** to be half of the rate of rotation of an actuator having a single electromagnet while maintaining the same rate of actuation of the pin members **80**. Thus, the provision of two electromagnets **90** and **92** for actuating the pin members **80** doubles the effective rate of rotation of the actuator assembly **82** about the central axis **106**.

Referring now to FIG. **5**, taken in connection with FIGS. **6** through **8**, when the electromagnet **90** is energized, a coil or winding **180** induces a magnetic field in

a generally U-shaped core piece **182** which is perhaps best seen in FIG. **3**. The magnetic field emanates from leg sections of the core piece **182** to attract the pin member **80** which is adjacent to the core piece **182** when the electromagnet is energized (see FIG. **5**). The magnetic field draws the pin members **80** toward the core piece **182** from the normal position shown in FIG. **6** to an intermediate position shown in FIG. **7**. When the pin member **80** moves from the position shown in FIG. **6** to the position shown in FIG. **7** under the influence of the magnetic fields emanating from the core piece **182**, a latching or retaining surface **184** is moved out of abutting engagement with an annular latch plate **186** of the frame **94** and the pin member is released for vertical movement from the position shown in FIG. **7** to the signaling position shown in FIG. **8** under the urging of a spring **188**. This upward movement of the pin **80** results in a sliding of the pin relative to both an annular upper support plate **190** and the lower support plate **186** through apertures or slots **192** and **194** in the support plates **186** and **190**. As the pin member **80** moves upwardly, a lower latching or retaining surface **198** engages the lower support plate or latching plate **186** to retain the pin member in the signaling position shown in FIG. **8**. It should be noted that the outwardly projecting latching or retaining surface **198** cannot be drawn through the aperture **194** so that the pin member **80** cannot, under the urging of the spring **188** become disengaged from the frame **94**. Thus, when the electromagnet **90** is deenergized, the pin member **80** assumes the signaling or outwardly projecting position shown in FIG. **8**.

The pin members **80** are divided into two groups, that is, a first group **204** associated with the "A" side **42** of the record **38** and a second group **206** associated with the "B" side **44** of the record **38** (see FIG. **4**). The pin member **80** shown in FIGS. **6** through **8** is associated with the "A" side of the record **38** and has therefore been designated **204**. When a pin member associated with the first or "A" side group **204** is in the signaling position shown in FIG. **8** the pin member engages the switch arm **120** of the "A" side sensing switch **116** to signal the control circuitry (shown in FIG. **24**) that the "A" side of a record has been selected for playing. It should be noted that when the pin member **80** is in the normal position shown in FIG. **6**, the pin member is spaced below the switch arms **120** and **122** so that the sensing switches **116** and **118** are not actuated as the sensor arm **114** is rotated around a central axis **106** of the selector unit **70** (see FIG. **3**).

A pin member **80** associated with the second or "B" side group **206** is illustrated in FIG. **9** and has accordingly been designated **206**. The pin member is shown in the outwardly projecting signaling position which corresponds to the signaling position for the pin member **80** of the "A" side group **204**, as shown in FIG. **8**. It should be noted that when the pin members of the second group **206** are in the signaling position, illustrated in FIG. **9**, the pin members engage the switch arm **122** associated with the "B" sides **44** of the records **38**.

From a comparison of FIGS. **8** and **9** it will be apparent that the pin members **80** of the first group **204** include a notch or recess **210** in their upper outer end portions which enables the pin members **204** to clear the switch arm **122** associated with the "B" side of the records **38** when the pin member is in the signaling position shown in FIG. **8**. Similarly, the pin members of the second group **206** have a notch or recess **212** in their upper outer end portion for clearing the switch arm **120** associated with the "A" side of the records when the pin members are in the signaling position shown in FIG. **9**. Of course, the pin members **80** of both the first and second groups **204** and **206** are positioned beneath or inwardly of the switch arms **120** and **122** when the pin members are in the normal position.

In view of the foregoing remarks it will be apparent that the selector unit **70** includes an accumulator **74** having a plurality of pins **80** which are moved from a normal position, shown in FIG. **6**, to an outwardly projecting signaling position, shown in FIGS. **8** and **9**, by the actuator assembly **82**. The pins **80** are divided into two groups, that is, a first group **204** associated with the "A" side of a record and a second group **206** associated with the "B" side of a record. The pins of the first group are interspersed with the pins of the second group so that a pin member of one group is flanked on both sides by a pin member of the other group (see FIG. **4**). The pin members **80** are moved from the normal position shown in FIG. **6** to the signaling position shown in FIG. **8** by energizing one of two electromagnets **90** and **92** as they are moved past the pin members **80**. When the electromagnets are energized, a magnetic field emanates from the core piece of the electromagnet to attract the pin members and disengage a latching surface **184** of the pin members from the latching or support plate **186** (see FIG. **7**). Once the latching surface **184** has been disengaged from the latch plate **186** the pin member is free to move vertically upwardly under the urging of the spring **188** to the signaling position shown in FIG. **8**.

The pin members associated with the first group **204** and the "A" side **42** of the records **38** are sensibly engaged by the switch arm **120** when the sensor arm **114** is rotated relative to the accumulator **74**. Similarly, the pin members associated with the second group **206** and the "B" side **44** of the records are sensibly engaged by the switch arm **122** when the sensor arm **114** is rotated relative to the central axis **106**. Since the sensor arm **114** is fixedly connected to the record magazine **34**, the sensor arm is rotated contemporaneously with the record magazines so that the sensing switches **116** and **118** are actuated by a pin member **80** which is in the signaling position when the record associated with the pin member is in the loading or pick-up position **50** (see FIG. **2**) adjacent to the record transfer assembly **46**. The sensing switches **116** and **118** actuate the control circuitry of FIG. **24** to operate the record transfer assembly **46** to move a record from the record storage magazine **34** into playing position on the turntable **52**. The records are positioned on the turntable **52** with the side associated with a pin member which actuated the sensor switch positioned upwardly. Thus, if a pin member of the first or "A" side group **204** actuated the switch arm **120** to operate the record transfer assembly **46**, the record transfer assembly would position the record on the turntable **52** with the "A" side **42** of the record facing upwardly for engagement with the tone arm **60**. Conversely, if a pin member of the second or "B" side group **206** actuated the switch arm **122** to

operate the record transfer assembly **46**, the record transfer assembly would position the associated record on the turntable **52** (with the "B" side **44** of the record upwardly for engagement by the tone arm **60**.

SENSOR ASSEMBLY

The mounting of the sensor arm **114** on the shaft **150** is disclosed in detail in FIGS. **10** and **11**. The sensor arm rotates in a clockwise direction, as viewed from above in FIG. **10**, about the shaft **150** as indicated by the arrow **210**. A contact support plate or surface **212** is mounted on the base structure **32** by a plurality of connector bolts or rivets **214**. A plurality of annular contact rings **216** are mounted on the contact plate **212**. The fixed contact rings **216** are engaged by a plurality of moving contact arms or wipers **220** (see FIGS. **3** and **11**) with a separate moving contact or wiper **220** being provided for each of the contact rings **216**. An inner contact ring **222** connects a 24-volt a.c. source to the sensing switches **116** and **118** and the pin member return assembly **126**. When the sensing switch **116** is actuated by sensible contact with a pin member **80**, a circuit is completed over the contact ring **224** to the control circuitry of FIG. **24**. When the switch **118** is actuated by sensible engagement with a pin member **80**, a circuit is completed over the contact ring **226** to the control circuitry of FIG. **24**. Contact rings **227** and **228** are provided for energization of the pin member return assembly **126**.

The interrelationship between the pin members **80** and the switch arms **120** and **122** of the sensing switchs **116** and **118** is further illustrated in FIG. **12**. It should be noted that in FIG. **12** only the upper, outermost end of the pin members **80** have been shown. It is these upper, outermost ends of the pin members which engage the switch arms **120** and **122**. Thus, the upper, outermost end portion of a pin member of the first or "A" side group **204** engages the switch arm **120** when the pin members are in the signaling position shown in FIG. **8**. Similarly, the upper, outermost end portion of the members of the second or "B" side group engage the switch arm **122** when the pin members are in a signaling position shown in FIG. **9** to actuate the sensing switch **118**. As the sensor arm **114** is rotated with the record magazine **34** about the central axis **106** (see FIG. **3**), the sensing switches **116** and **118** are actuated by any pin member of the associated group which is in the signalling position. The position of the sensing switches **116** and **118** relative to the sensor arm **114** can be varied by adjusting mounting assemblies **230** and **232**.

As was previously explained, the record magazine **34** is rotated contemporaneously with the sensor arm **114**. As is perhaps best seen in FIG. **13**, the record magazine **34** is rotated by the motor **166** through a gear drive **168** which engages a ring gear **170** at the base of the record magazine **34**. The records **38** are supported on a base plate **172** by a plurality of radially outwardly extending panels or side walls **36** which define storage locations **238** for the records in the record magazine **34**. The details of the structure of the record magazine do not, per se, form a part of the present invention, and it is not believed to be necessary to go further into the structure of the record magazine **34** at this time. However, for those who are interested, the structure of the record magazine **34** is set forth in considerable detail in copending application, Ser. No. 619,687, Changer and Selector Mechanism, filed in the names of Fred H. Osborne, Robert S. Tuttle, and Michael J. Corbett. For purposes of the present invention it is sufficient to note that the base plate **172** is rotated contemporaneously with the positioning arm **114** until one of the sensing switches **116** or **118** is actuated by a pin member **80** which is located in the outwardly extending signaling position. When this occurs, a record associated with the pin member **80** is in the pick-up or loading position **50**.

When either of the sensing switches **116** or **118** is actuated by a pin member, the record magazine drive motor **166** is deenergized and a latch assembly **242** is released to enable a latch bar to pivot about a mounting pin **246** to engage an index tooth or notch **248** in the outer periphery of the base plate **172**. When the latch bar **244** engages a notch **248**, the base plate **172** is locked against further movement relative to the base structure **32**. The records **38** are positioned in filing locations so that when a pin member associated with a given record actuates a switch arm of either the sensing switch **116** or **118** the associated record is positioned in the pick-up or loading position indicated at **50** in FIG. **1**. The latch bar **244** remains in engagement with a tooth **248** of the base plate **172** until after the selected record has been played on the turntable **52** and returned to its storage location in the record magazine **34**.

Referring now to FIG. **13** taken in connection with FIG. **14**, the latch assembly **242** includes a latching solenoid **250** which is energized to disengage an upstanding pin **252** on the latch bar **244** from the teeth or notches **248** to enable the record magazine to be rotated relative to the base structure **32**. When the latch bar **244** is in the locking or latching position shown in FIG. **13**, a switch **254** is in its normally open position. However, when the solenoid **250** is energized to disengage the upstanding pin **252** from the tooth or notch **248**, the switch **254** is closed by an engagement of the latch bar **244** with an outwardly extending switch arm **256** of the switch **254**. The switch **254** is connected to a circuit for energizing the record storage magazine drive motor **166** so that the record magazine can be driven only when the switch **254** is closed and the latch bar **244** is disengaged from the teeth **248** in the base plate **172**.

PIN MEMBER RETURN ASSEMBLY

Referring now to FIG. **15**, taken in conjunction with FIGS. **3** and **12**, the pin member return assembly **126** includes a pair of pin member return solenoids or actuators **260** and **262**. The solenoid **260** is associated with the pin members of the first or "A" side group **204**, while the solenoid **262** is associated with the pin members of the second or "B" side group **206**. After the switch arm **120** for the sensing switch **116** has been actuated, the solenoid **260** is energized by the control circuitry, shown in FIG. **24**, through the contact ring **227** of FIG. **10** to move the pin member **80** which actuated the switch arm **120** to the normal or retracted position. Similarly after the switch arm **122** has been actuated by a pin member of the second or "B" side group **206**, the solenoid **262** is energized through the

contact ring **228** of FIG. **10** to return the pin member to its normal or retracted position. The solenoids **260** and **262** return the pin members **80** to their normal positions by pressing the pin members downwardly against the springs **188** with pin member return bars or fingers **264** and **266** which are forced outwardly and downwardly relative to the solenoids **260** and **262** when the solenoids are energized.

The solenoids **260** and **262** are offset relative to each other, as shown in FIG. **12**, so that the pin member return bar engages only the pin members **80** of the first or "A" side group, while the pin member return bar **266** will engage only the pin members of the second or "B" side group **206**. The pin members **80** of both the first group **204** and the second group **206** include a stop surface **270**, which is best seen in FIGS. **3** and **6**, for engaging a stop plate **272** of the frame **94**. The engagement of the stop surface **270** with the stop plate **272** limits the downward movement of the pin members **80** under the influence of the solenoids **260** and **262**. Thus, the pin members **80** are returned from the outwardly projecting signaling position shown in FIGS. **8** and **9** to the normal position shown in FIG. **6** by the action of the solenoids **260** and **262** after the pin members are sensibly engaged by either the switch arm **120** or **122**.

The record magazine **34** and the sensor arm **114** are locked in a stationary position by the latch assembly **242** while a record is being played. Thus, the sensor arm **114** is immediately above the pin member **80** which is just sensibly engaged by either the switch arm **120** or the switch arm **122**, the pin member having been returned to the normal position by the pin member return assembly **126**. While the selected record is being played on the turntable **52**, it is possible, and even probable, that another record may be selected for playing immediately after the record presently being played. If the pin member associated with the second record is immediately behind the sensor arm **114**, the sensor arm can return to its normal position without engaging the pin member associated with the record which had just been selected. Therefore, each time a record is selected, the sensor arm **114** is rotated for a plurality of revolutions (in the preferred embodiment two) relative to the pin members **80**. The counter assembly **280**, illustrated in FIGS. **16** and **17**, is provided for counting the revolutions of the sensor arm **114** relative to the accumulator **74**. The counter assembly **280** is shown in FIG. **16** in an end-of-count position before a record has been selected.

The counter **280** includes a register or counter member or plate **282** which is rotatably mounted on a central axis **284**. The counter plate **282** is retained in the position shown in FIG. **16**, holding a switch **286** open, by means of a latch pawl **288** which is pivotally mounted on a pin **290**. The latch pawl **288** engages latch or latching teeth **292** to hold the counter plate **282** in the end-of-count position shown against the urging of a spring **294**. When a record is selected, a counter reset electromagnet **300** is energized to attract the pawl **288** and pivot the pawl out of engagement with the teeth **292**. The spring **294** can then pull the counter plate **282** from the end-of-count position shown in FIG. **16** to a beginning or start-of-count position shown in FIG. **17**, with the switch **286** closed. As the sensor arm **114** is rotated relative to the counter assembly **280**, an outwardly extending lever **304** engages a pin member **306** which is connected to a drive lever **308** of the counter assembly **280**. The drive lever **308** is pivoted around the central axis **284** to rotate a drive pawl **310** clockwise into engagement with a drive surface **312** of a first drive tooth **314**. The drive pawl **310** is now positioned intermediate the first drive tooth **314** and a second drive tooth **316**. On the next revolution of the sensor arm **114** the outwardly projecting lever **304** engages the pin **306** to again actuate the drive lever and pivot the drive pawl **310** in a clockwise direction so that the drive pawl engages a driving surface **318** of the tooth **316** to rotate the counter plate **282** into the end-of-count position shown in FIG. **16** under the influence of the return spring **320**. Although only two drive teeth **314** and **316** have been provided on the counter plate **282**, it will be apparent to those skilled in the art that any number of drive teeth can be provided on the counter plate **282** to provide any desired number of revolutions of the sensor arm **114** relative to the accumulator **74** each time a record is selected. It is merely necessary that the counter unit **280** act as a predetermined counter to count a predetermined number of revolutions of the sensor arm **114** relative to the accumulator **74**. This insures that all of the pin members which are moved from the normal position to the signaling position are engaged by the switch arms **120** or **122** to play all of the selected records.

ACcUMULATOR CONTACT ASSEMBLY

Referring now to FIG. **18**, a partial plan view of the contact support panel **100** is illustrated. The panel **100** is formed on an insulating material and has a generally circular shape. A first group of contacts **330** are mounted in an annular configuration on a radially outer section of the panel **100**. Each of the contacts **330** is associated with a pin member **80**. Of course, the contacts **330** are also associated with the record storage locations **238** in a record storage magazine **34**, since the pin members **80** are associated with the record storage locations.

Just as there are two pin members **80** associated with each record storage location, that is, a pin member of the first or "A" side group **204** and a pin member of the second or "B" side group **206**, there are two contacts **330** associated with each record storage location **238**, that is, a first contact associated with the "A" side of a record in a record storage location and a second contact associated with the "B" side of a record in a record storage location **238**. In addition, the contacts **330** are also associated with a second group of contacts **334** which are mounted on the panel **100**. There are twenty contacts **330** associated with each of the radially inwardly positioned contacts **334**. By designating the contacts **330** with letter indicia and the contacts **334** with numerical indicia, it is possible to reference each of the plurality of storage locations in the record storage magazine **34** by a number and letter designation, such as A–1, B–1, C–1, D–1 . . . , A–2, B–2, C–2, D–2 . . ., A–3, B– 3, C–3, D–3 . . . , etc. Of course, the number of contacts **330** and **334** varies with the capacity of the record storage magazine **34**. The capacity of a record storage magazine is limited by space considerations and the necessity of keeping the record changer assembly **30** relatively compact. In one preferred em-

bodiment of the invention a record storage magazine having 80 storage locations is provided. The storage locations are divided into eight number groups associated with eight contacts 334 on the panel 100 and 160 letter contacts 330 which are divided into sub-groups of 20 contacts associated with each of the number contacts 334.

As previously indicated, a plurality of mounting panels 104 are mounted on the actuator arm 84 (see FIG. 3). A plurality of contacts 102 project downwardly from the panel 104, as shown in FIG. 19, to engage the contacts mounted on the panel 100. A first pair of moving contacts 340 and 342 project downwardly from the panel 104 to engage the fixed contacts 330 on the panel 100. Similarly, a second pair of contacts 344 and 346 project downwardly from the panel 104 to engage the contacts 334 on the panel 100. The contactor arms or wipers 342 and 346 are connected to the electromagnet 90 while the contactor arms 340 and 344 are connected to the electromagnet 92 (see FIG. 4). Thus the electromagnet 90 is energized while in motion by a circuit extending from a fixed contact 330 on the panel 100, through the movable contactor arm 342 and to the coil 180 of the electromagnet and back to the movable contactor arm 346 to a fixed contact 334 on the panel 100. Similarly, the electromagnet 92 is energized by a circuit extending from a fixed contact 330 on the panel 100, through the movable contactor arm 340 to the electromagnet, and back through the movable contactor arm 344 to a fixed contact 334 on the panel 100. As will be explained in greater detail subsequently, when a sound recording on a side of a record in the record storage magazine 34 is selected for playing, a circuit is momentarily completed through the letter contact 330 and the number contact 334 associated with the selected side of the record to energize one of the moving electromagnets 90 or 92 to move a pin member 80 from the normal position of FIG. 6 to the signaling position of either FIG. 8 or 9. Since each side of the record in the record magazine 34 is associated with one and only one combination of the letter contacts 330 and the number contacts 334, either the "A" or the "B" side of any record in a record storage magazine can be selected for playing by energizing the actuator assembly 82 to move a pin member 80 corresponding to the selected side of the selected record.

Referring again to FIG. 18, a plurality of contacts 350 are positioned radially inwardly of the contacts 334. There are eight contacts 350 arranged in a semicircular configuration about the central axis 106 or the panel 100. An elongated semicircular shaped contact 352 is positioned radially inwardly and adjacent to the contacts 350. A circuit between the two contacts 350 and 352 is completed by means of moving contacts 353, 356, 358, and 360 which are mounted on the panels 104. The completed circuit between the contacts 354, 356, 358, and 360 pulses a credit cancelling mechanism in a manner to be explained in greater detail subsequently. A pair of semicircular contacts 366 and 368 are positioned radially inwardly of the contact 352. The contacts 366 and 368 are engaged by a single moving contact 370 which is mounted on one of the panels 104. A fixed circular contact 372 is positioned radially inwardly of the contacts 366 and 368 on the panel 100 and is engaged by a single contact 374 in the panel 104. Since a pair of electromagnets 90 and 92 are provided for actuating the pin members 80 from the initial or normal position to the signaling position, it is only necessary for the actuator arm 82 to rotate for half a revolution on each cycling of the selector unit 70 to enable the electromagnets to actuate any pin member in the accumulator 74. Therefore, the semicircular contacts 366 and 368 are provided to signal when the actuator arm 82 has reached a home or initial position with the contactor arm 370 engaging the insulating panel 100 at either of two initial or home areas 378 or 380.

The structure of the contactor arms 340 and 354 is set forth in greater detail in FIGS. 20 and 21. The contactor arm 340 includes a body section 384 which is positioned at an acute angle to the mounting plate 104. Extending downwardly in a substantially vertical direction from the body section 284 is an operating or contact engaging section 386 which engages the fixed contact 330. Since the contact engaging section 386 of the contactor arms 340 extends upwardly in a substantially perpendicular relationship with the fixed contact 330, any wear of the contact engaging section 386 of the contactor arm 340 results in a relatively constant end area positioned in sliding engagement with the fixed contacts 330.

Referring now to FIG. 21 in which the contactor arm 354 is shown, it can be seen that the contactor arm 354 includes a body section 390 to which a contact engaging protuberance 392 is connected. Since the protuberance 392 has a varying cross-sectional area, when the contact 392 is worn down due to sliding engagement with the panel 100 and the contact 350, the area of engagement between the contactor arm 390 and the contact 350 will vary. Since the contacts 350 are spaced a relatively wide distance apart, the variation in the cross-sectional area of the protuberance 392 does not affect the accuracy of the contactor arms 254 in engaging the contacts 350. However, the contacts 330 and 334 are spaced a relatively small distance apart so that any substantial variation in the cross-sectional area of the contact engaging section 386 of the contacts 340 or 344 could result in the contact arms engaging two adjacent contacts. Therefore, it is highly advantageous to have the cross-sectional area of the contact engaging sections of the movable contacts 340 and 344 remain relatively constant as the contacts are worn.

CONTROL CIRCUITRY

Referring now to FIGS. 22, 23, and 24, in which control circuitry for the automatic record changer assembly 30 is set forth, the circuitry includes a latching or set-up circuit 400 which is shown in FIG. 22. The latching circuit 400 is connected by leads to a selector circuit 402 and the selector unit 70 which is shown in FIG. 23. The selector circuit and selector unit of FIG. 23 are connected to control circuitry 404 (see FIG. 24) for controlling the operation of the record changer assembly 30. The control circuitry of FIG. 24 is also connected to the latching or set-up circuitry 400 of FIG. 22. Since the circuitry of FIGS. 22, 23, and 24 is interconnected it is suggested, to facilitate the reader's understanding of the invention, that FIGS. 22, 23, and 24 be aligned to interconnect the circuitry. To do this,

FIG. 23 is positioned with its longitudinal axis extending outwardly away from the reader, while FIGS. 22 and 24 are positioned with their longitudinal axes extending perpendicular to the longitudinal axis of FIG. 23, FIG. 22 being positioned adjacent to the lower portion of FIG. 23 and FIG. 24 being positioned adjacent to the upper portion of FIG. 23 so that the leads interconnecting the circuitry for the two figures are in substantial alignment.

The latching circuit **400**, of FIG. 22, is connected to a suitable coin receiving mechanism and controls the operation of the selector circuit **402** of FIG. 23. The selector circuit **402** includes a plurality of letter selector switches and number selector switches for selecting a record in a record magazine **34** which is associated with the selector switches in a predetermined code arrangement. The letter and number selector switches are connected to the selector unit **70**, in the manner previously explained, to read or put information into the selector unit **70** corresponding to the selected record; that is, the letter and number contacts corresponding to the selected record are energized by the letter and number selector switches. The selector unit is in turn connected to the control circuitry **404** of FIG. **24** to control the operation of the record changer assembly. Although it is intended that the selector unit **70**, the selector circuitry **402**, and the latching circuitry **400** will be used with the record changer assembly set forth in application, Ser. No. 619,687, filed in the name of Fred H. Osborne, Robert S. Tuttle and Michael J. Corbett, it will be apparent to those skilled in the art that other record changer assemblies of known construction can be used.

To select a single record for playing, a coin of a suitable denomination — in one embodiment, a dime — is inserted in a coin receiving apparatus of known construction. The coin receiving apparatus includes a coin register mechanism, not shown, which functions to receive coins, register credits in a positive direction in accordance with the denomination of the coins received, reject coins while registration is in progress, and to cancel registered credits by actuating the register in a negative direction after a record selection has been made. Coin receiving mechanisms which perform the above functions are well known to those skilled in the art and need not be described in greater detail at this time. Those who are interested in the details of the structure of the coin receiving mechanisms are referred to U.S. Pat. No. 3,131,000.

The registration of the depositing of a coin in the coin receiving apparatus closes a key switch **410** in the latching circuit **400**. The closing of the key switch **410** energizes a latch solenoid **412** in the latching circuit **400** to release letter selector switches **414** and number selector switches **416** in the selector circuitry **402**. To energize the latch solenoid **412**, a set-up relay **418** is energized by a circuit extending form a 28-volt power line **420** connected through normally made contacts **422** of a stop relay and leads **424** and **426** to the set-up relay **418**. The circuit for energizing the set-up relay **418** is completed over a lead **428** to the key switch **410** and through a lead **430** to a ground line **432**. It should be noted that although the key switch **410** is normally open, as shown, the key switch **410** is closed by the placing of a coin in the coin receiving mechanism. Once the set-up relay **418** has been energized through the above circuit, the set-up relay **418** is locked in an energized condition over its own normally open contacts **434** which are connected to the ground **432** by a lead **436**.

The energization of the set-up relay **418** closes a circuit to energize the latch solenoid **412**. As previously explained, the energizing of the latch solenoid **412** releases the letter and number selector switches **414** and **416** of the selector circuitry **401** to enable a recording on a record associated with the letter and number selector switches to be selected for playing. The circuit for energizing the latch solenoid **412** extends from the power line **420** over a lead **440** to the normally open contacts **442** of the set-up relay, the contacts **442** having been closed by the energization of the set-up relay **418**. The circuit extends from the contacts **442** of the set-up relay to leads **444** and **446** to normally closed upper contacts **448** of a top tune relay. The circuit is continued from the contacts **448** by leads **450** and **452** to normally closed contacts **454** of the latch solenoid **412**. The latch solenoid is in turn connected to the normally closed contacts **454** by a lead **456**. The circuit for energizing the latch solenoid **412** is completed in the ground line **432** through the letter selector switches **414** to the selector circuitry **402** in FIG. **23**. This circuit includes a lead **458** which connects the latch solenoid **412** to a lead **460** and the normally closed contact **462** of a selection release switch. The selection release switch **462** is connected by a lead **464** to the normally closed contacts **466** of a LP relay. The contacts **466** are connected by a lead **470** to the letter selector switches of FIG. **23**. The lead **470** is connected in a chain circuit by LP conditioning switches **472** and a lead **474** to the ground line **432** to complete the circuit for energizing the latch solenoid **412**.

Energization of the latch solenoid **412** opens the upper contacts **454** and closes lower contacts **475** to complete a circuit through a lead **476** and normally closed LP relay contacts **478** to energize a single-play light **480** through the leads **482** and **484** which connect to the ground line **432**. Of course, the single play light **480** is connected to the battery line **420** from the contacts **475** through the leads **452**, **450**, switch contacts **448**, leads **446**, **444**, switch contacts **442**, and the lead **440**. The latch solenoid **412** is retained in an energized condition, after the normally closed contacts **454** have opened and the normally open contacts **475** closed, over a circuit including a resistor **488**. The resistor **488** limits the current through the latch solenoid **412** to a value which is inadequate to initially actuate the latch solenoid but is adequate to retain the actuated latch solenoid **412** in an actuated condition.

The energizing or actuating of the latch solenoid **412** and single play light **480** releases the letter selector switches **414** and number selector switches **416** to enable a selection to be made, as indicated by the single play light **480**, by actuating letter switches **414** and number selector switches **416** which are associated with a record. Assuming, for example, that a recording A–2 is selected, a pair of selector switches **492**, which are associated with letter A record storage locations and are ganged together, are moved from the position shown in solid lines in FIG. **23** to the position shown in dashed lines in FIG. **23**. The closing of the switches **492**

connects ground from the lien 432 over the normally open contacts 494 of the now energized latch solenoid 412 to the A lead 496 through leads 498 and 500. The lead 496 is wired in common with all of the contacts 330 associated with the letter A on the selector unit 70. Thus the A contact of all eight number groups is connected to ground by the actuation of the switch 492. It should be noted that the leads designated B through V are also connected in common with their associated letter contacts 330 in the selector unit 70. Thus the lead designated B in FIG. 23 is connected to all of the B contacts associated with the number group contacts 1 through 8. The C through V leads are also connected in common with their associated letter contacts 330 of each of the number groups 1 through 8.

The number associated with the selected record is now actuated by operating one of the number selector switches 416. In our example the record A–2 was chosen. Thus, a switch 504 would be closed to connect the number 2 selector switch to the power line 420 through the number 1 selector switch which is in its normal position and normally closed contacts 506 of the top tunes relay which is connected to the number 1 selector switch by a lead 508. The contacts 506 are connected directly to the power line 420. The number 2 contact 334 in the selector unit 70 is now connected to the power line 420 through a circuit which includes a lead 514 which is connected to the number 2 contact 334 and a normally closed contact 516 of the top tunes relay. The normally closed contact 516 is in turn connected by a lead 518 to the actuated number 2 selector switch 504. Of course, the other selector switch leads designated 1 and 3 through 8 in FIG. 23 are connected to the associated number group contacts 334 in the selector unit 70.

In view of the preceding remarks it is apparent that placing of a coin of a predetermined amount in a coin receiving unit, not shown, closes a key switch 410 to energize a set-up relay 418. Energizing of the set-up relay 418 energizes the latch solenoid 412 to enable selector switches 414 and number selector switches 416 to be actuated to select a record associated with a predetermined combination of the letter and number selector switches. When a record is selected by actuating the letter and number selector switches 414 and 416 associated with the selected record, the contacts 330 of the letter which is associated with the selected record are connected to ground and the number contact 334 which is associated with the selected record is connected to a source of power by actuating a number selector switch 416. The actuation of a letter selector switch 414 closes letter latch switches 530 and 531 in the latching circuit 400. Similarly, the actuation of a number selector switch 416 closes number latch switches 532 and 533 in the latching circuitry 400. It should be noted that the number and letter latch switches 530 through 533 are closed by a mechanical interconnection between these latch switches and the keys for the letter and number selector switches 414 and 416. The closing of the latch switches 530 and 532 energizes the start relay 534 through normally open contacts 536 of the now energized set-up relay 418.

The circuit for energizing the start relay 534 extends from the power line 420 through a lead 540 to the letter and number latch switches 530 and 532 to a lead 542 which is connected to the start relay 534. The circuit for energizing the start relay 534 is completed over a lead 544 which is connected to the contact 536 of the set-up relay and a lead 546 which interconnects the contacts 536 of the set-up relay and the ground line 432. The energizing of the start relay closes normally open contacts 550 (see FIG. 23) to energize the actuator drive motor 134. The actuator drive motor 134 is energized from a 24-volt source of power through a lead 552 which is connected to the motor and leads 554 and 556 which connect the motor to the contacts 550 of the start relay 534. The contacts 550 are connected by leads 557, 558, and 559 to the ground line 432 to complete the circuit for energizing the actuator drive motor 134.

The energization of the actuator drive motor 134 causes the actuator assembly 82 (see FIG. 3) to rotate relative to the contact support plate or panel 100 of the selector unit 70. As is perhaps best seen in FIGS. 18 and 19, when the actuator drive motor 134 is energized, the actuator assembly 82 and the contact support plates 104, which are connected to the actuator bar 84, are moved relative to the contact support plate 100 from the initial positions indicated at 378 and 380 in a clockwise direction to move the contact arms extending from the panels 104 relative to the fixed contacts on the panel 100. This movement of the contact 370 to move into engagement with either the segment 366 or the segment 368 of the end of cycle contacts. The engagement of the moving contact 370 with either contacts 366 or 368 energizes a stop relay 560 through a circuit extending from FIG. 23 to FIGS. 24 and 22. The stop relay 560 of FIG. 24 is connected by a lead 562 to the power line 420 in FIG. 22. The circuit for energizing the stop relay 560 is completed by a lead 564 which extends from FIG. 24 to FIG. 23 where it is connected to an end-of-cycle contact segment 368. The end-of-cycle contact segment 368 is connected by a lead 566 to the opposite end-of-cycle segment 366. When the actuator drive motor 134 is energized, the moving contact 370 engages one of the two end-of-cycle segments and is shorted by a lead 568 to moving contact 374 which engages the radially innermost contact ring 372 which is connected to the ground line 432 by a lead 570. Thus, the stop relay 560 is energized immediately after the actuator assembly 82 leaves the initial or home positions 378 and 380 by a circuit extending from the ground line 432 through the central ring contact 372 to one of the two end-of-cycle segment contacts 366 or 368 to a source of power on the line 420.

Energization of a stop relay 560 releases the set-up relay 418 which had previously been energized through the normally closed contacts 422 of the stop relay (see FIG. 22). When the set-up relay 418 is deenergized, the start relay 534, which had previously been energized through the normally open contacts 536 of the set-up relay, is deenergized. The actuator drive motor 134, which had previously been energized over the contacts 550 of the start relay, is now held energized over contacts 572 of the stop relay. The deenergization of the set-up relay 418 opens contacts 442 over which the latch solenoid 412 was initially energized. However, the latch solenoid 412 is retained in an energized state (after the set-up relay 418 is deenergized and the stop

relay 560 has been energized) over a circuit extending from the lead 450 which is connected to the resistor 488, to the normally closed contact 448 of the top tune relay, and to a lead 446 which is connected to the normally open contact 576 of the now energized stop relay 560. The contacts 576 are connected by a lead 578 to the lead 542 and the ground line 420 through the number and letter latch switches 530 and 532. The latch solenoid 412 is connected to the ground line 432, in the manner previously explained, by the lead 470 which is connected to the letter selector switches 414. It should be noted that only the latch solenoid 412 of the latching circuitry 400 is now energized. Therefore, when the latch solenoid is deenergized, a second selection can be made on the letter and number selector switches 414 and 416.

In addition to energizing the stop relay 560 by engagement of the moving contact 370 with one of the segments 366 or 368 of the fixed end of cycle contacts, the initial movement of the actuator assembly 82 also causes either the moving contacts 358 and 360 or 354 and 356 to engage the first fixed credit cancel contact 350, designated 1 in FIG. 23, and the fixed credit cancel segment 352 to energize a credit cancel solenoid 584, shown in FIG. 24. The circuit for energizing the credit solenoid 584 extends from the ground line 432 through the lead 559 which is connected by a lead 586 to the first fixed credit cancel contact 350, designated 1 in FIG. 23. When the actuator assembly 82 begins its rotation in a clockwise direction, either the moving contact 360 or 354 engages the first fixed credit cancel contact 350. The moving contact 360 is connected by a lead 588 to a moving contact 358. Similarly, the moving contact 354 is connected by a lead 590 to the moving contact 356. Upon an initial rotation of the actuator assembly 82, either the moving contact 356 or the moving contact 358 engages the fixed credit cancel segment 352 to complete a circuit from the fixed credit cancel contact 350 to the credit cancel segment 352. The credit cancel segment 352 is in turn connected by a lead 592 to the credit cancel solenoid 584. The circuit for energizing the credit cancel solenoid 584 is completed to the power line 420 of FIG. 22 by a lead 594. The energization of a credit cancel solenoid 584 actuates the coin receiving apparatus to remove the credit previously registered by the depositing of a coin in the coin receiving apparatus to move the key switch 410 to the normal or open position and to clear the coin receiving apparatus to receive coins from subsequent customers desiring to select a record for playing. In addition, energization of the credit cancel solenoid 584 closes normally open contacts 596 (see FIG. 22) and energizes a credit counter 598. The credit counter 598 totals the number of credits cancelled.

The actuator drive motor 134 remains energized over the closed stop relay contacts 572 to rotate the actuator assembly 82 relative to the pin members 80 in the accumulator 74 (see FIG. 3). As the actuator assembly is rotated relative to the contact support panel 100, the moving contacts 342 and 346 or 340 and 344 engage the letter contact 330 and number contact 334 associated with the selected record. In the example, it was assumed that the letter selector switch A (designated 492) had been actuated and that the number selector switch 2 (designated 504) had been actuated. Therefore, each time either the moving contact 340 or 342 engages a contact 330 associated with the letter A, ground is connected to the electromagnets 90 and 92. However, the electromagnets 90 and 92 are connected to battery only when the moving contacts 344 and 346 engage the fixed number contact 2 of the number contact group 334. Thus, when the moving contacts 342 and 346 engage A–1 — that is, when the moving contact 342 is on the A contact 330 associated with the number contact 1 of the number group 334 —, the electromagnet 90 is not energized, since the number contact 1 is not connected to a source of power. However, when the moving contact 342 engages the letter contact A of the letter group 330 associated with the number contact 2 of the number contact group 334, a circuit is completed to energize the electromagnet 90. The electromagnet 92 is energized in a similar manner when the moving contacts 340 and 344 engage fixed letter and number contacts 330 and 334 associated with a selected record. Energization of the electromagnet 90 causes a magnetic field to emanate from the core 182 of the electromagnet to attract a pin member 80 which is adjacent to the core to move the pin member from the normal position shown in FIG. 6 to the signaling position shown in FIG. 8. Since the actuator assembly 82 is rotating at a constant speed relative to the pin members 80 and the letter group contacts 330, the electromagnet 90 is energized for a relatively brief period of time during which the core piece 182 is adjacent to only the pin member associated with the selected record.

As the actuator assembly 82 completes a half of a revolution or one cycle, the actuator assembly is moved back toward the initial position, that is, with the actuator bar 84 of FIG. 3 extending between the starting or initial areas 378 and 380 of the contact support panel 100. As the actuator assembly 82 moves toward the initial position, a pair of fixed counter contacts 600 and 602, which are mounted on the contact panel 100, are engaged by either the moving contacts 354 and 356 or the moving contacts 358 and 360. The engagement of either set of moving contacts completes a circuit to energize the counter reset magnet 300 of FIG. 24 which is associated with the counter assembly 280 of FIGS. 16 and 17. The circuits for energizing the counter reset magnet 300 include power conducted from a power line 608 of FIG. 24 over a lead 610 which is connected to the counter reset magnet 300. The circuit for energizing the counter reset magnet 300 is completed to the ground line 432 of FIG. 23 over a circuit including a lead 612 which interconnects the counter reset magnet 300 and the fixed counter contact 600. The engagement of either set of moving contacts 354 and 356 or 358 and 360 with the fixed contacts 600 and 602 connects the fixed contact 600 with the lead 586 which is connected to the contact 602 and to the lead 559 which is connected to the ground line 432.

As previously indicated, energization of the counter reset electromagnet 300 actuates the counter assembly 280 to close the switch contacts 286 and to set the counter assembly 280 to count a predetermined number of revolutions of the sensor arm 114, that is, two revolutions of the sensor arm. Closing of the counter contact 286 completes a circuit to energize the counter relay 618 from a ground line 620 of FIG. 24 to

the power line 420 of FIG. 22. The contacts 286 are connected to the ground line 620 by a lead 622. The contacts 286 are in turn connected to the counter relay 618 by a lead 624. The circuit for energizing the counter relay 618 is completed by a lead 626 which is connected to the ground line 420 of FIG. 22. Energization of the counter relay 618 over the aforementioned circuit closes normally open contact 628 to complete a circuit for energizing the record magazine latch solenoid 250 (see FIG. 24).

After the actuator arm 84 has rotated past the fixed counter contacts 600 and 602, the arm moves to position the actuator assembly 82 in the initial or start positions 378 and 380. When the actuator is in the initial or start positions 378 and 380 the moving contact 370, which had previously been in engagement with either the end-of-cycle segment 366 or 368, is moved out of engagement with the end-of-cycle segments and onto the contact support panel 100, which is made of insulating material, to interrupt the circuit for energizing the actuator drive motor 134 which was formerly energized over a circuit including the moving contact 370, the lead 568 connecting the moving contact 370 to the moving contact 374. In addition to deenergizing the actuator drive motor 134, the movement of the contact 570 to the initial area 578 or 580 of the contact panel 100 deenergizes the stop relay 560 which had previously been energized over a lead 562 extending from the power line 420 to the stop relay 560 and a line 564 which is connected to the end cycle segments 366 and 368 on the contact board 100 of FIG. 23. The deenergization of the stop relay 560 opens the contacts 576 of FIG. 22. The latch solenoid 412, which had previously been held energized by a circuit including the contacts 576, is deenergized by the opening of the contacts 576. The deenergizing of the latch solenoid 576 returns the latching circuitry 400 to its initial condition and releases the letter selector switches 414 and number selector switches 416 to enable subsequent record selections to be made after the pin member 80 for the previously selected record has been moved to the signaling position.

As previously mentioned, the energization of the counter relay 618 closed the contacts 628 to energize the record magazine latch solenoid 250. Energization of the record magazine latch solenoid 250 closes normally open contacts 254 by engagement of the latch lever 244 of the latching assembly 242, which is best seen in FIG. 13. When the contacts 254 are closed, a circuit is completed for energizing the record magazine drive motor 166. The circuit for energizing the record magazine drive motor includes a lead 630 which interconnects the power line 608 and the record magazine drive motor 166. The circuit for energizing the motor 166 is completed through a lead 632 which is connected to the now closed switch contacts 254, a lead 634 which interconnects the closed switch contact 254, and a transfer switch 636 which is in the position shown in FIG. 24 to connect the lead 634 to ground through a normally closed switch 638 and the leads 640 and 642. The normally closed switch 638 is actuated by the control mechanism 64 of FIG. 1 in a manner to be explained in greater detail subsequently.

The energization of the record magazine drive motor 166 rotates the record magazine 34 and the sensor arm 114 relative to the selector unit 70 (see FIG. 3) until either the switch arm 120 associated with the "A" side sensor switch 116 or the switch arm 122 associated with the "B" side sensor switch 118 is closed by sensing engagement with a pin member 80 which has been moved to the signaling position through the energization of either the electromagnet 90 or 92 of the actuator assembly 82. Assuming that the selected recording, that is, a recording associated with the A switch of the letter selector switches 414 and the number 2 switch of the number selector switches 416, is on the "A" side of a record, the sensor arm 120 engages the pin 80 which was previously moved to the signaling position by the energization of either the electromagnet 90 or the electromagnet 92. When the sensor arm 120 is actuated by the pin member 80 associated with the selected side of a selected record, the normally open sensor switch 116 (see FIG. 24) is closed. The actuation or closing of the normally open sensor switch 116 completes a circuit extending from the power line 608 to the ground line 620 to energize an "A" side relay 648. The "A" side relay is energized over a circuit including a lead 650 connected to the power line 608, the now closed sensor switch 116, and a lead 652 which is connected to the "A" side relay. The circuit for energizing the "A" side relay 648 is completed over leads 654 and 656 which connect the "A" side relay 648 to the ground line 620.

The energization of the "A" side relay 648 closes the normally open "A" side relay contacts 660 to lock the "A" side relay in energized condition and the energization of the "A" side relay also closes normally open relay contacts 662 to complete a circuit to energize a main cam relay 664 through leads 666, 668, and 656. Energization of the main cam relay 664 opens normally closed contacts 669 to deenergize the record magazine latch solenoid 250 to lock the record magazine in position. Energization of the main cam relay 664 also closes the normally open contact 670 to energize a control mechanism drive motor 672 over a circuit including leads 676 and 678 which connect the motor 672 to the contacts 670 of the now energized main cam relay 664. The contacts 670 of the main cam relay 664 are connected to the ground line 620 of leads 680, 684, and 640, switch contacts 638, and the lead 642. Contemporaneously with the energization of the control mechanism drive motor 672 by the closing of the main cam relay contacts 670, an "A" side solenoid 688 is energized by the closing of the normally open contacts 690 of the "A" side relay 648. The "A" side solenoid 688 is then energized by a circuit extending over leads 692 and 694 from the ground line 620 to the power line 420. The energization of the "A" side solenoid 688 actuates the record transfer assembly 46, in a manner explained in greater detail in application, Ser. No. 619,687, Changer and Selector Mechanism, filed in the names of Fred H. Osborne, Robert S. Tuttle, and Michael J. Corbett, to position the "A" side of the selected record upwardly on the turntable 52. The energization of the "A" side relay 648 also moves "A" side relay contacts 698 from the position shown in FIG. 24, wherein the contactor bar 700 engages the upper contact 702, to a position wherein the contactor bar 700 engages the lower contact 704.

The rotation of the control mechanism drive motor 672 actuates the control mechanism 64, which is set

forth in greater detail in the aforementioned application, Ser. No. 619,687, filed in the names of Fred H. Osborne, Robert S. Tuttle, and Michael J. Corbett, to move the transfer switch from the position shown in FIG. 24 wherein a switch arm 706 engages a contact 708 to a position engaging a contact 710 of the transfer switch 636. This movement of the contactor arm 706 breaks the circuits which have previously connected the record magazine drive motor 166 to ground. A cancel switch 714 is closed by the rotation of the control mechanism 64 by the drive motor 672. Closing the cancel switch 714 energizes the "A" side pin return solenoid 260 through a circuit including a lead 718 which interconnects the "A" side pin return solenoid 260 and the power line 608 and a lead 720 which interconnects the solenoid 260 with the now closed contacts 700 and 704 which are connected by a lead 722 to the now closed cancel switch 714. The cancel switch 714 is connected to the ground line by a lead 724. When the "A" side pin return solenoid 260 is energized, the pin member return bar 264 (see FIG. 15) is moved downwardly to urge a pin member from the signaling position to the normal position.

Further rotation of the control mechanism 64 positions the record on the turntable with the selected side, that is, the "A" side, upwardly, and contemporaneously therewith opens a normally closed "A" side limit switch 730 to deenergize the "A" side relay 648 and the main cam relay 664 which was previously held energized over the normally open contacts 662 of the "A" side relay. The control mechanism 664 continues to rotate under the driving force of the motor 672 to position the tone arm 60 on the selected record. The normally closed switch 638 is then opened by the control mechanism and a switch is closed to energize the turntable drive motor 56 to rotate the turntable and play the record. Opening the switch 638 deenergizes the control mechanism drive motor 672 which was previously energized through a circuit including the contact 710 and contact arm 706 of the transfer switch 630, and the leads 640 and 642. At the end of the record, a normally open tone arm switch 732 is closed by a lever connected to the tone arm to reenergize the control mechanism drive motor 672 over a circuit extending form the transfer switch 636 to the tone arm switch 732 through leads 684 and 734 which connect the tone arm switch 732 to ground through leads 736, 738 and 642. The reenergized control mechanism drive motor 672 rotates the control mechanism 64 to close the switch 638, deenergize the turntable drive motor, and drive the record transfer assembly 46 to return the just played record to the record storage magazine 34. The transfer switch 636 is then moved back to the position shown in FIG. 24 and the sensor arm 614 continues its cycle of rotation relative to the accumulator assembly 74.

As the sensor arm 114 continues to rotate, the counter assembly 280 (see FIGS. 16 and 17) is actuated by the lever 304 to move the counter plate 282 and count one revolution of the sensor arm by moving the counter plate 282 one notch. On the second revolution of the sensor arm 114, if a record has not been selected subsequent to the record which has just been played, the sensor arm 114 moves to its initial position and actuates the counter assembly a second time to open the contacts 286 and deenergize the counter relay 618. Deenergizing the counter relay 618 opens the contacts 628 and deenergizes the record magazine latch solenoid 250 to open the solenoid switch 254 and deenergize the record magazine drive motor 166 while locking the record magazine 34 in its initial position. If a record had been selected subsequent to the record which had just been played, the second revolution of the sensor arm 114 relative to the accumulator 74 would have sensed the pin member 80 associated with the selected record to repeat the aforementioned process.

If the "B" side of a record had been selected for playing, the sensor switch 118 would have been actuated by engagement with the pin member 80 associated with the record and a "B" side relay 746 would be energized. Energization of the "B" side relay 746 would close the B side interlock contact 748 to hold the "B" side relay in an energized state, and would close normally open contacts 750 to energize the main cam relay 664. The operation of the record changer assembly 30 would be substantially the same as when the "A" side relay 648 was energized except that the "B" side pin return solenoid 262 would be energized by actuation of a switch 754 to return the pin 80 to its normal position after the main cam relay 664 had been actuated. In addition, the contact 756 would be opened by positioning the record on the turntable 52 to deenergize the "B" side relay in much the same manner as previously explained for the "A" side relay 648.

The selector circuitry 402 can be conditioned for playing an LP record by positioning the LP conditioning switches 472 as indicated in dashed lines in FIG. 23. When the LP conditioning switches 472 are positioned as shown in dashed lines in FIG. 23, the letter selector switches 414 are conditioned internally for the selection of an LP record in the record magazine 34. Assuming that a quarter or 25 cents is deposited in the coin receiving apparatus, the key switch 410 (FIG. 24) is closed, and an LP credit switch 766 in the latching circuitry 400 is closed by the coin receiving apparatus. The closing of the key switch 410 energizes the set-up relay 418 by a circuit extending from the power line 420 to the ground line 432 in the manner previously explained. When the set-up relay 418 has been energized, the contacts 442 of the set-up relay are closed to complete a circuit for energizing the latch solenoid 412. In addition to completing a circuit for energizing the latch solenoid 412, a circuit for energizing an LP relay 768 is completed. The circuit for energizing an LP relay 768 extends from the power line 420 over the lead 440 to the contacts 442. The contacts 442 are in turn connected by leads 444 and 446 to the normally made contacts 448 of the top tunes relay. The contacts 448 are connected by leads 450 and 770 to the LP relay 768 which is in turn connected by leads 772 and 774 to the now closed LP credit switch 766. The LP credit switch 766 is connected by a lead 776 to the ground line 432 to complete the circuit for energizing the LP relay 768.

Energization of the LP relay 768 closes normally open relay contact 778 to lock the LP relay in an energized condition over a lead 780 which is connected to the ground line 432. Energization of the LP relay 768 also operates the contacts 466 to move the contactor

bar 782 into engagement with the lower contact 784 to lock the latch solenoid 412 in an operated condition through a circuit extending from the ground line 432 including a lead 788 which is connected to the LP relay contacts 466. The now closed contactor bar 782 and contact 784 connect the lead 788 to the lead 464 which is connected through the normally closed selection button release switch 462 to the latch solenoid by the leads 458 and 460. An LP light 792 is energized by actuation of the LP relay contacts 478 from the position shown in FIG. 22 to a position wherein the contactor bar 794 engages a lower contact 796 to complete a circuit extending from a lead 798 which is connected to the ground line 432 to the lead 476 which is connected through the now made contact 474 of the latch solenoid 412 to the power line 420.

In addition to operating the aforementioned LP relay contacts, energization of the LP relay actuates contacts 800 (FIG. 23) in the selector circuitry 402 to connect a central lead or common line 802 of the letter selector switches 414 to an LP shorting or conductor bar 804. By connecting the shorting bar to a shorting patch or contact 806 with a suitable adjustable connector 808, any number of the shorting patches 806 can be connected to the central lead 802. The shorting patches 806 are designated 2 through 8 in FIG. 23 and are connected to credit cancel contacts 350 having the same designation by leads which are not shown. The actuation of a letter selector switch 492 associated with an LP record connects ground to the contact patch 806 which is designated by the number 2 in FIG. 23. This contact patch 806 is connected to the ground lead 432 through the lead 474 which is connected to the LP conditioning switch 472, which has been moved to the position shown in dotted lines in FIG. 23, which is connected in turn by a lead 814 to the selector switch 492. The selector switch 492 connects the lead 814 to the central lead 802 which is connected through the operated LP relay contacts 800 by a lead 816 to the LP conductor bar 804. As previously mentioned the LP conductor bar 804 is connected by a suitable adjustable connection means 808 to the patch contact 806 which is designated by the numeral 2 in FIG. 23. The patch 806 is in turn connected to the credit cancel contact 350 which is designated by the numeral 2 on the contact mounting panel 100. Therefore, when the accumulator assembly 82 is rotated relative to the mounting panel 100, two credit canceling pulses are transmitted to the credit cancel solenoid 584 to remove a credit corresponding to the cost of playing an LP record from the coin receiving apparatus.

The operation of the control circuitry 404 of FIG. 24 is substantially the same when an LP record is played as it is when a standard record is played. However, when the start relay 534 is deenergized by the deenergization of the set-up relay 418 and the stop relay 560, both the latch solenoid 412 and LP relay 768 are deenergized. The LP credit switch 478 is then returned to the position shown in FIG. 22. Since a quarter was deposited in the coin receiving apparatus and entitles the customer to play both a standard record and an LP record, the set-up relay 418 and start relay 534 are again energized by the remaining credit in the registration mechanism in the coin receiving apparatus. The energization of the set-up relay 418 and start relay 534 energizes the latch solenoid 412 to enable the customer to select a standard record in the manner previously explained. Thus, the latch circuitry 400 enables a customer to select a single record for playing or, by depositing coins to obtain the proper credit in the credit registration mechanism in the coin receiving apparatus, to play a single record and an LP record. It should be noted that if, after depositing a quarter, the customer had so elected, he could play three standard single play records before the credit registered in the credit registering mechanism in the coin receiving apparatus would be completely cancelled by the credit cancel solenoid 584.

An anti-cheat feature is provided in the circuitry to prevent a customer from selecting an LP record after he has deposited coins sufficient to pay for only a standard record. When coins of a sufficient denomination to cover only a standard record have been deposited in the coin receiving apparatus, or when only sufficient credit remains in the coin receiving apparatus to entitle a customer to play a standard record, the LP credit switch 766 remains in its normally open condition shown in FIG. 22 so that the LP relay is deenergized. When the LP relay is deenergized, the LP relay contacts 800 are positioned as shown in FIG. 23. With the LP relay contacts 800 as shown in FIG. 23, the selection of an LP record by the closing of a letter selector switch 492 associated with an LP record places ground from a central lead 802 in a manner previously explained. The ground from the central lead 802 completes a circuit for energizing a light 818 through a lead 820 which interconnects the LP relay contacts 800 and the light. The light 818 is in turn connected to a 24-volt source of power by normally open contacts 822 of the now energized set-up relay 418. The signal light 818 indicates that only a single play or standard record can be selected. The actuation of a letter selector switch 492 corresponding to an LP record is ineffective to conduct ground to the associated letter group contacts 330 on the contact mounting panel 100. The chain circuit to the lead 474 for retaining the latch solenoid 412 energized must include either LP conditioning switches 472, which are in the normal position associated with a standard record as shown in solid lines in FIG. 23, or letter selector switches 492 which are in the unactuated position shown in solid lines in FIG. 23, and an LP conditioning switch 472 which is in the actuated position, that is, the position indicated in dashed lines in FIG. 23. Thus, the chain circuitry associated with the letter selector switches 414 prevents a customer from selecting an LP record when he has paid for only a standard record.

In addition to the standard and LP record selection circuitry, circuitry is provided for selecting a plurality of predetermined series of records. When a customer deposits fifty cents and actuates a series or top tunes selector switch 830 (see FIG. 22), a group of leads designated 832 in FIG. 23, connected to predetermined contacts 330 of the letter group, are grounded. In addition, the actuation of the top tune or series selector switch 830 connects battery to predetermined contacts of the number group 334. Thus, a predetermined series of letter contacts 330 are connected to ground, and predetermined number contacts 334 are connected to battery to energize the actuator assembly 82 to select a predetermined series of records for playing.

Considering the top tunes or series selection circuit in greater detail, the depositing of 50 cents in the coin receiving apparatus registers sufficient credit on the credit registering mechanism to actuate the key switch **410**, the LP credit switch **766**, and top tunes or series credit switch **836** from their normal open position to a closed position. When the top tunes or series credit switch **836** is closed, a pair of top tunes or series lights **840** are energized over a circuit extending form the power line **420** to the ground line **432**. This circuit includes a lead **842** connecting the lights **840** to the ground line **420**, leads **844** and **846** connecting the lights **840** to the top tunes selector switch **836**, and a lead **848** connecting the top tunes selector switch to the ground line **432**. Assuming that the customer selects to play the predetermined series of records or the top tunes, the top tunes selector switch **830** is actuated to energize a top tunes relay **854** over a circuit including a lead **856** interconnecting the power line **420** in the top tunes relay **854**. The circuit for energizing the top tunes relay **854** is completed by a lead **858** which is connected to the top tunes selector switch **830** and to the ground line **432** for the leads **846** and **848**. Energizing the top tunes relay **854** actuates the top tunes relay contacts **448** (FIG. 22) from the position shown to a position connecting the connector bar **862** to a lower contact **864**. This actuation of the contacts **448** of the top tunes relay disables the latch solenoid **412**, since the latch solenoid can no longer be connected to the power line **420** by closing either the set-up relay contacts **442** or the stop relay contacts **576**. Thus, after the top tune selector switch **830** has been actuated, the letter selector switches **414** and number selector switches **416** cannot be subsequently actuated to select individual records in addition to the predetermined series of records, since the latch solenoid **412** must be energized before the letter selector switches and number selector switches can be actuated.

In addition to energizing the top tunes relay **854**, actuation of the top tunes selector switch **830** energizes the group relay **868** in parallel with the top tunes relay **854**. A shorting or contactor bar **870** is moved into engagement with fixed contacts **872** and **874** when the group relay **868** is energized. The start relay **534** is energized after the top tunes relay **854** is energized over a circuit including the lead **578**, **880**, the contacts **864** and the contactor bar **862**, of the now energized top tunes relay **854**, the leads **446** and **444**, and the contacts **442** of the set-up relay **418**, and the lead **440** which is connected to the power line **420**. The energization of the start relay **534** closes start relay contacts **882** to connect ground to the shorting bar **870** from the ground line **432** over leads **884**, **886** which are connected to the start relay contacts **882**, and leads **888** and **890** which are connected to the contact **874** which engages the contactor or shorting bar **870**. Thus, actuating the top tunes selector switch **830** connects ground to the shorting bar **870**.

Referring now to FIG. 23, it can be seen that the shorting bar **870** is connected to a plurality of leads, including the leads **832** which are connected to predetermined letter contacts **330** on the contact mounting panel **100**, to energize the actuator assembly **82** to move pin members **80** which are associated with the records of the predetermined series of records or top ten tunes. In addition, a plurality of leads **894** are connected to patch contacts **896**. The patch contacts **896** are connected by suitable adjustable connectors, such as screws **898**, to patch contacts **806** which are connected to the cancel contacts **350** on the contact board **100**. In addition, leads **514** are connected to predetermined number segments **334** on the contact panel **100** and associated with predetermined number selector switches **416**. In the embodiment shown, number selector switches **1** and **2** are connected to ground by movement of the top tunes relay contacts **506** to engage the connector bar with the lower contact and to connect the operated contacts **516** of the top tunes relay to the power line **420**. The electromagnets **90** and **92** are energized by circuits extending from ground of the shorting bar **870**, through the leads **832**, to the letter contacts **330** when the actuator assembly **82** is rotated. The circuit for energizing the electromagnets **90** and **92** is completed by leads **514** which are connected to battery over the operated contacts **506** of the top tunes relay **854**. As the actuator assembly **82** is rotated, a series of pulses is emitted to the credit cancel solenoid **584** by successive connection of the contact **352** to the grounded credit cancel contacts **350**. Thus, as the actuator assembly **82** is rotated, a plurality of pin members **80**, associated with a predetermined series of records, are moved from the normal position to the signaling position, and a plurality of pulses actuates the credit cancel solenoid **584** to remove the credit registration from the coin receiving apparatus.

A selector switch **904** is provided for selecting a second series of tunes. By moving a selector arm **906** from a position engaging the contact **908** to a position in engagement with a contact **910**, a series of tunes associated with the number selector switches **4** and **5**, rather than the number selector switches **1** and **2**, can be selected. The selector switch **904** enables a first series of tunes, for example the top 10 Western tunes, to be selected for playing when the top tunes selector switch **830** is actuated, or a second series of tunes, for example the top 10 jazz tunes, to be played when the top tunes selector switch **830** is actuated. Although in the embodiment shown the same letter group of contacts **330** is energized over the leads **832** with either the first or the second series of tunes, it will be apparent to those skilled in the art that a switching mechanism can be provided to change the contacts of the letter group **330** as well as the number group contacts **334** which are associated with the selected series of tunes. It will also be apparent to those skilled in the art that a large number of predetermined series of tunes can be programed for selection by actuating the top tunes or series selector switch **830** by providing a suitable switching device, similar to the selector switch **904**, and switches for engaging different series of letter contacts over leads **832**.

METHOD OF OPERATION

For purposes of affording a more complete understanding of the invention, it is advantageous now to provide a functional description of the mode in which the component parts cooperate. When a customer wishes to select a record **38** in the record magazine **34** for playing on the turntable **52**, he will place coin of sufficient denomination to cover a predetermined cost of playing the record in a coin receiving apparatus. The

coin receiving apparatus registers a credit in accordance with the amount of money deposited by the customer. A key switch **410** in the latching circuitry **400** is then closed to energize the set-up relay **418**. Energizing the set-up relay **418** enables the customer to select a single side or recording on a record in the record magazine **34** for playing. If the customer has deposited coins totaling a sufficient amount to cover the cost of playing an LP record, the LP credit switch **766** will also be closed. The customer can then select an LP or long-playing record by actuating or operating a letter selector switch **414** which has been associated with an LP record. In addition, if the customer deposits enough money to provide a sufficient credit registration in the coin receiving apparatus, the top tunes credit switch **836** is closed and the customer can select a predetermined series of tunes by actuating a top tunes selector switch **830**. To increase the options which a customer has, a selector switch **904** is provided to enable the customer to select either a first series of tunes, such as the top Western tunes, or a second series of tunes, such as the top jazz tunes.

The record selections made by a customer are read into or stored in the register or accumulator **74** of the selector unit **70**. The accumulator **74** registers or stores the record selections by moving pin members **80** which are associated with the selected recording from a first normal position to a second signaling position. The pin members **80** will be moved from the first normal position to the signaling position by an actuator assembly **82** which will be rotated relative to the pin members **80** by a motor **134**. When the actuator is moved into a position directly adjacent, but spaced apart from, a pin member **80** associated with a selected record either the electromagnet **90** or **92** will be energized to emanate a magnetic field which will move the pin member from the normal position to the signaling position. As was previously explained, the electromagnets **90** or **92** are energized over a circuit including the actuated letter selector switch **414** associated with the selected record, the actuated number selector switch **416** associated with the selected record, a first group of letter contacts **330** which are connected directly to the letter selector switches **414**, and a second group of number contacts **334** which are connected directly to the number selector switches **416**.

The rotation of the actuator assembly **82** will cause the movable contacts **340**, **344**, **346**, and **342** to move or wipe across the first or letter group contacts **330** and the second or number group contacts **334**. When the movable contacts engage the number contact **334** associated with the selected record, and the letter contact **330** associated with the selected record, a circuit is completed between the letter contacts **330** and the number contacts **334** to energize the electromagnet **90** or **92** which is adjacent to the pin member **80** associated with these contacts and the selected record. It should be noted that the electromagnet **90** or **92** is actuated while being moved relative to the pin members **80**. Since the electromagnets do not engage the pin members to move the pin members from the normal position to the actuated position, it is not necessary for the rotation of the actuator assembly to be halted to move a pin member. The provision of two electromagnets **90** and **92** on opposite ends of the actuator bar or arm **84** enables the actuator assembly to sensibly engage all of the letter and number group contacts **330** and **334** on one half of a revolution. When the one-half revolution of the actuator assembly **82** is completed, the latching circuitry **400** and the selector circuitry **402** return to their normal condition to enable additional record selections to be made.

As the actuator assembly completes its cycle of operation, a pair of counter contacts **600** and **602** on the contact mounting panel **100** are interconnected by either the moving contacts **354** and **356** or the moving contacts **358** and **360**. The interconnection of the two counter contacts **600** and **602** completes a circuit for energizing the counter reset magnet **300**. Energization of the counter reset magnet **300** closes the normally open contacts **286** to energize the counter relay **618** to complete a circuit over the now closed contacts **628** of the counter relay for energizing the record magazine latch solenoid **250** to release the record magazine **34** for rotation relative to the base structure **32**. The energization of the record magazine latch solenoid **250** closes the normally open contacts **254** to complete a circuit for energizing the record magazine drive motor **160** to rotate the record magazine. As the record magazine is rotated, a sensor arm **114** is rotated relative to the pin members **80** in the accumulator **74**. A pair of sensing switches **116** and **118** are mounted on the sensor arm **114** for sensible engagement with the pin members **80** which are in the outwardly extending signaling position. When one of the sensor switches **116** or **118** is actuated by sensing engagement with a pin member **80**, the record magazine **34** will be positioned with the record associated with the pin member in the pickup or loading position **50** wherein the record is engaged by the record transfer assembly **46**. The closing of one of the sensor switches **116** and **118** actuates the control circuitry **404** to energize the control mechanism drive motor **672** which powers the record transfer mechanism **46** to transfer a record from the storage magazine **34** to the turntable **52** with the selected recording positioned upwardly on the turntable **52** for engagement by the tone arm **60**. When the record has been played, the tone arm **60** will actuate the switch **736** to complete a circuit for reenergizing the control mechanism drive motor **672** to move the record from the turntable back to its storage position in the record magazine **34**.

The counter assembly **280** retains the contact **286** closed until the sensor arm has made two complete revolutions relative to the accumulator **74**. Thus, after the selected record has been played, the sensor arm **114** continues on its first revolution relative to the accumulator **74** and, if a record has not been subsequently selected, will complete its second revolution relative to the accumulator **74** and will open the contacts **286** to deenergize the counter relay **618** and open the previously closed contacts **254** to deenergize the record magazine drive motor **160**. On the other hand, if a record selection had been made subsequent to the record selection which had just been played, one of the sensor switches **116** or **118** would have been actuated by the continued rotation of the sensor arm **114** relative to the accumulator **74**. When the predetermined number of revolutions have been registered on the counter assembly **280** by rotation of the sensor arm

relative to the accumulator **74**, the contacts **286** will be opened to deenergize the counter relay **618** and the record magazine drive motor **160**.

Although the selector unit **70** has been shown in use with the record changer assembly **30** and with a selector circuitry capable of selecting a single record, an LP record, and a plurality of series of predetermined tunes, it will be apparent to those skilled in the art that the selector unit **70** could be used with very minor modifications with existing automatic record changer assemblies and with known selector circuitry. It will also be apparent to those skilled in the art that the selector circuitry (which is highly versatile and enables a customer to select either a single record, an LP record, or one series of a plurality of series of tunes) can be used with record changer assemblies and selector units other than the one shown. In addition, it is contemplated that the positioning of the pin members **80** relative to the actuator unit **82** in the selector unit **70** can be varied without deviating from the spirit of the present invention.

What is claimed is:

1. A selector assembly for an automatic phonograph comprising: a base means, a plurality of elongated magnetically susceptible members supported by said base means in a circular array with the individual members substantially parallel to the axis of the circle and having upper and lower ends and respectively corresponding to predetermined storage locations for a plurality of records, said magnetically susceptible members being movable radially inwardly of said array relative to said base means from a first position to a second position; and a magnetic actuator supported by said base means, said magnetic actuator being movable relative to said magnetically susceptible members in a path radially within said circular array spaced radially from said members, said magnetic actuator comprising an electromagnet with a generally U-shaped core having upper and lower legs respectively passing in close proximity to the upper and lower ends of said members, said electromagnet further having a coil thereon selectively energizable while said actuator is moving to move a magnetically susceptible member corresponding to a predetermined record storage location radially inwardly of said array and from said first position to said second position by bringing the magnetically susceptible member within the influence of a magnetic field emanating from said magnetic actuator without contact between said actuator and said members.

2. An assembly as set forth in claim **1** further including: sensor means mounted for sensing said member when said members are in said second position to signal the position of a predetermined record storage location; and a member return means supported by said base means for moving said member from said second position to said first position after said members have been sensed by said sensor means, said sensor means and said member return means being mounted on an arm supported by said base means for movement relative to said members.

3. An assembly as set forth in claim **1** further including: a plurality of contact means supported by said base means and associated with both said record storage locations and said members; and a contact arm mounted on said magnetic actuator for engaging said contact means to enable said magnetic actuator to be electrically energized through circuitry including said contact arm and a contact means associated with a predetermined record storage location to move a member associated with a predetermined record storage location from said first position to said second position.

4. An assembly as set forth in claim **3** further including: circuit means for transmitting electricity to said magnetic actuator through a predetermined group of said contact means when said contact arm engages a contact means of said predetermined group of contact means to move a predetermined plurality of members associated with a predetermined group of records from said first position to said second position.

5. An assembly as set forth in claim **1** further including: sensor means mounted for movement relative to said members while sensing said members when said members are moved from said first position to signal the position of the predetermined record storage location; and a counter mechanism mounted for actuation by said sensor means in each cycle of movement of said sensor means relative to said members, said sensor means being moved relative to said members until said counter means has been actuated a predetermined number of times.

6. An assembly as set forth in claim **5** wherein: said plurality of members includes a plurality of pairs of metallic members, each of said pairs of metallic members being corresponding to a record filing location and including a first member associated with a first side of a record positioned in the associated filing location and a second member associated with a second side of a record positioned in the associated filing location; a first sensor means being mounted for sensing said first member of the plurality of pairs of metallic members when said first member is in said second position; a second sensor means being mounted for sensing the second member of the plurality of pairs of metallic members when said second member is in said second position; a first return means mounted for moving the first member of the plurality of pairs of members from said second position to said first position; and a second return means mounted for moving the second member of the plurality of pairs of members from said second position to said first position, whereby said members are moved from said first position to said second position by said magnetic actuator and moved from said second position to said first position by the associated return means after being sensed by the associated sensor means.

7. An assembly as set forth in claim **1** further including: a first group of contacts supported by said base means, each contact of said first group of contacts being associated with a plurality of said record storage locations; a second group of contacts supported by said base means with each contact of said second group being associated with a record storage location, said second group of contacts being formed into a plurality of subgroups of contacts with each subgroup of contacts being associated with a different contact of said first group of contacts; a first contactor arm connected to said magnetic actuator and positioned for engaging said first group of contacts; a second contactor arm connected to said magnetic actuator and positioned for engaging said second group of contacts; and control circuitry connected to said first and second group of

contacts to selectively energize said magnetic actuator through a circuit including a contact of said first group, a contact of the sub-group of contacts associated with the contacts of said first group, and said first and second contactor arms to move a member corresponding to a predetermined side of a predetermined record from said first position to said second position.

8. An assembly as set forth in claim 1 further including: a second magnetic actuator supported by said base means, said second magnetic actuator being selectively energizable to move a member associated with a predetermined record storage location from said first position to said second position by bringing the member within the influence of a magnetic field emanating from said second magnetic actuator.

9. An assembly as set forth in claim 1 and further comprising selector circuitry including selectively operable group selector means for providing circuits for energizing said actuator to change a predetermined group of said members from said first position to said second position, said predetermined group of said members being associated with a preselected group of records in a plurality of predetermined record storage locations, said circuits for energizing said actuator including at least one of the contacts of a first group of fixed contacts, a plurality of the contacts of a second group of fixed contacts, and first and second movable contactors.

10. An assembly for use in an automatic phonograph comprising: a base means; a plurality of members supported by said base means and respectively corresponding to a plurality of predetermined record storage locations in a record magazine; an actuator supported by said base means, said actuator being energizable to change a selected member from a first condition to a second condition; a first group of fixed contacts supported by said base means, each contact of said first group of fixed contacts being associated with a plurality of said members; a second group of fixed contacts supported by said base means, each contact of said second group of fixed contacts being associated with one of said members; a first movable contactor connected to said actuator and positioned for moving engagement with said first group of fixed contacts; a second movable contactor connected to said actuator and positioned for moving engagement with said second group of fixed contacts; and selector circuitry connected to said first and second group of fixed contacts, said selector circuitry being selectively operable to provide a circuit for energizing said actuator to change a member from said first condition to said second condition when said actuator is adjacent to a member associated with a selected record in a predetermined record storage location, said circuit for energizing said actuator including a contact of said first group of fixed contacts, a contact of said second group of fixed contacts associated with the member associated with the selected record, and said first and second movable contactors, said selector circuitry including selectively operable group selector means for providing circuits for energizing said actuator to change a predetermined group of said members from said first position to said second position, said predetermined group of said members being associated with a preselected group of records in a plurality of predetermined record storage locations, said circuits for energizing said actuator including a plurality of the contacts of a first group of fixed contacts corresponding to said group of members, a corresponding number of the contacts of a second group of fixed contacts, and said first and second movable contactors, said selector circuitry including a plurality of group selector means for providing a plurality of circuits for energizing said actuator to change a plurality of predetermined groups of said members from said first condition to said second condition, each of said predetermined groups of said members being associated with a preselected group of records in a plurality of predetermined record storage locations, each circuit of said plurality of circuits for energizing said actuator including at least one of the contacts of said first group of fixed contacts, a plurality of the contacts of said second group of fixed contacts, and said first and second movable contactors; and said selector circuitry further including switch means for selecting one of said plurality of group selector means to provide a selected circuit of said plurality of circuits for energizing said actuator to change a selected group of said plurality of predetermined groups of said members from said first condition to said second condition, said selected group of said plurality of predetermined groups of members being associated with a selected group of records.

11. An assembly for use in an automatic phonograph comprising: a base means; a plurality of members supported by said base means and respectively corresponding to a plurality of predetermined record storage locations in a record magazine; an actuator supported by said base means, said actuator being energizable to change a selected member from a first condition to a second condition; a first group of fixed contacts supported by said base means, each contact of said first group of fixed contacts being associated with a plurality of said members; a second group of fixed contacts supported by said base means, each contact of said second group of fixed contacts being associated with one of said members; a first movable contactor connected to said actuator and positioned for moving engagement with said first group of fixed contacts; a second movable contactor connected to said actuator and positioned for moving engagement with said second group of fixed contacts; and selector circuitry connected to said first and second group of fixed contacts, said selector circuitry being selectively operable to provide a circuit for energizing said actuator to change a member from said first condition to said second condition when said actuator is adjacent to a member associated with a selected record in a predetermined record storage location, said circuit for energizing said actuator including a contact of said first group of fixed contacts, a contact of said second group of fixed contacts associated with the member associated with the selected record, and said first and second movable contactors, said selector circuitry including selectively operable group selector means for providing circuits for energizing said actuator to change a predetermined group of said members from said first position to said second position, said predetermined group of said members being associated with a preselected group of records in a plurality of predetermined record storage locations, said circuits for ener-

gizing said actuator including a plurality of the contacts of a first group of fixed contacts corresponding to said group of members, a corresponding number of the contacts of a second group of fixed contacts, and said first and second movable contactors, said selector circuitry including a plurality of group selector means for providing a plurality of circuits for energizing said actuator to change a plurality of predetermined groups of said members from said first condition to said second condition, each of said predetermined groups of said members being associated with a preselected group of records in a plurality of predetermined record storage locations, each circuit of said plurality of circuits for energizing said actuator including at least one of the contacts of said first group of fixed contacts, a plurality of the contacts of said second group of fixed contacts and said first and second movable contactors, and said selector circuitry further including switch means for selecting one of said plurality of group selector means to provide a selected circuit of said plurality of circuits for energizing said actuator to change a selected group of said plurality of predetermined groups of said members from said first condition to said second condition, said selected group of said plurality of predetermined groups being associated with a selected group of records; a third group of fixed contacts supported by said base means; and a third movable contactor mounted for moving contemporaneously with said first and second movable contactors and in engagement with said third group of fixed contacts; money receiving means connected to said selector circuitry and to said third group of contacts for controlling the operation of the automatic phonograph, said money receiving means including a register means which is actuated in a positive direction in accordance with the value of the money inserted into the money receiving means, said register means being actuated in a negative direction by the energization of circuitry interconnecting said money receiving means and said third group of contacts.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,690,680 Dated September 12, 1972

Inventor(s) Frank B. Lumney and Ronald P. Eberhardt

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 5, line 37, change "on" to --an--
Col. 8, line 53, change "FIG. 2" to --FIG. 1--
Col. 11, line 58, change "latching" to --locking--
Col. 12, line 34, change "on" to --of--
Col. 13, line 54, change "or" to --of--
Col. 13, line 58, change "353" to --354--
Col. 14, line 41, change "254" to --354--
Col. 15, line 59. change "form" to --from--
Col. 16, line 4, after "ground" insert --line--
Col. 16, line 10, change "401" to --402--
Col. 16, line 26, change "in" to --to--
Col. 16, line 27, change "to" to --of--
Col. 17, line 42-43, after "enable" insert --letter--
Col. 18, line 28-29, after "contact" insert --arms extending from the panels 104 causes the movable contact--
Col. 19, line 27, after "credit" insert --cancel--
Col. 22, line 45, change "of" to --by--
Col. 23, line 47, change "form" to --from--
Col. 27, line 9, change "form" to --from--
Col. 32, line 28, omit "metallic" both occurrences
Col. 32, line 29, omit "being"
Col. 32, line 35, omit "metallic"
Col. 32, line 38, omit "metallic"

Signed and sealed this 23rd day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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