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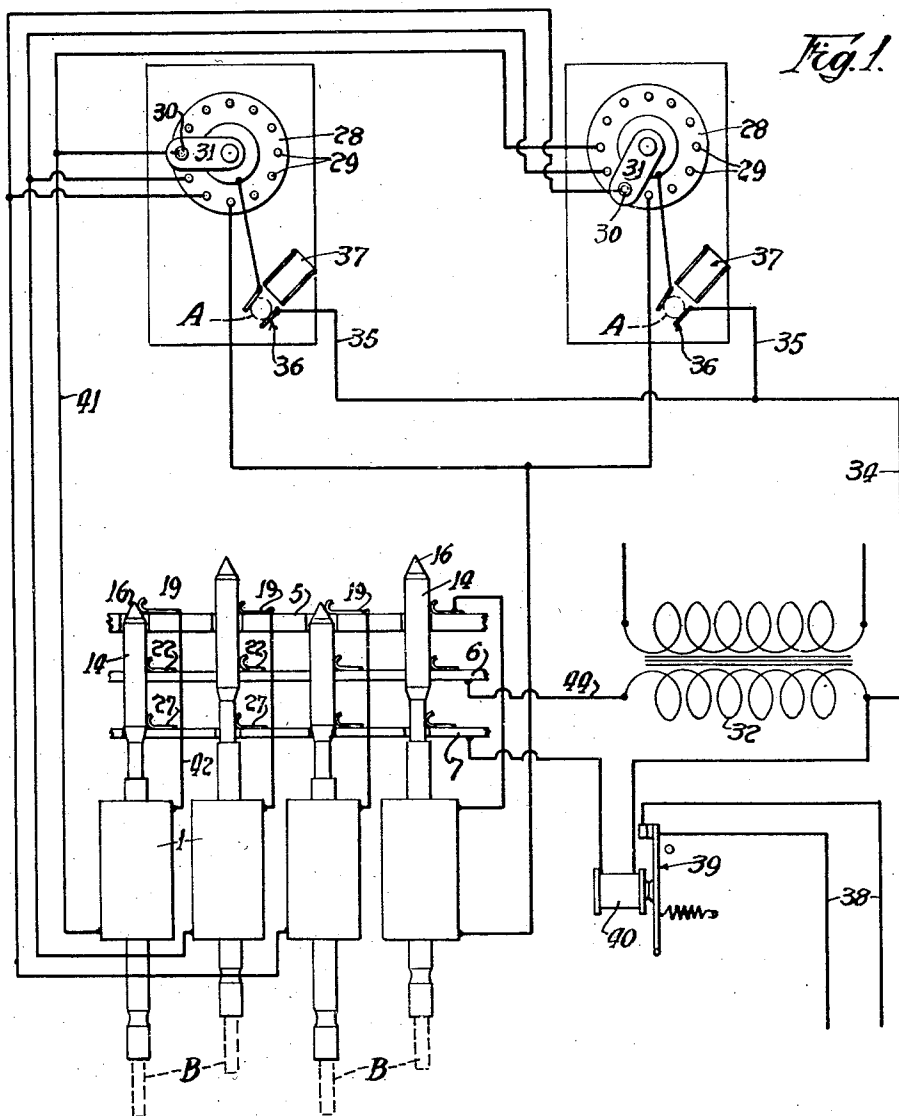
E. G. HENRY

2,255,216

ELECTROMAGNETIC RECORD-SELECTING CONTROL MEANS

Filed Aug. 26, 1939

2 Sheets-Sheet 1



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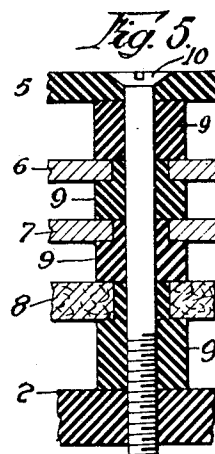
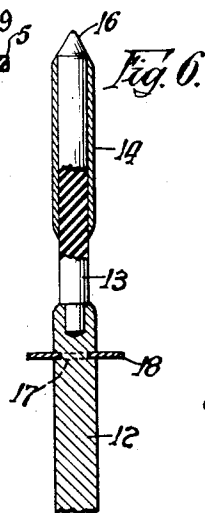
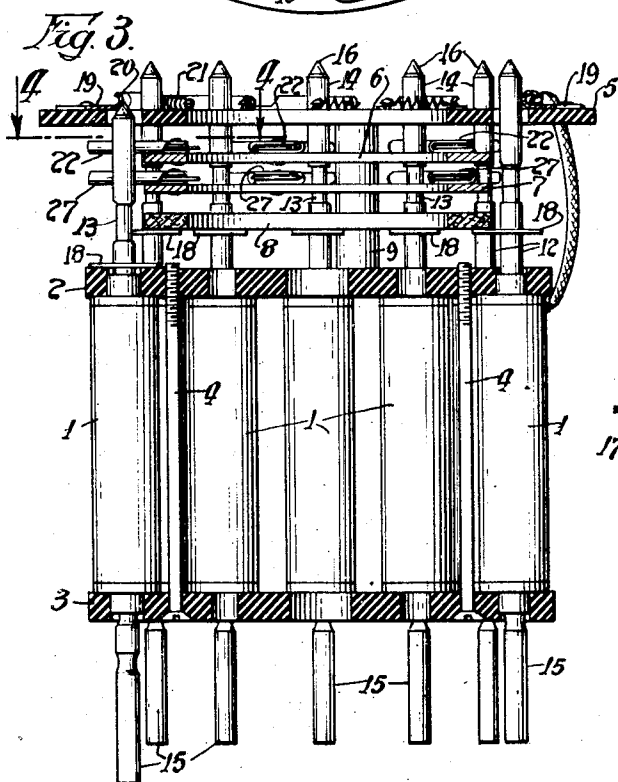
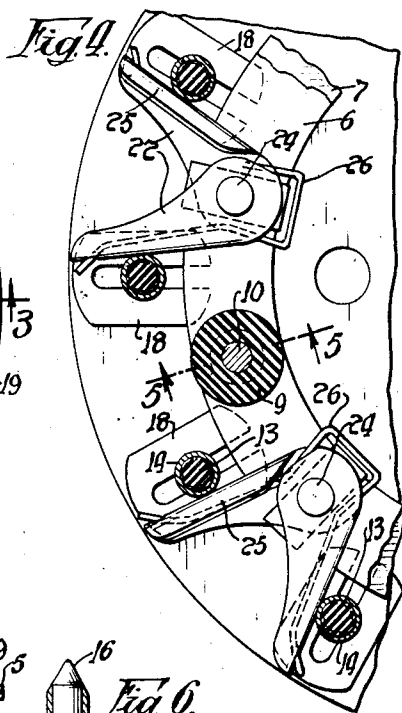
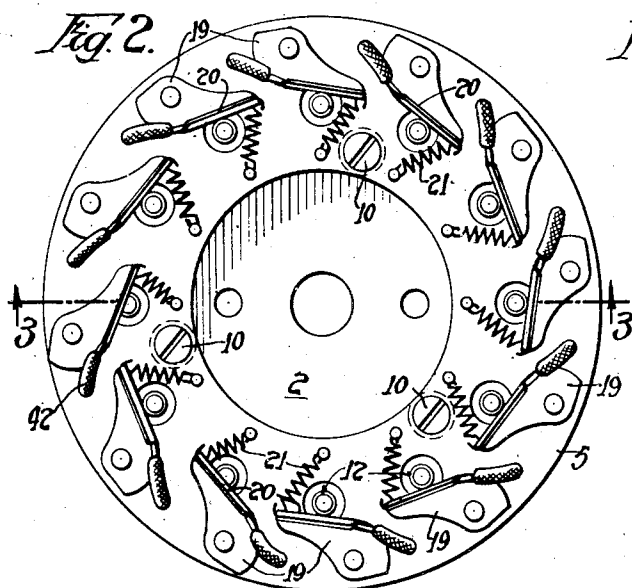
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ELECTROMAGNETIC RECORD-SELECTING CONTROL MEANS

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UNITED STATES PATENT OFFICE

2,255,216

ELECTROMAGNETIC RECORD-SELECTING
CONTROL MEANSEarle G. Henry, Chicago, Ill., assignor to Buckley
Music System, Inc., a corporation of Illinois

Application August 26, 1939, Serial No. 292,097

4 Claims. (Cl. 274-10)

The present invention has for its object to produce a simple, novel and efficient remote control system for musical instruments or machines adapted selectively to play any desired number of records.

A subsidiary object of the invention is to permit the presence of any desired number of distributed coin boxes or other control stations, without interference with each other, in connection with a record-selective system.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a diagram illustrating the present invention; Fig. 2 is a top plan view of the electromagnetic actuator for operating the selective means forming part of a phonograph or other musical instrument adapted selectively to play a number of records; Fig. 3 is a section on line 3-3 of Fig. 2; Fig. 4 is a section on line 4-4 of Fig. 3, on a somewhat larger scale than the latter; Fig. 5 is a section on line 5-5 of Fig. 4; Fig. 6 is a central longitudinal section through the upper portion of one of the combined contact makers and solenoid cores or plungers; and Fig. 7 is a perspective view of a clip, one of which is associated with each of the solenoid cores or plungers to limit the lengthwise movement of the latter.

Referring to Figures 2 to 7 of the drawings, 1, 1 represent a series of vertical solenoids corresponding in number to the number of records the playing of which is to be controlled. In the arrangement shown, these solenoids are located between upper and lower disks 2 and 3 of insulating material, so as to be distributed at equal distances around a vertical axis containing the centers of the disks. As best shown in Fig. 3, the disks are drawn together, with the solenoids clamped between them, by means of long screws 4, 4 extending between them.

Mounted upon the upper insulating disk 2 is a superstructure comprising an upper horizontal ring 5 of insulating material; metal rings 6 and 7 arranged one above the other, below the ring 5 and in spaced relation to each other and the ring 5; and a fiber ring 8 lying below the ring 7 and spaced apart from both the ring 7 and the disk 2. As shown in Fig. 5, the several elements

5, 6, 7, 8 and 2 are spaced apart from each other by means of aligned spacing blocks 9 arranged one directly above the other and at least some of them having neck portions extending through the overlying rings so as to form, in effect, a post or column positioned between the disk 2 and the ring 5. The super structure assembly is rigidly united into a single unit by means of screws 10 passing down from the ring 5 into the disk 2 through each post or column.

The disks 2 and 3 and the ring 5 contain holes axially aligned in the vertical direction with the solenoids, so that the solenoid cores, with their extensions, to be described, may move freely in the vertical direction so as to project above the top of the ring 5 and below the bottom of the disk 3, as may be required.

Each solenoid core comprises a long cylindrical portion 12 of magnetic material, preferably iron; a rod 13 of insulating material fixed to and rising from the upper end of the part 12; a sleeve 14 of metal, considerably shorter than the rod 13, surrounding and fixed to the upper part of the insulating rod; and a downward extension 15 of non-magnetic material, conveniently brass, on the lower end of the core member proper. The sleeve 14 is somewhat shorter than the distance from the top of the ring 7 to the top of the ring 5. The upper end of the insulating rod 13 is pointed or cone-shaped, as indicated at 16.

As shown in Fig. 6, each solenoid core has in the body member, near the upper end, an annular groove 17, providing a reduced neck portion adapted to be straddled by the arms of a flat U-shaped plate or clip 18, as best shown in Fig. 7; this plate or clip serving to limit both the upward and downward movements of the plunger. Thus, as shown in Fig. 3, the clip 18 on the plunger at the extreme right is engaged with the under side of the fiber ring 8, so that the plunger cannot rise any farther. On the other hand, the clip on the plunger at the extreme left is resting upon the disk 2, thus preventing that plunger from moving down any farther. It will be seen that the plungers may easily be released for removal, by simply withdrawing the clips and allowing the plungers to drop out.

The two plungers to which reference has just been made as being respectively in an up and a down position, illustrate the two positions of each plunger, one or the other of which must always be occupied. It will be seen from an examination of the right and lefthand plungers in Fig. 3, that when a plunger is up, a part of its metal sleeve extends above and below the planes of the

tops of the two upper rings 5 and 6, while the bare portion of the insulating rod 13 between the lower end of the sleeve and the body of the plunger lies opposite the edge of the ring 7. When the plunger is down, as on lefthand side of Fig. 3, only the pointed upper end of the insulating rod projects above the ring 5, whereas the metal sleeve 14 extends upwardly and downwardly past the edges of both the rings 6 and 7. By providing each of the rings 5, 6 and 7 with yieldable contact pieces adapted to engage such portions of each plunger device that lie just above the plane of each ring, in either of the two positions of the plunger, the plunger devices may be caused to effect changes in the electric circuits upon energization and de-energization of the solenoids. In the arrangement shown, there is placed on top of the disk 5, adjacent to each of the plunger devices, a swinging contact finger 19 in the form of a metal plate having one edge flanged upwardly, as indicated at 20, for engagement with the plunger device; there being a spring 21 acting on each of these contact fingers in a direction yieldingly to hold the flange 20 against the corresponding plunger device. On each of the rings 6 and 7 I have mounted contact fingers arranged in pairs between consecutive plunger devices. As shown in Fig. 4, each of these pairs of contact fingers comprises a little metal plate 22 overlapping at one end the corresponding end of the other finger, so that both fingers may be pivotally held by a single pivot pin 24. Each of the fingers 22 has a long edge flanged upwardly, as indicated at 25, to provide the actual contact face. A single U-shaped spring 26 having its arms extending along behind and engaged with the flanges 25, serves yieldingly to spread the contact fingers of each pair apart and hold them both against their cooperating plunger devices. The contact devices on the ring 7 may be and preferably are exactly like those just described; but, to distinguish between the two similar sets, each contact finger on the ring 7 is designated by the reference character 27.

From an inspection of Fig. 3, it will be seen that whenever a plunger device is in its raised position, one of the contact fingers 19 and one of the contact fingers 22 bears against the sleeve 14 of that device, whereas the corresponding contact finger 27 engages the rod 13 of insulating material and is therefore idle or ineffective. When a plunger is in its down position, the corresponding contact finger 19 engages with the pointed upper end 16 of the rod 13 of insulating material, so that it is now ineffective or idle; whereas the contact finger 22 still remains in engagement with the sleeve 14 which is now also being contacted by the corresponding finger 27 on the ring 7.

In using the electro-magnetic switch device just described, it is positioned in or upon a phonograph cabinet, for example, with the lower ends 15 of the plunger devices each above one of the selective buttons, levers or other elements forming part of the phonograph apparatus. Then, whenever a plunger device is moved into the lower of its two positions, it operates the selective device below the same. The phonograph apparatus containing within itself means that permit each selective device setting to remain undisturbed until the record corresponding thereto has been played, and then restoring that device to its normal, idle position, is utilized to return the plungers to their raised positions as soon as

the corresponding records have been played. Consequently, I need provide no means for raising the plunger devices, but only means, the solenoids, for pulling them down with sufficient force to operate the selective devices in the phonograph apparatus.

In order not to place on the phonograph apparatus the burden of holding the plunger devices raised, the three contact fingers that constantly press against the side of each plunger device are utilized as frictional holding means to prevent the dropping of the plunger device, through the action of gravity, when they are in their raised positions.

In Fig. 1 I have shown diagrammatically the manner of using the device just described. Referring to this figure of the drawings, 28 is a dial, of which there may be any desired number, so that a phonograph, for example, may be controlled from any one of a plurality of spots. The dialing devices may be constructed as described in my Selective switch application, Serial No. 292,098, filed August 26, 1939, now Patent No. 2,222,564, granted November 19, 1940, and may be mounted in boxes and operated as illustrated in my application for Wall box, Serial No. 289,615, filed August 11, 1939, now Patent No. 2,219,257, granted October 22, 1940; and reference may be had to those patents for further structural details with respect thereto. It is sufficient to say here that each dial has thereon a series of contacts 29, arranged in a circle, the number of contacts corresponding to the number of plunger devices. Cooperating with each of the stationary contacts 29 is a movable contact 30 mounted on a swinging arm 31 by means of which the movable contact may be engaged successively with all of the stationary contacts. The movable contact 30, through its arm 31, is connected to one side of the secondary 32 of a transformer through a line 34; this line containing as many branches 35, in parallel with each other, as there are dialing devices. Each of the branch lines 35 contains a switch 36 adapted to be closed momentarily by a coin, indicated in dotted lines at A, delivered through the usual or any suitable coin chute 37. Each of the stationary contacts 29 is connected to one terminal of one of the solenoids, so that each of the solenoids may be said to correspond to a stationary contact. The connections between corresponding stationary contacts in the several dialing devices are connected in parallel to the same solenoid terminal, so that any solenoid may be energized by the manipulation of any one of the dialing devices.

The electromagnetic actuator for the selective devices in the playing machine or instrument serves also to close a controlling circuit for the latter so as to insure that the playing of the records will not stop until all of the records that have been selected are played. In the diagram there is shown a portion 38 of a circuit which may be the motor's circuit or any usual or suitable circuit by means of which the playing of the accumulation of selections is insured in the phonograph apparatus itself. In this circuit is a switch 39 which is normally open and is adapted to be closed by an electromagnet 40 upon energization of the latter. It will be seen that the circuit for the electromagnet 40 includes the transformer secondary 32 and has its terminals at the metal rings 6 and 7, respectively. Therefore, whenever the rings 6 and 7 are conductively connected to each other, the electromagnet 40 is energized. As heretofore explained, and as

shown in the diagram, whenever any plunger is in its lower position, its metal sleeve 14 is engaged by one of the contact fingers 22 on the ring 6 and by one of the contact fingers 27 on the ring 7. Consequently, whenever one of the plunger devices is down, the circuit for the electromagnet 40 is complete and the switch 39 is held closed. It will be seen that while the lowering of a single plunger device serves to close the switch 39, the holding of this switch closed does not depend upon that plunger device remaining down, provided another plunger device has been moved down before the first one has been raised. In other words, if all of the plunger devices are moved down so as to provide for the playing of all of the records, the switch device 39 remains closed until the last record has been played and the last plunger device has been driven into its raised position.

In the diagram the movable contact of the lefthand dialing device is shown as engaging the stationary contact corresponding to the lefthand solenoid. Therefore, when the plunger device associated with this solenoid was in its raised position, and a coin, indicated in dotted lines at A, was passing the switch 38: a circuit can be traced from the righthand terminal of transformer coil 32, through wires 34 and 35, switch 38, dialing device, wire 41, through the lefthand solenoid, through wire 42, contact finger 19, sleeve 14, contact finger 22, ring 6 and wire 44 to the lefthand terminal of the transformer secondary. Thus, the solenoid becomes energized and draws the plunger device down as shown, pressing down the selective element of the phonograph apparatus, which is indicated in dotted lines at B. As heretofore explained, if all of the plunger devices were up at the time of pulling down the first one, the switch 39 now closes and a playing cycle of the phonograph begins. As soon as the plunger device reaches its lower position, the energizing circuit for its solenoid coil is interrupted at the contact finger 19 which now engages with the tip 15 of insulating material instead of with the sleeve 14, as it did previously. Therefore, the energizing circuit for each solenoid is broken as soon as the latter has accomplished its purpose of pulling its plunger device down, thus avoiding overheating of the solenoid in case the coin happened to become stuck in circuit-closing position.

Should it be attempted to select the same record simultaneously at two coin boxes or in such sequence that the record has not been played before the selection is made at the second box, nothing happens except that the record will be played once only in its proper turn. This is also true if more than one coin is inserted in the same box while or at times when the arm of the dial occupies a given position.

After the first-solenoid has been energized, any or all of the others may be energized by dialing and inserting coins at one or more control stations; the phonograph then automatically playing one record after the other until all selections have been played. In the diagram the circuit for the solenoid which is the third from the left has been closed at the righthand control station and has again been broken at the upper end of the plunger device; or this may represent an attempt to select a record which has already been selected but not yet played.

Upon the playing of a record, the selection-controlling solenoid B in the phonograph apparatus rises as is the case with the element below

the second plunger device from the left in Fig. 1, forcing the corresponding plunger device up to be in readiness again to select the corresponding record when occasion demands.

It will thus be seen that I have produced a simple and novel selective control system, including a simple and novel electro-magnetic selective actuator and circuit closer to permit remote control from any desired number of stations of a musical instrument or apparatus of the automatic, selective player type. It will also be seen that because of the novel actuator device, automatic phonographs or other playing machines or apparatuses, which would otherwise be obsolete, can continue to be usefully employed; since the buttons or other finger pieces thereof may be operated by remote control, the plungers of the actuator doing the work requiring human fingers in the original structures. Furthermore, both in the case of an old type of instrument or machine adapted to be manually controlled by means of a series of push buttons, or in the case of machines being newly built, the electro-magnetic actuator may be associated directly with the levers, pins or other elements built into and forming part of such machines.

While I have illustrated and described with particularity only a single preferred form of my invention, I do not desire to be limited to the exact structural details thus illustrated and described; but intend to cover all forms and arrangements which come within the definitions of my invention constituting the appended claims.

I claim:

1. A control system for an automatic machine adapted selectively to play any desired number of records, having a series of manually operable selective elements each of which corresponds to one of the records, and having also a controlling switch, comprising: a series of electro-magnets corresponding in number to said elements and each including a coil and a movable member adapted to push one of said elements into its record-selecting position when the corresponding coil is energized, a controlling circuit for each of said coils, a selective switch common to all of said controlling circuits, an electro-magnetic actuator for the said controlling switch, an energizing circuit for the said electro-magnetic actuator, and a switch in said energizing circuit associated with and opened and closed by each of said movable members, the last-mentioned switches being arranged in parallel so that said energizing circuit can be closed by any one of these switches.

2. A control system for an automatic machine adapted selectively to play any desired number of records, having a series of manually operable selective elements each of which corresponds to one of the records, and having also a controlling switch, comprising: a series of electro-magnets corresponding in number to said elements and each including a coil and a two-position movable member adapted to be moved into one of its positions when the coil is energized and to remain in that position when the coil is again de-energized, each of said members serving to push one of said elements into its record-selecting position when the corresponding coil is energized, a controlling circuit for each of said coils, means associated with each of said movable members to interrupt the controlling circuit for its coil after that member has been moved upon the energization of its coil, a selective switch common to all of said controlling circuits, and means associated

with each of said movable members to close said controlling switch upon the energization of the corresponding coil, if it be not already closed.

3. In combination, a series of electro-magnets each including a coil and a two-position member which is moved into one of said positions when the coil is energized and which remains in that position upon deenergization of the coil, each of said members being adapted to serve as an actuator for a selective element, a master controller for causing selective energization of the said coils, means controlled by each member to cause its coil to be de-energized when that member reaches its aforesaid position, an electro-magnetic device to be energized, and a circuit for said device including switches connected in parallel and each including a movable switch element carried by one of said members.

4. In a combined selective actuator and switch device, a series of vertical solenoids arranged in a circle, disk frame members overlying and underlying the solenoids and secured together to hold the solenoids in fixed relation to each other, each disk having holes therethrough in axial alignment with the solenoids, two bus bars in the form of rings mounted above the upper disk parallel therewith and in spaced relation to each other, vertically movable plunger devices extending upwardly through the solenoids and past said bus bars, and cooperating means on each bus bar and each plunger device to cause each plunger device to make an electrically-conductive connection between the bus bars in one position of the plunger device and to interrupt that connection in another position.

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