

Feb. 25, 1947.

H. G. JENSEN

2,416,445

AUTOMATIC PHONOGRAPH

Filed Nov. 4, 1944

4 Sheets-Sheet 1

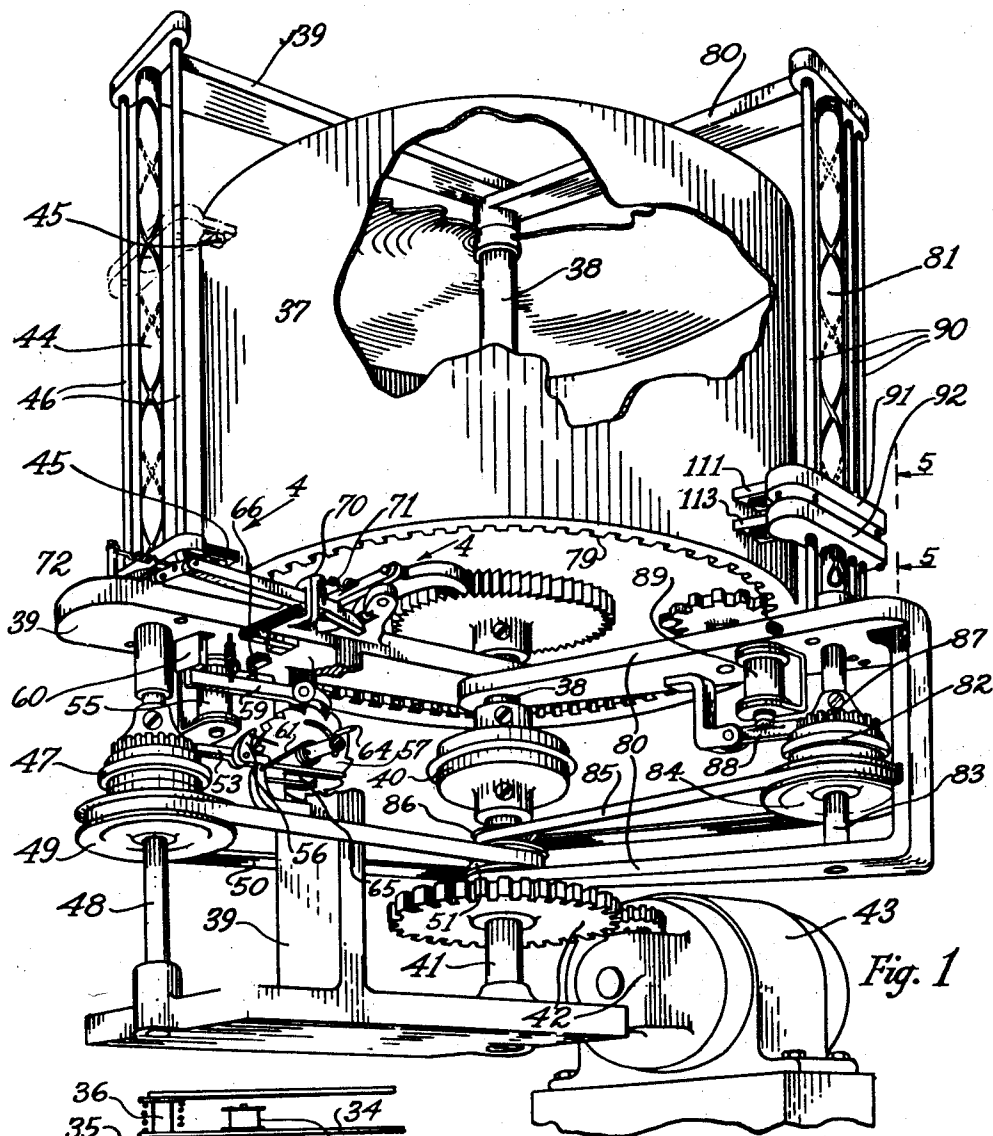


Fig. 1

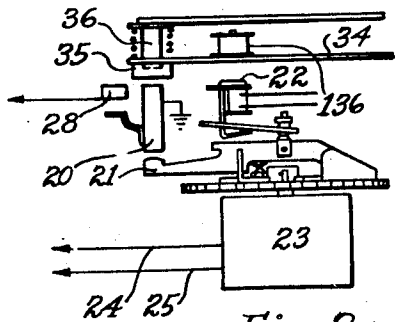


Fig. 8A

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4 Sheets-Sheet 2

Fig. 2

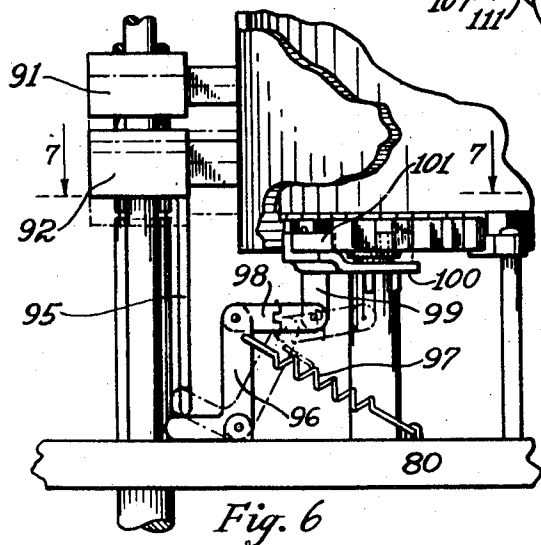
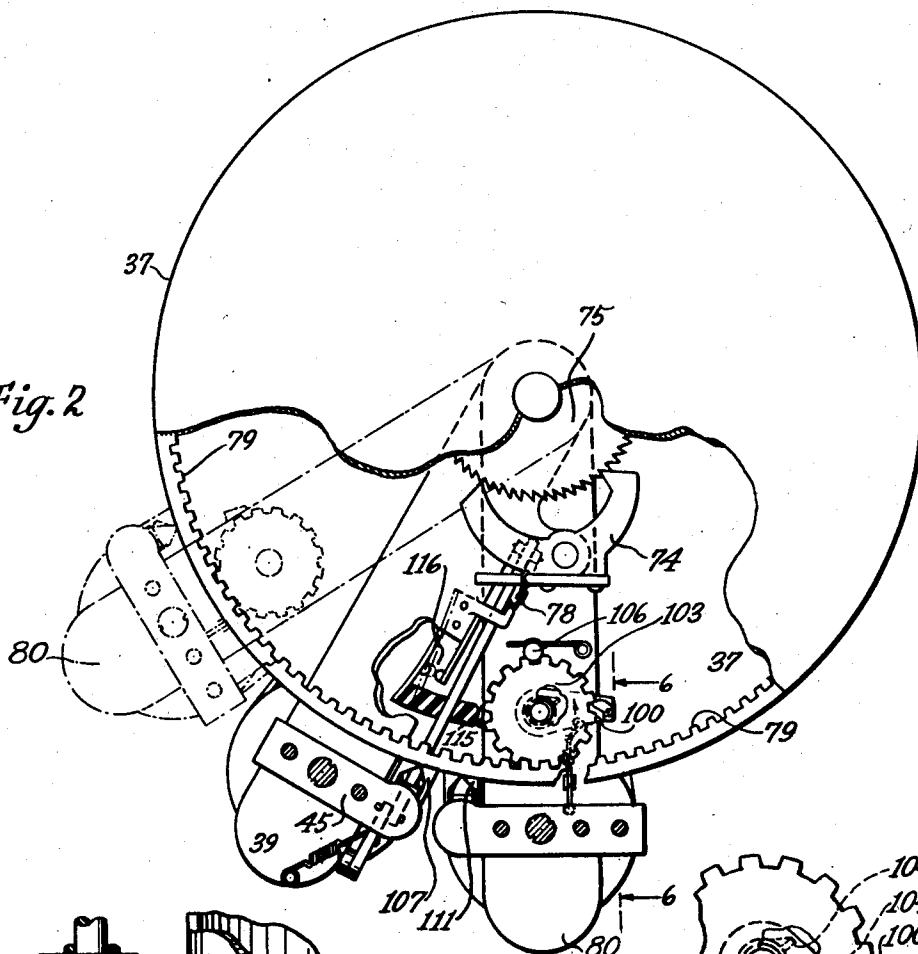


Fig. 6

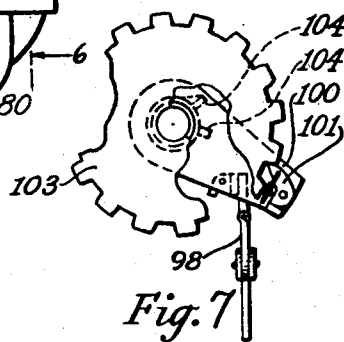


Fig. 7

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4 Sheets-Sheet 3

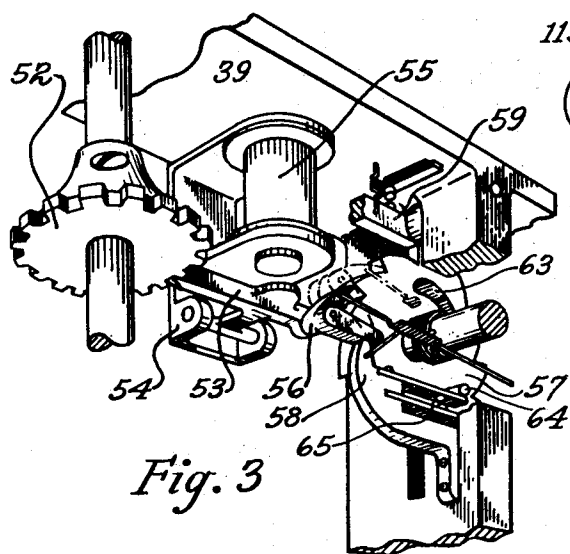


Fig. 3

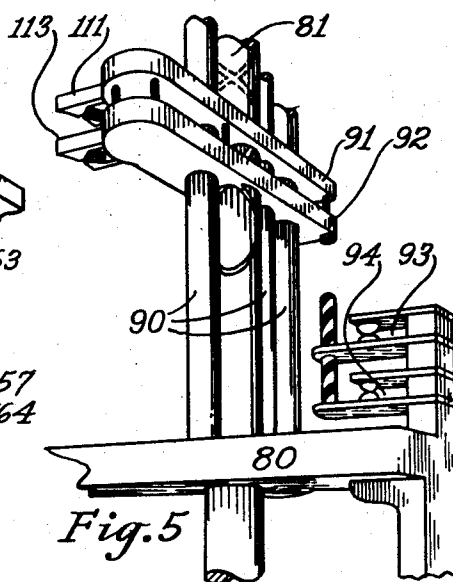


Fig. 5

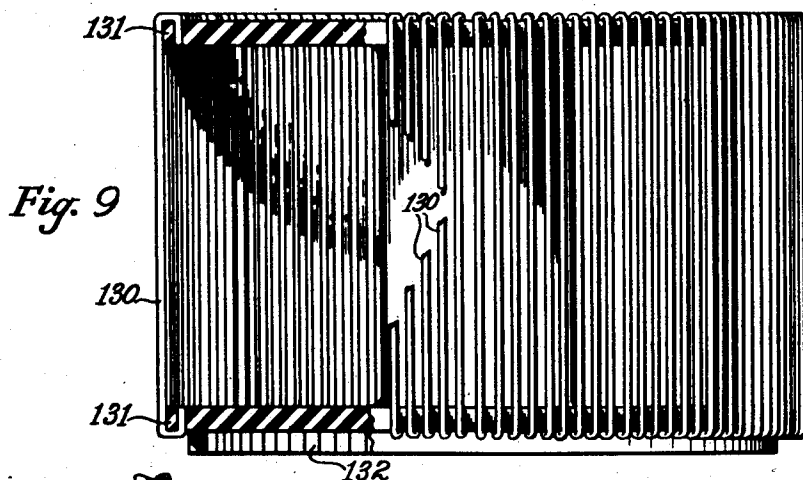


Fig. 9

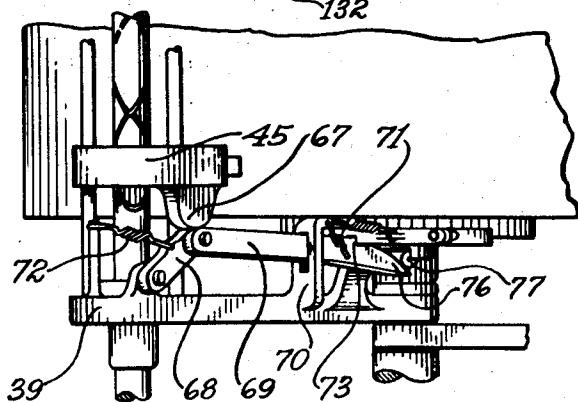


Fig. 4

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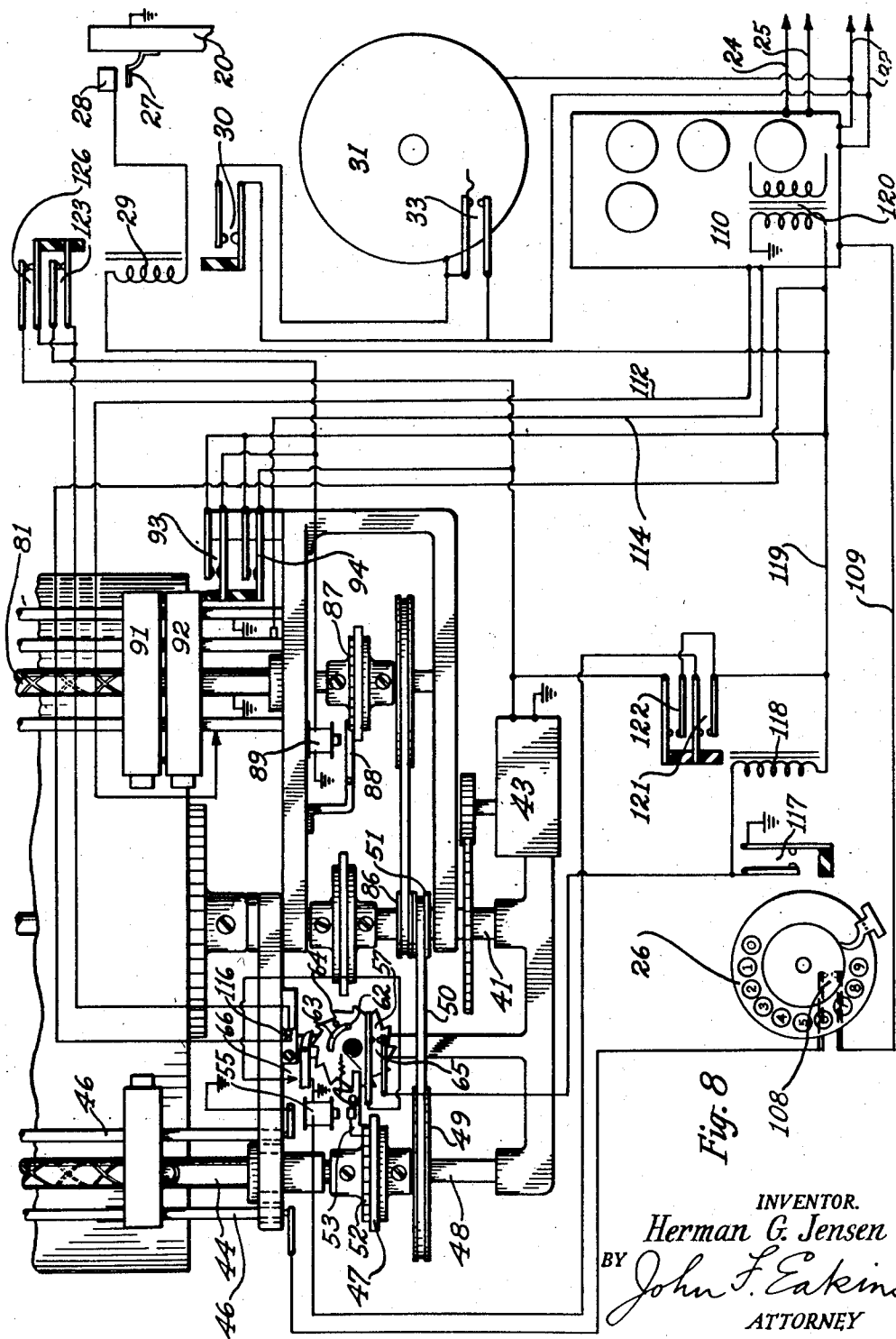


Fig. 8

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UNITED STATES PATENT OFFICE

2,416,445

AUTOMATIC PHONOGRAPH

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Application November 4, 1944, Serial No. 561,985

12 Claims. (Cl. 177—353)

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This invention relates to automatic phonographs of the multiselective type in which any of a plurality of records may be selected for playing at will.

One of the principal objects of the invention is to provide an improved multiselective phonograph in which any number of selections may be made in chronological order and will be reproduced in that order.

A further object of the invention is to provide an improved means for storing a large number of selecting signals.

Other objects, advantages, and capabilities of the invention will appear from the following description of a preferred embodiment thereof taken in conjunction with the accompanying drawings, in which

Fig. 1 is a perspective view of the signal storing means and associated parts;

Fig. 2 is a plan view thereof;

Fig. 3 is a fragmentary perspective view of elements associated with the signal recording head;

Fig. 4 is a fragmentary elevational view of mechanism associated with the signal recording head;

Fig. 5 is a fragmentary perspective view of the signal pickup and the eraser heads and associated mechanism;

Fig. 6 is a fragmentary elevational view of mechanism associated with the signal pickup and the eraser heads, parts being broken away for the sake of clarity;

Fig. 7 is a fragmentary plan view showing part of the mechanism illustrated in Fig. 6;

Fig. 8 is an elevational view of the mechanism shown in Fig. 1 together with a wiring diagram;

Fig. 8A is a continuation of Fig. 8; and

Fig. 9 is an elevational view, partly in section, a modified form of signal storing drum.

In accordance with the present invention I provide a magnetic storing device upon which selecting signals are stored. The magnetic member may suitably be a steel drum. The selecting signals may be constituted by a series of magnetized spots applied to the drum by a moving recording head.

The embodiment of the invention illustrated is adapted for a phonograph having one hundred available recordings. The number of magnetized spots is suitably controlled by a manually actuated dial and it is convenient to arrange the mechanism so that each signal is constituted by two separate trains of magnetized spots applied by two consecutive operations of the dial. The recordings are suitably numbered from 00 to 99.

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If the number 0 is dialed, a suitable number of spots, for example three are applied to the surface of the drum. If the number 9 is dialed, twelve magnetized spots are applied to the drum and so forth. Two consecutive actuations of the dial apply two trains of spots to the drum, the two trains being in alignment and being separated so that the pickup head picks up two trains of signals when passing over the same line on the drum. After each double train of spots is applied to the drum, the drum is stepped and any number of double trains, corresponding to the desired recordings can be applied to the drum, the various signals being spaced in the circumferential direction of the drum due to its stepping. The pickup head is carried by the drum during each step it makes. The pickup head goes into operation after a double train of impulses has been applied to the drum so as to pick up the first selecting signal. On each operation of the pickup head it steps in the opposite direction so that the signals are picked up one at a time for the selection of the corresponding signal on the phonograph. The operation of the pickup head is controlled by the presence of one or more signals recorded on the drum and by the phonograph. The phonograph comprises a series of selector members arranged to be displaced to effect the playing of the corresponding recording. When the pickup head has scanned a signal on the drum and effected the displacement of the corresponding selector member, the pickup head is rendered inoperative. When the phonograph has determined from the displaced selector member the recording to be played, the selector member is returned to normal position so that the pickup head is again operative to pick up the next signal from the drum and project the corresponding selector member.

Thus if the operator dials several selections corresponding signals are applied to the drum and during the playing of the corresponding recordings the phonograph is normally playing a recording and the selector member corresponding to the next recording is displaced. After the playing recording is completely reproduced the record changing mechanism of the phonograph goes into operation to initiate the playing of the recording corresponding to the displaced selector member. During that record changing cycle the displaced selector member is returned to its initial position and the pickup head is put into operation to pick up the next signal from the drum and displace the selector member corresponding thereto. After that recording has been

reproduced, the pickup head becomes operative to pick up the next signal and so on. The general operation is that the operator can apply to the drum any desired number of signals. These signals are stored on the drum in the form of magnetized spots and the pickup head picks up the signals one at a time as the recordings are reproduced, eventually depleting the stored signals.

Means are provided for erasing the magnetized spots after they are utilized by the pickup head so that the drum is left in its original unmagnetized condition.

The phonograph remains in operation playing the recordings in the order in which they were selected until all the signals on the drum are depleted whereupon the selector ceases to operate and after the last recording has reproduced the phonograph stops.

While it is preferred to employ a drum for storing signals, it is to be understood that any other magnetizable member may be employed. A drum is preferred because it needs no adjustment to zero position. The employment of a dial is likewise merely the matter of convenience. Any other known type of impulser may be employed for applying selected numbers of magnetized spots to the magnetizable storing member.

My invention is applicable to any phonograph having a plurality of movable selector elements each corresponding individually to, and controlling the operation of the phonograph to reproduce a corresponding recording. The present invention is illustrated in its application to the phonograph and mechanical selector described and claimed in the copending applications of Mahlon W. Kenney and Herman G. Jensen, Ser. No. 505,776, filed October 11, 1943, now U. S. Letters Patent 2,382,487, granted August 14, 1945, and Ser. No. 561,986 filed November 4, 1944, now U. S. Letters Patent 2,392,488, granted August 14, 1945. This phonograph will therefore be quite briefly described in relation to the parts thereof illustrated which cooperate with the present invention.

The phonograph referred to comprises one hundred selector bars 20 arranged in equally spaced relation on an arc or circle. Each of these bars is adapted to be displaced from normal position by means of an actuator 21 which moves upwardly when an electromagnet 22 is energized. The actuator 21 is stepped around by means of a stepping unit 23 which is controlled by two trains of impulses supplied by the lines 24 and 25. The first train of impulses displaces the actuator 21 ten bar spaces for each impulse, the first train of impulses being the decade impulses. The second train of impulses, the units impulses, steps the actuator 21 one bar spacing for each impulse. The mechanism is arranged so that each train comprises between three and twelve impulses. Thus if the dial 26 is operated to dial the No. 00 two trains of three impulses are created which are eventually supplied to the stepper 23 bringing the actuator 21 thirty-three bar spacings from its initial position into register with the bar 20 controlling the selection 00. If the No. 99 is dialed, two trains of twelve impulses are created which are eventually supplied to the stepper 23 stepping the actuator 21 one hundred and thirty-two bar spacings from its initial position to bring the actuator into register with the bar 20 corresponding to selection No. 99. If intermediate numbers are dialed the actuator 21 is brought into register with the bar 20 corresponding to the number dialed.

After the stepper mechanism 23 has received two trains of impulses and located the actuator 21 in register with the bar 20 corresponding to these two trains the magnet 22 is momentarily energized and the actuator is moved upwardly to displace the corresponding bar 20. Thereafter the actuator 21 automatically returns to its initial position. Each bar 20 is grounded and when it is displaced upwardly a projection 27 carried by the bar engages a conductive ring 28. When any bar 20 is displaced upwardly the relay 29 is energized and the normally open switch 30 is closed. The switch 30 is located in the circuit of the phonograph motor 31, energy being supplied to the motor from the power lines 32. Immediately the phonograph motor 31 starts a switch 33 in parallel with the switch 30 becomes closed and remains closed until the recording is completely reproduced. At the end of the reproduction the record changing mechanism of the phonograph opens the switch 33 and if the switch 30 is then open the phonograph motor stops. Immediately the phonograph 31 starts to operate it drives a disc 34 through at least one revolution until the abutment 35 carried by the disc 34 engages the particular bar 20 which has been displaced. The drive disc 34 is frictional so that it may be arrested by engagement between the abutment 35 and the projected bar 20. The position of the disc 34 determines the record which is to be played and after that has been determined automatic means including the plunger 36 returns the arresting bar 20 to initial position.

A steel drum 37 is mounted by a shaft 38 in a stationary frame 39. The shaft 38 is connected by means of a slipping clutch 40 to a shaft 41 in axial alignment with the shaft 38. The shaft 41 is connected by a suitable gear reduction 42 to the selector motor 43. Consequently the motor tends to drive the drum 37 in the counterclockwise direction as viewed from above.

The endless reversing screw 44 is mounted vertically in the frame 39 adjacent the drum 37. A magnetic recording head 45 is mounted on the screw 44 and on two parallel rods 46 so that the head is moved up and down over the surface of the drum 37 as the screw 44 is driven in one direction. The screw 44 is connected through a friction clutch 47 with a shaft 48 in alignment with the screw 44. The shaft 48 rigidly carries a pulley 49 around which passes a belt 50 which is driven by a pulley 51 rigidly mounted on the shaft 41. Rigidly mounted on the screw 44 is a toothed wheel 52 which may suitably be part of the clutch 47. A dog 53, pivotally mounted at 54 on the frame 39 normally engages the toothed wheel 52 so as to prevent rotation of the screw 44. The dog 53 is adapted to be moved away from the toothed wheel 52 by means of an electromagnet 55. Consequently when the electromagnet 55 is energized and the motor 43 is running the screw 44 is driven. The dog 53 carries a pawl 56 which is adapted to engage a ratchet wheel 57 mounted on the frame 39. When the magnet 55 is deenergized and the dog 53 is in engagement with the wheel 52 an arm on the pawl 56 engages a stationary abutment 58 so that the pawl is held clear of the ratchet wheel 57. A holding dog 59 is adapted to engage the ratchet wheel 57. This dog is normally held out of engagement with the ratchet wheel 57 by means of a projection 60 extending from the recording head 45. In the normal condition of the mechanism the recording head 45 is in its lowermost position and the electromagnet 55 is deenergized so that the ratchet

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wheel 57 is free. The ratchet wheel is biased in counterclockwise direction by a spring 61. The normal position of the ratchet wheel 57 is determined by a pin 62 which projects through a slot 63 on the ratchet wheel. The ratchet wheel 57 carries a pin 64 which is adapted to cooperate with a switch 65, the pin being arranged to close this switch after the pawl 56 has displaced the ratchet wheel 57 two teeth spaces from its normal position. The dog 59 is grounded and when it moves into engagement with the ratchet wheel 57 it engages and grounds a contact 66 carried by and insulated from the frame 39.

The head 45 carries an abutment 67 which is adapted to engage the linked elements 68 and 69 when the head moves towards its lowest position. The element 68 is a link pivotally mounted on the frame 39. The element 69 is an arm which is pivotally connected to the link 68. The arm 69 extends inwardly towards the center of the drum being guided through a slotted element 70 carried by the frame 39. The arm 69 is biased upwardly by a spring 71 and outwardly by a spring 72. Near its inner end the arm 69 is provided with a shoulder 73 which is adapted to engage an escapement 74 which cooperates with a ratchet wheel 75 rigidly carried on the lower side of the drum. When the member 69 is moved inwardly its shoulder 73 swings the escapement 74 in the clockwise direction as viewed from above. Continued inward movement of the arm 69 brings its inner cam-shaped end 76 into engagement with a roller 77 so that the arm 69 is forced downwardly so that its shoulder 73 disengages the escapement 74. This escapement then moves in the counterclockwise direction as viewed from above under the influence of its spring 78. These two movements of the escapement 74 permit the motor 43 to drive the drum 37 one tooth space of the ratchet wheel 75 or two tooth spaces of the inwardly directed teeth 79 at the bottom edge of the drum.

A frame 80 is pivotally mounted on the shafts 38 and 41. This frame serves as a mounting for an endless reversing screw 81 similar to the reversing screw 44. The reversing screw is connected by a fraction clutch 82 to a shaft 83 in alignment with the screw 81. The shaft 83 has rigidly secured thereto a pulley 84 which is driven by a belt 85, which belt passes over a pulley 86 on the shaft 41. The screw 81 rigidly carries a toothed wheel 87 which is adapted to cooperate with a pivoted dog 88. In normal condition the dog 88 prevents drive of the shaft 81. The dog 88 is adapted to be attracted by an electromagnet 89 carried by the frame 80. It will thus be seen that when the electromagnet 89 is energized and the motor 43 is operating the screw 81 will be continuously driven. The frame 80 comprises three vertical bars 90 in parallel relation to the screw 81. A double head unit comprising a pickup head 91 and an erasing head 92 are mounted on the bars 90 and on the screw 81 so that they move up and down over the drum when the screw 81 is driven. The double head unit cooperates with two switches 93 and 94 so as to open these switches when the double head unit moves towards its lowest position. Immediately the double head unit starts to rise the switches 93 and 94 close.

The head 92 carries a downward projection 95 which is adapted in the lowermost position of the head to engage one arm of a bell crank lever 96 pivotally mounted on the frame 80 so as to swing it into its full line position in Fig. 6

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against the tension of a strong spring 97. The other arm of the lever 96 is connected by an articulated link 98 to a member 99 which projects downwardly from an arm 100 which is pivotally mounted on the axis of a pinion 103 which meshes with the teeth 79 at the lower end of the drum 37. The arm 100 carries a spring pressed dog 101 which engages the teeth of the pinion 103. When the double head 91, 92 starts to rise the spring 97 moves the bell crank lever 96 into its dot dash position in Fig. 6 swinging the arm 100 in the counterclockwise direction as viewed from above. Stops 104 limit the movement of the arm 100 so that the dog 101 moves the pinion two teeth. A spring pressed member 106 holds the pinion 103 against accidental movement. When the heads 91 and 92 again reach their lowermost position the arm 100 is moved in the clockwise direction as viewed from above and the dog 101 slips past two teeth on the pinion 103, the member 106 preventing rotation of the pinion 103.

The head 45 carries an electromagnet 107 which is connected to the bars 46. One of these bars is grounded. The other bar is connected to the impulse switch 108 of the dial 26. The other side of the switch 108 is connected by a line 109 to the amplifying and the electrical unit 110. This unit supplies the line 109 with a suitable magnetizing current. This current may suitably be a direct current having a 60 cycle component. As the head 45 moves up over the surface of the drum 37 and the switch 108 is closed repeatedly, the electromagnet 107 applies a plurality of spots of magnetization to the drum along the line of travel of the electromagnet 107. The number of these spots corresponds to the number of times the switch 108 closes.

The head 91 carries a similar magnet 111 which is adapted to pick up 60 cycle frequency impulses as this head moves past the spots of magnetization. One side of the electromagnet is connected to one of the bars 90 which is grounded. The other side of this electromagnet is connected to an insulated bar 90, which bar is connected to a line 112 which supplies the signal picked up to amplifying and detecting means in the unit 110. This unit supplies the amplified and rectified impulses to the lines 24 and 25 which supply them to the stepping unit 23. The head 92 carries a similar electromagnet 113 which is in vertical alignment with, and below the electromagnet 111. One side of the electromagnet 113 is connected to the grounded bar 90. Its other side is connected to the third bar 90 which is insulated and is connected by a line 114 to the unit 110. The unit 110 includes an oscillator which supplies high frequency voltage to the electromagnet 113 so that this electromagnet serves to erase spots of magnetization after the electromagnet 111 has picked up the signals therefrom.

The normal relationship of the magnets is shown in Fig. 2, the magnets on the frames 39 and 80 being displaced from each other by an angle corresponding to two tooth spaces of the teeth 79. When the frames are in this condition the frame 80 engages a block of insulating material 115 and holds open a switch 116 on the frame 39.

The dial 26 is preferably of the type described and illustrated in the copending application Ser. No. 524,232, filed February 28, 1944, by Mahlon W. Kenney and Hugh H. Davis. This dial has associated with it a switch 117 which is closed

automatically when the dial 26 is manually actuated and released. The arrangement is such that the switch 117 closes before the switch 108 starts to close and open in response to the dialing. One side of the switch 117 is grounded. The other side of the switch 117 is connected to one side of a relay 118 and to the switch 65. The other side of the switch 65 is connected to the contact 66. The other side of the relay 118 is connected to a line 119 which is connected to the secondary of a transformer 120 in the unit 110. This transformer supplies A. C. current of suitable voltage for the operation of the relay 118, the electromagnet 55, the motor 43, the electromagnet 89 and the relay 29. The line 119 is connected to one side of each of the normally open switches 121 and 122 which are adapted to be closed by the relay 118 when it is energized. The other side of the switch 121 is connected to the electromagnet 55, the other side of this magnet being grounded. The other side of the switch 122 is connected to the ungrounded terminal of the motor 43. The line 119 is connected to one side of each of the switches 93 and 94, to one side of the switch 116 and to the relay 29. The other side of the switch 116 is connected to one side of each of two normally closed switches 123 and 126. When the relay 29 is energized the switches 123 and 126 open. The other side of the switch 123 is connected to the electromagnet 89, the other side of which is grounded. The other side of the switch 126 is connected to the ungrounded terminal of the motor and to the other side of the switch 94. The other side of the switch 93 is connected to the ungrounded side of the magnet 89.

The operation for a single selection will now be described. If the operator desires to select recording No. 64, for example, he dials six and after the dial 26 has returned to normal position he dials four. During the first dialing the operator releases the dial so that it starts moving back to its normal position. The switch 117 closes and the relay 118 is energized closing switches 121 and 122 so that the motor 43 is put into operation and the electromagnet 55 is energized lifting the dog 53 out of its engagement with the wheel 52. The motor drives the screw 44 so that the head 45 moves upwardly thereon. The upward movement of the dog 53 engages the pawl 56 with the ratchet wheel 57 and moves it one tooth in the clockwise direction. The projection 60 on the head 45 moves upwardly from the dog 59 so that this dog engages the ratchet wheel 57 and engages the contact 66. After the upward movement of the head 45 is initiated the impulse switch 108 of the dial closes nine times and nine spots of magnetization are applied to the surface of the drum 37. It is to be noted that a single actuation of the ratchet wheel 57 does not close the switch 65. After the dial 26 has returned to its normal position the switch 117 opens, the relay 118 is deenergized and the motor 43 stops leaving the head 45 at a position intermediate of the drum 37. It is to be noted that during this operation of the motor the drum remains stationary since it is prevented from movement by the escapement 74. Furthermore the screw 81 is not driven by the motor because the dog 88 is in engagement with the toothed wheel 87 on the screw 81. The clutches 40 and 82 merely slip. The operator now dials the No. 4. When he releases the dial the switch 117 closes energizing the relay 118 which again closes the switches 121 and 122. The motor 43 is again put into operation and the magnet

55 is energized so that the upward movement of the head 45 is resumed. After this resumption the switch 108 closes seven times in succession applying a second train of magnetized spots in vertical alignment with the first train on the drum 37. In this case also the drum 37 and the screw 81 remain stationary. The second energization of the magnet 55 effects the second movement of the ratchet wheel 57 so that the switch 65 is closed. At the end of the movement of the dial the switch 117 opens but the relay 118 remains energized, its circuit being completed through switch 65 and contact 66 which is engaged by the grounded dog 59. Consequently after the two trains of impulses have been applied by the head 45 the screw 44 continues to rotate bringing the head 45 to its highest position and then down to its normal position. As the head 45 approaches its normal position it actuates the linkage 68, 69 so that the escapement 74 is oscillated by the shoulder 73. Continued inward movement of the arm 69 moves its cam-shaped end 76 below the roller 77 so that the shoulder 73 clears the escapement and the spring 78 returns the escapement 74 to its normal position. During the oscillation of the escapement 74 the motor 43 drives the drum through an angle corresponding to two of the peripheral teeth on the drum with the result that the line of magnetized spots is displaced two tooth spaces in the counter-clockwise direction into the position of the magnet 111 in Fig. 2. However the same movement of the drum carries the frame 80 two tooth spaces in the clockwise direction. This two tooth displacement of the frame 80 with the drum closes the switch 116. After the two tooth displacement of the drum 37 the projection 60 engages the dog 59 raising its tooth out of engagement with the ratchet wheel 57 and breaking its engagement with the contact 66. This breaks the circuit of the relay 118 so that the magnet 55 is deenergized and the dog 53 descends locking the screw 44 against rotation. The downward movement of the dog 53 brings the pawl 56 into engagement with the abutment 58 so that the pawl is raised away from the ratchet wheel 57. The ratchet wheel 57 is now free to return to its normal position under the influence of its spring 61. Consequently the head 45 is left in its lowest position ready for another selection to be dialed.

The deenergization of the relay 118 does not terminate the operation of the motor since the circuit of the motor is completed through the normally closed switch 126 and the switch 116 which became closed as a result of the two tooth movement of the drum 37. The closing of the switch 116 also completes the circuit of the magnet 89 through the normally closed switch 123. The energization of the electromagnet 89 lifts the dog 88 clear of the toothed wheel 87 on the screw 81 so that the double head 91, 92 is driven upwardly. Upward displacement of the double head closes switches 93 and 94 so that the motor circuit is complete and the electromagnet 89 remains energized until the double head again returns to its initial position notwithstanding that the switch 116 and the switches 123 and 126 may be opened before that return. The initial upward movement of the double head 91, 92 raises the projection 95 from the bell crank lever 96 so that the dog 101 rotates the pinion 103 two teeth in the counterclockwise direction as viewed in Fig. 2 moving the frame 80 two teeth in the clockwise direction as viewed in that figure. This brings

the magnets 111 and 113 back to their position shown in Fig. 2 so that they are in alignment with the double train of magnetized spots. It is to be noted that the two trains are separated owing to the fact that the switch 117 started the operation of the motor for recording the second train of impulses on the drum, a short time before the switch 108 started to close during the second dialing. The motor 43 continues the upward displacement of the double head 91 and 92 over the double train so that the electromagnet 111 picks up signals corresponding to the double train with the result that two trains of impulses, in this case nine and seven impulses respectively are supplied to the stepping mechanism 23. After the magnet 111 picks up these impulses the electromagnet 113 erases the spots of magnetization from the drum. After the double head has moved upwardly over the drum it is driven down again by the screw 81 so that the switches 93 and 94 are opened and the arm 100 is returned to its normal position. Before the double head 91, 92 has returned to its normal position the double train of impulses supplied to the stepping mechanism 23 have caused the actuator 21 to be moved into alignment with the bar 20 corresponding to selection 64 and the magnet 22 has moved the actuator 21 upwardly. This puts the phonograph motor 31 into operation to reproduce recording No. 64 and after this selection has been determined the electromagnet 136 is energized to force the plunger 36 downwardly returning the actuated bar to its initial position. After the recording has been reproduced the switch 33 opens and the phonograph ceases to operate.

If the operator dials up a plurality of selections, for example if he makes five selections by dialing ten times, five double trains of magnetized spots are applied to the surface of the drum. These lines of spots are separated because the drum moves two teeth (79) in the counterclockwise direction after each units dialing. After the first movement of the drum the switch 116 closes and the screw 81 is driven so that the head 91 picks up a record selecting signal from the first line of magnetized spots putting the phonograph into operation to reproduce the first recording. When the first selected bar 20 is displaced upwardly the screw 81 continues to drive because the switches 93 and 94 are closed until the heads 91 and 92 return to their lowermost position. This complete return may occur after the bar 20 corresponding to the first selection has been returned to its normal position. In this event the screw 81 continues to operate, the circuit of the motor 43 being completed through the closed switch 116 and the closed switch 126 and the electromagnet 89 being energized through the closed switches 116 and 123. The switch 116 is closed because the frame 80 was displaced ten teeth (79) in the clockwise direction by the dialing up of five selections and it was returned two teeth as a result of the upward movement of the heads 91 and 92. The switches 123 and 126 are closed because no bar 20 is displaced upwardly. The continued operation of the screw 81 results in the head 91 picking up impulses corresponding to the second selection so that the corresponding bar 20 is displaced upwardly while the first selection is being reproduced. Here again the screw 81 continues to drive as a result of the closing of the switches 93 and 94 until the heads 91 and 92 return to their lowermost position opening the switches 93 and 94. The motor 43 now ceases to operate since the switch 94 is open and the switch 126

is open as a result of the displaced condition of the bar 20 corresponding to the second selection and the energization of the relay 29. After the first recording has been reproduced, the phonograph motor 31 continues to operate to reproduce the second selected recording returning the bar 20 corresponding to that recording to its initial position. The motor 31 continues to operate after the return of this bar because the switch 33 is closed before the bar 20 is returned. Return of the bar 20 corresponding to the second recording deenergizes the relay 29 so that the switches 123 and 126 close again completing the circuit of the motor 43 and the circuit of the electromagnet 89 so that the bar 20 corresponding to the third selection is displaced and the switches 123 and 126 are opened so that the motor 43 stops until that displaced bar has been returned to its initial position. This sequence is repeated until all the signals have been picked up from the drum and all the corresponding recordings have been reproduced. It is to be noted that the line of spots corresponding to the last selection are located in vertical alignment with the position of the magnet 111 in Fig. 2. When the head 91 starts to move upwardly to pick up the last selection from the drum the magnet 111 is located two teeth spaces (79) to the right of its position in Fig. 2 and the switch 116 is closed. When the bar 20 corresponding to the second last selection is returned to its normal position the shaft 81 starts to drive the heads 91 and 92 upwardly closing the switches 93 and 94. After these switches are closed the dog 101 becomes effective to move the frame 80 into its position of Fig. 2 so that continued upward movement of the head 91 brings the magnet 111 upwardly over the last line of magnetized spots. This displacement of the frame 80 opens the switch 116 so that when the heads 91, 92 return to their lowermost position and open the switches 93 and 94, the drive of the screw 81 is terminated until after the last bar 20 has been returned to its normal position and further selecting signals are made by the dial 26. After the last recording has been reproduced the switch 33 is opened and the phonograph is completely stopped until a further selection or selections are made.

It is to be noted that a very large number of selecting signals may be stored on the drum 37. The dot and dash position of the frame 80 in Fig. 2 corresponds to a condition in which approximately fifty selections are stored. It will of course be readily understood that it is merely a matter of design to adapt the device for the storage of any possible desired number of stored selections.

In the embodiment of the invention described I have employed a drum having a continuous surface. In Fig. 9 I have shown a modified form of drum having separated bars 130 of steel or other suitable magnetic material for individual reception of trains of magnetized spots corresponding to selections. The bars 130 may be mounted in suitable fashion on upper and lower discs 131 so as to constitute a drum. The lower disc 131 carries a toothed annulus 132 corresponding to the teeth 79 of the first described embodiment. It will of course be understood that the bars 130 are angularly displaced so that they align with the operating positions of the magnets 45, 111, and 113.

Although the invention has been described in connection with the specific details of preferred embodiments thereof, it must be understood that such details are not intended to be limitative of

the invention except in so far as set forth in the accompanying claims.

I claim:

1. In an automatic phonograph, in combination, a relatively large magnetizable member, signal recording means adapted to apply a line of magnetized spots to said member, means for moving said recording means in a line on said member during the application of said spots, a pickup member adapted to pick up impulses from said line of spots, means for moving said pickup member along said line and means for relatively stepping said magnetizable member to remove the line away from the recording means and into register with the pickup member before the pickup member is moved over said line to pick up a signal therefrom.

2. In an automatic phonograph, in combination, a relatively large magnetizable member, a recording head adapted to apply a plurality of lines of magnetized spots on said member, means for moving said head in a line over said member as the spots are being applied, means for relatively stepping said head and said member after each line of magnetized spots is applied whereby any desired number of lines of spots may be applied on said member, a pickup head adapted to pick up impulses from said lines of spots, means preventing relative movement between said member and said pickup head by the first mentioned stepping means, means for moving said pickup head over said lines during the pickup of said impulses, and means for relatively stepping said pickup head and said member into alignment with successive lines, between successive pickup operations, whereby impulses are picked up from each line seriatim in the order in which the signals were applied to said member.

3. In an automatic phonograph, in combination, a relatively large magnetizable member, a recording head adapted to apply a plurality of lines of magnetized spots on said member, means for moving said head in a line over said member as the spots are being applied, means for relatively stepping said head and said member after each line of magnetized spots is applied, whereby any desired number of lines of spots may be applied on said member, a pickup head adapted to pick up impulses from said spots, means for moving said pickup head along a line of magnetized spots of said member during the pickup of said impulses, means for bringing said pickup head into alignment with the first line of unscanned spots after each pickup operation whereby impulses are picked up from each line in the order in which the signals were applied to said member, and means controlled by said recording head for rendering said pickup head operative after a line of spots has been applied to said member.

4. In an automatic phonograph, in combination, a relatively large magnetizable member, a recording head adapted to apply a plurality of lines of magnetized spots on said member, means for moving said head in a line over said member as the spots are being applied, means for relatively stepping said head and said member after each line of magnetized spots is applied, whereby any desired number of lines of spots may be applied on said member, a pickup head adapted to pick up impulses from said spots, means for moving said pickup head over said lines during the pickup of said impulses, means for relatively stepping said pickup head and said member to bring the pickup head into alignment with successive lines, between successive pickup operations

whereby impulses are picked up from each line in the order in which the signals were applied to said member, means controlled by said recording head for rendering said pickup head operative after a line of spots has been applied to said member, displaceable selector members controlled by said pickup head, and means controlled by any displaced selector member for rendering said pickup head inoperative.

5. In an automatic phonograph, in combination, a relatively large magnetizable member, signal recording means adapted to apply a plurality of lines of magnetized spots to said member, means for moving said recording means in a line on said member during the application of said spots, means for stepping said magnetizable member after each line of spots is applied whereby a plurality of lines of magnetized spots may be applied to the magnetizable member, a pickup member adapted to pick up impulses from said lines of spots, means for moving said pickup member along said lines and means for locating said pickup member in alignment with the first line of unscanned spots after each pickup operation, whereby the pickup head may pick up signals from the series of lines of spots seriatim.

6. In an automatic phonograph, in combination, a relatively large movable magnetic member, a recording head adapted to apply a plurality of lines of magnetized spots on said member, means for moving said head in a line over said member as the spots are being applied, means for stepping said member after each line of magnetized spots is applied whereby any desired number of lines of spots may be applied on said member, a pickup head adapted to pick up impulses from said lines of spots, means connecting said pickup head to said member whereby the pickup head moves with the member during its stepping movements, means for moving said pickup head over said lines during the pickup of said impulses and means for stepping said head relative to said member into alignment with successive lines after each pickup operation whereby impulses are picked up from each line seriatim in the order in which the signals were applied to said member.

7. In an automatic phonograph, in combination, a relatively large movable magnetic member, a recording head adapted to apply a plurality of lines of magnetized spots on said member, means for moving said head in a line over said member as the spots are being applied, means for stepping said member after each line of magnetized spots is applied, whereby any desired number of lines of spots may be applied on said member, a pickup head adapted to pick up impulses from said lines of spots, means connecting said pickup head to said member whereby the pickup head moves with the member during its stepping movements, means for bringing the pickup head into alignment with the first line of unscanned spots, means for moving said pickup head over said member during the pickup of said impulses and means controlled by said recording head for rendering said pickup head operative after a line of spots has been applied to said member.

8. In an automatic phonograph, in combination, a relatively large movable magnetic member, a recording head adapted to apply a plurality of lines of magnetized spots on said member, means for moving said head in a line over said member as the spots are being applied, means for stepping said member after each line of mag-

netized spots is applied whereby any desired number of lines of spots may be applied on said member, a pickup head adapted to pick up impulses from said spots, means connecting said pickup head to said member whereby the pickup head moves with the member during its stepping movements, means for moving said pickup head over said lines during the pickup of said impulses, means controlled by said recording head for rendering said pickup head operative after a line of spots has been applied to said member, means for moving said pickup head into alignment with successive lines after each pickup operation, a plurality of displaceable selector members controlled by said pickup head, and means controlled by any displaced selector member for rendering said pickup means inoperative.

9. In an automatic phonograph, in combination, a magnetizable drum, signal recording means adapted to apply a plurality of lines of magnetized spots to said drum, means for moving said recording means longitudinally on said drum during the application of said spots, means for relatively stepping said recording means and said drum whereby a plurality of spaced lines of magnetized spots may be applied to the drum, a pickup member adapted to pick up impulses from said lines of spots, means for moving said pickup member along said lines and means for relatively stepping said pickup member and said drum after each pickup operation, to bring said pickup member into alignment with the first line of unscanned spots, whereby the pickup member may pick up signals from the series of lines of spots seriatim.

10. In an automatic phonograph, in combination, a magnetizable drum, a recording head adapted to apply a plurality of lines of magnetized spots on said drum, means for moving said head longitudinally on said drum as the spots are being applied, means for relatively stepping said head and said drum after each line of magnetized spots is applied whereby any desired number of lines of spots may be applied on said drum, a pickup head adapted to pick up impulses from the resulting lines of spots, means preventing relative displacement of said pickup head and drum by said stepping means, means for moving said pickup head over said lines during the pickup of said impulses, and means for relatively stepping said pickup head and said member after each pickup operation, to bring the pickup head into alignment with the successive lines whereby impulses are picked up from each line seriatim in the order in which the signals were applied to said drum.

11. In an automatic phonograph, in combination, a magnetizable drum, a recording head adapted to apply a plurality of lines of magnetized spots on said drum, means for moving said

head longitudinally on said drum as each line of spots is being applied, means for relatively stepping said head and said drum after each line of magnetized spots is applied whereby any desired number of lines of spots may be applied on said drum, a pickup head adapted to pick up impulses from said lines of spots, means for moving said pickup head over said lines during the pickup of said impulses, means for relatively stepping said pickup head and said drum after each pickup operation, to bring the pickup head into alignment with the first line of unscanned spots whereby impulses are picked up from each line in the order in which the signals were applied to said member, and means controlled by said recording head for rendering said pickup head operative after a line of spots has been applied to said drum.

12. In an automatic phonograph, in combination, a relatively large magnetizable drum, a recording head adapted to apply a plurality of lines of magnetized spots on said drum, means for moving said head longitudinally on said drum as a line of spots is being applied, means for relatively stepping said head and said drum after each line of magnetized spots is applied whereby any desired number of lines of spots may be applied on said drum, a pickup head adapted to pick up impulses from said spots, means preventing relative displacement between said pickup head and said drum by said stepping means, means for moving said pickup head over said lines during the pickup of said impulses, means for relatively stepping said pickup head and said drum after each pickup operation, to bring the pickup head into alignment with the first unscanned line of spots, whereby impulses are picked up from each line in the order in which the signals were applied to said drum, means controlled by said recording head for rendering said pickup head operative after a line of spots has been applied to said drum, a plurality of displaceable selector members controlled by said pickup head, and means controlled by any displaced selector member for rendering said pickup head inoperative.

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