Feb. 19, 1952 M. G. NELSEN 2,586,173

COIN CREDIT MECHANISMS AND CIRCUITS

Filed Oct. 31, 1946 4 Sheets-Sheet 1

Fig. 1.

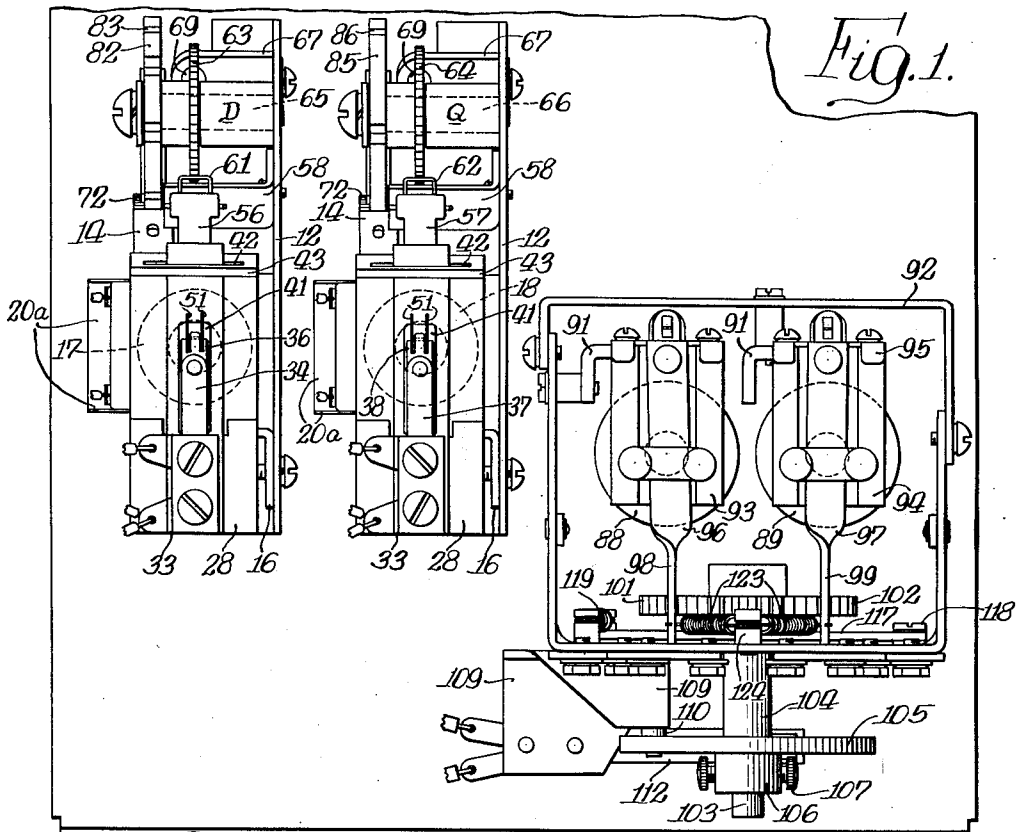
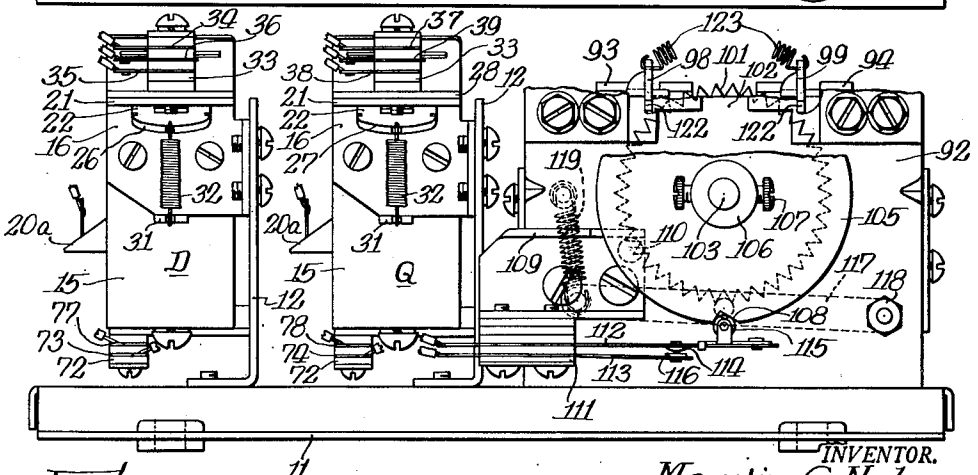


Fig. 2.



INVENTOR.
Marvin G. Nelsen,
BY Burr & Freeman
Atty's.

Feb. 19, 1952 M. G. NELSEN 2,586,173

COIN CREDIT MECHANISMS AND CIRCUITS

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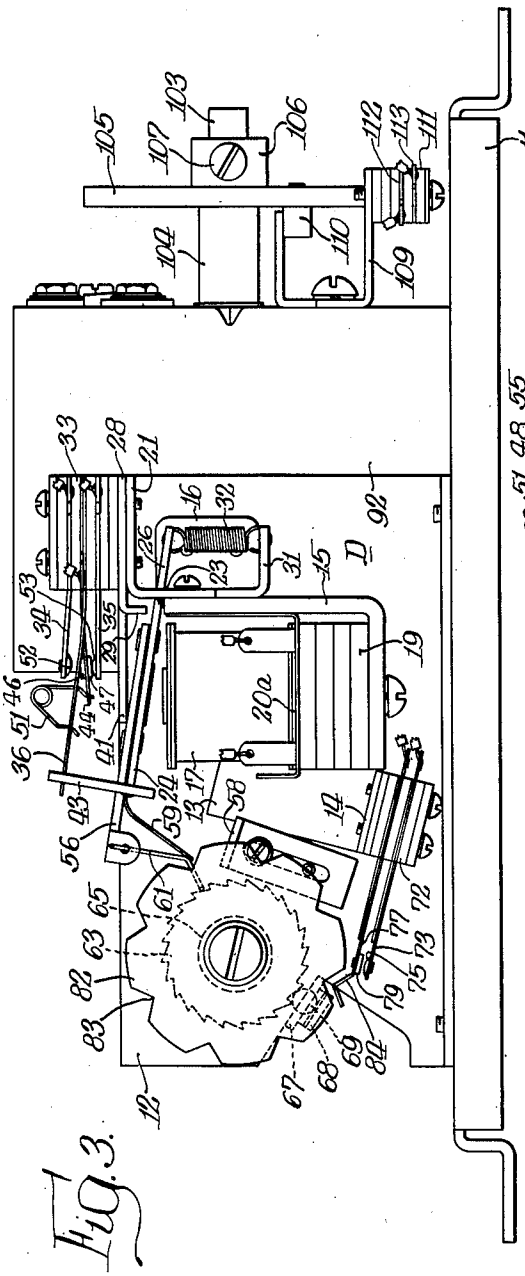

FIG. 3.

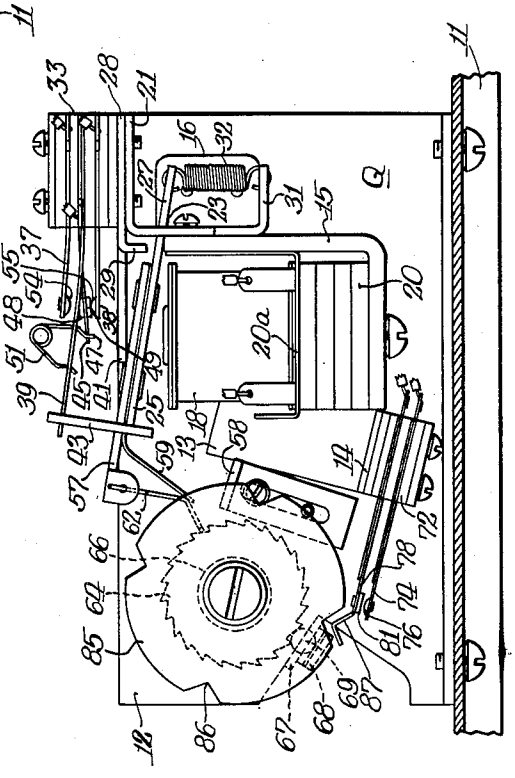

FIG. 4.

INVENTOR.
Marvin G. Nelsen,
BY Bair & Freeman
Atty's.

Feb. 19, 1952 M. G. NELSEN 2,586,173

COIN CREDIT MECHANISMS AND CIRCUITS

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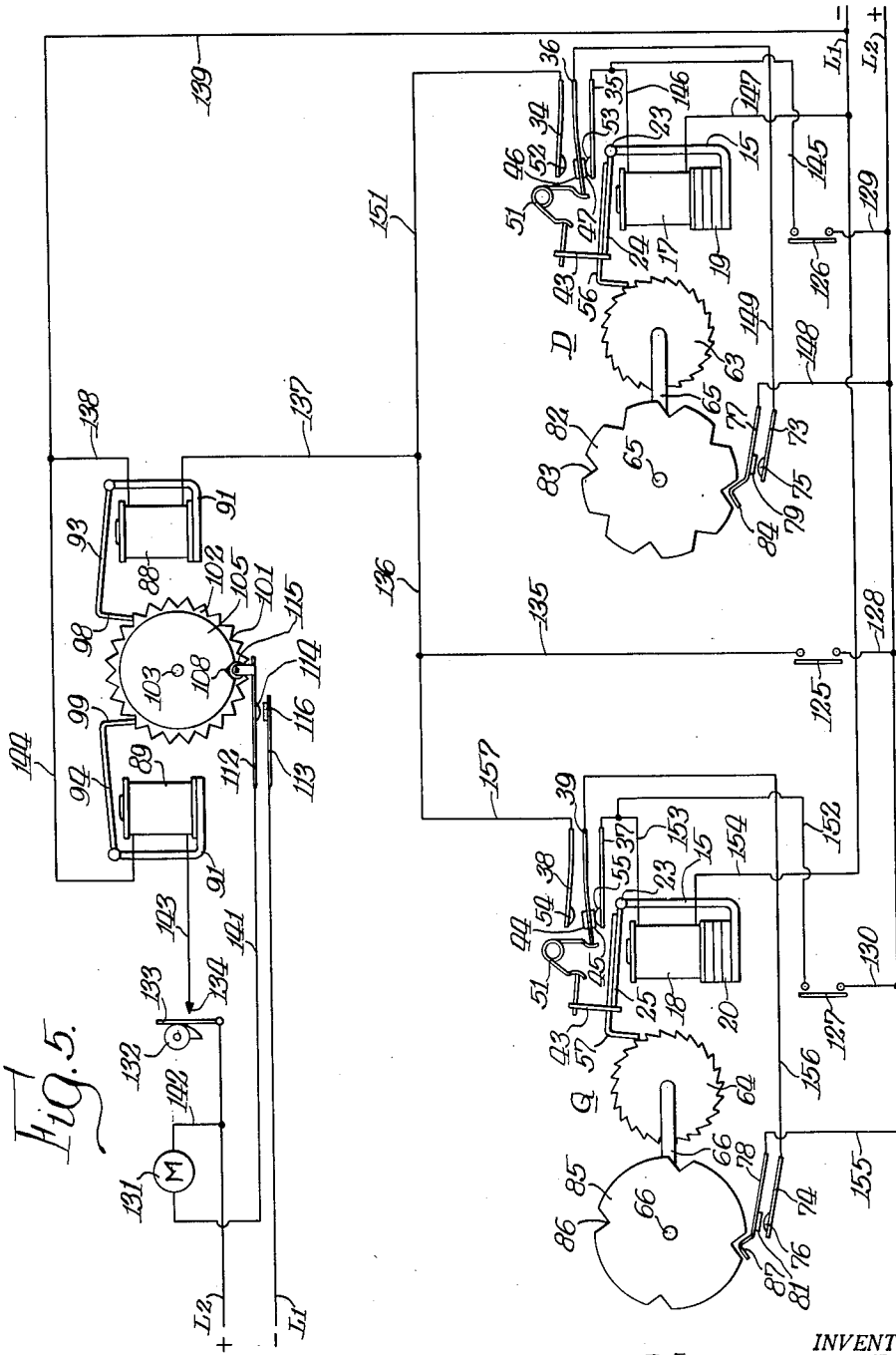

Fig. 5.

INVENTOR.
Marvin G. Nelsen,
BY Bair & Freeman
Atty's.

Feb. 19, 1952 M. G. NELSEN 2,586,173

COIN CREDIT MECHANISMS AND CIRCUITS

Filed Oct. 31, 1946 4 Sheets-Sheet 4

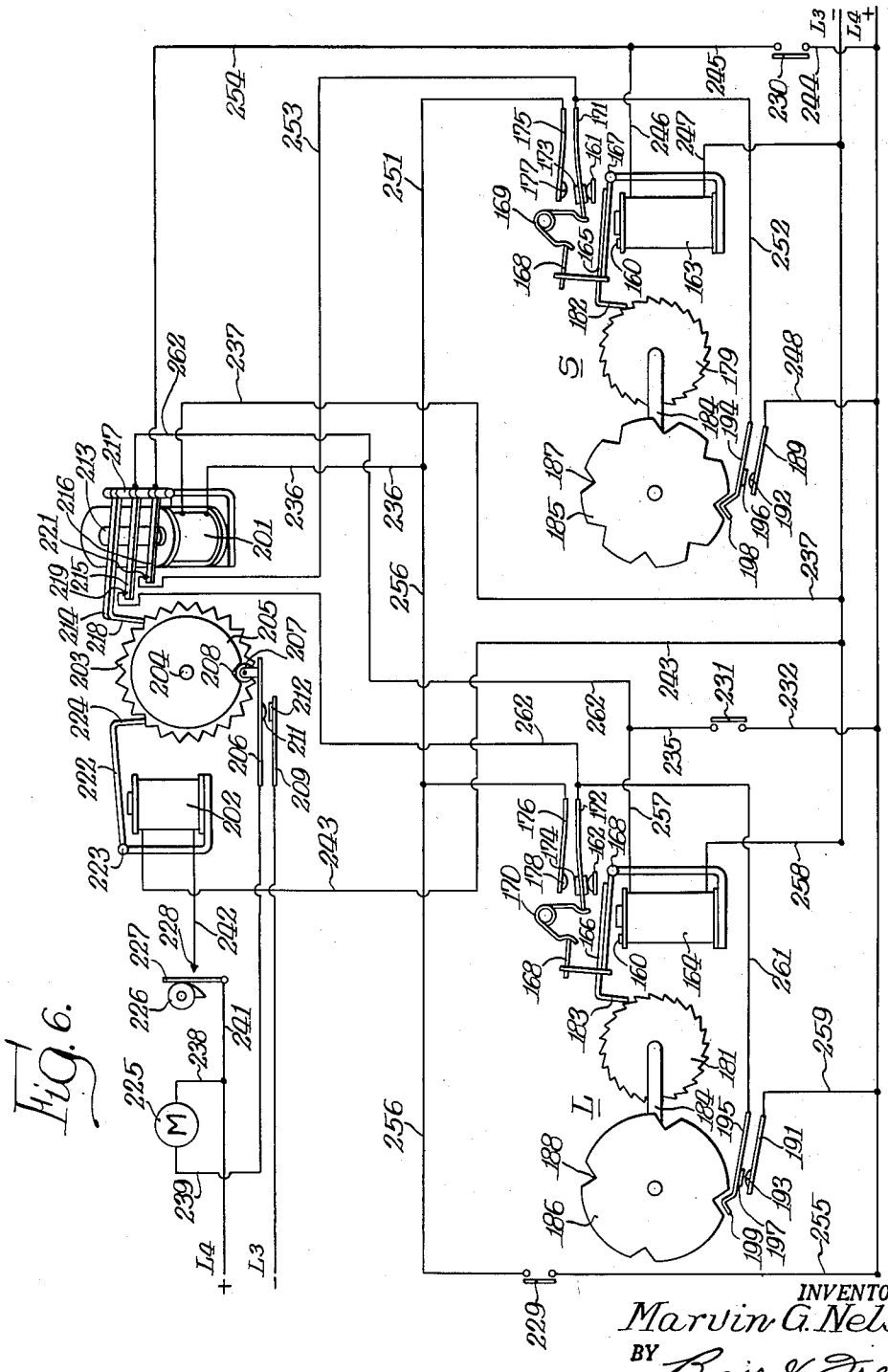

Fig. 6.

INVENTOR.
Marvin G. Nelsen,
BY Bair & Freeman
Attys.

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2,586,173

UNITED STATES PATENT OFFICE

2,586,173

COIN CREDIT MECHANISMS AND CIRCUITS

Marvin G. Nelsen, Skokie, Ill., assignor to Guardian Electric Manufacturing Co., Chicago, Ill., a corporation of Illinois

Application October 31, 1946, Serial No. 706,931

7 Claims. (Cl. 235—92)

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This invention relates to coin credit mechanisms and circuits and particularly to coin credit mechanisms and circuits adapted to accept coins of various denominations, add the values in units or credits, then subtract the units or credits, for example, as selections are played on an automatic phonograph.

The invention is particularly applicable to, and is illustrated with automatic phonograph mechanism, but is not limited thereto, as it is applicable to many types of vending machines.

It is an object of the invention to provide improved coin credit mechanisms of the type which accept coins of different denominations and add and subtract credits.

It is a further object of the invention to provide multi-denominational coin control mechanism which is very inexpensive compared to devices now on the market.

It is an important object of the invention to provide such a coin control mechanism which is extremely fast in its operation.

It is also an object of the invention to provide impulse relays for coins of larger denominations than one unit, which relays are self-deenergizing when the proper number of impulses have been transmitted to an impulse adding mechanism.

It is a further object of the invention to provide novel impulse transmitting relays for coins of larger denominations than one unit.

It is furthermore an object of the invention to provide improved and simple control circuits to be utilized in connection with the aforesaid coin credit mechanism.

It is an additional object of the invention to provide novel stepper control relays for adding and subtracting units or credits.

It is another object of the invention to provide coin credit mechanisms and circuits, one of which will operate on D. C. current and another of which will operate on A. C. current.

It is also an object of the invention to provide coin credit mechanisms which dispense with electric motors, gears and complicated contact mechanisms.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, wherein:

Figure 1 is a top plan view of a coin credit mechanism;

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Figure 2 is a front elevational view of the coin credit mechanism shown in Figure 1;

Figure 3 is a side elevational view of the coin credit mechanism illustrated in Figure 1, showing one of the impulse transmitting relays;

Figure 4 is a partial sectional view illustrating another of the impulse transmitting relays shown in Figure 1;

Figure 5 is a schematic-wiring diagram, illustrating a D. C. control circuit and relays to be utilized with the coin credit mechanism shown in Figures 1 to 4; and

Figure 6 is a schematic wiring diagram illustrating an A. C. control circuit and relays.

Referring specifically to Figures 1 to 5 inclusive for a detailed description of one embodiment of the invention, numeral 11 designates a base plate on which are mounted two similar upright spaced plates 12 for relays D and Q, i. e., dime and quarter responsive relays. The plates 12 have square cut-outs 13 therein, bent over to form horizontal supporting flanges 14. L-shaped brackets 15 are supported by angles 16 secured to the plates 12 in any suitable manner, which L-shaped brackets 15 support respective electromagnets or coils 17 and 18 for relays D and Q and copper time delay slugs 19 and 20 below each of the coils. Insulating material 20a, such as fibre, is disposed between the solenoid and copper slugs.

The angles 16 are provided with overhanging portions 21 and apertures 22 (see Figure 2), which provide knife edges or pivot points 23 for pivoted armatures 24 and 25 associated with coils 17 and 18 respectively. The armatures 24 and 25 are provided with grooved extensions 26 and 27 extending through the apertures 22 to retain the armatures in position on the knife edges 23. Brackets 28 having downwardly turned flanges 29 are secured to angles 16 and limit the movement of armatures 24 and 25. Angles 16 are also provided with lower horizontal extensions 31 and tension springs 32 are connected between the extensions 26 and 27 of armatures 24 and 25 and extensions 31 on angles 16.

Laminations 33 of insulating material are secured to the top of brackets 28 and retain fixed contact arms 34 and 35 and a movable contact arm 36 above solenoid 17 and fixed contact arms 37 and 38 and movable contact arm 39 above solenoid 18. Extensions 41 from brackets 28 extend horizontally above the main part of armatures 24 and 25 and provide upper limit stops therefor.

The movable contact arms 36 and 39 extend

through slits 42 in insulating plates 43 attached to the outer ends of the main part of armatures 24 and 25. The movable contact arms 36 and 39 are formed of spring steel and have flexible fingers 44 and 45 cut therefrom carrying contacts 46 and 47 and 48 and 49 on opposite sides of respective flexible fingers 44 and 45. Hairpin springs 51 are anchored at one end to an intermediate portion of the movable contact arms 36 and 39, and at the other end to the flexible fingers 44 and 45, respectively. The fixed contact arms 34 and 35 are provided with contacts 52 and 53 respectively, and fixed contact arms 37 and 38 are provided with contacts 54 and 55 respectively. The hairpin springs 51 provide for snap-acting movement of the fingers 44 and 45 between contacts 52, 53 and 54, 55, respectively, as the corresponding armatures 24 and 25 are moved downwardly by the energization of coils 17 and 18, and are moved upwardly by the tension springs 32 upon deenergization of the coils 17 and 18.

Extensions 56 and 57 are secured to the main portion of armatures 24 and 25 and extend through lower slits (not shown) in the insulating plates 43 attached to armatures 24 and 25. Leaf spring members 59 are secured to the extensions 56 and 57 and bias wire pawls 61 and 62 toward ratchet wheels 63 and 64, respectively, journalled on shafts 65 and 66 supported from the upright supporting plates 12. Adjustable stop angles 58 are provided for the wire pawls 61 and 62. The outer ends of plates 12 are cut and provided with oblique flanges 67. Leaf springs 68 are secured to the plates 12 adjacent the oblique flanges 67 and retain balls 69 in engagement with the ratchet wheels 63 and 64 through apertures (not shown) in oblique flanges 67 to add slight resistance to rotation of the ratchet wheels.

Laminations 72 are secured to the underside of flanges 14 struck from plates 12 and substantially fixed spring contact arms 73 and 74 carrying contacts 75 and 76, respectively, and movable spring contact arms 77 and 78 carrying contacts 79 and 81, respectively, are associated with the plate 12 for respective relays D and Q. Up to this point, it will be noted that the relays D and Q are identical.

A wheel 82, preferably formed of insulating material, is mounted on shaft 65 and rotates therewith. Eight equally spaced notches 83 are provided in wheel 82. Movable contact arm 77 is provided with an angular extension 84 shaped to fit into the notches 83, for a purpose hereinafter described.

A second wheel 85, preferably formed of insulating material, is mounted on shaft 66 and rotates therewith. Four equally spaced notches 86 are provided in wheel 85. Movable contact arm 78 is likewise provided with an angular extension 87 shaped to fit into the notches 86, for a purpose hereinafter described.

The add and substract mechanism includes an add electromagnet or coil 88 and a substract electromagnet 89. These coils are mounted on brackets 91 extending from a vertical substantially rectangular supporting plate 92 which is secured to bed plate 11. Armatures 93 and 94 for coils 88 and 89, respectively, are pivoted on extensions 95 from bracket 91. The armatures 93 and 94 have members 96 and 97 extending therefrom which are provided with vertically extending fingers 98 and 99 which engage notches 101 in a wheel 102. The wheel 102 is preferably formed of insulating material and is rotatably mounted on a shaft 103 journalled in a bearing 104 mounted in the front of plate 92. The wheel 102 preferably has a large number of notches 101 therein, forty-two being shown, so that forty-two selections may be played on the phonograph, for example, as hereinafter described.

A second wheel or disc 105 is secured to the outer end of shaft 103 by a collar 106 held on shaft 103 by screws 107. The wheel 105 is also formed of insulating material and has one notch 108 formed therein.

A bracket 109 is secured to the front of supporting plate 92 and laminations of insulating material 111 are secured thereto. The bracket 109 also provides a stop which is engaged by a pin 110 on disc 105 when the disc is rotated counterclockwise slightly less than 360°. A movable spring contact arm 112 is fastened between some of the laminations 111 and a relatively fixed spring contact arm 113 is secured between other of the laminations 111. The contact arm 112 is provided with a contact 114 and with a roller 115 adapted to engage the periphery of disc 105 and drop into notch 108 when the notch is in one position with respect to disc 105. The contact arm 113 is provided with a contact 116. As long as roller 115 engages the periphery of the disc 105, contacts 114 and 116 are closed, and when the roller 115 drops into notch 108, contacts 114 and 116 open.

A bar 117 is pivoted at 118 on the plate 92 and is biased upwardly by a spring 119. The bar 117 has a roller 121 mounted on the top thereof, which engages the notches 101 in wheel 102 at all times and adds frictional resistance to the turning thereof. Slots 122 are provided in the front of plate 92 and extensions 98 and 99 of armatures 93 and 94 extend therethrough, the edges of slots 122 serving as stops for the movement of extensions 98 and 99. Coil springs 123 are secured to the extensions 98 and 99 and to the plate 92 at a stud 124, which springs bias the armatures 93 and 94 to their raised position.

Referring now to Figure 5, a line L1, L2 conveys D. C. power from any suitable source and one side L2 of the line is connected to coin switches 125, 126 and 127 by leads 128, 129 and 130. As illustrated, switch 125 is for a nickel, switch 126 for a dime, and switch 127 for a quarter. Coin switches which close a circuit upon the insertion of a coin of the correct denomination are well known in the art, and a diagrammatic showing thereof is sufficient, since their construction forms no part of the present invention. It is to be noted, however, that coins of different denominations are placed in one slot and pass through the coin mechanism in sequence, so that not more than one switch is closed at a time. The relays act fast enough that all credits for one coin are racked up before another coin closes a coin switch, and no credits are lost. Also diagrammatically shown in Figure 5 is a phonograph motor 131 and a cam switch 132, which includes a set of contacts 133, 134 which are closed each time a record has been played, and are normally open.

Operation of Figures 1 to 5

Assuming first that a nickel is dropped in the nickel slot, switch 125 is momentarily closed, thus establishing a circuit from line L2, through lead 128, through conductors 135, 136, 137, through add coil 88 and conductors 138 and 139 to line L1. Coil 88 is, therefore, energized and armature 93 is drawn down once and then re-

turned by a spring 123. Extension 98 on armature 93 engages a notch 101 of wheel 102 and rotates it, thus rotating disc 105 the distance of one notch 101 and closing contacts 114 and 116 when roller 115 engages the periphery of disc 105 instead of the notch 108. A circuit is then established from the line L1, L2. Current flows from line L2, through contacts 114 and 116, conductor 141, through motor 131, and through conductor 142 to line L3, thus energizing the motor and any other electrical equipment which may be associated with the phonograph.

Coin switch 132 is operated in any suitable manner upon the completion of the playing of a record, thus closing contacts 133, 134 for a short interval. A circuit is then established from line L2, through contacts 133 and 134, conductor 143, subtract coil 89 and conductors 144 and 139 to line L1. The subtract coil 89 is then energized, armature 94 drawn down once and returned by a spring 123, extension 99 engaging a tooth 101 of wheel 102 and moving it and disc 105 the space of one notch in a direction opposite to that in which they were moved by the energization of the add coil 88. Roller 115 then drops off the periphery of disc 105 into notch 108, thus opening contacts 114, 116 and breaking the circuit to the motor 131 and preventing any additional playing of the phonograph until the insertion of another coin.

Assuming now that a dime is dropped in the dime slot, switch 126 is closed momentarily. A circuit is, therefore, established from line L2, through lead 129, and conductors 145 and 146 to coil 17 and to line L1 through a conductor 147. Armature 24 is, therefore, drawn downwardly and extension 56 operates ratchet wheel 63 once, thus turning wheel 82, whereupon extension 84 on switch arm 77 is forced out of a notch 83 and contacts 75, 79 are closed. At the same time that armature 24 is drawn downwardly, contacts 47, 53 of the relay D open by action of spring 51, and contacts 46, 52 close. A circuit is established, therefore, from line L2, through a conductor 148, through closed contacts 75, 79, a conductor 149, closed contacts 46, 52, a conductor 151, through conductor 137, add coil 88, and conductors 138 and 139 to line L1.

The add coil 88 is, therefore, energized and rotates the wheel 102 and disc 105 to give one credit and to close contacts 114, 116, thus energizing the phonograph motor 131.

Since the coin has passed switch 126 by this time, the coil 17 is deenergized and armature 24 drawn upwardly by spring arm 36. Spring 51 then opens contacts 46, 52 and closes contacts 47, 53. The circuit to the add coil 88 is then broken and spring 123 returns the armature 93 to the raised position where it is again conditioned to move wheel 102. Since contacts 75 and 79 are now closed, however, a circuit is established from line L2, through lead 148, contacts 75, 79, conductor 149, contacts 47, 53, conductor 146, coil 17 and to line L1 through conductor 147. The ratchet wheel 63 is turned another notch, wheel 82 is again rotated, but not a sufficient distance to open contacts 75, 79 and contacts 46, 52 are again closed, thus producing another impulse on add coil 88 and turning wheel 102 and disc 105 a sufficient distance to give a second credit. The same sequence of operations again occurs, but this time, upon energization of coil 17, extension 84 drops into the next notch 83 on wheel 82 and contacts 75, 79 open. Therefore, no circuit may be established

to energize add coil 88 to produce additional credits, even though contacts 46, 52 are closed, until additional coins are deposited. Coil 17, however, has been deenergized again, and contacts 47, 53 remain closed and conditioned to energize coil 17 upon the insertion of another dime in switch 126.

It is to be noted that conductor 145 is preferably connected directly to contact 53 through switch arm 35. This prevents the relay D from continuing to operate should a coin become jammed or switch 126 remain closed for any reason, as would be the case if switch 126 were connected directly to lead 149.

It is also pointed out that a dime racks up two credits on the disc 105, but the relay D operates three times, the last operation breaking the relay circuit and stopping its operation.

Assuming now that a quarter is inserted to momentarily close switch 127, a circuit is completed from line L2, through lead 130, switch 127, conductor 152, conductor 153, coil 18, and conductor 154 to line L1. The coil 18 is thereby energized and wheel 85 rotated in the same manner as explained with respect to relay D, thereby closing contacts 76, 81 on the first energization. Similarly, an impulse is directed to add coil 88, a circuit having been established from line L2, through lead 155, contacts 76, 81, lead 156, closed contacts 44, 54 (contacts 45, 55 being open at this time), conductors 157, 136, 137, through add coil 88 and conductors 138 and 139 to line L1. Because of the greater spacing of notches 86 on wheel 88 as compared with notches 83 on wheel 82, the coil 18 is operated six times before extension 87 drops into the next depression 86 to open contacts 76, 81 and stop operation of relay Q. Five impulses are, therefore, delivered to add coil 88, thus racking up five credits on disc 105. The sixth operation merely breaks the relay circuit.

As each record finishes playing, the contacts 133, 134 are closed, thus operating the subtract coil 89 in a manner hereinbefore described to subtract one credit on disc 105. So long as coins have been inserted to maintain contacts 114, 116 closed, the phonograph will continue to play, and as many coins of different denominations as desired, up to forty-two nickel units, may be deposited.

Description of Figure 6

Referring now to Figure 6, an A. C. circuit and mechanisms adapted to operate on A. C. power are illustrated somewhat diagrammatically.

This circuit includes a dime and a quarter relay, for example, designated by the letters S and L, respectively. The relays may be mounted on a base plate, such as shown in Figures 1 to 4, and are identical with relays D and Q, with the exception that the copper slugs 19 are not used with an A. C. coil, but shading pieces 160 are used. Furthermore, stops 161 and 162 are provided in the place of contact arms 35 and 37, respectively.

The relays S and L include A. C. electromagnets or coils 163 and 164, respectively, having armatures 165 and 166 associated with the coils. The armatures 165 and 166 are pivoted at 167 and are biased upwardly by spring arms 168. Hairpin springs 169 and 170 are provided on the relays and are secured to spring arms 168 and to movable contact arms 171 and 172 on respective relays S and L. The contact arms 171 and 172 are provided with contacts 173 and 174. The relays S and L are also provided with fixed spring contact arms 175 and 176, and are provided with contacts 177 and 178, respectively. Relays S and L

include ratchet wheels 179 and 181, the teeth of which are engaged by extensions 182 and 183 on respective armatures 165 and 166. The ratchet wheels 179 and 181 are secured to shafts 184 and wheels 185 and 186 of insulating material are also secured to the shafts 184 and are rotated by rotation of ratchet wheels 179 and 181, respectively.

The wheel 185 is provided with eight equally spaced notches 187 and the wheel 186 is provided with four equally spaced notches 188. Switches including fixed spring contact arms 189 and 191, carrying contacts 192 and 193 respectively, are associated with respective wheels 185 and 186. The switches also includes movable spring contact arms 194 and 195 respectively, provided with contacts 196 and 197 and with extensions 198 and 199, adapted to be received in the notches 187 and 188 or ride on the periphery of wheels 185 and 186.

An add and subtract relay is also provided and comprises, essentially, an add coil 201, a subtract coil 202, a ratchet wheel 203 mounted on a shaft 204, and a disc 205 rotated by movement of the ratchet wheel 203. A movable spring contact arm 206 carries a roller 207 adapted to ride on the periphery of disc 205 or be received in a slot 208 in disc 205. A fixed spring contact arm 209 is associted with the movable contact arm. Movable contact arm 206 is provided with a contact 211 and fixed contact arm 209 with a contact 212. When the roller 207 is in the notch 208, contacts 211 and 212 are open and when the roller rides on the periphery of disc 205, contacts 211 and 212 are closed. A suitable stop means (not shown), similar to that shown in the first embodiment of the invention, is provided on disc 205. In fact, this much of the add and subtract relay is identical with that already described, except that A. C. coils are used, and the add coil is elliptical in shape and has a wide core 213, for the purpose of simultaneously attracting three armatures 214, 215 and 216 pivoted on a shaft 217 of insulating material.

Armature 214 corresponds with armature 93 in Figure 5, and an extension 218 thereon engages ratchet wheel 203. Fixed contacts 219 and 221 are engaged by armatures 215 and 216, respectively, when in their upper positions, for purposes hereinafter described. Obviously, one armature may be used with suitable contacts operated thereby. Suitable spring means (not shown) bias the armatures 215 and 216 toward their upper positions into engagement with contacts 219 and 221.

The subtract coil 202 is provided with an armature 222 pivoted at 223 and normally biased upwardly by a spring (not shown). Armature 222 is also provided with an extension 224 which engages ratchet wheel 203.

Also included in the circuit is a phonograph motor 225, a cam switch 226 including movable and fixed contacts 227 and 228, and coin switches 229, 230 and 231, for example, for nickels, dimes and quarters, respectively. A source of A. C. power designated at L3, L4 is provided.

Operation of Figure 6

Assuming that a nickel is deposited in nickel switch 229, the switch is momentarily closed and a circuit is set up, starting from line L4, through a lead 255, switch 229, conductors 256 and 236, coil 201, and conductor 237 to line L3. The coil 201 is thus energized once, and armature 214 turns ratchet 203 and disc 205 to give one credit, closing contacts 211 and 212. Phonograph motor 225 is energized by a circuit from line L4, conductor 238, through the motor 225, conductor 239, through contacts 211 and 212 to line L3. When the record is completed playing, the cam switch 226 is operated to momentarily close contacts 227, 228 and energize subtract coil 202 through a circuit from L4, conductor 241, contacts 227, 228, conductor 242, coil 202, and conductor 243 to line L3. The ratchet 203 and disc 205 are rotated in a counterclockwise direction, roller 207 enters notch 208 in disc 205 and contacts 211 and 212 open to break the circuit to motor 225. No more records may be played, therefore, until additional coins are deposited.

While armatures 215 and 216 will be drawn downwardly when solenoid 201 is energized, no circuits are broken or completed between lines L3 and L4, as is obvious from the wiring diagram.

Assuming now that a dime is inserted and dime switch 230 momentarily closed, a circuit is established from line L4, through lead 244, switch 230, conductors 245 and 246, through coil 163 and conductor 247, to line L3. Coil 163 is thereby energized and relay S begins operation, first by drawing armature 165 downwardly and rotating ratchet 179 and wheel 185. Contacts 192, 196 are thereupon closed since extension 198 is no longer in notch 187, but engages the periphery of the wheel 185. Furthermore, contacts 173, 177 are closed by the action of spring 169.

When contacts 192, 196 close, a circuit is established from line L4, through conductor 248, contacts 192, 196, conductors 252, 253, through contact 221, armature 216, conductors 254, 249, through coil 163, and conductor 247 to line L3, thus maintaining coil 163 energized even though switch 230 is open after the coin has passed therethrough.

The following circuit is also established. From line L4, through conductor 248, contacts 192, 196, conductor 249, contacts 173, 177, conductors 251 and 236, through coil 201, and to line L3 through conductor 237. Coil 201 is thereby energized and all three armatures 214, 215 and 216 are drawn downwardly. Armature 214 operates ratchet 203 and disc 205 to give one credit and close contacts 211, 212 and energize motor 225, as explained above. Opening of contact 219 serves no function at this time. Opening of contact 221, however, breaks the holding circuit to coil 163 and the latter is deenergized, thus opening contacts 173, 177 and deenergizing coil 201. Contact 221 is again closed, reenergizing coil 163, closing contacts 173, 177 and moving wheel 185 another step. Coil 201 is also reenergized, moving disc 205 to add another credit and opening contact 221 to again deenergize coil 163. The same sequence of operations is then repeated, but on this sequence, when coil 163 is reenergized, wheel 185 is moved so that extension 198 drops into the next notch 187 and contacts 192, 196 are, therefore, opened. The coil 201 thus cannot be energized and no further credits are given. Furthermore, coil 201 and its associated armatures and coil 163 and its armature are conditioned for operation upon the insertion of another dime.

It is to be noted, therefore, that coil 163 is energized three times and wheel 185 moved three steps upon the insertion of a dime, while coil

201 is energized only two times and wheel 205 moved two steps.

As records are played, the subtract coil 202 is energized periodically, as explained above, and credits are subtracted until roller 207 engages notch 208, whereupon motor 225 is deenergized.

Assuming now that a quarter is inserted and switch 231 is momentarily closed. A circuit is established from line L4, through a conductor 232, switch 231, conductor 235, conductor 257, coil 164 and conductor 258 to line L3. Coil 164 is thereby energized and armature 166 drawn downwardly to turn ratchet 181 and wheel 186 one step. Abutment 199 is forced out of notch 188 and contacts 193, 197 are closed. Contacts 174, 178 are also closed when armature 166 is drawn downwardly, and a circuit is, therefore, established from line L4, through a conductor 259, contacts 193, 197, conductors 261, 256 and 236, through coil 201, and conductor 237 to line L3, thus energizing coil 201. Armature 214 is drawn downwardly and ratchet 203 and disc 205 are rotated to give one credit. Contacts 211, 212 are closed and the phonograph motor 225 is energized.

Contact 219 is opened by armature 215 being drawn downwardly, thus breaking a holding circuit to coil 164, which had been established from line L4, through conductor 259, contacts 193, 197, conductors 261, 262, contact 219, armature 215 and conductor 262. Coil 164 is, therefore, deenergized and contacts 174, 178 open, thus deenergizing coil 201, closing contact 219 and reenergizing coil 164. The sequence is then repeated, wheel 186 is turned another step and disc 205 is rotated another step to establish another credit. The coil 164 is energized six times and the coil 201 is energized five times to give five credits, since the sixth energization of coil 164 drops abutment 199 into the next notch 188, to open contacts 193, 197, and coil 201 is not energized the sixth time.

As records are played, the subtract coil 202 is periodically energized to counter-rotate disc 205 until contacts 211, 212 are again opened, in a manner hereinbefore described.

From the foregoing it will be apparent that a very fast acting, relatively inexpensive, multi-denominational coin control mechanism has been provided. Furthermore, the device has but few parts likely to wear and life tests have shown that the device is exceptionally rugged and should normally last longer than the phonograph equipment with which it is generally used.

Some changes may be made in the construction and arrangement of the parts of my coin credit mechanisms and circuits without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope without sacrificing any of the advantages thereof.

I claim as my invention:

1. A control unit for an automatic machine adapted when controlled by a switch to perform in sequence one or more movements, said unit comprising a first switch capable of controlling the operation of said machine, ratchet means for actuating said switch, first electromagnetic means for moving said ratchet means step by step toward and into a position where said first switch opens and operative after each machine movement to move said ratchet means one such step, second elecromagnetic means for moving said ratchet means step by step out of and away from said position where said first switch opens, first means adapted to be connected for transmitting a single impulse to said second electromagnetic means and second means adapted to be connected to said source of electrical energy for transmitting a plurality of separate impulses to said second electromagnetic means, said second transmitting means including a relay, second switch means including a first and a second fixed contact member and a third contact member movable therebetween, means operated by said relay for closing said first contact on energization of said relay and for closing said second contact on deenergization of said relay, said movable contact member being adapted to be connected to said source of electrical energy, said first fixed contact member being connected to said second electromagnetic means and said second fixed contact member being connected to said relay, connecting means for said relay and said second electromagnetic means adapted to be connected to said source of electrical energy for forming a circuit, third switch means associated with said movable contact member and means for actuating said third switch means operative upon the first energization of said relay to close said third switch and after a predetermined number of energizations of said relay to open said third switch, fourth switch means associated with said relay and operative to energize said relay momentarily for initiating relay operation, the opening of said third switch being effective to prevent further energization of said relay until said fourth switch has again been closed.

2. A control unit for an automatic machine adapted, when controlled by a switch, to perform a series of operations in sequence, said unit comprising a first switch capable of controlling the operation of said machine, ratchet means for actuating said switch, first electro-magnetic means for moving said ratchet means step by step toward and into a position where said first switch opens and operative after each machine movement to move said ratchet means one such step, second electro-magnetic means for moving said ratchet means step by step out of and away from said position where said first switch opens, and means for transmitting separate electrical impulses sequentially to said second electro-magnetic means, said transmitting means being adapted to be connected to a source of electrical energy and each transmitted impulse being operative to move said ratchet means one step, said transmitting means including a plurality of separate relays operative to transmit a different plurality of impulses, said separate relays each having cam means rotated thereby, said cam means each having a different number of lobes thereon, a second switch and a third switch for each relay both adapted to control the operation thereof, said second switch having a movable contact member and a pair of relatively fixed contact members adapted to be engaged by said movable contact member, means for effecting the engagement of the movable contact member with said fixed contact members sequentially upon each energization and deenergization of the associated relay, said engagement of one of the fixed contacts being adapted to transmit one impulse and said engagement of the other of said fixed contacts adapted to energize its associated relay to effect rotation of its cam means, a fourth switch connected to each relay, each of said fourth switches, when closed, adapted to effect initial

energization of its associated relay, said second switch being operative after said third switch has been closed by the initial rotation of its associated cam means to energize said relay one more time than the number of impulses transmitted upon sequential energization of said relay and said relay being operative upon its last energization to rotate its associated cam member to a position to open said third switch.

3. A control unit for an automatic machine adapted, when controlled by a switch, to perform a series of operations in sequence, said unit comprising a first switch capable of controlling the operation of said machine, ratchet means for actuating said switch, first electro-magnetic means for moving said ratchet means step by step toward and into a position where said first switch opens and operative after each machine movement to move said ratchet means one such step, second electro-magnetic means for moving said ratchet means step by step out of and away from said position where said first switch opens, and means for transmitting separate electrical impulses sequentially to said second electro-magnetic means, said transmitting means being adapted to be connected to a source of electrical energy and each transmitted impulse being operative to move said ratchet means one step, said transmitting means including a plurality of separate relays operative to transmit a different plurality of impulses, said separate relays each having cam means rotated thereby, said cam means each having a different number of lobes thereon, a second switch and a third switch for each relay both adapted to control the operation thereof, said second switch having a movable contact member and a pair of relatively fixed contact members adapted to be engaged by said movable contact member, means for effecting the engagement of the movable contact member with said fixed contact members sequentially upon each energization and deenergization of the associated relay, said last means including a spring means adapted to bias the movable contact member in two directions, said engagement of one of the fixed contacts being adapted to transmit one impulse and said engagement of the other of said fixed contacts adapted to energize its associated relay to effect rotation of its cam means, a fourth switch connected to each relay, each of said fourth switches, when closed, adapted to effect initial energization of its associated relay, said second switch being operative after said third switch has been closed by the initial rotation of its associated cam means to energize said relay one more time than the number of impulses transmitted upon sequential energization of said relay and said relay being operative upon its last energization to rotate its associated cam member to a position to open said third switch.

4. A control unit for an automatic machine adapted, when controlled by a switch, to perform a series of operations in sequence, said unit comprising a first switch capable of controlling the operation of said machine, ratchet means for actuating said switch, first electro-magnetic means for moving said ratchet means step by step toward and into a position where said first switch opens and operative after each machine movement to move said ratchet means one such step, second electromagnetic means for moving said ratchet means step by step out of and away from said position where said first switch opens, and means for transmitting separate electrical impulses sequentially to said second electromagnetic means, said transmitting means being adapted to be connected to a source of alternating current and each transmitted impulse being operative to move said ratchet means one step, said transmitting means including a plurality of separate relays operative to transmit a different plurality of impulses, said separate relays each having cam means rotated thereby, said cam means each having a different number of lobes thereon, a second switch and a third switch for each relay both adapted to control the operation thereof, said second switch having a movable contact member and a pair of relatively fixed contact members adapted to be engaged by said movable contact member, means for effecting the engagement of the movable contact member with said fixed contact members sequentially upon each energization and deenergization of the associated relay, said engagement of one of the fixed contacts being adapted to transmit one impulse and said engagement of the other of said fixed contacts adapted to energize its associated relay to effect rotation of its cam means, a fourth switch connected to each relay, each of said fourth switches, when closed, adapted to effect initial energization of its associated relay, said second switch being operative after said third switch has been closed by the initial rotation of its associated cam means to energize said relay one more time than the number of impulses transmitted upon sequential energization of said relay and said relay being operative upon its last energization to rotate its associated cam member to a position to open said third switch.

5. A control unit for an automatic machine adapted, when controlled by a switch, to perform in sequence one or more movements, said unit comprising a first switch capable of controlling the operation of said machine, ratchet means for actuating said switch, first electro-magnetic means for moving said ratchet means step by step toward and into a position where said first switch opens and operative after each machine movement to move said ratchet means one such step, second electro-magnetic means for moving said ratchet means step by step out of and away from said position where said first switch opens, first means adapted to be connected to a source of electrical energy for transmitting a single impulse to said second electro-magnetic means, and second means adapted to be connected to said source of electrical energy for transmitting a plurality of separate impulses to said second electro-magnetic means, said second transmitting means including a relay, a cam having a predetermined number of lobes adapted to be rotated by sequential operation of said relay, a second switch means including a first and second fixed contact member and a third contact member movable therebetween to close said first contact upon energization of said relay and to close said second contact upon deenergization of said relay, a fourth switch adapted to effect initial energization of said relay when closed, means for thereafter moving said third contact into sequential engagement with said first and second contacts upon sequential energization and deenergization of said relay, said movable contact member being adapted to be connected to said source of electrical energy, said first fixed contact member being connected to said second electro-magnetic means and said second fixed contact member being connected to said relay to effect sequential operation thereof, connecting means for said relay and said second electro-magnetic means

adapted to be connected to said source of electrical energy for forming a circuit, third switch members associated with said movable contact member, means for actuating said cam means to effect closing of said third switch means upon the first energization of said relay and after a predetermined number of energizations of said relay to open said third switch.

6. Means for transmitting electrical impulses sequentially comprising a source of electrical energy and including a plurality of separate relays operative to transmit a different plurality of impulses, said separate relays each having cam means rotated thereby, said cam means each having a different number of lobes thereon, a first switch and a second switch for each relay both adapted to control the operation thereof, said first switch having a movable contact member and a pair of relatively fixed contact members adapted to be engaged by said movable contact member, means for effecting the engagement of the movable contact member with said fixed contact members sequentially upon each energization and deenergization of the associated relay, said engagement of one of the fixed contacts being adapted to transmit one impulse and said engagement of the other of said fixed contacts adapted to energize its associated relay to effect rotation of its cam means, a third switch connected to each relay, each of said third switches, when closed, adapted to effect initial energization of its associated relay, said first switch being operative after said second switch has been closed by the initial rotation of its associated cam means to energize said relay one more time than the number of impulses transmitted upon sequential energization of said relay and said relay being operative upon its last energization to rotate its associated cam member to a position to open said second switch.

7. Means for transmitting separate electrical impulses sequentially and adapted to be connected to a source of power, said transmitting

means including a relay, a cam having a predetermined number of lobes adapted to be rotated by sequential operation of said relay, a first switch means including a first and second fixed contact member and a third contact member movable therebetween to close said first contact upon energization of said relay and to close said second contact upon deenergization of said relay, a third switch adapted to effect initial energization of said relay when closed, means for thereafter moving said third contact member into sequential engagement with said first and second contacts upon sequential energization and deenergization of said relay, said movable contact member being adapted to be connected to said source of electrical energy, said first fixed contact member being connected to said second electro-magnetic means and said second fixed contact member being connected to said relay to effect sequential operation thereof, connecting means for said relay and said second electro-magnetic means adapted to be connected to said source of electrical energy for forming a circuit, second switch means associated with said movable contact member, means for actuating said cam means to effect closing of said second switch means upon the first energization of said relay and after a predetermined number of energizations of said relay to open said second switch.

MARVIN G. NELSEN.

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