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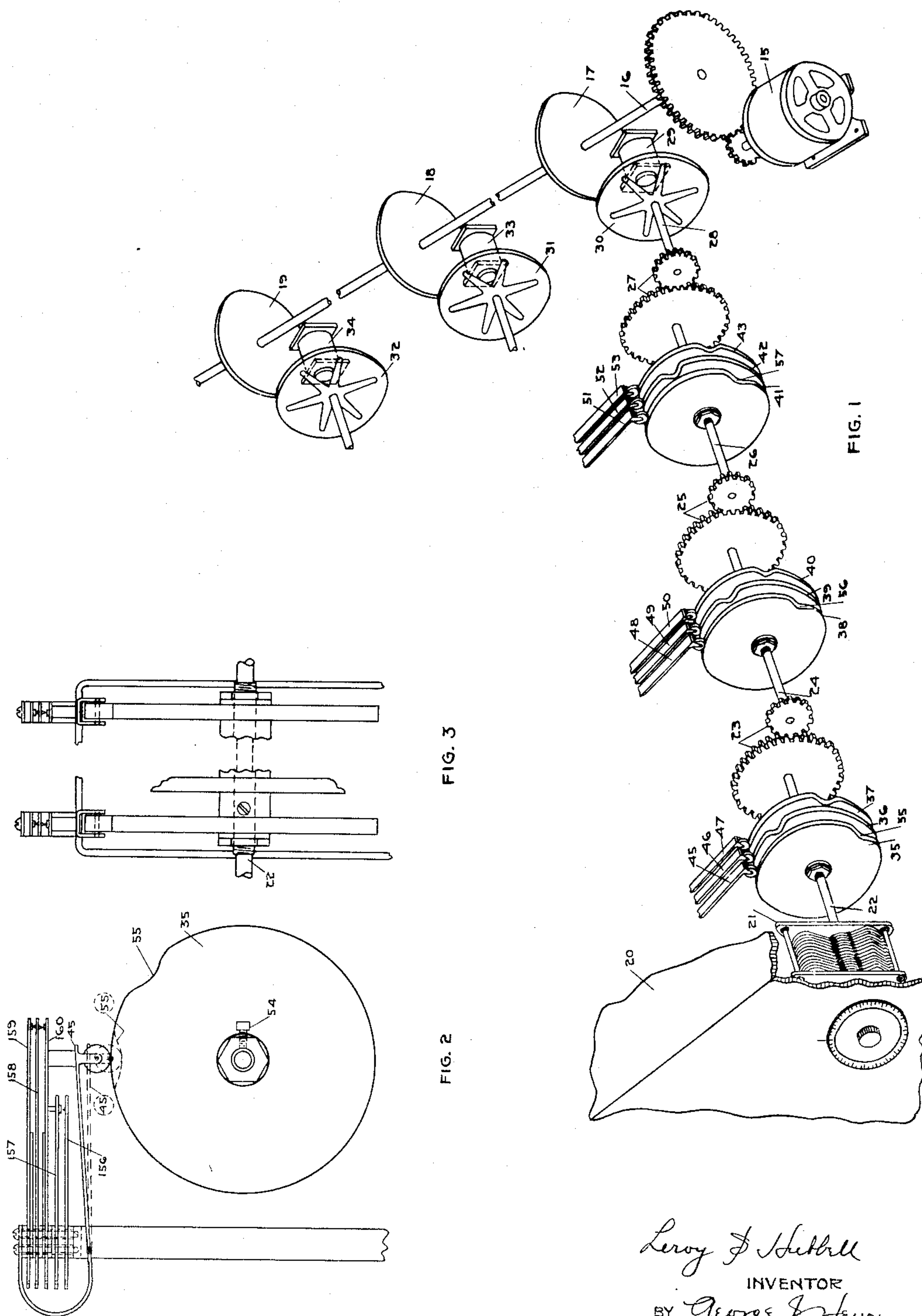
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1,777,796

TUNING MECHANISM

Filed Jan. 18, 1927

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

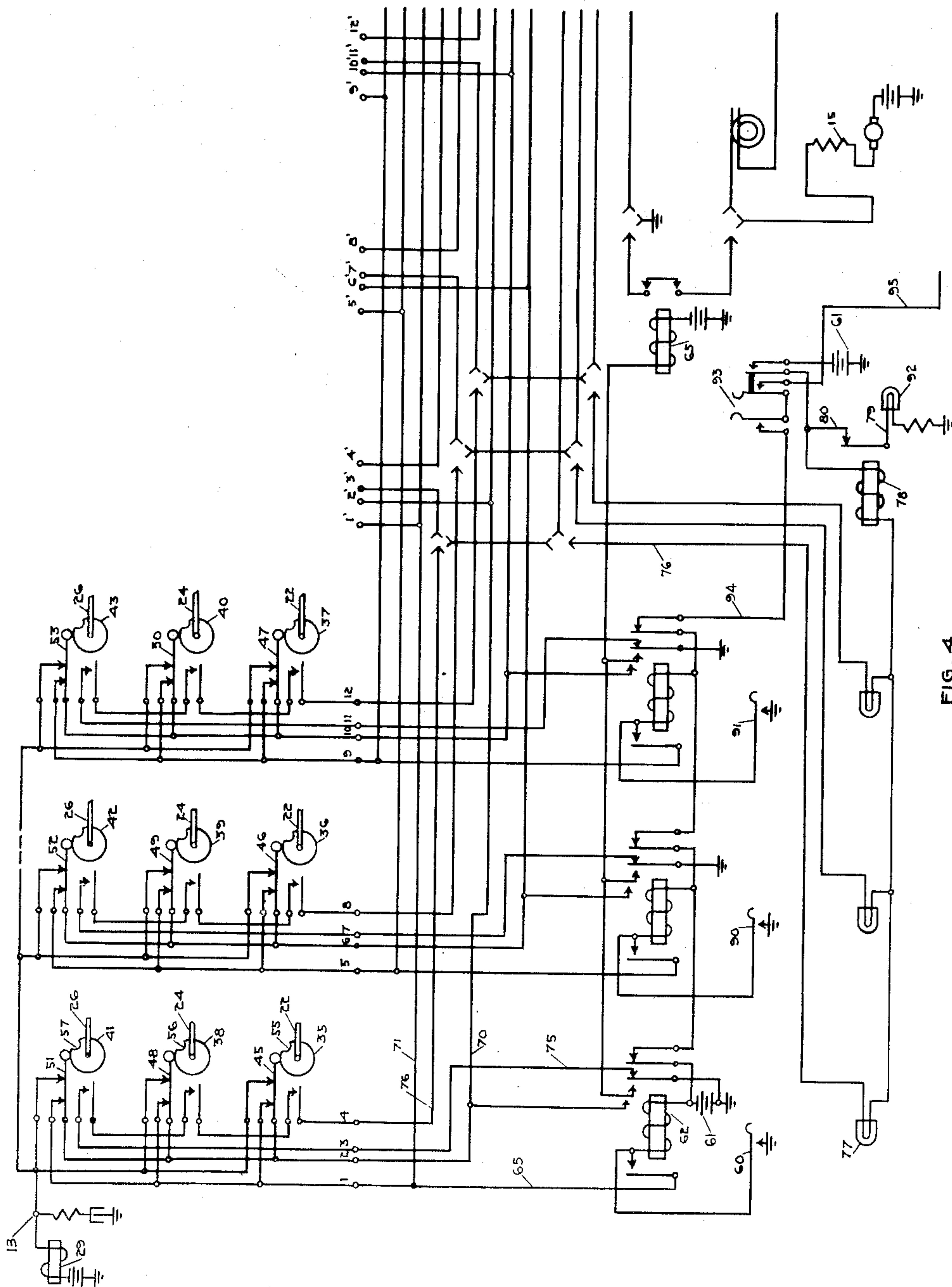


FIG. 4

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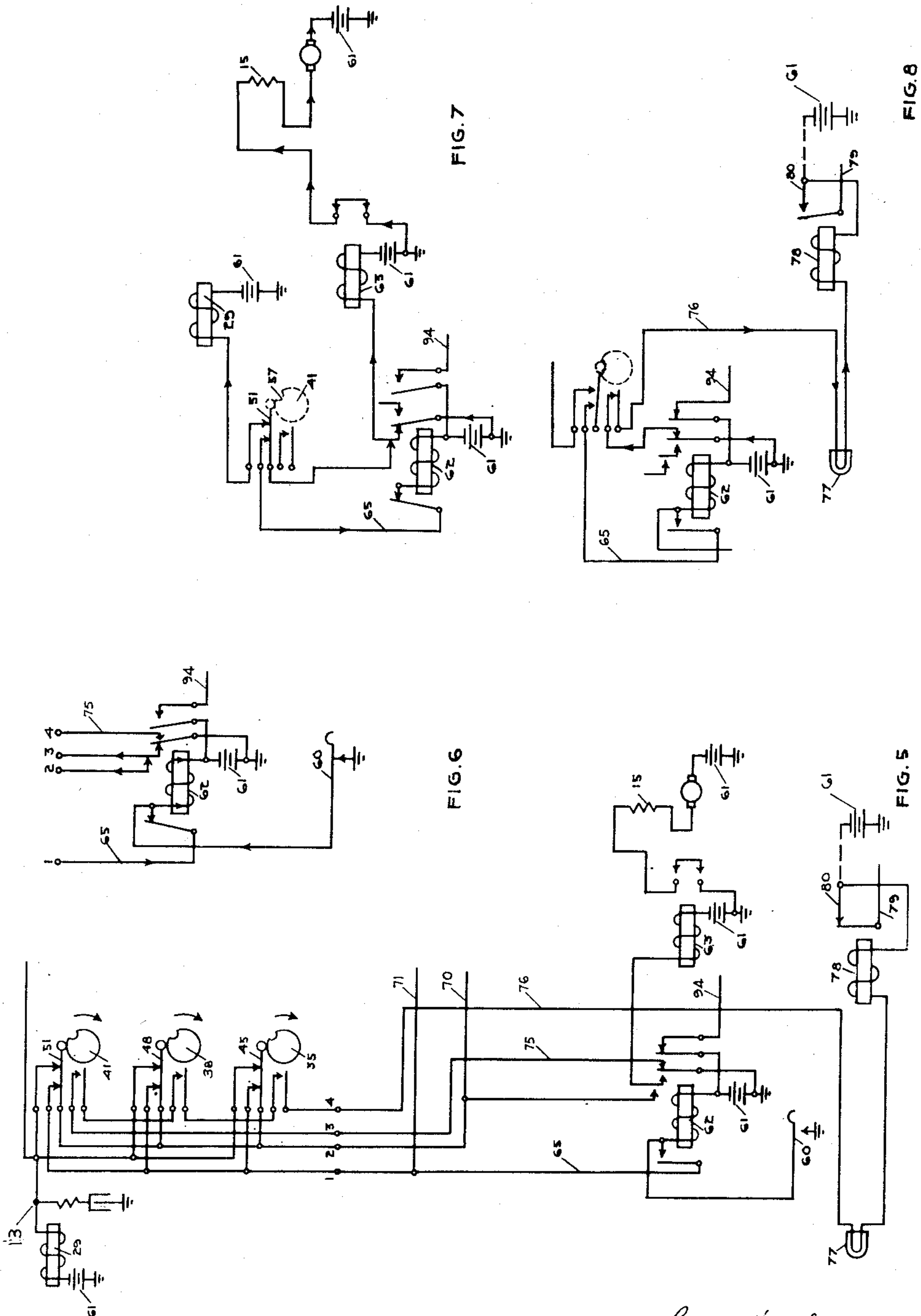
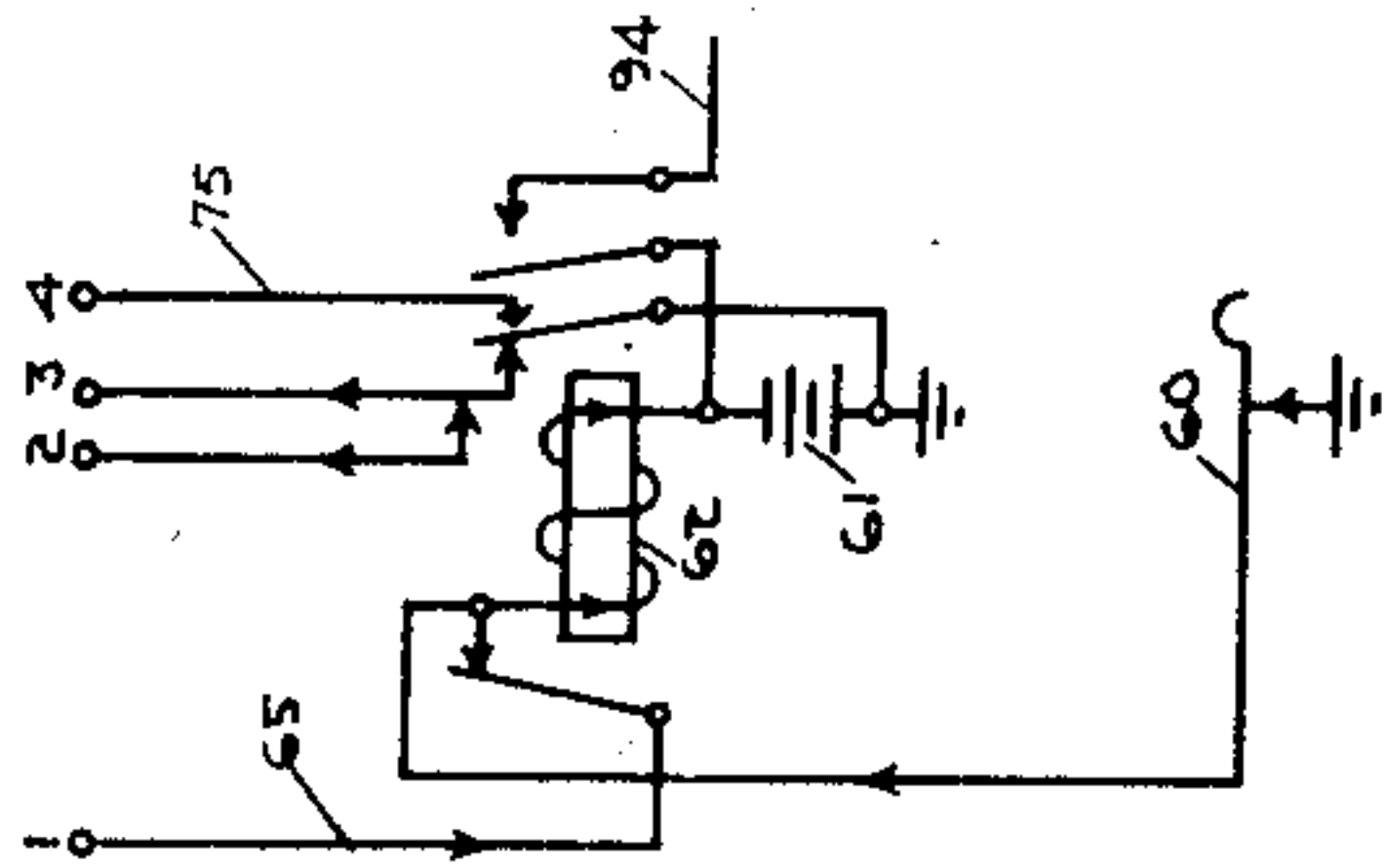


Fig. 5



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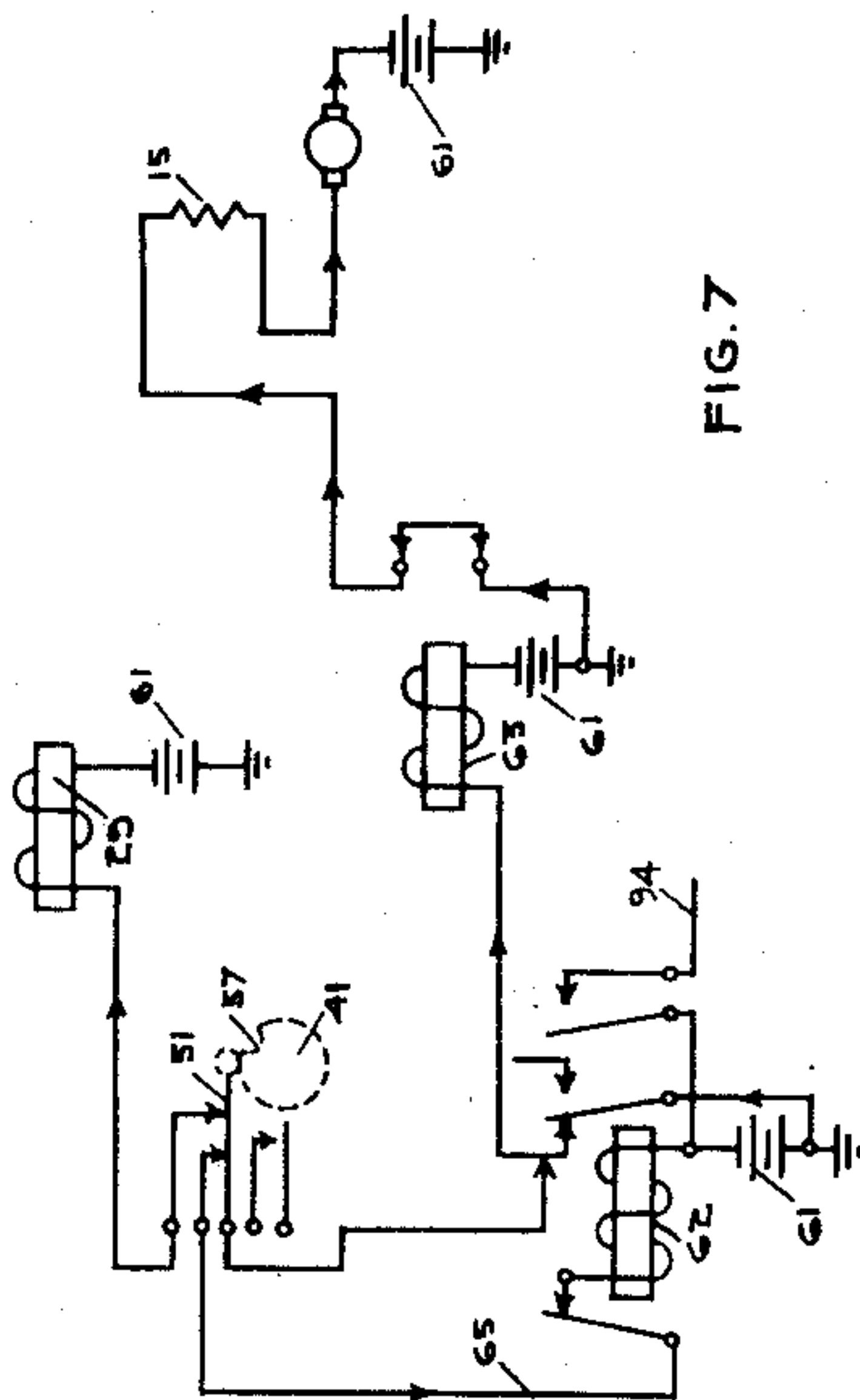
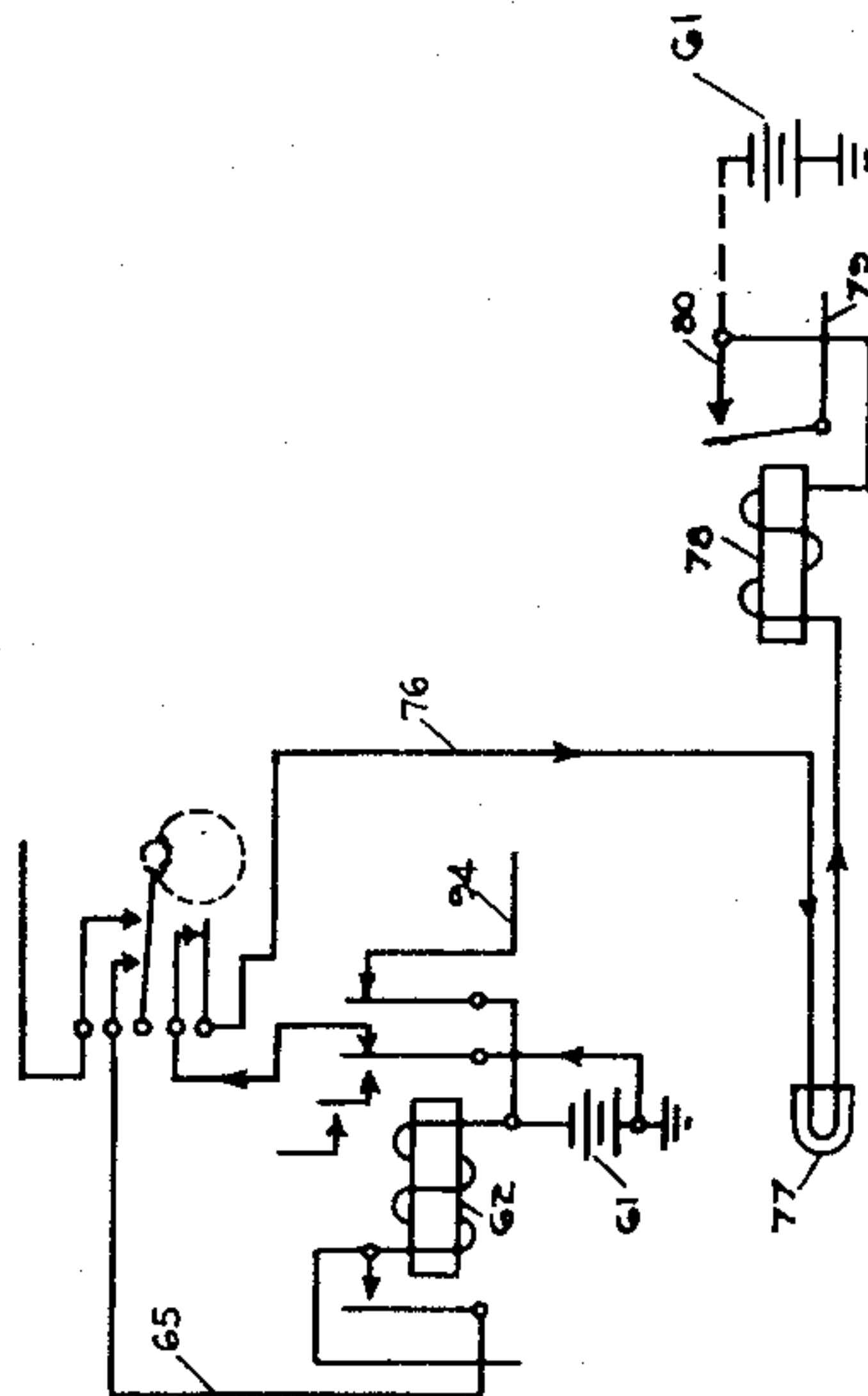


Fig. 7



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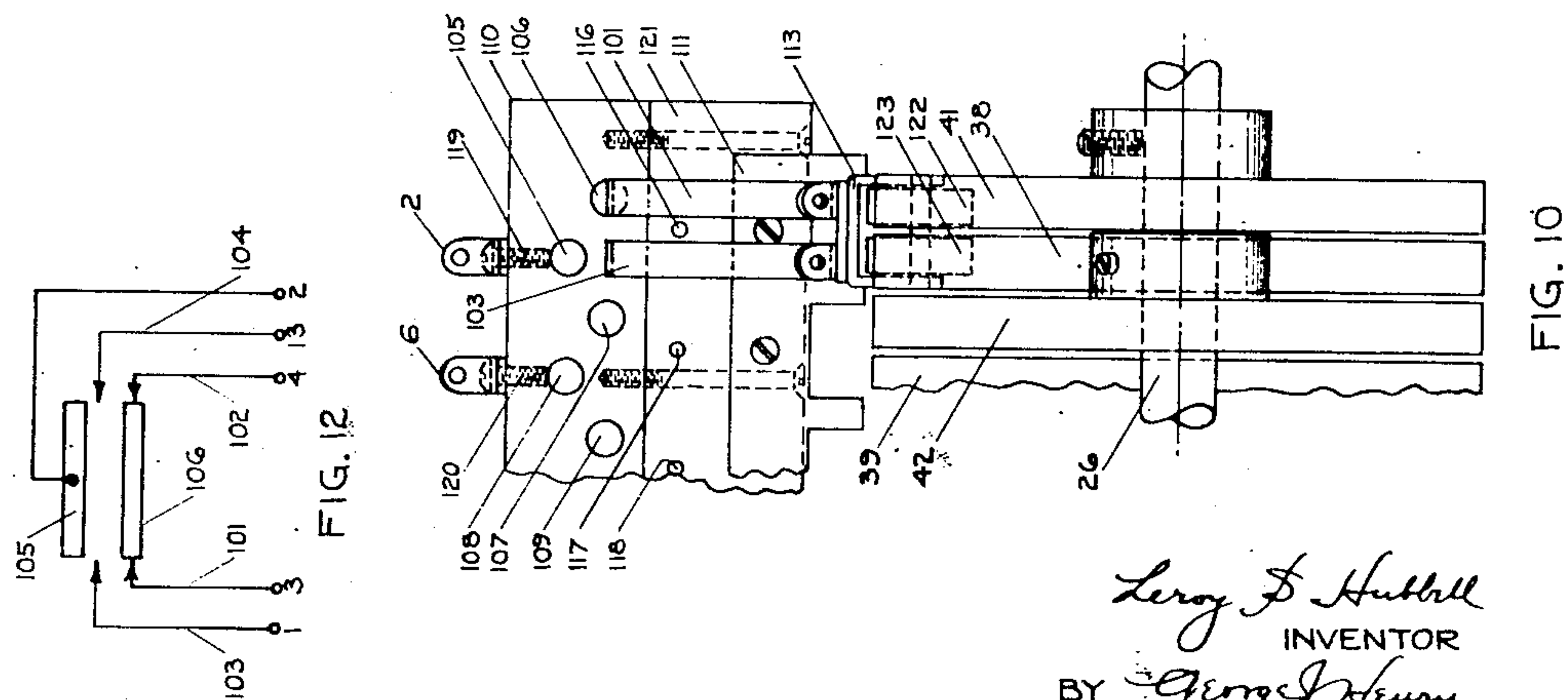
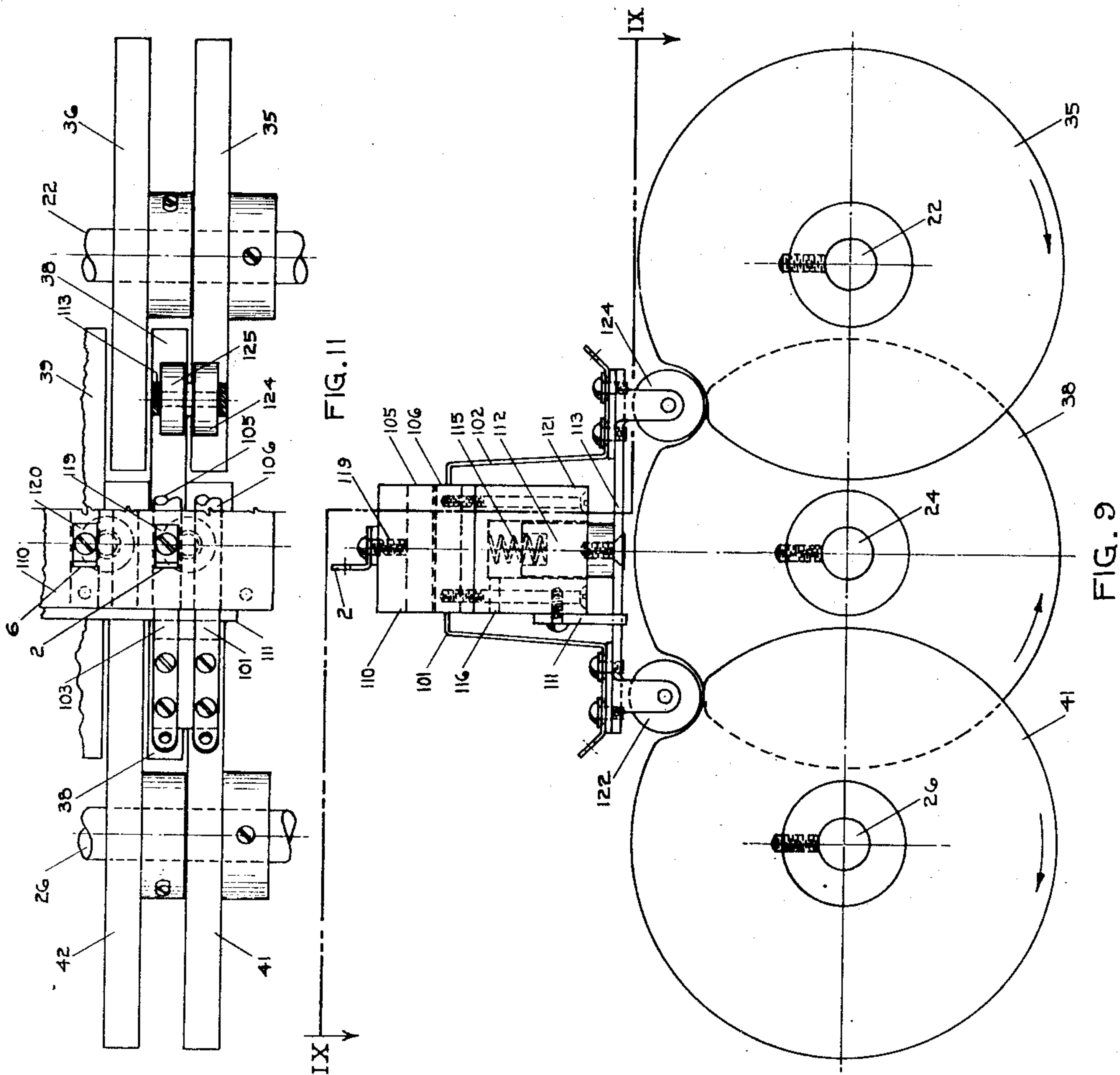
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TUNING MECHANISM

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4 Sheets-Sheet 4



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TUNING MECHANISM

Application filed January 18, 1927. Serial No. 161,724.

My invention has for its object mechanism which may be manually set in accordance with any desired tuning result and will thereafter initiate the necessary mechanical movement and which movement will then be completed to the accurate predetermined point.

A further object is a mechanism of the character described especially adapted to the adjusting of the several tuning elements of a radio receiving set, although the invention is also applicable to operate and bring into tune other mechanical devices.

A further object is a mechanism of the character described which, when once set into operation will automatically continue until it has completed its predetermined degree of movement.

A further object is a mechanism of the character described wherein a plurality of tuning elements may all be brought into synchronism for a predetermined wave length.

A further object is a mechanism of the character described wherein the movement of the tuning elements is dependent upon a series of consecutively connected elements adapted to different rates and degrees of angular movement, enabling a micrometer adjustment of each connected tuning element.

By referring to the accompanying drawings and description my invention will be made clear.

While I have herein shown and described a conventional radio receiving set with my invention applied thereto, it is to be understood that other forms of tuning elements may be employed in combination with my invention and also my invention may be employed for automatically adjusting other devices and forms of mechanism to a predetermined setting, with a high degree of accuracy.

Fig. 1 shows in prospective and partly diagrammatic one form of mechanism embodying my invention, with certain of the parts left off to better show the mechanism and its operation.

Figs. 2 and 3 are side and front views of certain of the cam members with the spring contact arms and rollers.

Fig. 4 is a diagrammatic showing of the

circuit connections adapted for three predetermined wave lengths and for operating any one of the tuning elements on a conventional radio set, and with bus connections for other tuning elements.

Fig. 5 is a diagrammatic showing of the circuit connections for operating one of the tuning elements and for automatically setting the mechanism to a selected wave length.

Figs. 6, 7 and 8 are fragmentary views showing the progressive operations of the circuit.

Figs. 9, 10, 11 and 12 show an alternate construction of cam discs and associated parts and circuit connections for controlling the magnetic clutch 29 and motor 15.

Fig. 9 shows the front view of a series of three discs on the periphery of which rides a carriage through the medium of four rollers. To the carriage and projecting upward are four springs which engage contacts at the upper part of the assembly.

Fig. 10 shows the side view of Fig. 9 with the series of three discs and corresponding carriage and two of the springs which engage contacts at the upper part of the assembly.

Fig. 11 is partly a plan view of Fig. 10 and a sectional view of Fig. 9 along the line IX—IX.

Fig. 12 is a diagram of the electrical connections of the mechanism of Figs. 9, 10 and 11.

Referring to Fig. 1, an operating motor is shown by the numeral 15 adapted to operate the common shaft 16 provided with friction discs 17, 18, 19, which in turn are each adapted to actuate a train of mechanism controlling the movement of a tuning element 21 in a conventional radio set 20.

In the present example there are supposed to be three such tuning elements and I have shown the apparatus as adapted to automatically set the three tuning elements to any one of three predetermined wave lengths.

It is to be understood however, that my apparatus is adapted to actuate any number of tuning elements and to automatically shift or position the said tuning elements to correspond with any number of predeter-

mined wave lengths, by duplication of the parts of the mechanism.

At 20 is shown diagrammatically, a conventional radio set, one of whose tuning elements is indicated by the variable condenser 21. The capacity of this condenser is varied by the rotation of one set of its plates on the shaft 22 and this shaft is actuated through a gear train 23 to the higher speed shaft 24 which in turn, is actuated through the gear train 25 from the shaft 26.

The latter is brought into operation through the gear train 27 by the high speed shaft 28 when the conventional magnetic clutch at 29 is energized, pulling the disc 30 against the rotating friction wheel 17.

Disc for operating a similar train of mechanism up to other tuning elements of the radio set 20 are shown at 31, and 32 which in turn are actuated through the magnetic clutches 33 and 34 respectively.

On the shaft 22, I have shown three discs 35, 36, 37 and on the shaft 24, three other discs 38, 39 and 40 and on the shaft 26 three similar discs 41, 42 and 43.

Bearing on the peripheries of these discs are rollers and arms 45, 46, 47, 48, 49, 50, 51, 52, and 53.

These groups of three cams each on shafts 22, 24 and 26 are operated at different speeds from the motor 15 and the arms 45 to 53 inclusive operate the spring contacts shown in detail in Figs. 2 and 3 and diagrammatically in Figs. 4, 5, 7 and 8.

Each of the discs 35 to 43 inclusive is rotatively mounted on its respective shaft and may be locked in position by any conventional means as by the set screw 54. See Fig. 2. Likewise each of the discs is provided with a depression or cam surface, one of which is shown at 55, another at 56 and a third one at 57.

When the arm 45 riding on the periphery of the disc 35 falls into the cam slot 55 as indicated in the dotted position of Fig. 2 a series circuit through the contacts 156 and 157 is partly established and a parallel circuit through the contacts 158, 159 and 160 is broken.

When the mechanism is started to automatically adjust the tuning element 21 of the radio set 20 for a predetermined wave length, corresponding to the settings of the discs 35, 38 and 41; the resulting action will be as follows:

Discs 41 and 38 rotating at a higher speed than disc 35 will continue to revolve until the arm 45 falls into the cam slot 55 of disc 35 and thereafter the rotation of shaft 22 will be continued until the arm 48 falls into the cam slot 56, being a further progressive movement of the shaft 22 but less than one revolution, and thereafter the shaft 22 will continue to rotate during a further fraction of a revolution until the cam slot 57 al-

lows the arm 51 to drop at which time the circuit connections which cause the continued operation of the shaft 28 through clutch 29 are interrupted and the movement of the condenser 21 ceases at the predetermined wave length setting.

This is occasioned by the interrupting of the circuit through the magnetic clutch 29 and the disengagement of the disc 30 from the friction wheel 17. The adjustment of the condenser 21 is now complete but movement may continue to take place through other condensers or tuning elements either simultaneously or at other periods by the operation of the magnetic clutches 33 and 34 from the motor 15.

The motor 15 serves to actuate a plurality of tuning mechanisms and therefore as many tuning elements as may be desired and continues to rotate only during the period of adjustment of any of the tuning elements.

Referring to the circuit connections in Figs. 4 and 5, assuming now that we are desirous of setting the tuning elements for our radio set in accordance with the predetermined wave length corresponding with the key 60. This key is first depressed, energizing the relay 62 from the battery 61, which thereupon actuates its armature to close the circuits to operate the mechanism as indicated in Figs. 6 and 7.

The relay 63 is now energized from the battery 61 setting into operation the motor 15 and shaft 16 of Fig. 1.

Magnetic clutch 29 is now energized, and the arms 45, 48 and lastly 51 riding on the high portion of the discs 35, 38 and lastly 41 respectively. Likewise there is a circuit through the lead 65 which completes a circuit through the relay 62 and which now holds its armature retracted and in the position initiated by the key 60 until there is a progression of the discs 35, 38, 41 to their final positions although the key 60 may be released in the interim.

The circuit connections controlled by the arms 45, 48 and 51 are parallel respectively and therefore the contacts will be retained in the position shown in Figs. 2, 4, and 5 until all three of the arms 45, 48 and 51 fall into their respective cam slots.

If any one of them be retained upon the full diameter of its cam disc the circuit condition just described will be maintained.

The shaft 22 is now revolving at the slowest speed and therefore the magnetic clutch 29 will, through connecting up the shafts 22, 24, 26 and 28 with the rotating shaft 16, cause the discs 35, 38 and 41 to revolve until the cam slot 55 rides under the arm 45.

Thereafter disc 38 will continue to revolve a fraction of its revolution and more than one revolution of disc 41 until cam slot 56 rides under the arm 48.

The disc 41 will now continue to revolve

a fraction of a revolution until its cam slot 57 rides under the arm 51. The circuit through the magnetic clutch 29 and relay 62 will now be broken and the armature of the relay 62 will release causing the contacts to be shifted from the positions shown in Figs. 6 and 7 to the position shown in Fig. 8 and the adjustment of tuning element 20 is complete.

It may be however, that other tuning elements of the radio set 20 are not yet properly tuned to the desired wave length corresponding with the key 60 and therefore the relay 62 is being still energized through leads 70 and 71 which are under the control of mechanism actuated from the friction disc 31 of Fig. 1 and which will continue, the detailed connections for which will be similar to that shown on the left hand of Fig. 4.

In Fig. 4 all of the wiring and connections for the left hand portion are for one tuning element, as 21 and all of the right hand upper portion of the figure (which is a mere duplication of the wiring of the left hand side) are for a second and similar tuning element actuated by its respective mechanism from the disc 31 and the wiring may of course be continued to as many tuning elements as desired, the several groups of connections for the several tuning elements being in parallel with each other.

When therefore, the last of the tuning elements has been adjusted as described for the tuning element 21 the circuit flowing through the leads 70, 71 will be broken.

The relay 63 will be de-energized and the motor 15 will stop.

When all of the tuning elements have arrived at their final adjusted position, the arms riding on their respective discs will be in the depressed cam portions and contacts 156 and 157 of Fig. 2 will be closed. These contacts are all in series and complete a circuit from the released relay 62 over leads 75 and 76 through lamp 77 and relay 78, lighting lamp 77 and energizing relay 78. The lighting of lamp 77 indicates the completed setting of the mechanism and the operation of the relay 78 opens a circuit over leads 80 and 79 extinguishing the master display lamp 92 which lights only when the tuning elements are set on a wave length not covered by the tuning mechanisms.

Key 93 is the filament control switch on the conventional radio set, energization to the set being furnished over leads 94 and 95 through the series contacts on the control relays such as 62. This arrangement is made to prevent undesirable noises being reproduced by the radio receiver while the tuning elements are passing over other and undesired wave lengths.

A key for automatically setting the tuning mechanism of the set 20 to a second selected wave length is shown at 90 and a further key

for a third selected wave length at 91, these being adapted respectively to actuate the cam discs 36, 39, 42 and discs 37, 40, 41 of Fig. 1, through a similar group of connections to that described above.

Bus connections are shown on the right of Fig. 4 by the numerals 1' to 12' inclusive, corresponding with the bus connections 1 to 12 inclusive on the left of the figure and actuating the condenser 21 through the shaft 22, it being understood that there are cam and actuating mechanism and circuit connections whose operation is initiated by the friction disc 31 therefor, and that the bus bars shown broken at the right of Fig. 4 may be continued on and other circuit connections made therewith for as many tuning element circuits as desired.

It will now be apparent that other forms of motor devices than electric motor 15 and shaft 16 with its friction discs 17, 18, 19, may be employed and other forms of clutch mechanism than the magnetic clutches and friction discs, also other types of gearing and gear ratios, cams, contact mechanism and arrangement of circuits, or mechanism employing mechanical connections in place of electric circuits may be employed all within the skill of those familiar with this art, without departing from the spirit of my invention and I desire to be understood as claiming all such variations.

In Figs. 9 and 10, the roller 122 rides on the periphery of disc 41 and roller 123 rides on the periphery of disc 38 both rollers being attached to carriage 113 and revolving in opposite directions on a common shaft. The roller 124 rides on the periphery of disc 35 and roller 125 rides on the periphery of disc 38 both rollers being attached to carriage 113 and revolving in opposite directions on a common shaft.

On the platform of carriage 113 are attached, but electrically insulated, four contact springs 101, 102, 103 and 104. These contact springs press against a non-conducting strip 110 in which are imbedded electrical conductors 105 and 106.

In Figs. 9, 10, and 11, the carriage is shown in a down position and contact springs 101 and 102 are in contact with conductor 106 and the circuit is closed between terminals 3 and 4 as shown in Fig. 12. Discs 35, 38 and 41 are connected through their shafts to a gear train as described in connection with Fig. 1.

When disc 35 moves beyond the position shown in Fig. 9 the carriage 113 is forced upward through the roller 124, contact springs 101, 102, 103 and 104 move upward, springs 101 and 102 break contact with conductor 106 and springs 103 and 104, directly opposite 103, make contact with conductor 105 (see Fig. 12). In this position a circuit is closed from terminal 2 (Fig. 12) to terminals 1 and 13.

The carriage 113 is limited to an up and down motion only by the plunger 112 which fits snugly into a socket in the block 121 and by the guide 111. A downward pressure
5 against plunger 112 is maintained by coil spring 115. A vent hole 116 is provided to eliminate air pressure behind plunger 112.

Screw 119 connects conductor 105 with terminal lug 2.

10 In Fig. 10 the carriage and contact springs for the adjacent series of 3 discs has been omitted to show more clearly the assembly of block 121, strip 110 and guide 111. Conductors 107, 108 and 109, screw 120, terminal
15 6 and vent holes 117 and 118 are associated with the adjacent plurality of discs.

The terminals 1, 3, 4, 13 and 2 in Fig. 12 correspond with the same numbered terminals in Fig. 4. The assembly shown in Figs.
20 9, 10 and 11 is an alternative means to that shown in Figs. 2 and 3 and the upper portion of Fig. 4 for controlling the operation of the magnetic clutch 29 and motor 15.

I claim:

25 1. Automatic adjusting apparatus adapted to tune a radio set, said apparatus comprising a plurality of movable elements, mechanism constructed and adapted for moving said elements, an electric circuit and contact
30 arm means adapted to control said circuit, cam surfaces on said elements with which said arm means engage to break said circuit only when said elements are in a predetermined position, and to retain said circuit energized when any of said elements are in any
35 other position, and wherein said elements include discs adjustably mounted on shaft means, said shaft means adapted to engage a tuning element of said radio set and where-
40 in said mechanism includes motor means and an electric clutch energized by said circuit and adapted to engage said shaft means with said motor means to operate said discs.

45 2. In radio apparatus having a plurality of tuning devices for adjusting said apparatus to operate on different wave lengths, mechanism for actuating said tuning devices comprising a shaft means for each and en-
50 gaging each of said devices, motor means adapted to actuate the plurality of said shaft means, a clutch between each shaft means and said motor means, cam elements on each shaft means, connections engaging the cam ele-
55 ments of each shaft means constructed and adapted to operate the corresponding clutch to disengage the respective shaft means from the motor means when the cam elements on the respective shaft means have been moved
60 to a single adjusted position.

3. In radio apparatus having a plurality of tuning devices for adjusting said apparatus to operate on different wave lengths, mechanism for actuating said tuning devices com-
65 prising a shaft means for each and engaging

each of said devices, motor means adapted to actuate the plurality of said shaft means, a clutch between each shaft means and said motor means, cam elements on each shaft means, connections engaging the cam elements of
70 each shaft means constructed and adapted to operate the corresponding clutch to disengage the respective shaft means from the motor means when the cam elements on the respective shaft means have been moved to a single
75 adjusted position and instrumentalities operating to de-energize said motor means when all of said tuning devices have arrived at a predetermined position.

4. In radio apparatus having a plurality
80 of tuning devices for adjusting said apparatus to operate on different wave lengths, mechanism for actuating said tuning devices comprising a shaft means for each and en-
85 gaging each of said devices, motor means adapted to actuate the plurality of said shaft means, a clutch between each shaft means and said motor means, cam elements on each shaft means, connections engaging the cam
90 elements of each shaft means constructed and adapted to operate the corresponding clutch to disengage the respective shaft means from the motor means when the cam elements on the respective shaft means have
95 been moved to a single adjusted position and instrumentalities operating to de-energize said motor means and also to connect said apparatus into radio operative relation when all of said tuning devices have arrived at
100 their predetermined position.

5. In combination with a radio receiving set having a plurality of tuning devices, a plurality of instrumentalities each adapted to independently adjust one of said devices to a predetermined wave length, a starting
105 key and a relay adapted to operate said instrumentalities only to a position corresponding to said predetermined wave length and other instrumentalities and other starting keys and relays to adjust said devices to
110 other wave lengths, a motor means common to all of said instrumentalities and a clutch connecting the instrumentalities of each of said devices to said motor means when any starting key is operated and disconnecting
115 said clutch when the device has arrived at the corresponding predetermined wave length.

6. In combination with a radio receiving set having a plurality of tuning devices, a
120 plurality of instrumentalities each adapted to independently adjust one of said devices to a predetermined wave length, a starting key and a relay adapted to operate said instrumentalities only to a position corre-
125 sponding to said predetermined wave length and other instrumentalities and other starting keys and relays to adjust said devices to other wave lengths, a motor means common to all of said instrumentalities and a clutch
130

connecting the instrumentalities of each of said devices to said motor means when any starting key is operated and disconnecting said clutch when the device has arrived
5 at the corresponding predetermined wave length, and a switch de-energizing the radio set when any of the said adjustments are being made and re-energizing said set when any of the said wave length adjustments are
10 completed.

7. Automatic adjusting apparatus adapted to tune a radio set, said apparatus comprising a plurality of movable elements and electric circuit and contact means adapted
15 to control said circuit, cam surfaces on said elements, arm means engaging said surfaces and adapted to break said circuit only when said elements are in a predetermined position and to retain said circuit energized
20 when any of said elements are in any other position, and wherein said elements include discs adjustably mounted on shaft means, said shaft means being adapted to engage a tuning element of said radio set.

25 8. In radio apparatus having a plurality of adjustable devices, mechanism for actuating said devices comprising a shaft means for each and engaging each of said devices, motor means adapted to actuate the plurality
30 of said shaft means, a clutch between each shaft means and said motor means, cam elements on each shaft means, connections engaging the cam elements of each shaft means constructed and adapted to operate
35 the corresponding clutch to disengage the respective shaft means from the motor means when the cam elements on the respective shaft means have been moved to a single adjusted position.

40 9. In automatic radio tuning mechanism, the combination of tuning means comprising a stationary element and a movable element, a shaft adapted to actuate said movable element, power means adapted to actuate
45 said shaft, an energizing circuit for said power means, switch means in said energizing circuit, an adjustable arm carried by said shaft for actuating said switch means, a relay having contacts in said energizing circuit,
50 a second circuit and a single impulse key adapted to initially actuate said relay, said relay also energized by said first named circuit to retain said relay contacts closed and said first named circuit energized until the
55 power means has actuated said movable element to a predetermined tuned position when said switch means has broken the first named circuit.

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