Sept. 12, 1944. F. J. WHITE ET AL 2,358,117

TELEGRAPH APPARATUS

Filed Oct. 1, 1940 4 Sheets-Sheet 1

FIG. 1

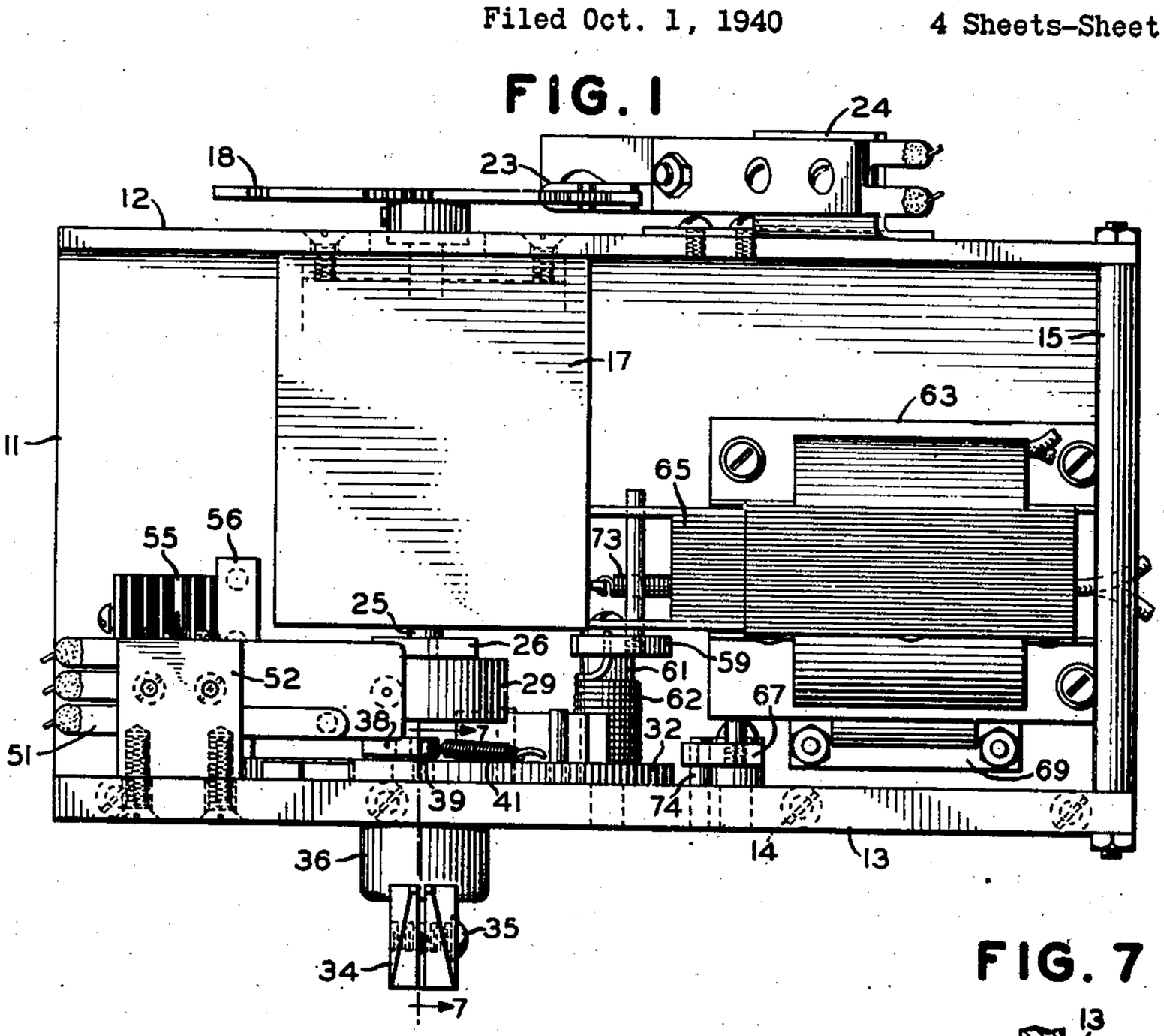


FIG. 2

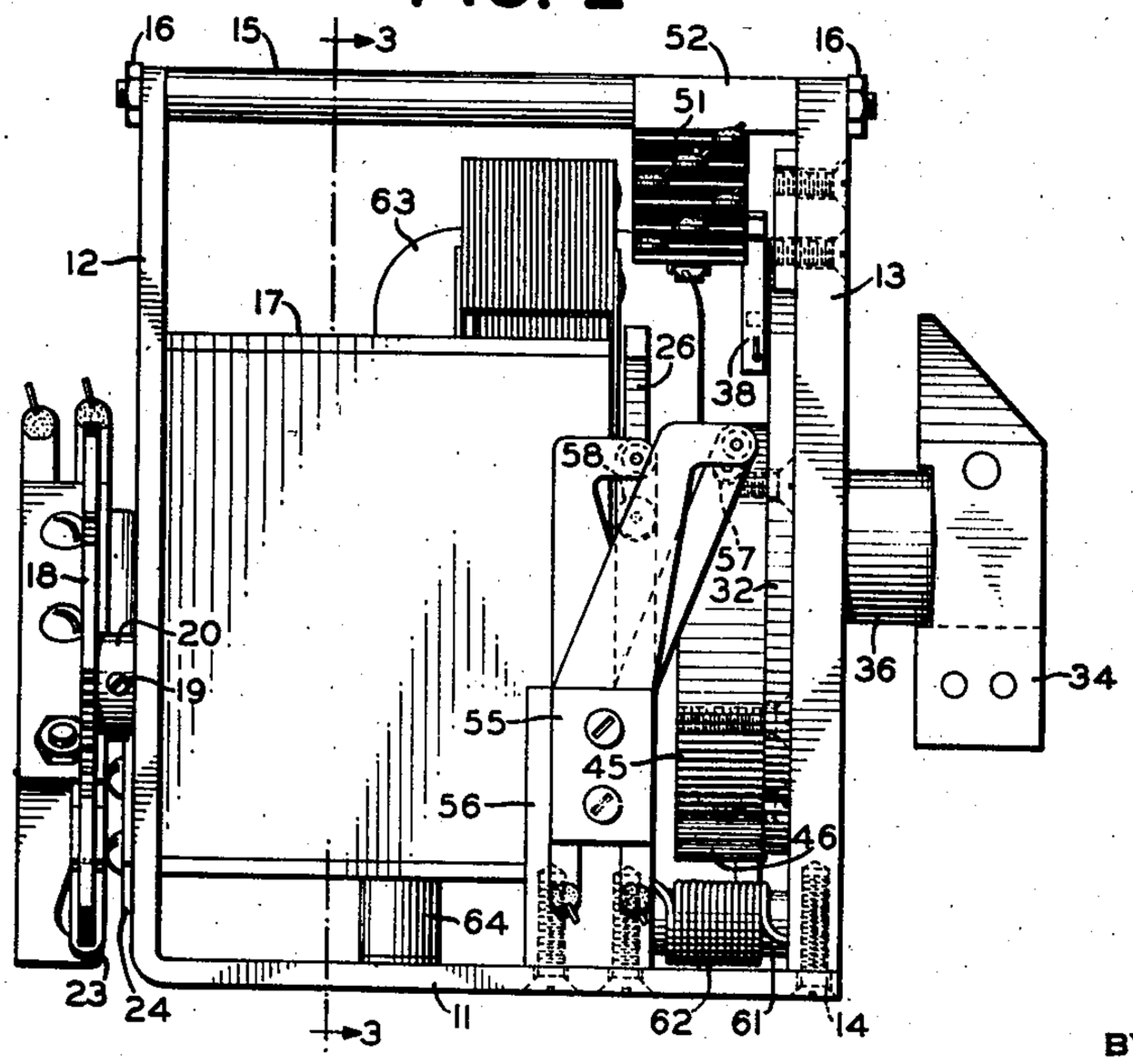
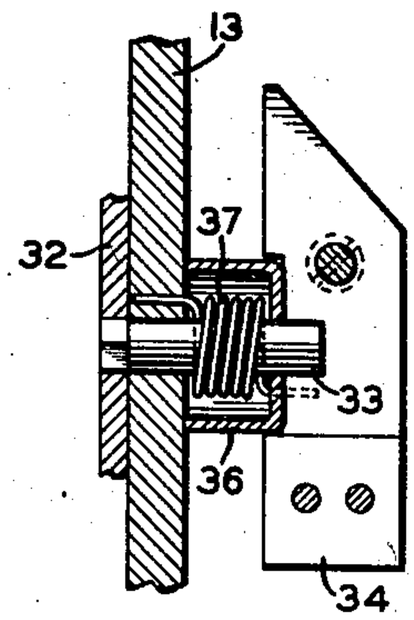


FIG. 7



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TELEGRAPH APPARATUS

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FIG. 3

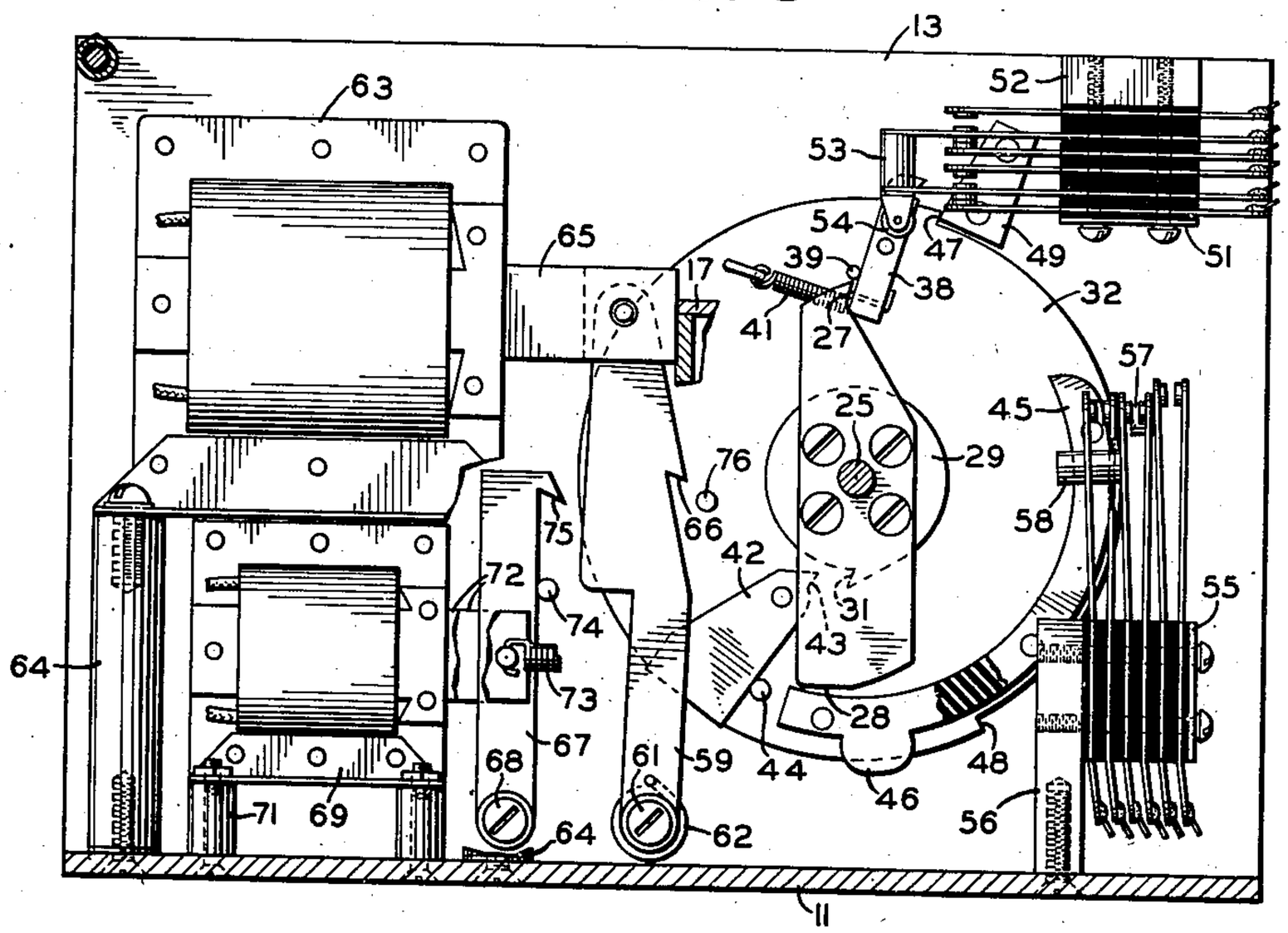
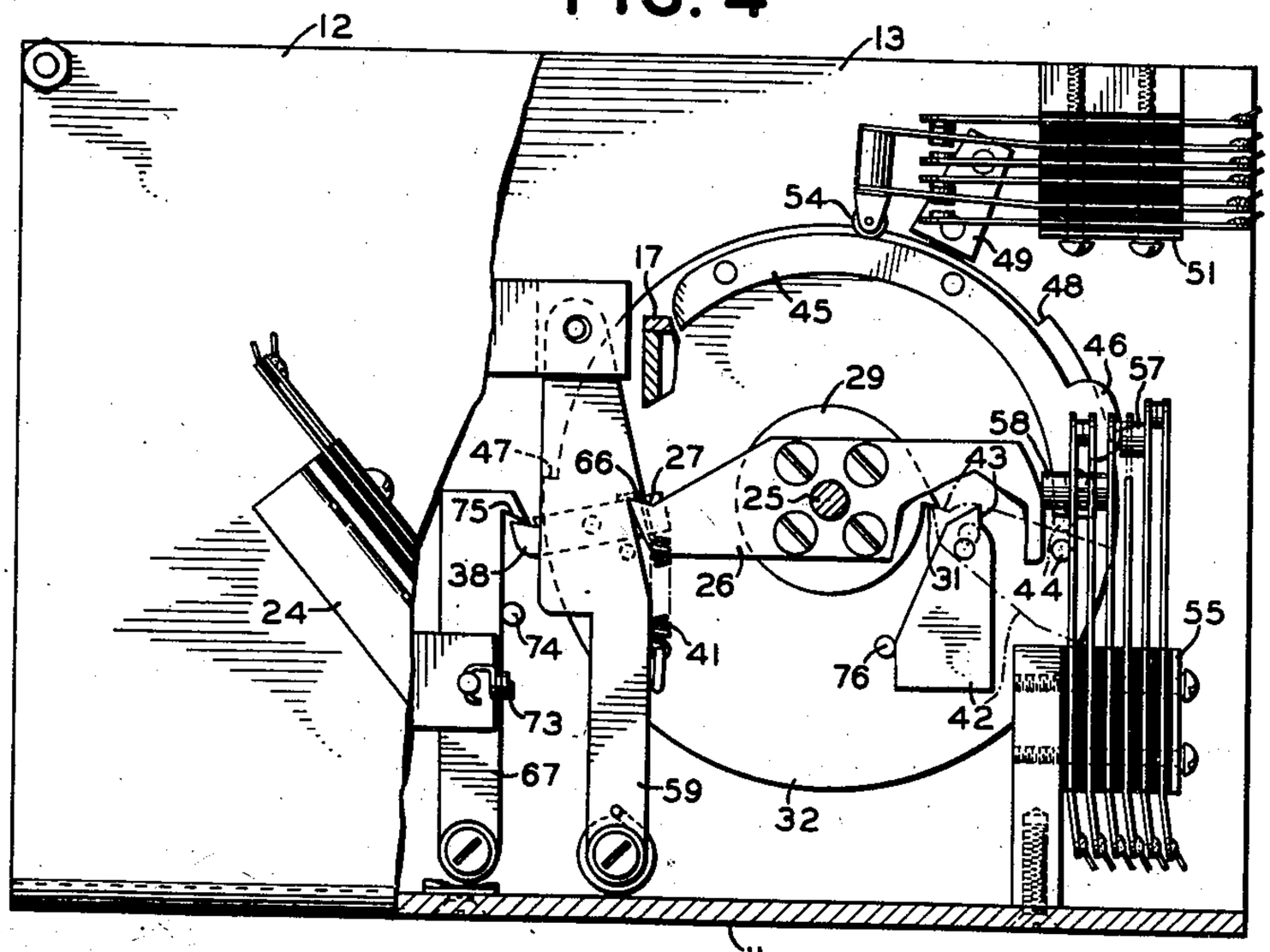


FIG. 4



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TELEGRAPH APPARATUS

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FIG. 5

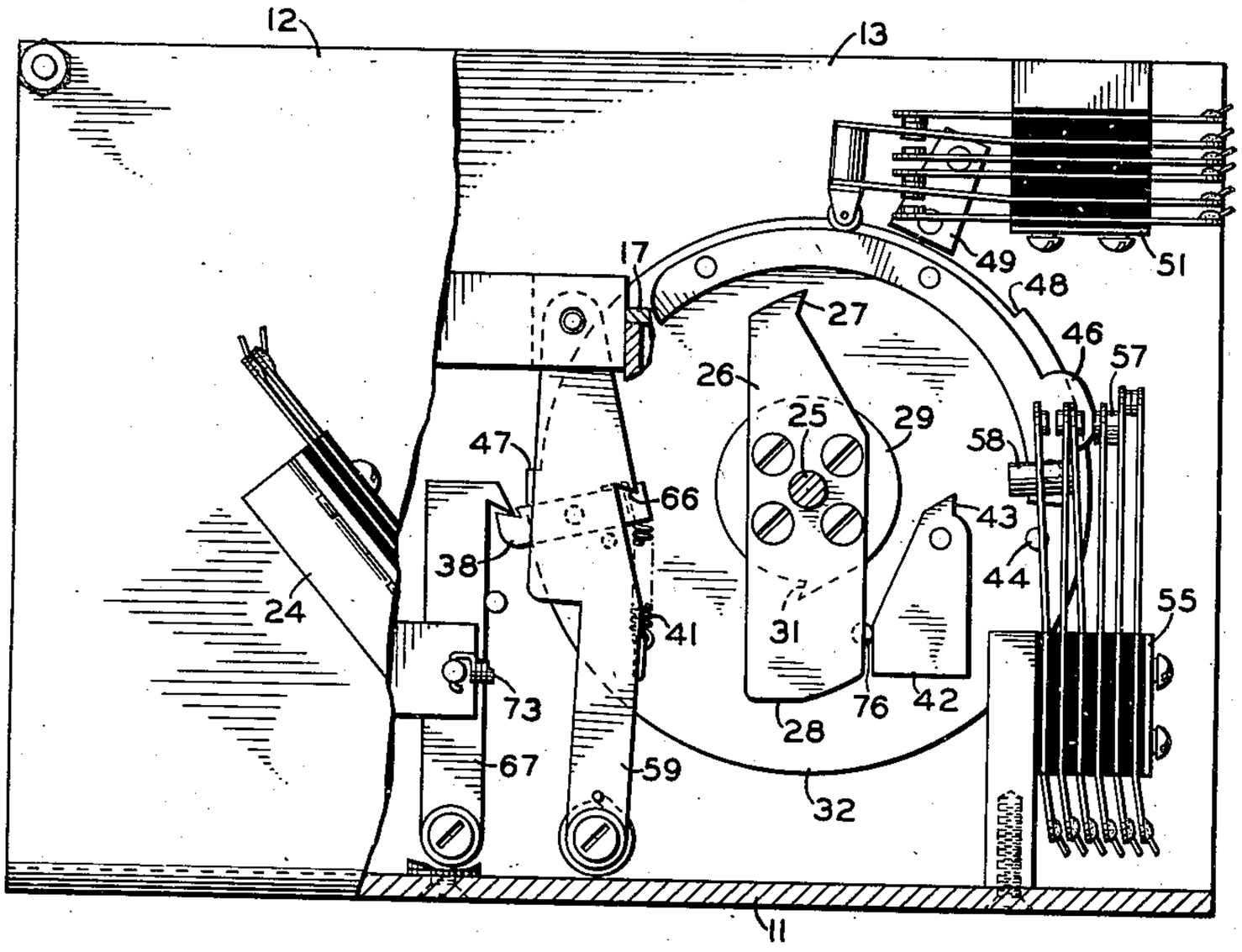
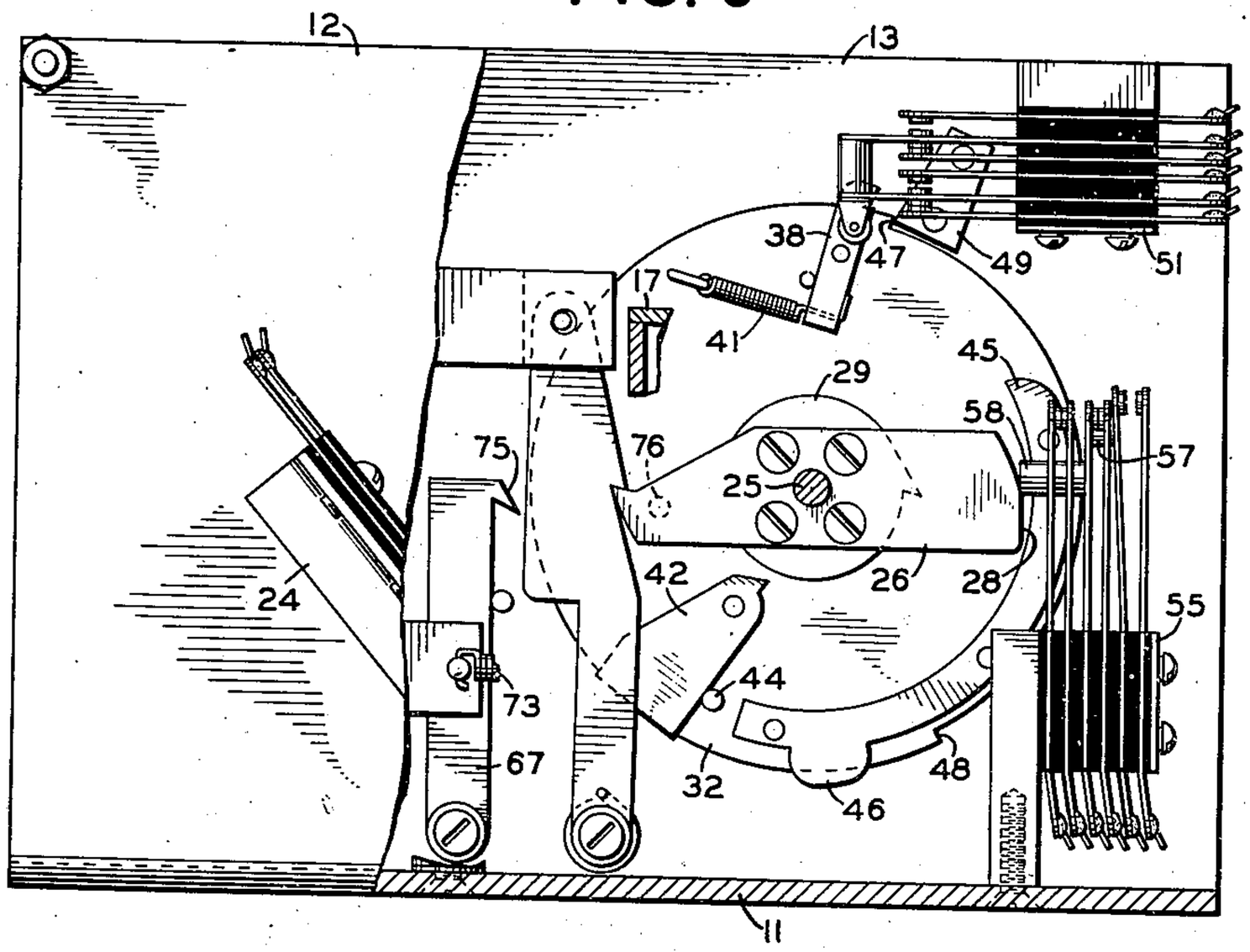


FIG. 6



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TELEGRAPH APPARATUS

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FIG. 8

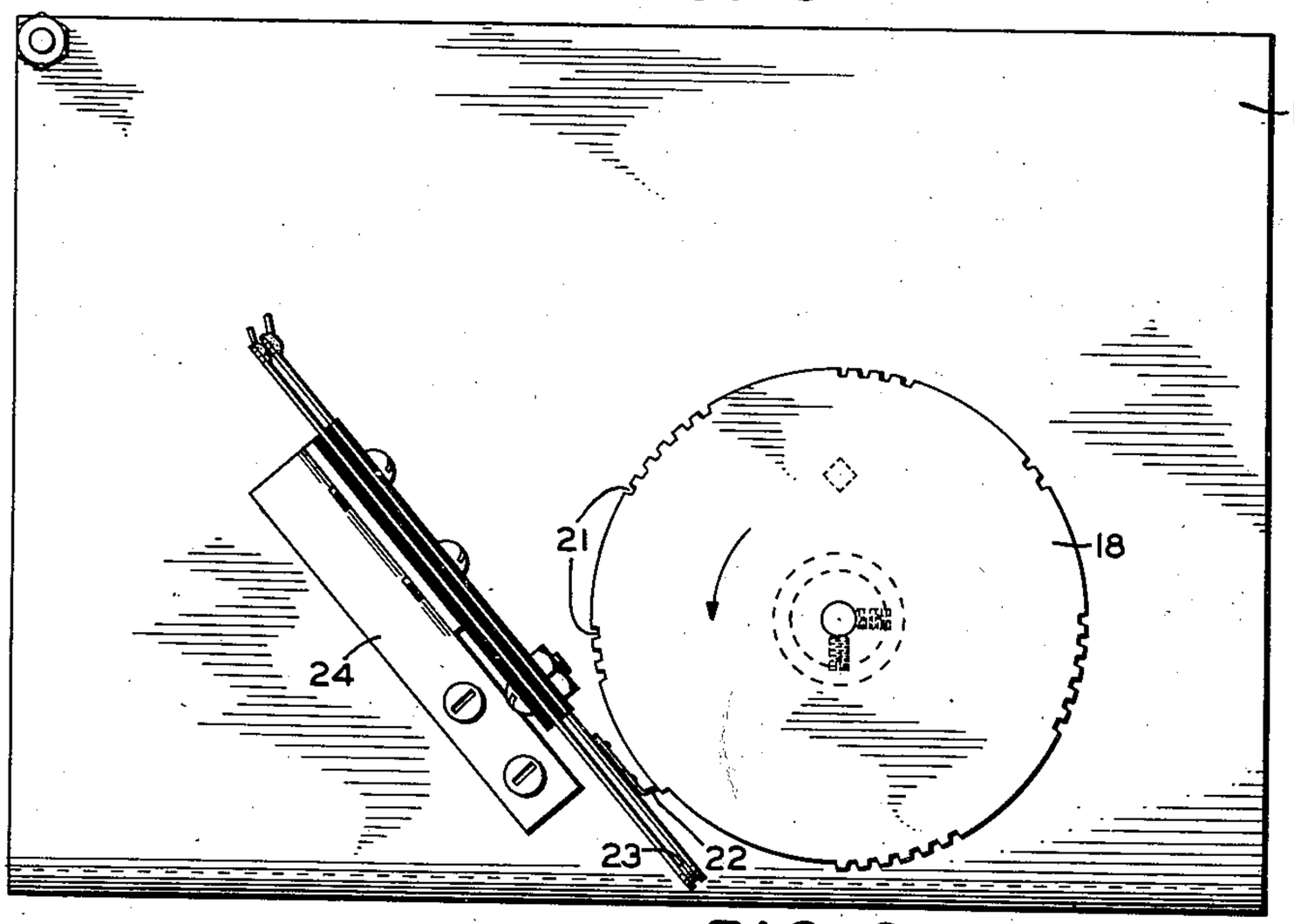
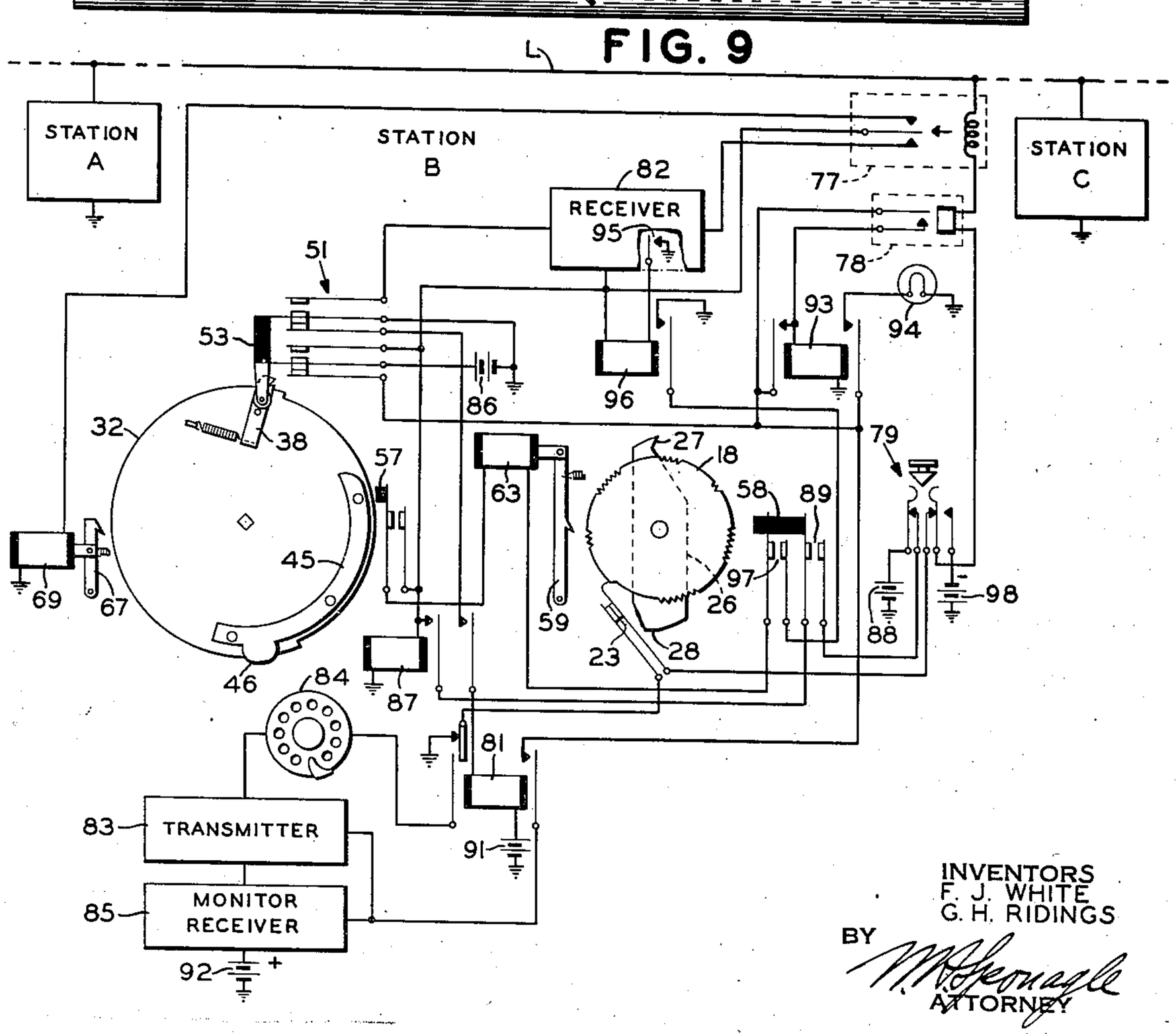


FIG. 9



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Patented Sept. 12, 1944 2,358,117

UNITED STATES PATENT OFFICE

2,358,117

TELEGRAPH APPARATUS

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Application October 1, 1940, Serial No. 359,180

6 Claims. (Cl. 177—380)

This invention relates to telegraph apparatus and has particular reference to a code transmitting device and control apparatus therefor.

One object of the instant invention is to provide means for conditioning a transmitting device for operation and for simultaneously preparing for the subsequent operation of said device.

Another object of the invention is to provide, in a spring driven device, means for winding the spring whereby subsequently said device and/or said winding means may be released independently.

Still another object of the invention is to provide an organization of instrumentalities whereby the spring of a spring driven device may be manually wound and held in its wound condition for later automatic release and whereby the winding mechanism, after winding, is held in a position from which it may be released either manually or automatically independently of the release of said spring driven device.

A further object of the present invention is to provide, in a device having two rotatable members each latchable in their operated positions, a linkage engageable to drive one member by the other from their unoperated to their operated positions and thereafter disengageable to permit the rotatable members to be restored to their unoperated positions independently.

The invention as embodied in the illustrative form disclosed herein contemplates the use of a code wheel transmitter driven by a spring motor. Means are provided for winding the spring from which the transmitter motor derives its power and for the latching of the wound spring by a retaining member under the control of an electromagnet. The winding mechanism which is normally not connected mechanically to the motor spring is provided with means for coupling the winding mechanism to the spring for winding purposes only when both the spring and the winding mechanism are in their normal or unoperated positions. The winding mechanism is also provided with a yieldable detent which is engageable with an electromagnetically controlled latch to retain the mechanism in its operated position. When the spring is wound and the winding mechanism is latched in its operated position, the coupling between these two instrumentalities is disengaged. The latchable detent of the winding mechanism is made yieldable so that the mechanism may be manually returned to its unoperated position by rotating the control knob. Also, the winding mechanism may be automatically returned to its unoperated position by energizing the electromagnet which controls the latch. Both the spring motor mechanism and the winding mechanism therefor control auxiliary contacts by means of which the latch electromagnets may be conditioned for operation and also other contacts which may be employed for the control of the communication apparatus associated with the control device.

An illustrative embodiment of the invention will be described in conjunction with the accompanying drawings, of which:

Fig. 1 is a top or plan view of the transmitting and control device;

Fig. 2 is a view taken in elevation of one end of the device;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Figs. 4, 5 and 6 are views taken in elevation of the rear of the device with a portion of the rear mounting plate broken away to show a portion of the mechanism illustrated in Fig. 3 and show the winding mechanism in various operating positions;

Fig. 7 is a fragmentary view taken on line 7—7 of Fig. 1 to show details of the winding control knob;

Fig. 8 is a rear elevational view of the control device; and

Fig. 9 is a circuit diagram illustrating one system in which the transmitting and control apparatus embodying the invention may be used.

Having reference first to Figs. 1, 2 and 3, the mechanical structure of the transmitting and control device will be described. The apparatus is mounted upon a supporting structure comprising a base 11, a rear plate 12 which may, if desired, be integral with the base, and a front plate 13 which is shown attached to the base 11 by means of a plurality of screws 14. A spacing rod is secured to the mounting plates 12 and 13 adjacent an upper corner thereof by means of nuts 16.

A spring driven motor 17 is secured to the rear plate 12 by means of suitable mounting screws. The details of the motor are not shown herein, since numerous examples of this type of motor may be found in the prior art, one of which is disclosed in Patent No. 2,078,902, granted to E. A. Demonet, April 27, 1937. The driven shaft of the motor 17 is extended through the rear plate 12 so that a code disc or wheel 18 may be attached thereto by means of a set screw 19 which is threaded into a hub 20 attached to the code wheel. As better illustrated in Fig. 8, the code

wheel has formed in the periphery thereof a plurality of notches 21. As the code wheel is rotated by the driving motor 17, the notches are engaged by a follower 22 which is mechanically attached to and electrically insulated from one of a pair of normally closed contacts 23. The engagement of the follower 22 with one of the notches 21 permits the contacts 23 to be momentarily opened, thereby interrupting the current flow in the circuit in which the contacts are included. An angular bracket 24 serves to mount the contacts on the outer surface of the rear mounting plate 12.

The spring motor 17 is provided with a second shaft 25 which extends from the opposite side of the motor to the driven shaft. The shaft 25 is utilized to wind the spring by which the driven shaft is rotated through suitable gearing. Rigidly secured to the winding shaft 25 is an arm 26. In one end of this arm is formed a detent 27 and in the other end is formed a cam surface 28. Also secured rigidly to the extended portion of the winding shaft 25 is a hub or collar 29 which is provided with a tooth 31.

A winding disc 32 is provided with a shaft 33 (see Fig. 7) which extends through the front mounting plate 13 and is coaxial with but mechanically not connected with the winding shaft 25. A split knob 34 is attached to the outer end of the shaft 33 by a clamping screw 35 which serves to draw the split portions of the knob together and thereby firmly grip the shaft 33. A retaining cup 36 is secured between the knob 34 and the front mounting plate 13 and is employed to house a helical spring 37, the ends of which are extended outwardly from the body of the spring and substantially parallel with the axis thereof. One of the ends is inserted in a suitable hole in the knob 34. The purpose of this spring is to so urge the knob 34 that it is always restored to its illustrated unoperated position when released.

Pivoted on the inner surface of the winding disc 32 adjacent the periphery thereof is a detent 38 which is normally urged toward an engagement with a stop pin 39 by means of a retractile spring 41. Also pivoted on the inner surface of the winding disc 32 is a gravity controlled member 42. This member has formed therein adjacent one end a pawl 43 and is pivoted at a point close to the pawl, thereby providing a substantial amount of metal at the other side of the pivot point from the pawl. By reason of the eccentric pivoting of the member 42, it tends to assume a substantially vertical position insofar as it is permitted to do so by the stops and other instrumentalities hereinafter described. As shown in Fig. 3, the member 42 is held in contact with a stop pin 44 by the action of gravity. A substantial portion of the member 42 lies in the same vertical plane with a portion of the hub 29 so that the pawl 43 is in a position to engage the tooth 31 upon the rotation of the winding disc 32 in a counterclockwise direction as viewed in this figure.

There is also secured to the inner surface of the winding disc 32 adjacent the periphery thereof a contact operating cam 45 which is preferably formed of insulating material. Adjacent the lower extremity of the cam 45, as viewed in Fig. 3, is formed an auxiliary cam surface or lobe 46. Both the elongated portion of the cam 45 and the lobe 46 are adapted to operate contacts in a manner to be described. A substantial portion of the periphery of the winding disc 32 is cut away to form shoulders 47 and 48. As shown in Fig. 3, the shoulder 47 is in engagement with one side of a stop block 49 which is attached to the inside of the front mounting plate 13. The disc 32 is adapted to be rotated in a counterclockwise manner until such movement is arrested by the engagement of the shoulder 48 with the other side of the stop block 49.

A contact assembly 51 is secured to a mounting block 52 which is attached to the inside of the front mounting plate 13. The contacts comprising this assembly are controlled by an actuating member 53 which terminates at its lower end in a roller 54. The roller is adapted to be engaged by the elongated portion of the cam 45 when the winding disc 32 is rotated in a counterclockwise manner as viewed in Fig. 3. As shown, the contact assembly 51 is made up of two transfer sets of contacts whereby the levers or armatures attached to the actuating member 53 are moved from their engagements with their respective lower contacts to engagements with their respective upper contacts when the cam 45 engages the roller 54.

Another contact assembly 55 is fastened to a mounting block 56 which is attached to the base 11. This assembly comprises three sets of make contacts, one set of which is displaced laterally from the other two, as best illustrated in Fig. 2. The off-set set of contacts is controlled by an actuating member 57 which is adapted to be engaged by the cam lobe 46 when the winding disc 32 is rotated to its operated position. The other two sets of contacts are arranged to be closed by the engagement of an actuating member 58 with the cam surface 28 of the winding shaft arm 26.

Although a specific arrangement of the contacts comprising the assemblies 51 and 55 is illustrated herein for the purpose of describing the invention, it is contemplated that other contact arrangements similarly operated may be used within the scope of the invention without departing from the spirit thereof.

In order to retain the spring of the motor 17 in its wound condition a latch 59 is provided. This latch is pivotally mounted upon a pin or rod 61 which is secured to the front mounting plate 13 at a point adjacent the base 11. A helical spring 62 is supported by the rod 61 and one end thereof is inserted in a hole in the latch 59. The other end of the spring 62 is inserted in a hole in the front mounting plate 13. The function of the spring 62 is to urge the latch 59 toward the right as viewed in Fig. 3. An electromagnet is supported in spaced relation to the base 11 by a plurality of rods 64 which are attached to and extend upwardly from the base. The armature 65 of the electromagnet 63 is pivotally secured to the upper end of the latch 59. Normally, with the electromagnet deenergized, the action of the spring 62 effects the engagement of the end of the armature 65 with a portion of the supporting structure of the spring motor 17 which thus acts as a stop. Thus, with the latch 59 in the position shown in Fig. 3, a notch 66 which is provided therein is arranged to engage the detent 27 when the winding shaft arm 26 is rotated counterclockwise, thereby preventing the spring from unwinding.

A second latch 67 is also provided and is pivotally mounted on a rod 68 attached to the front supporting plate 13. A second electromagnet 69 is also mounted at the upper ends of a plurality

of rods 71 attached to the base 11. The armature 72 of this electromagnet is pivotally attached to the latch 67 and is normally urged by a retractile spring 73 against a stop pin 74 extending from the inside surface of the front mounting plate 13. The latch 67 is provided with a hook 75 which is adapted to engage the notched end of the detent 38 so that, when the winding plate 32 has been moved to its operated position, it is held in such position by the latch 67.

The operation of the control device will be described by having particular reference to Figs. 3, 4, 5 and 6. With the device in its unoperated position the mechanism is substantially as illustrated in Fig. 3. When it is desired to wind the spring of the motor 17 and set the code transmitter in condition for operation, the control knob 34 is turned so as to rotate the winding disc 32 in a counterclockwise direction as viewed in these figures. During the first stage of the rotation of the winding disc, the tooth 31 of the hub 29 by which the winding shaft 25 is rotated is engaged by the pawl 43. Since the gravity controlled member 42 is already in engagement with the stop pin 44, the continued rotation of the winding disc effects the rotation of the hub 29 and, therefore, the shaft 25. Thus, the winding of the motor spring is initiated. The continued rotation of the winding disc brings the elongated portion of the cam 45 into engagement with the roller 54, thereby transferring the contact levers of the assembly 51 from their lower to their upper contacts. The next stage of the winding operation brings the cam lobe 46 into engagement with the contact actuating member 57, thereby closing the set of contacts of the assembly 55 controlled thereby. The following stage of the winding operation disengages the cam lobe 46 from the actuating member 57 and thereby permits the set of contacts to open again. Substantially at the same time the detent 38 engages the bevelled outer surface of the hook 75 of the latch 67, moving the latch toward the left against the action of the retractile spring 73. When the detent 38 has passed the hook 75, the latch 67 is again restored to the position shown in these figures. The final stage of the winding operation rotates the detent 27 beyond the notch 66 formed in the latch 59 and brings the shoulder 48 of the winding disc into contact with the stop block 49. Also, the cam surface 28 of the winding shaft arm 26 engages the actuating member 58 to close the two sets of contacts of the assembly 55 controlled thereby. At this time the gravity controlled member 42 is still kept in contact with the tooth 31, as illustrated by the broken lines of Fig. 4. As soon as the winding operation is completed, the control knob 34 is released, thereby permitting the winding disc 32 to rotate backward in a clockwise direction under the combined influence of the spring of the motor 17 and the helical spring 37. The action of the wound spring of the motor 17 moves the arm 26 also in a clockwise direction until the detent 27 is engaged and held by the notch 66 of the latch 59. Thus, further movement of the arm 26 and the hub 29 is prevented and the contacts controlled by the actuating member 58 remain closed.

However, the action of the helical spring 37 continues to move the winding disc 32 in a clockwise direction, thereby permitting the pawl 43 to become disengaged from the tooth 31 and effecting the reengagement of the cam lobe 46 with the actuating member 57 to reclose the contacts controlled thereby. With the winding disc in the position shown in Fig. 4, the action of gravity upon the member 42 pivots this member against a stop pin 76. Thus, it is seen that as long as the winding shaft arm 26 is retained in the position illustrated in Fig. 4, it is no longer possible to effect the engagement of the tooth 31 by the pawl 43 for the reason that no matter how the winding disc 32 is thereafter rotated, the member 42 is entirely under the control of gravity, pivoting between the two limits set by the stop pins 44 and 76. After the disengagement of the pawl 43 from the tooth 31, the detent 38 becomes engaged with the hook 75 of the latch 67. Since the connection of the detent 38 with the disc 32 is not a rigid one, the detent is permitted to pivot until a balance has been reached between the restraining action of the spring 41 and the helical spring 37 which tends to return the winding disc 32 to its unoperated position. The two springs are so arranged that the restraining spring 41 is somewhat the stronger and, therefore, the disc remains latched in its operated position.

Thus, at the completion of the winding and setting operation the apparatus is in the condition illustrated in Fig. 4. It will be observed that the upper contacts of the assembly 51 are made and all of the contacts of the assembly 55 are closed.

If, after the winding operation has been completed as described, the electromagnet 63 is energized to move its armature 65 toward the left as viewed in these figures, the latch 59 is withdrawn, thereby disengaging the notch 66 from the detent 27. The winding shaft arm 26 is thus permitted to be restored to its unoperated position by the action of the wound driving spring of the motor 17. Thus, the cam surface 28 of the winding shaft arm 26 becomes disengaged from the actuating member 58, thereby allowing the contacts controlled thereby to open. As the driving spring is being unwound, the driven shaft to which the code wheel 18 is attached is rotated, thus causing the contacts 23 to be operated in accordance with the notches formed in the periphery of the code wheel. The gearing between the winding shaft 25 and the driven shaft to which the code wheel is attached is such that the code wheel makes a complete revolution while the winding shaft arm 26 is rotated from the position shown in Fig. 4 to that shown in Fig. 3 or Fig. 5. The motor 17 is arranged to stop when it has reached the end of its cycle, leaving the code wheel in the position shown in Fig. 8 and the winding shaft arm 26 in the position shown in Fig. 5.

It will be observed from an inspection of Fig. 5, that the winding disc 32 is retained in its operated position, thereby maintaining the contact levers of the assembly 51 engaged with their upper contacts. Also, the off-set pair of contacts of the assembly 55, which is controlled by the actuating member 57, is closed while the other two pairs of these contacts are open. The winding disc 32 may be restored to its unoperated position under the influence of the helical spring 37 by energizing the electromagnet 69 and thereby disengaging the latch 67 and the detent 38.

The winding disc mechanism is so arranged that after the winding operation has been performed, placing the apparatus in the condition shown in Fig. 4, the spring of the motor 17 may be left in its wound condition and the winding

disc **32** returned manually or automatically to its unoperated position. The automatic release of the winding disc is effected by energizing the electromagnet **69** in the manner described. However, it is also possible to restore the winding disc **32** to its unoperated position manually by rotating the control knob **34** in the opposite direction to that used for winding purposes. The engagement between the hook **75** of the latch **67** and the notched end of the detent **38** is a resilient one by reason of the action of the restraining spring **41**. As previously pointed out, this spring is made somewhat stronger than the helical spring **37** which tends to return the disc to its unoperated position. However, by the application of an additional manual force to the control knob in the direction tending to restore the knob to its normal position, the spring **41** may be overcome, thereby permitting the detent **38** to pivot sufficiently to disengage itself from the pawl **67**. Fig. 6 illustrates the position of the mechanism after the completion of such an operation. It will be seen that the contacts of the assembly **51** are restored to normal and also that the off-set pair of contacts of the assembly **55** is open. However, since the driving spring of the motor **17** is still held in its wound condition, the two sets of contacts of the assembly **55** which are controlled by the winding shaft arm **26** remain closed. There is no provision made for the manual release of the spring winding shaft **25** so that, if the operating circuit for the electromagnet **63** includes one of the sets of contacts controlled by the winding shaft arm **26** and also the off-set pair of contacts controlled by the cam lobe **46**, it will not be possible to energize the electromagnet so long as the apparatus is in the position shown in Fig. 6. An inspection of the apparatus as illustrated in Figs. 3, 4, 5 and 6 will disclose that the only time when the operating circuit for the electromagnet **63** would be in condition for operation is when the apparatus is in the condition illustrated in Fig. 4.

The device comprising this invention may be utilized in numerous types of systems. One such system is a telegraph exchange system in which a plurality of stations are connected to a communication channel, each station being provided with transmitting and receiving apparatus and also with facilities for selectively calling any of the other stations included in the system. One manner of employing the device embodying the invention is illustrated in Fig. 9, to which reference will now be made. A plurality of stations such as A, B and C are connected to a line circuit L for intercommunication. The circuit details for only station B are shown, it being understood that similar connections and apparatus are used at the other stations connected to the line circuit L. The pertinent parts of the code transmitting and control device are shown diagrammatically in this figure. For convenience in identifying the various parts of the device, they are given the same numerals of reference as used in the other figures illustrating the mechanical structure of the device. Certain liberties are taken in depicting the control device in this figure, such as the separation of the contacts comprising the assembly **55** and also the relation of the winding shaft arm **26** to the code wheel **18**. It will be understood that, in view of the foregoing description of the device, the arm **26**, in traveling over one-quarter of a revolution in a clockwise direction, will produce a complete revolution of the code wheel **18** in a similar direction.

The line circuit L, when idle, is connected through the line equipment of the various stations to ground, as indicated at station A and station C. This connection is illustrated in detail at station B and comprises a connection from the line circuit L through the winding of a three-position polar relay **77**, the winding of a code selector **78**, the right hand break contact of a disconnect key **79**, the code transmitting contacts **23** and the left hand normal contact of relay **81** to ground. The three-position polar relay **77** is of such a character that when the winding is deenergized, as it is with the previously described connection, the armature is disengaged from both its upper and lower contacts. The selector **78** may be of the type disclosed in Patent 2,029,636, granted to E. M. Rickard on February 4, 1936. Such a selector functions only in response to a code individual to itself to close a contact. Each of the stations connected to the line circuit L is provided with a similar selector, each of which responds to a different code.

Each of the communicating stations is provided with a receiver **82** which, when conditioned as described hereinafter, responds to operations of the line relay **77** which is actuated by the signals transmitted over the line L. Each of the stations is also provided with a transmitter **83** and a selective code transmitting device, such as the dial **84**. Each station may also be provided with a monitor receiver **85** by which the signals transmitted from the transmitter **83** and the dial **84** may be recorded for a home office copy, or for another purpose which will be described in a subsequent portion of the specification.

For the operation of the system the detailed portion of the circuit diagram of Fig. 9 will be used to describe the functioning of both the transmitting and the receiving stations. When it is desired to initiate a call at any of the stations, such as the station B, the control knob of the transmitting and control device is operated so as to rotate the winding disc **32** counterclockwise as viewed in this figure, thereby winding the spring of the spring motor and eventuating in the engagement of the detent **27** with the latch **59** and also of the detent **38** with its associated latch 67. The armatures of the contact assembly **51** are moved into engagement with their respective upper contacts. Also, the contacts controlled by the actuating members **57** and **58** are closed. The engagement of the lower armature of the assembly **51** with its upper contact connects the battery **86** to the winding of relay **87**, thereby operating this relay. Relay **87** immediately locks from battery **88** through the left hand break contact of the disconnect key **79**, the contact **89** and the inner make contact of relay **87**.

When it is desired to transmit to another station after the foregoing sequence of operations has been performed, the control knob of the device is manually restored to its unoperated position, thereby rotating the winding disc **32** back to the position in which it is shown. The contacts of the assembly **51** are all transferred to their lower contacts, thereby opening the operating circuit of the relay **87**. However, the contacts controlled by the actuating member **58** remain closed, since the winding shaft arm **26** is latched in its operated position, thereby maintaining the locking circuit for relay **87**. The engagement of the upper armature of the assembly **51** with its lower contact closes a circuit from the ground connected to the battery **86** through the outer

make contact of relay 87 and the winding of relay 81 to the battery 91, thereby operating the latter relay. The line connection which is made to the left hand normal contact of relay 81 is disconnected from ground and is connected through the left hand armature of relay 81, through the dial 84, the transmitter 83 and the monitor receiver 85 to a positive battery 92. It is preferable that the line circuit be transferred from ground to the described circuit by means of a continuity preserving contact on the relay 81 so that there will be no interruption of the connection to the line circuit while the transfer is being made. The operation of relay 81 also supplies power to the transmitter 83 and the monitor receiver 85 through its right hand make contact from the battery 86.

The connection of positive battery to the line circuit at station B causes a response by the line relays connected to the line L at all of the stations. The armatures of these relays move into engagement with their respective lower contacts but produce no results at this time, since the connection through the armatures is open at the upper contact associated with the lower armatures of the assembly 51 at all of the stations. The attendant at the calling station then operates the dial 84 in accordance with the code assigned to the station which is being called. The selectors 78 at all of the stations are subjected to the signals transmitted from the dial 84. However, only one of the selectors will be operated in response to the transmitted code to close its contacts.

Assume now that the apparatus shown in Fig. 9 is located at the called station. The closure of the contacts of the selector 78 connects the battery 86 through the lower contact associated with the lower armature of the assembly 51 to the winding of relay 93 which immediately locks up through its left hand make contact. The battery 86 is also connected through the right hand make contact of relay 93 to a signal lamp 94. The attendant at the called station, in response to the operation of the signal lamp 94, turns the control knob of the transmitting and control device to its operated position and leaves it in such a position. The disengagement of the lower armature of the assembly 51 from its lower contact opens the locking circuit of the relay 93, thereby releasing this relay and extinguishing the lamp 94. The engagement of the lower armature of the assembly 51 with its upper contact connects the battery 86 to supply power to the receiver 82 and also operates relay 87 as at the calling station.

Associated with the receiver 82 is a delayed action contact 95 which does not close as soon as the power is connected to the receiver. Such a contact may be controlled by a slow-to-operate relay, by a vacuum tube which requires some time for the heating of its cathode or by any other well-known time delay device. As soon as the contact 95 does close, however, the winding of relay 96 is energized through an obvious circuit to apply a ground through its make contact and through the contact 97 controlled by the winding shaft arm 26, through the winding of the electromagnet 63, the make contact controlled by the actuating member 57 and the upper contact associated with the lower armature of the assembly 51 to battery 86. The electromagnet 63 thus becomes energized to withdraw the latch 59, thereby permitting the winding shaft arm 26 to return to the position in which it is shown and to rotate the code wheel disc 18 through one complete revolution. The line circuit which terminates in ground at this station at the left hand normal contact of relay 81 is thus interrupted by the contacts 23 in accordance with the notches cut in the periphery of the code wheel 18. The answer-back code which is thus transmitted over the line circuit L is received at the calling station by the monitor receiver 85. Since this receiver has previously recorded the called station's code as transmitted by the dial 84, comparison between the transmitted code and the answer-back code of the selected station may be obtained. Thus, the attendant at the calling station will have before him evidence that he is now connected with the station which he has called.

At the called station the release of the winding shaft arm 26 opens the contacts 89 and 97, thereby opening the locking circuit for relay 87 and opening the operating circuit for the electromagnet 63. The relay 87 remains operated, however, since its operating circuit is still intact through the contacts of the assembly 51. Also, at the called station the battery 86 is connected to the armature of the line relay 77 through the lower armature and associated upper contact of the assembly 51. The lower contact of this relay is connected through the signal responsive apparatus of the receiver 82 and through the upper contact associated with the upper armature of the assembly 51 to ground. Therefore, after the answer-back code has been sent over the line L from the called station, there is a complete circuit from the positive battery 92 at the calling station to the ground of the left hand contact of relay 81 at the called station. The positive potential thus applied to the line relay 77 at the called station effects the engagement of the armature of this relay with its lower contact. Hence, there is a complete circuit from the battery 86 through the lower contact of the line relay 77 and the receiver 82 to ground.

The transmitter 83 at the calling station is operated to send the intelligence conveying signals over the line L by opening and closing the line circuit. These make and break signals, when received at the called station, open and close the circuit of the receiver 82 by the action of the contacts of line relay 77. Thus, the signals which are transmitted from the calling station transmitter are received at the called station receiver.

Following the transmission of the message from the calling station, the disconnect key 79 is operated momentarily. The opening of the left hand break contact of this key interrupts the locking circuit of relay 87, thereby releasing this relay. At the same time the line is disconnected by the right hand break contact of the disconnect key from the contacts of relay 81 and is connected by the right hand make contact of the disconnect key to negative battery 98. The release of relay 87 opens the operating circuit of the relay 81 which transfers the line connection from the positive battery 92 to ground in which the line will terminate as soon as the disconnect key is released.

The connection of negative battery to the line circuit at the calling station produces a response by the line relay 77 at the called station, resulting in the engagement of the armature of this relay with its upper contact. A circuit is then completed from the battery 86 through the upper contact associated with the lower armature of the assembly 51 through the upper contact of

relay 77 and the winding of the electromagnet 69 to ground. This electromagnet is energized to withdraw the latch 67 and to permit the winding disc 32 to be restored to the position in which it is shown. The upper contacts of the assembly 51 are thus broken, and the lower contacts remade, thereby disconnecting the battery 86 from the receiver 82, the relay 96, the contacts of relay 77 and the winding of relay 87. Relays 96 and 87 are, therefore, released and the electromagnet 69 is deenergized. Thus, it will be observed that the control apparatus at the called station is restored to normal in response to the negative potential which is momentarily applied to the line circuit L.

Also, it is seen at the calling station that the operation of the disconnect key 79 restores all of the control apparatus at this station to normal. However, it will be seen that the spring motor is left in condition for operation, but is incapable thereof since the operating circuit for the release electromagnet 63 is open at several points, particularly at the contact controlled by the actuating member 57. When the key is released, the line circuit connection is transferred from the negative potential of battery 98 to the ground connected to the contacts of relay 81.

The nature of the invention may be ascertained from the foregoing description of an illustrative embodiment, it being understood that changes in the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

What is claimed is:

1. Telegraph apparatus comprising a code wheel transmitter and a spring actuated driving motor therefor, winding means for said spring provided with a detainable member, detaining means engageable with said detainable member in the spring wound position of said winding means, winding mechanism including an actuating member arranged for movement between two positions and provided with a second detainable member, a second detaining means engageable with said second detainable member in one position of said actuating member, a pawl controlled in part by said actuating member, means including said pawl for operating said winding means, and means for disengaging both of said detaining means from both of said detainable members independently.

2. Telegraph apparatus comprising a code wheel transmitter and a spring actuated driving motor therefor, a winding shaft for said spring having a latchable detent secured thereto, a first latch engageable with said winding shaft detent in the spring wound position of said winding shaft, winding mechanism including a rotatable member arranged for rotation between unoperated and operated positions, a latchable detent carried by said rotatable member, a second latch engageable with said last mentioned detent in the operated position of said rotatable member, a gravity controlled pawl carried by said rotatable member, means including said pawl for rotating said winding shaft, and means for releasing said detents independently.

3. Telegraph apparatus comprising a code wheel transmitter and a spring actuated driving motor therefor, a winding shaft for said spring having a latchable detent secured thereto, a first electromagnetically controlled latch engageable with said winding shaft detent in the spring wound position of said winding shaft, winding mechanism including a rotatable member and an actuating knob therefor, said member being arranged for rotation between unoperated and operated positions, a latchable detent carried by said rotatable member, a second electromagnetically controlled latch engageable with said last mentioned detent in the operated position of said rotatable member, a gravity controlled pawl carried by said rotatable member, means including said pawl for rotating said winding shaft, and circuit control means for withdrawing either or both of said latches.

4. Telegraph apparatus comprising a code wheel transmitter and a spring actuated driving motor therefor, means for winding said spring, said winding means being provided with a latchable detent and a toothed operating member, a transmitter release latch adapted to engage said latachable detent in the wound position of said winding means, means operable for actuating said winding means, said actuating means being provided with a yieldable detent and a pawl normally arranged to pivot under the action of gravity and being disposed to engage saiad toothed operating member only in the unwound position of said winding means, a release latch for said actuating means arranged to engage said yieldable detent after operation of said actuating means, the latching of said winding means and said actuating means permitting the pivoting of said pawl out of engagement with said toothed operating member, the yieldable detent permitting the manual restoration of the actuating means to its unoperated position independently of the latched winding means and of the release latch for said actuating means, and means controlled jointly by said winding means and said actuating means to condition said transmitter release latch for release.

5. Telegraph apparatus comprising a code wheel transmitter and a spring actuated driving motor therefor, a winding shaft for said spring having a latchable detent and a toothed member secured thereto, a transmitter release latch and a control electromagnet therefor, said transmitter release latch being adapted to engage said winding shaft detent in the spring wound position of said shaft, a winding disc having an actuating knob operable between unoperated and operated positions, said disc being provided with a pawl normally arranged to pivot between two limiting positions under the action of gravity, said pawl being disposed to engage said toothed member in the unoperated position of the disc and to rotate the winding shaft by operation of said disc from its unoperated to its operated position, a yieldable detent attached to said winding disc, a disc release latch and a control electromagnet therefor, said disc release latch being arranged to engage said yieldable detent in the operated position of said disc, the latching of said winding shaft and said winding disc permitting the pivoting of the gravity controlled pawl out of engagement with said toothed member, the yieldable detent permitting the manual restoration of the winding disc to its unoperated position independently of the latched winding shaft and of the disc release latch, a plurality of electrical contacts, and cam surfaces carried by said winding shaft and said winding disc to operate said contacts in a manner to condition the operating circuit of said transmitter release latch control electromagnet.

6. Telegraph apparaus comprising a code wheel transmitter and a spring actuated driving motor therefor, a winding shaft for said spring

having a latchable detent and a toothed member secured thereto, a transmitter release latch and a control electromagnet therefor, said transmitter release latch being adapted to engage said winding shaft detent in the spring wound position of said shaft, a winding disc having an actuating knob operable between unoperated and operated positions, said disc being provided with a pawl normally arranged to pivot between two limiting positions under the action of gravity, said pawl being disposed to engage said toothed member in the unoperated position of the disc and to rotate the winding shaft by operation of said disc from its unoperated to its operated position, a yieldable detent attached to said winding disc, a disc release latch and a control electromagnet therefor, said disc release latch being arranged to engage said yieldable detent in the operated position of said disc, the latching of said winding shaft and said winding disc permitting the pivoting of the gravity controlled pawl out of engagement with said toothed member, the yieldable detent permitting the manual restoration of the winding disc to its unoperated position independently of the latched winding shaft and of the disc release latch, a plurality of electrical contacts, and means including said contacts for separately energizing said control electromagnets to withdraw said latches independently.

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