

Oct. 25, 1938.

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2,134,076

TELETYPEWRITER SYSTEM

Filed Sept. 25, 1936

3 Sheets-Sheet 1

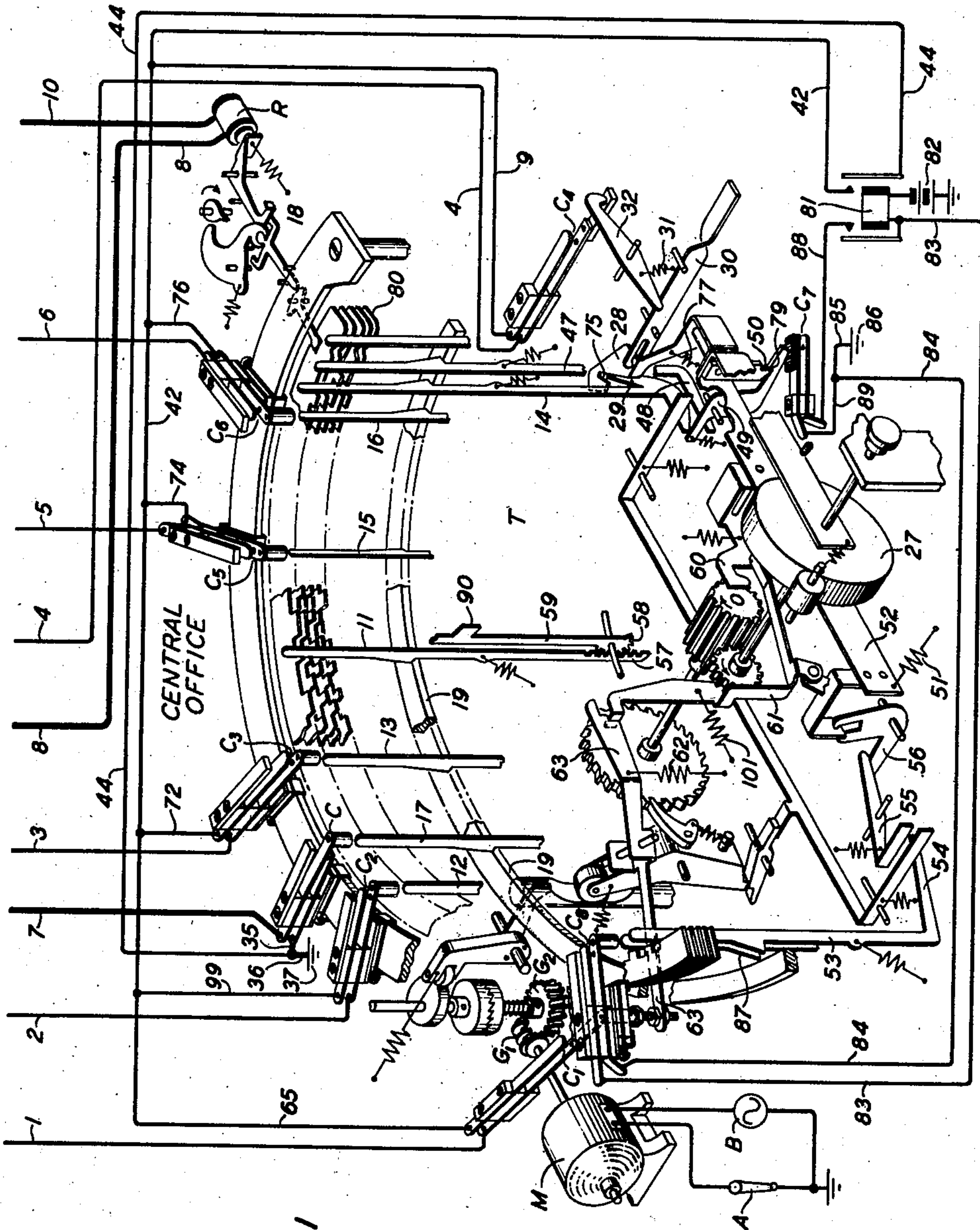


FIG. 1

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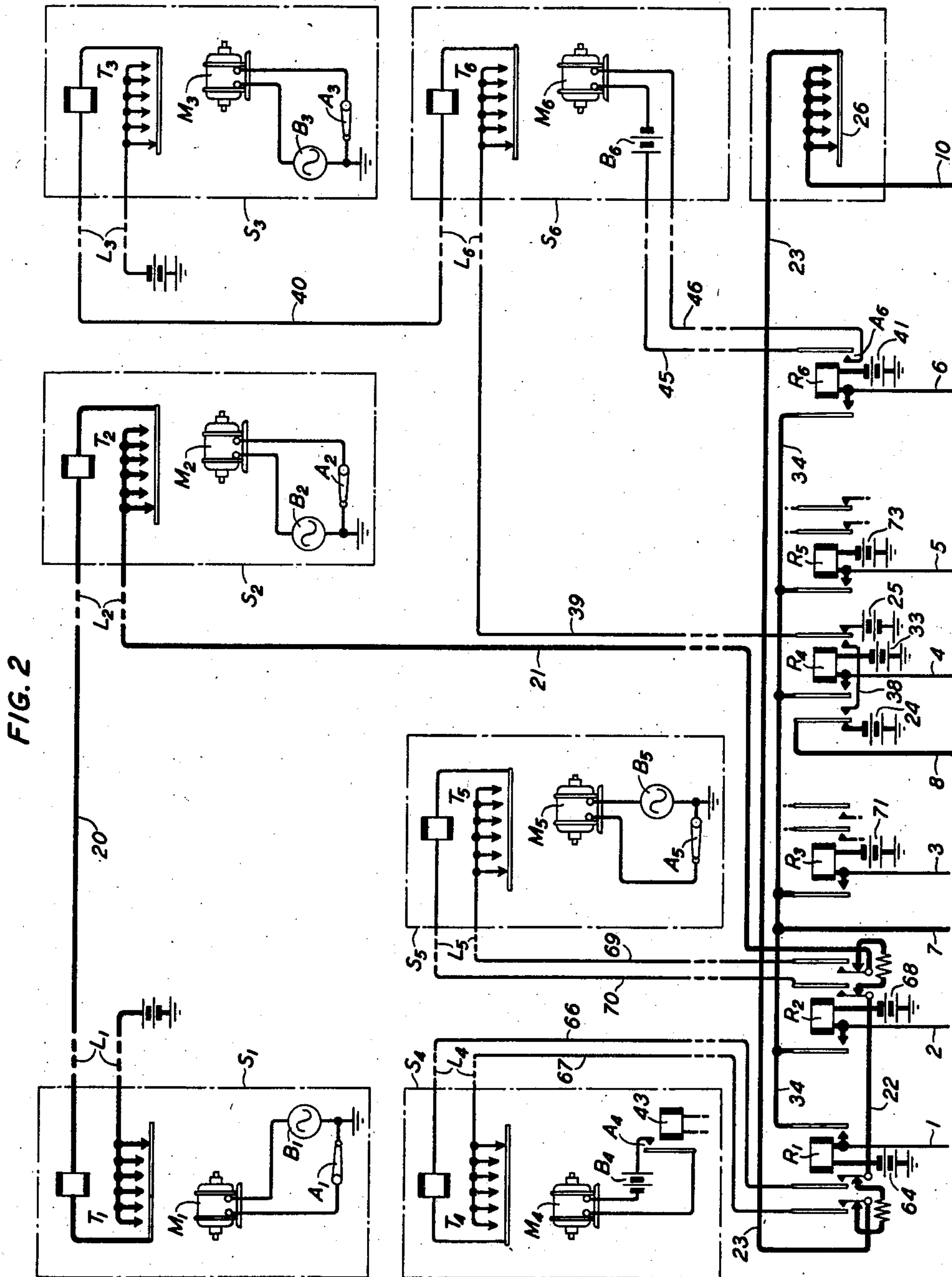
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TELETYPEWRITER SYSTEM

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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

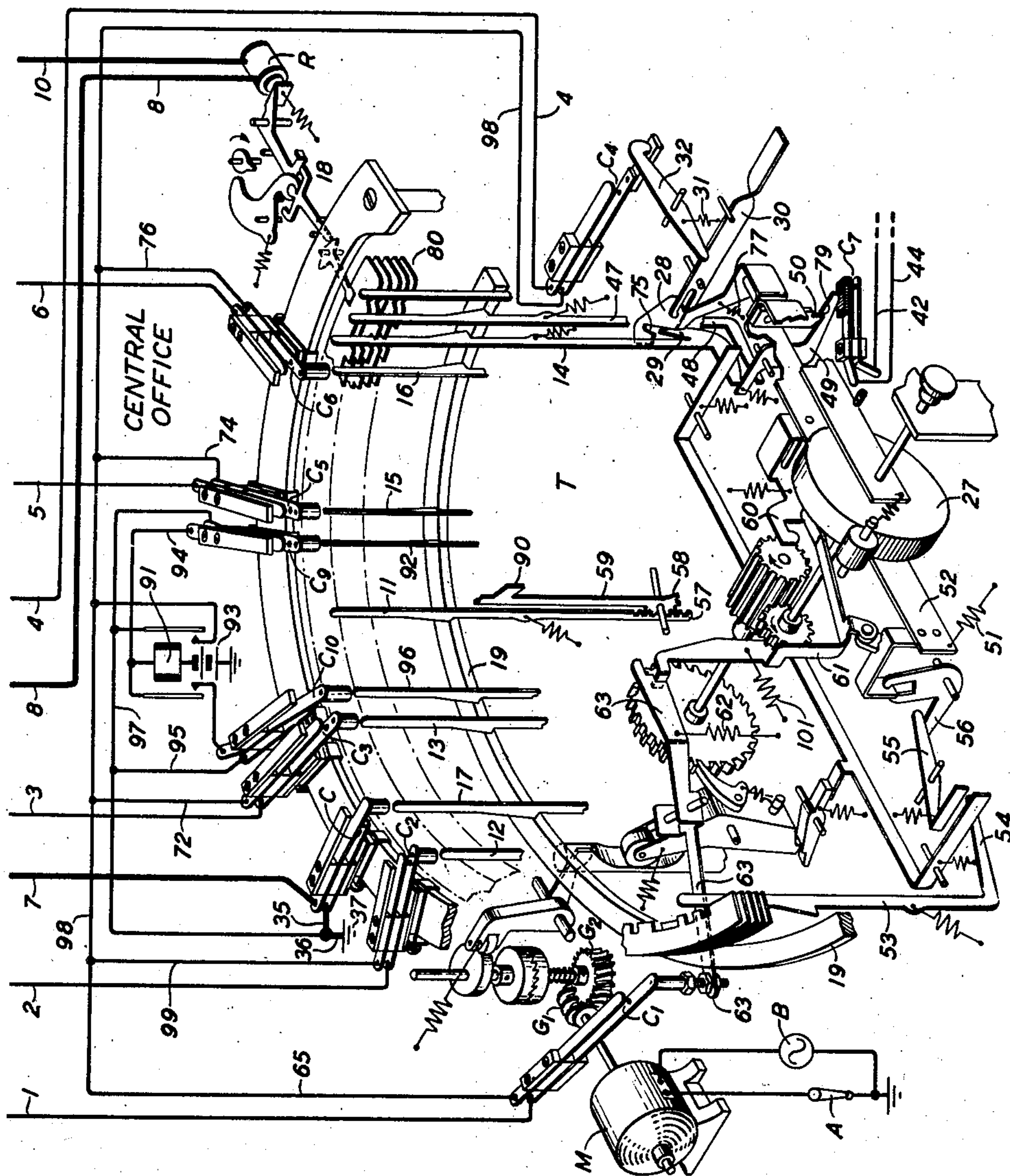


FIG. 3

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2,134,076

TELETYPEWRITER SYSTEM

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Application September 25, 1936, Serial No. 102,578

10 Claims. (Cl. 178—2)

This invention relates to teletypewriter systems and, more particularly, to systems which include a teletypewriter having contacts for performing various functions.

5 It is an object of this invention to mount contacts for performing various functions, in a teletypewriter to be operated by the teletypewriter mechanism in response to the transmission and reception of any or all upper case characters without hindering the printing functions of these characters.

10 It is also an object of this invention to open and close, by means of a central teletypewriter, telegraph lines leading from a teletypewriter office to other teletypewriter stations.

15 It is a further object of this invention to provide a central teletypewriter office with an improve switching device for switching various circuits.

20 It is an additional object of this invention to enable a subscriber at a teletypewriter station to connect his teletypewriter through a teletypewriter central office to another teletypewriter station without the assistance of an operator at the central office thereby effecting a saving in operating time.

25 It is a further object of this invention to enable subscribers having their lines connected together at a central office to disconnect the lines at the central office without the assistance of an operator at the central office, thereby effecting a further saving in operating time.

30 These and other objects of the invention are attained by means of a plurality of contact assemblies mounted in a teletypewriter at various predetermined positions. The contacts are adapted to be operated by the teletypewriter mechanism in response to certain preassigned teletypewriter signals which may, if desired, be sent from other teletypewriter stations. In the preferred embodiment of the invention, the operation of the contacts serves to operate relays which operate and lock-up to perform any desired functions, such as switching telegraph circuits. Also in the preferred embodiment of the invention, the operation of a particular contact unlocks the switching relays and causes them to deenergize thereby restoring the system to its normal condition. If desired, these relays may be designed to perform a variety of functions, such as switching on and off a teletypewriter motor at an outlying teletypewriter station.

35 Most of the contact assemblies are adjustably mounted in the central teletypewriter near the tops of the pull bars and are designed to be op-

erated by the pull bars. A few of the contact assemblies are mounted in other places in the teletypewriter and are designed to be operated by certain mechanisms in the teletypewriter. The operation of most of the contacts is normally ineffective to perform any useful function because the circuits through most of the contacts are connected in series with a control circuit which is normally open at the armature and contact of a normally unenergized control relay.

40 This control relay is provided with an energizing circuit having a normally open contact connected in series with it and is also provided with a locking-up circuit having a normally open contact in series with it. The contact in the locking-up circuit is designed to be closed when the platen assembly of the teletypewriter is shifted to its upper case position, and the contact in the energizing circuit is momentarily closed by a pull bar in response to the reception by the central teletypewriter of a preassigned upper case code selection. The closing of both of these contacts permits energization of the control relay and also enables the control relay to lock-up over the circuit leading through the platen contact. Thus, the control relay remains operated and locked-up only as long as the platen assembly remains in its upper case position.

45 As soon as the platen assembly is shifted to its lower case position, the platen contact opens thereby opening the locking-up circuit of the control relay which becomes deenergized and releases its armatures. The release of one of the armatures of the control relay opens the control circuit and all of the contact circuits connected in series with it thereby discontinuing the functions of most of the contacts until the control circuit is closed again. Therefore, the operation of these switching contacts will be effective to perform their various switching functions only after the control circuit has been closed. Likewise, their operation will be effective only as long as the platen assembly remains in its upper case position and will be rendered ineffective as soon as the platen assembly is shifted to its lower case position.

50 A modification of the invention is similar to the structure just described except that it uses a normally closed pull bar contact instead of the normally open platen contact which is left free to be used to perform any other function that may be desired. With this modification, when the normally open pull bar contact is closed in response to the reception by the central teletypewriter of a preassigned code signal, the control

relay will become energized and will operate its armatures. The operation of one of the armatures closes a circuit for the control relay to lock-up through the normally closed pull bar contact thereby rendering the operation of the various switching contacts effective to perform their intended functions.

After the desired switching functions have been accomplished, further operation of the switching contacts can be rendered ineffective by transmitting a second pre-assigned code signal which causes the selecting mechanism of the central teletypewriter to select a particular pull bar. Operation of this pull bar opens the normally closed contact which, in turn, opens the locking-up circuit of the control relay. Consequently, the control relay becomes deenergized and releases its armatures thereby opening the control circuit common to the switching circuits. Operation of the switching contacts will now be ineffective to perform their intended functions until the pre-assigned code signal has been transmitted to energize the control relay for closing the control circuit.

These and other features of the invention will now be described in detail with reference to the drawings in which:

Figure 1 represents a teletypewriter central office and shows a schematic diagram in perspective of a teletypewriter provided with special contacts and circuit connections leading to the switching relays and having its platen assembly in the lower case position;

Fig. 2 shows the switching relays at the central office and the other teletypewriter stations to which the teletypewriter central office shown in Fig. 1 is connected; and

Fig. 3, which is somewhat similar to Fig. 1, represents an alternative method of controlling the effectiveness of the switching contacts.

The teletypewriter T, shown in Fig. 1, is similar to the teletypewriter disclosed in Patent 1,745,633 granted February 4, 1930 to S. Morton et al. The disclosure of this Morton et al. patent is incorporated herein by reference as a part of this specification. However, the invention is not limited to this type of teletypewriter nor is it limited to the specific structure shown in the drawings which is a preferred embodiment of the invention and is shown and described in order to illustrate and explain the features and principles of operation of the invention.

For purposes of illustration, teletypewriter T is shown to be located at a teletypewriter central office, although it may be located at an ordinary subscriber's teletypewriter station if desired. Connected to this central office by telegraph lines L₁ to L₆, inclusive, are the subscribers' teletypewriter stations S₁ to S₆, inclusive, each of which is provided with a teletypewriter T₁ to T₆, inclusive, and a teletypewriter motor M₁ to M₆, inclusive. Each of the motors M₁ to M₆, inclusive, is operated by an individual power supply source B₁ to B₆, respectively. At stations S₁, S₂, S₃, and S₅ the energizing circuits leading from the respective local power supply sources to the motors are opened and closed by manually operable switches A₁, A₂, A₃, and A₅, respectively, controlled by the local attendant at each station.

The energizing circuit of the motor M₄ is normally open at the armature and contact A₄ of the normally unoperated relay 43. This energizing circuit is adapted to be opened and closed by any control method that may be desired, such as the method described in Patent 1,913,431 granted

June 13, 1933 to W. Daum. The disclosure of this Daum patent is incorporated herein by reference as a part of this specification. The energizing circuit of motor M₆ is normally open at contact A₆ of relay R₆ located at the central office. It is to be understood that these different motor control circuits may be varied as desired to meet the particular requirements of a given system and that they are shown here for the purpose of illustrating the wide extent to which the invention may be applied. It should also be understood that the invention is capable of use with any other type of line circuits, such as duplex circuits.

The teletypewriter T at the central office has a motor M which is operated by a power supply source B over an energizing circuit closed by a manually operable switch lever A. Motor M operates teletypewriter T by means of gears G₁ and G₂ which alternately raise and lower the printing bail 19 to operate the pull bars selected by the code bars 80 which are actuated by the selecting mechanism 18, and is described in the Morton et al. patent.

Adjustably mounted in the upper part of teletypewriter T just above the tops of the pull bars are the assemblies for contacts C, C₂, C₃, C₅, C₆, and C₈. Although these contact assemblies have been shown to be adjustably mounted, it is to be understood that this is merely one form of the invention and that the contact assemblies may be fixedly located by being drilled and tapped onto the frame of the teletypewriter T. All of these contacts are normally open except contact C which is normally closed. Contacts C, C₂, C₃, C₅, C₆, and C₈ are designed to be operated in response to selections of pull bars 17, 12, 13, 15, 16, and 87, respectively. However, the operation of these contacts will be effective to perform their intended functions only when their operating signals have been preceded by a preassigned code signal, which may be any convenient signal according to the requirements of a particular system.

In the preferred embodiment of the invention, this preassigned signal is what is known as a "bell" signal which is a signal ordinarily designed to effect the ringing of a bell in the teletypewriter T. With the type of teletypewriter shown in Fig. 1, a "bell" signal is what is known as an upper case signal and, accordingly, requires that it be preceded by a "figures" shift signal. Furthermore, if a code signal corresponding to a bell signal should be sent while the platen assembly 52 is in its lower case position, the bell pull bar 87 would not be selected but, instead, another pull bar (not shown) would be selected. Since this other pull bar is not selected by any upper case signal, its associated type bar (not shown) is blank in the upper case.

In addition to contacts C, C₂, C₃, C₅, C₆, and C₈, the switching mechanism also includes the normally open contact C₇ which is operated by the platen assembly in a manner described in detail hereinafter. The switching mechanism further includes the normally open contacts C₁ and C₄ which are designed to be operated by portions of the teletypewriter mechanism only in response to the reception by the receiving relay R of certain upper case teletypewriter code signals. The manner of operating contacts C₁ and C₄ will be described hereinafter in connection with the description of the operation of the system as a whole.

Since all of the contacts mentioned above, except contacts C and C₈, have their circuits open

at the right armature and contact of control relay 81, their operation will be effective to perform their intended functions only after control relay 81 has operated and locked-up. This permits greater flexibility of the teletypewriter T in that all of its pull bars, except pull bars 17 and 87, may be used for performing their ordinary lower and upper case printing functions without performing any of their switching functions until desired.

In the operation of the system, let it be assumed that the subscriber at station S₁ wishes to connect himself through the central office to the subscriber at station S₃. The subscriber at station S₁ normally has his switch A₁ closed during business hours so that his motor M₁ is energized by his local power supply source B₁. Accordingly, the subscriber, by means of his teletypewriter T₁, first transmits a figures shift signal out over line L₁, conductor 20, line L₂, through station S₂, line L₂, conductor 21, through the normally closed contacts of relay R₂, conductor 22, through the normally closed contacts of relay R₁, conductor 23, sending contacts 26, conductor 10, receiving relay R, conductor 8, outer left armature of the normally unoperated relay R₄, and then to grounded battery 24.

The figures shift signal transmitted over this path energizes the receiving relay R which operates the selecting mechanism 18 to select the figures pull bar 47 which is then elevated by the reciprocating bail 19. In rising, pull bar 47 causes its extension 48 to elevate the left end of bell crank 49. This causes the right end of bell crank 49 to dip down thereby releasing latch 50. The release of latch 50 allows spring 51 to pull the platen assembly 52 forward. The forward movement of the platen assembly 52 pulls lever 28 forward sufficiently to remove slot 75 from the path of travel of extension 29 of the so-called "blank" pull bar 14. At the same time, the forward movement of the platen assembly 52 pushes down the right end of bell crank lever 49 to close contact C₇ for a purpose to be explained hereinafter.

The subscriber at station S₁ now transmits a permutation code bell signal which causes the bell pull bar 87 to be selected by the code bars 80 for operation by the reciprocating bail 19. During the resulting elevation of pull bar 87, the top of pull bar 87 will momentarily close contact C₈. This closes a path for current from grounded battery 82 to pass through the winding of control relay 81, over conductor 83, through contact C₈, conductor 84, conductor 85, and then to ground 86. Before contact C₈ opens, due to the restoration of pull bar 87 to its normal position, control relay 81 operates both its armatures, the right armature closing a path across conductors 42 and 44 for a purpose to be explained hereinafter. Relay 81 now locks-up over a circuit traced from battery 82, through the winding of relay 81, over the operated left armature, conductor 88, through contact C₇ (now closed), conductor 89, conductor 85, and then to ground 86. Consequently, when contact C₈ now opens, relay 81 will remain operated due to this locking-up circuit which remains closed until contact C₇ is opened by the platen assembly 52 returning to its lower case position as will be described hereinafter.

The subscriber at station S₁ next transmits a preassigned permutation code combination of significant current variations which in this preferred embodiment of the invention, is known as a "blank" signal. Upon being received at the cen-

tral office, this particular upper case permutation code signal causes the selecting mechanism 18 to select the blank pull bar 14. Accordingly, the printing bail 19 elevates the blank pull bar 14 with the result that extension 29 of pull bar 14 engages with lever 28 and tilts it up. This elevates the left end of lever 30 and, consequently, lowers the right end of lever 30 thereby allowing spring 31 to pull down the left end of lever 32. As a result, the right end of lever 32 is raised and allows the spring contact C₄ to close. This closing is only momentary because pull bar 14 is soon lowered by the reciprocating bail 19, and spring 77 then pulls lever 28 back into the position shown in the drawings.

It should be noted that contact C₄ can only be closed by this upper case blank signal because, when the platen assembly 52 is in its lower case position, slot 75 in lever 28 would then be positioned over extension 29 of the blank pull bar 14 as is shown in Fig. 1. Elevation of pull bar 14 would then be futile to cause the closing of contact C₄ because extension 29 would pass through slot 75 and would thus be unable to tilt lever 28.

The closing of contact C₄ momentarily closes the energizing circuit of relay R₄ from grounded battery 33 through the winding of relay R₄, conductor 4, contact C₄, conductor 9, conductor 42, over the operated right armature of relay 81, conductor 44, conductor 36, and then to ground 37. As a result, relay R₄ becomes energized and operates both its armatures. Before contact C₄ opens, relay R₄ locks-up over a circuit leading from grounded battery 33, through the winding of relay R₄, inner left armature, conductor 34, conductor 7, through the normally closed contact C, conductor 35, conductor 36, and then to ground 37. At the same time, the communication circuit is switched from grounded battery 24 to the joining conductor 38 and then to conductor 39, out over line L₆ to station S₆, over line L₆, conductor 40, line L₃, and then to station S₃. Since the subscriber at station S₃ normally has his switch A₃ closed during business hours, his motor M₃ will be energized at this time by his local power supply source B₃.

Before communication begins, the pull bars of the teletypewriter T should be relieved of their switching functions to prepare them for performing their ordinary printing functions. To do this, a so-called "letters" shift code signal is transmitted for causing the selecting mechanism 18 of teletypewriter T to operate the code bars 80 to select pull bar 53. Upon being elevated by the reciprocating bail 19, pull bar 53 elevates its extension 54 which correspondingly elevates the left end of lever 55 thereby depressing the right end of lever 55. When the right end of lever 55 is depressed, it causes the left end of bell crank 56 to be correspondingly depressed thereby causing the top end of bell crank 56 to move backward to the rear of the teletypewriter T. This acts as a lever to pull back the platen assembly 52.

In traveling to the rear of the teletypewriter T, the platen assembly 52 causes latch 50 to also move to the rear of the teletypewriter T with the result that latch 50 will engage with the catch 79 in the right end of bell crank lever 49. This serves to hold the platen assembly 52 in this rearward position and prevents spring 51 from pulling it forward. Thus, the platen assembly 52 is latched in its lower case position, as is shown in Fig. 1, where it remains until a figures shift signal is received by relay R. At the same time,

in moving to the rear, latch 50 releases its pressure on bell crank lever 49 and allows the right end of lever 49 to move upward. This permits the spring contact C₇ to open thereby opening the locking up circuit of relay 81 which consequently releases its armatures. The release of the right armature of relay 81 opens the control circuit to prevent further operation of the switching relays. However, the operation of relay R₄ will not be discontinued because relay R₄ is locked-up and will remain locked-up until contact C is opened.

Accordingly, the system is now in condition for communication to take place between the subscriber at station S₁ and the subscriber at station S₃. Significant current variations transmitted by the teletypewriter T₁ will travel over line L₁, conductor 20, line L₂, through station S₂, line L₂, conductor 21, conductor 22, conductor 23, sending contacts 26, conductor 10, receiving relay R, conductor 8, conductor 38, conductor 39, line L₆, through station S₆, line L₆, conductor 40, line L₃, and then to station S₃.

Since both stations S₄ and S₅ are disconnected from the communication circuit at the armatures of relays R₁ and R₂, respectively, neither teletypewriter T₄ nor teletypewriter T₅ will record the signals sent from teletypewriter T₁ at this time. Teletypewriter T₆ will also not record these signals due to the fact that the energizing circuit for its motor M₆ is open at contact A₆ of relay R₆. However, with the system in the condition shown in the drawings, teletypewriter T₂ will follow the signals transmitted by teletypewriter T₁ because the energizing circuit for its motor M₂ is closed at switch A₂. If the subscriber at station S₂ finds that the message being transmitted from station S₁ to station S₃ is of no interest to him, he can open switch A₂ thereby shutting down his motor M₂ with the result that his teletypewriter T₂ will not now record the signals being transmitted.

Thus, the subscriber at station S₁, which may be located at a remote point, has connected himself through the central office to the distant subscriber's station S₃ without any assistance from an operator at the central office. In other words, the subscriber at station S₁ has switched both his and the other subscriber's lines 8 and 39 from their terminations at batteries 24 and 25, respectively, to the joining conductor 38 thereby switching the line conductors 8 and 39 together. Consequently, a considerable saving in operating time is effected since the subscriber at station S₁ simply transmits a bell signal to effect the operation of relay 81 and then transmits the upper case code combination assigned to select pull bar 14 which closes contact C₄ to operate relay R₄ which immediately switches the two lines 8 and 39 together without any act by an operator at the central office. This saving in operating time is of importance in certain types of business where time is of the essence and promptness in putting calls through is essential.

When the subscribers at stations S₁ and S₃ have finished communicating with each other, either one of them may effect a disconnection of their lines 8 and 39 at the central office by transmitting a preassigned telegraphic permutation code signal from either station S₁ or station S₃. This signal is received by the receiving relay R at the central office which accordingly actuates the selecting mechanism 18 to operate the code bars 80 to select pull bar 17. Bail 19 then elevates pull bar 17 thereby momentarily opening the normally

closed contact C. The opening of contact C opens the locking-up circuit of relay R₄. Consequently, relay R₄ releases its armatures and switches the line conductors 8 and 39 from the joining conductor 38 to batteries 24 and 25, respectively, thereby disconnecting stations S₁ and S₃ from each other and restoring the system to its normal condition. If desired, the subscriber at station S₂ may also effect this disconnection. Since this disconnection is accomplished by any of the connected subscribers without the assistance of an operator at the central office, a further saving in operating time is effected.

The nature of the business of the subscriber at station S₁ may be such that it would be desirable for him to send a message to both the subscriber at station S₃ and the subscriber at station S₆ (which may, for example, be an outlying station near the central office) and have the message recorded practically simultaneously by the teletypewriters T₃ and T₆. To accomplish this conference connection, it is first necessary to start the teletypewriter motor M₆ at station S₆ by energizing relay R₆. Accordingly, the subscriber at station S₁ transmits a figures shift signal for selecting the figures pull bar 47 to effect the release of latch 50 which then allows the platen assembly 52 to be pulled forward by spring 51. In moving forward, the platen assembly 52 carries latch 50 forward along the top edge of bell crank 49 thereby forcing down the right end of bell crank 49 to close contact C₇ which will remain closed during the time that the platen assembly 52 remains in its upper case position.

The subscriber at station S₁ next transmits a bell signal over line L₁, conductor 20, line L₂, through station S₂, line L₂, conductor 21, conductor 22, conductor 23, sending contacts 26, conductor 10, receiving relay R, conductor 8, and then to grounded battery 24. This bell signal effects the closing of contact C₈ which enables control relay 81 to operate and lock-up in the manner described above. The subscriber at station S₁ now transmits a preassigned combination of code impulses over the circuit traced above. This permutation code combination causes the selecting mechanism 18 of teletypewriter T to select pull bar 16 which is then momentarily operated by the printing bail 19 to close contact C₆ momentarily. A path for energizing relay R₆ is now closed from grounded battery 41, through the winding of relay R₆, conductor 6, through contact C₆, conductor 76, conductor 42, over the operated right armature of relay 81, conductor 44, conductor 36, and then to ground 37.

As a result, relay R₆ operates its armatures and locks-up through a path from battery 41, through the winding of relay R₆, operated left armature, conductor 34, conductor 7, through the normally closed contact C, conductor 35, conductor 36, and then to ground 37. At the same time, the right armature of relay R₆ is operated and closes a path from power supply source B₆ at station S₆, over line conductor 45, operated armature and contact A₆ of relay R₆, line conductor 46, motor M₆, and then back to power supply source B₆ thereby energizing motor M₆ and starting it into operation. The subscriber at station S₁ then transmits the code signal for selecting pull bar 14 in the teletypewriter T at the central office. When bail 19 elevates pull bar 14, contact C₄ will be momentarily closed and relay R₄ will operate its armatures and lock-up in the manner described above.

As soon as the platen assembly 52 moves back

to its lower case position (shown in Fig. 1) in response to the reception by relay R of a letters signal, the right end of bell crank 49 will be elevated sufficiently to allow contact C₇ to open, thereby opening the locking-up circuit of relay 81. This prevents further operation of the switching relays and relieves the pull bars of their switching functions. However, this has no effect on the switching relays R₄ and R₆ because these relays are locked-up through the normally closed contact C.

Messages now sent from station S₁ will pass through station S₂, through the central office, and then through stations S₆ and S₃. The messages will thus be recorded practically simultaneously on both the teletypewriters T₃ and T₆. They will also be recorded on the teletypewriter T₂ at station S₂ provided the subscriber at this station has his switch A₂ closed. The subscriber at station S₃ can transmit messages to any of the connected stations and these messages will be practically simultaneously recorded by the teletypewriters T₁, T₂ and T₆. Likewise, the subscriber at station S₆ can also send messages which will be recorded on all of the connected teletypewriters.

At the close of communication, any of the subscribers at stations S₁, S₂, S₃, or S₆ may disconnect the conference connection by transmitting the preassigned code signal for selecting pull bar 17 which will momentarily open the normally closed contact C as was described above. The opening of contact C will open the locking-up circuits of both relays R₄ and R₆ and will cause them to release their armatures. This switches the communication circuit from conductors 8 and 39 to batteries 24 and 25 as was described above. At the same time, the energizing circuit of motor M₆ is opened at contact A₆ of relay R₆ and, consequently, motor M₆ stops running. The system is thus restored to its normal condition.

In the event that the subscriber at station S₁ wishes to communicate with the subscriber at station S₄ (which may, for example, be an outlying station near the central office), he will transmit the figures shift signal to cause the platen 27 to be shifted to its upper case position. The subscriber will then transmit a preassigned upper case code signal which, upon being received by the receiving relay R, will effect the selection of pull bar 11 by the selecting mechanism 18 and the code bars 80. The elevation of pull bar 11 by reciprocating bail 19 will, by means of ratchet 57 and gear 58, drive the top of type bar 59 downward in an arcuate path.

The projection 90 on bar 59 will then hit lever 60, thereby tilting downward the right end of lever 61. This drives the top end of lever 61 to the right and allows spring 62 to pull down the right end of lever 63 into latching engagement with the top end of lever 61. Consequently, the left end of lever 63, which is normally located immediately beneath the printing bail 19, as shown in the drawings, is driven upward to close contact C₁ momentarily. It should be noted that contact C₁ can only be closed by an upper case selection of pull bar 11 because, when the platen assembly 52 is in its lower case position, lever 60 is carried to the rear of teletypewriter T a short distance which is sufficient to remove it from the path of travel of projection 90.

The closure of contact C₁ closes a path from grounded battery 64, through the winding of relay R₁, along conductor 1, through contact C₁, conductor 65, conductor 42, operated right armature of relay 81, conductor 44, conductor 36, and

then to ground 37. Consequently, relay R₁ operates its armatures and locks-up through its right armature over a path from grounded battery 64, winding of relay R₁, operated right armature and contact of relay R₁, conductor 34, conductor 7, normally closed contact C, conductor 35, conductor 36, and then to ground 37. It is necessary that relay R₁ be designed to lock-up quickly because, when the reciprocating bail 19 comes down, it forces down the left end of lever 63, thereby permitting contact C₁ to resume its normally open position. At the same time, the right end of lever 63 is forced upward thereby allowing spring 101 to pull back the top end of lever 61 into the lower notch in the right end of lever 63 as is shown in the drawings.

The operation of the two left armatures of relay R₁ opens the normally closed make-before-break left contacts of relay R₁ and closes a path from conductor 22, over the inner left armature of relay R₁, conductor 66, line L₄, through station S₄, back over line L₄, conductor 67, outer left armature of relay R₁, conductor 23, sending contacts 26, conductor 10, relay R, conductor 8, and then to grounded battery 24. The subscriber at station S₁ now transmits motor start signals, such as those described in the Daum patent mentioned above, which effect the energization of a relay 43 at station S₄, similar to the motor control relay disclosed in the Daum patent. Upon being energized, motor control relay 43 operates its armature to close the contact A₄, thereby closing the energizing circuit of motor M₄ and starting motor M₄ into operation.

After opening the control circuit in the manner described above to relieve the pull bars of their switching functions, communication may now take place between stations S₁, S₂, and S₄, the signals passing out over line L₁, conductor 20, line L₂, through station S₂, line L₂, conductor 21, conductor 22, conductor 66, line L₄, through station S₄, line L₄, conductor 67, conductor 23, and then to grounded battery 24 as was described above. These signals will also pass through the receiving relay R. It might be mentioned here that this is the case with all connections between the various subscribers' stations; that is, receiving relay R follows all the signals sent between these stations.

At the close of communication, any of the subscribers at the three connected stations S₁, S₂, and S₄, may send the code signal for selecting pull bar 17 which momentarily opens contact C, as described above, with the consequent opening of the locking-up circuit of relay R₁. Relay R₁ now releases its armatures and its make-before-break contacts now open the circuit leading to station S₄ and connect conductor 22 directly to conductor 23. Incidentally, the motor at station S₄ may be stopped by any of the subscribers in the manner described in the Daum patent. It might be stated here that, in this embodiment of the invention, the central office operator can effect any of the connections and disconnections between any of the subscribers' stations because her sending contacts 26 are always connected in series with the communication circuits. This circuit construction can be modified in accordance with the requirements of different systems.

If the subscriber at station S₁ wishes to send a message to be recorded by the teletypewriters T₃ and T₄ at stations S₃ and S₄ (leaving station S₂ out of consideration for the sake of simplicity), he will, after first transmitting a bell signal to operate relay 81, send the code signals to select

pull bars 11 and 14 for closing contacts C₁ and C₄. This will operate relays R₁ and R₄ which will lock-up as described above to close the lines leading to stations S₃ and S₄. Any of the connected subscribers may disconnect this conference connection by sending the code signal to select pull bar 17 for opening contact C. This opens the locking-up circuits of both relays R₁ and R₄, thereby restoring the system to its normal condition.

Also, if the subscriber at station S₁ wishes to send a message to be recorded by the teletype-writers at each of the stations S₃, S₄, and S₆ (again leaving station S₂ out of consideration for the sake of simplification), he will follow the same procedure as that outlined in the preceding paragraph except that he will, in addition, send the code signal to select pull bar 16. The operation of pull bar 16 will close contact C₆ and operate relay R₆ which will lock-up and close the energizing circuit of motor M₆ at station S₆, thereby conditioning station S₆ for the reception and transmission of messages. Any of the connected subscribers, or the central office operator, may disconnect this conference connection in the manner described above.

Likewise, the subscriber at station S₁ may connect himself through the central office to the station S₅ by transmitting a bell signal (thereby operating control relay 81 which locks-up as described above) followed by the preassigned code combination for selecting pull bar 12. The elevation of pull bar 12 by bail 19 momentarily closes contact C₂ thus closing the energizing path for relay R₂ from grounded battery 68, through the winding of relay R₂, conductor 2, contact C₂, conductor 99, conductor 42, over the operated right armature of relay 81, conductor 44, conductor 36, and then to ground 37 thereby energizing relay R₂.

Upon being energized, relay R₂ operates its armatures and locks-up from battery 68, through the winding of relay R₂, operated left armature, conductor 34, conductor 7, through the normally closed contact C, conductor 35, conductor 36, and then to ground 37. In operating its two right armatures, relay R₂ switches the line circuit from along conductor 21, over the outer right operated armature of relay R₂, conductor 69, line L₆, teletypewriter T₅ at station S₅, back over line L₅, conductor 70, inner operated right armature of relay R₂, conductor 22, conductor 23, and then through the receiving relay R, to grounded battery 24.

If a conference connection is desired, other stations may be connected into the communication circuit in the manner described above. At the close of communication, any of the connected subscribers may disconnect the connection by effecting the operation, or opening, of the normally closed contact C at the central office by causing the operation of pull bar 17 as described above.

In the event that it is desired to connect some other station into the communication circuit, or to perform any other switching function, a bell signal is first sent to close contact C₈ for operating relay 81 and then the preassigned upper case code combination is transmitted for selecting pull bar 13. The operation of pull bar 13 by bail 19 momentarily closes the switching contact C₃ for enabling relay R₃ to operate over a path traced from grounded battery 71, through the winding of relay R₃, conductor 3, contact C₃, conductor 72, conductor 42, over the operated

right armature of control relay 81, conductor 44, conductor 36, and then to ground 37 thereby energizing relay R₃. Upon being energized, relay R₃ operates its armatures and locks-up over a path from grounded battery 71, through the winding of relay R₃, operated left armature, conductor 34, conductor 7, through the normally closed contact C, conductor 35, conductor 36, and then to ground 37. In operating its right armatures, relay R₃ will perform the desired switching function.

When it is desired to discontinue the switching operation, the upper case code signal is sent for causing pull bar 17 to open the normally closed contact C which opens the locking-up circuit of relay R₃ thereby causing relay R₃ to release, thus restoring the system to its normal condition.

If it is desired to perform still another switching function, it may be effected by sending a bell signal to operate contact C₈ for operating relay 81 and then transmitting the preassigned upper case code combination for selecting pull bar 15. The elevation of pull bar 15 momentarily operates the switching contact C₅ for closing a path from grounded battery 73, through the winding of relay R₅, conductor 5, contact C₅, conductor 74, conductor 42, over the operated right armature of relay 81, conductor 44, conductor 36, and then to ground 37 thereby energizing relay R₅. Upon operating its armatures, relay R₅ will lock-up over a path leading from grounded battery 73, through the winding of relay R₅, operated left armature, conductor 34, conductor 7, through the normally closed contact C, conductor 35, conductor 36, and then to ground 37. In operating its right armatures, relay R₅ will perform the desired switching functions.

When it is desired to terminate this switching operation, the upper case signal for effecting the opening of the normally closed contact C is transmitted thereby opening the locking-up circuit of relay R₅ which now releases its armatures and restores the system to its normally unoperated condition.

If additional operations, or functions, are desired, more contacts can be mounted in the teletypewriter T and can be connected into the system in a manner similar to that in which the other contacts are connected.

Whereas the operation of the system has been described principally with reference to connections originating from the dominant station S₁, it is to be understood that the connections described above may be effected and disconnected in a similar manner by the subscriber at the other dominant station S₂. It is to be further understood that other dominant stations may be added according to the particular requirements of an individual system.

For the purpose of illustration, contact C₁ has been shown to be operable by an individual arrangement of the teletypewriter apparatus. If it is desired to have levers 60, 61 and 63 perform some other function, contact C₁ may be mounted above a pull bar the same as contacts C₂, C₃, C₅, and C₆. The same applies to contact C₄, which has also been shown to be operable by an individual arrangement of the teletypewriter apparatus. If it is desired to have levers 28, 30, and 32 perform some other function, this may readily be accomplished by placing contact C₄ above a pull bar the same as contacts C₂, C₃, C₅, and C₆. Contact C may be arranged to be operated in response to the reception of either an upper or a lower case code combination. It may be pref-

erable to design the selecting mechanism of teletypewriter T in such a manner that pull bar 17 will only be selected in response to an upper case selection.

Thus, by means of this invention, all the various pull bars (except bar 17) of the teletypewriter T at the central office may be used for performing their regular printing functions in response to both upper and lower case selections. The restriction of the switching functions of all the pull bars (except bar 17) to only those upper case selections which have been preceded by a bell signal facilitates regular communication between the stations during the period that the control relay 81 is unenergized. This is due to the fact that, if the control circuit were not open at the contact and unoperated right armature of control relay 81, every time the pull bars should be operated, they would close their contacts for energizing the particular switching relays associated therewith.

It is to be understood that this specific application of the invention has been shown and described for purposes of explaining the principles and features of operation of the invention. Changes may be made in the construction shown without exceeding the scope of the invention. More switching contacts to be operated by the pull bars of the teletypewriter at the central office may be added whenever desired to perform any functions that may be required. Likewise, the circuit connections of the various subscribers' stations may be varied as desired to meet the requirements of any particular communication system.

A modification of the invention is shown in Fig. 3 which discloses a central office teletypewriter equipped with switching contacts somewhat similar to those disclosed in Fig. 1 and having circuits leading to the switching relays and subscribers' stations shown in Fig. 2. The device shown in Fig. 3 differs from that shown in Fig. 1 in that control relay 91 is used instead of control relay 81. Furthermore, the effectiveness of most of the contacts is controlled by the control relay 91. Relay 91 is designed to operate and lock-up in response to a particular permutation code signal which effects the closing of a normally open contact C₉ and is designed to unlock in response to another preassigned permutation code signal which effects the opening of the locking-up circuit through the normally closed contact C₁₀.

With this modification, before the operation of contacts C₁, C₂, C₃, C₄, C₅, and C₆ will be effective to perform any useful switching functions, their operating circuits must be closed. It can be seen in Fig. 3 that each of their operating circuits is open, not only at the particular normally open contacts, but also at the unoperated right armature and contact of relay 91. Consequently, when it is desired to perform the switching function controlled by one of these contacts, the preassigned code signal is sent to operate the selecting mechanism 18 which actuates the code bars 80 to select pull bar 92. When pull bar 92 is elevated by the printing ball 19, the top of bar 92 will momentarily close contact C₉.

The closure of contact C₉ closes a path for operating control relay 91 from grounded battery 93, through the winding of relay 91, conductor 94, contact C₉, conductor 97, conductor 36, and then to ground 37. Consequently, control relay 91 becomes energized and operates its armatures. The operation of the left armature of relay 91 closes a locking-up circuit for relay 91 which ac-

cordingly locks-up over a circuit traced from grounded battery 93, through the winding of relay 91, operated left armature of relay 91, through the normally closed contact C₁₀, conductor 95, conductor 97, conductor 36, and then to ground 37. Consequently, control relay 91 remains operated until its locking-up circuit is opened in response to the preassigned code signal for selecting pull bar 96 to open the normally closed contact C₁₀.

At the same time, the operation of the right armature of relay 91 closes a path from conductor 98 (which is common to each of the contacts C₁, C₂, C₃, C₄, C₅, and C₆) to conductor 97. In other words, the operation of the right armature of relay 91 applies ground 37 to each of contacts C₁, C₂, C₃, C₄, C₅, and C₆. Thus, the code signals for operating each of these contacts must be preceded by the preassigned code signal for closing contact C₉ to operate control relay 91 or the operation of the contacts will be ineffective to accomplish any useful function.

For example, if the subscriber at station S₁ should wish to connect his station S₁ to station S₅, he would first transmit the preassigned signal for selecting pull bar 92. The elevation of pull bar 92 by ball 19 would momentarily close contact C₉ thereby closing the path traced above for operating relay 91 which would lock-up in the manner described above. Then the permutation code signal for selecting pull bar 13 would be sent to elevate pull bar 13 thereby closing contact C₃. This would operate relay R₃ over a path traced from grounded battery 71, through the winding of relay R₃, conductor 3, contact C₃, conductor 72, conductor 98, over the operated right armature of relay 91, conductor 97, conductor 36 and then to ground 37. Relay R₃ would then lock-up over a circuit leading from battery 71, through the winding of relay R₃, operated left armature of relay R₃, conductor 34, conductor 7, through the normally closed contact C, conductor 35, conductor 36, then to ground 37.

If it is desired to add any other stations to the communication circuit at this time, the signal for selecting the pull bar 13 may be immediately followed by the preassigned permutation code signals for selecting pull bars 12, 15, or any other desired contact operating pull bar. Then, when all of the desired stations have been added to the communication circuit, the preassigned code signal is sent for effecting the selection of pull bar 96. The elevation of pull bar 96 by ball 19 opens the normally closed contact C₁₀ thereby opening the locking-up circuit of relay 91 which, consequently, releases both its armatures. This removes ground 37 from the switching contacts and relieves most of the contact operating pull bars from their switching functions. Since pull bars 11, 12, 13, 14, 15, 16, and 96 may now be used for performing their ordinary printing functions, communication may take place.

At the close of communication, the permutation code signal is sent for selecting pull bar 17. The operation of contact C by the elevation of pull bar 17 opens the normally closed contact C which opens the locking-up circuits of the switching relays thereby restoring the communication system to its normal condition.

It is to be noted that, in this modification of the invention, contact C₇ may be used for performing an additional switching function if desired. Contact C₇ is shown to be bridged across the conductors 42 and 44 which may lead to the desired switching apparatus. The movement of

the platen assembly 52 from its lower case position (shown in Fig. 3) to its upper case position closes contact C₇ in the manner described above. Likewise, the movement of the platen assembly 52 from its upper case position to its lower case position opens contact C₇. The particular switching function to be accomplished by contact C₇ may be any function convenient to the requirements of a particular communication system.

It is to be understood that the circuits shown in the drawings are presented for purposes of illustration and it is to be further understood that they may be modified as desired. For example, the teletypewriter at each subscriber's station may be provided with switching contacts so that it will connect and disconnect telegraph lines. After the lines have been connected, the subscriber may relieve the pull bars in his teletypewriter of their switching functions and proceed with ordinary communication since the pull bars of this teletypewriter can then be used for performing only their ordinary upper and lower case printing functions.

What is claimed is:

1. A teletypewriter system including a teletypewriter having pull bars, selecting mechanism operable in response to the reception by the teletypewriter of preassigned code combinations of signal impulses for selecting the pull bars, a reciprocating bail for elevating the pull bars selected by the selecting mechanism, switching contacts mounted in the teletypewriter for operation by the pull bars when the pull bars are elevated, circuits adapted to be opened and closed by the switching contacts, the operation of said contacts being normally ineffective to perform any useful function, and control means for rendering the operation of said pull bar operated switching contacts effective, said control means including a normally unenergized relay operable only in response to the reception by the teletypewriter of a preassigned code combination of signal impulses.

2. A teletypewriter system including a teletypewriter having pull bars, selecting mechanism for selecting certain of the pull bars, a reciprocating bail for elevating the pull bars selected by the selecting mechanism, switching contacts mounted in the teletypewriter for operation by the pull bars when the pull bars are elevated, circuits adapted to be opened and closed by the switching contacts, the operation of said contacts being normally ineffective, and control means for rendering the operation of said switching contacts effective, said control means including a normally unenergized relay having a normally open energizing circuit and a normally open locking-up circuit, a first normally open control contact connected in series with the energizing circuit, a second normally open control contact connected in series with the locking-up circuit, a first instrumentality for closing the first control contact to close the energizing circuit, and a second instrumentality for closing the second control contact to close the locking-up circuit.

3. A teletypewriter system including a teletypewriter having pull bars, selecting mechanism for selecting certain of the pull bars, a reciprocating bail for elevating the pull bars selected by the selecting mechanism, switching contacts mounted in the teletypewriter for operation by the pull bars when the pull bars are elevated, circuits adapted to be opened and closed by the switching contacts, the operation of said contacts being normally ineffective, and control

means for rendering the operation of said switching contacts effective, said control means including a normally unenergized relay having a normally open energizing circuit and a normally open locking-up circuit, means for closing the locking-up circuit, a normally open control contact connected in series with the energizing circuit, a normally closed control contact connected in series with the locking-up circuit, a first instrumentality for closing the normally open control contact to energize the control relay, and a second instrumentality for opening the normally closed control contact to open the locking-up circuit of the control relay.

4. A teletypewriter having a plurality of pull bars, selecting mechanism for selecting certain of the pull bars, a reciprocating bail for elevating the pull bars selected by the selecting mechanism, switching contacts mounted in the teletypewriter for operation by the pull bars when the pull bars are elevated, circuits adapted to be opened and closed by the switching contacts, a normally open contact connected in series with said circuits whereby the operation of said contacts is normally ineffective to perform any useful function, a relay adapted to close the normally open contact for rendering the operation of the switching contacts effective, and operating means for energizing the relay.

5. A teletypewriter having shift mechanism, a plurality of pull bars, selecting mechanism for selecting certain of the pull bars, a reciprocating bail for operating those pull bars selected by the selecting mechanism, switching contacts mounted in the teletypewriter for operation by the pull bars when the pull bars are elevated, circuits adapted to be opened and closed by the switching contacts, a normally open contact connected in series with said circuits whereby the operation of said contacts is normally ineffective, a relay for closing said normally open contact for rendering the operation of the switching contacts effective, and means for energizing said relay only in response to the selection and operation of a preassigned pull bar.

6. A teletypewriter having shift mechanism, a plurality of pull bars, selecting mechanism for selecting certain of the pull bars, a reciprocating bail for elevating those pull bars selected by the selecting mechanism, contacts mounted in the teletypewriter for operation by the pull bars when the pull bars are elevated, circuits adapted to be opened and closed by the contacts, a normally open contact connected in series with said circuits, and electroresponsive means for closing and opening the contact, said electroresponsive means being energized in response to the reception by the teletypewriter of a preassigned code signal and being deenergized in response to the reception of a different preassigned code signal.

7. A teletypewriter including in combination a plurality of pull bars, selecting mechanism for selecting certain of the pull bars, a reciprocating bail for elevating those pull bars selected by the selecting mechanism, contacts mounted in the teletypewriter for operation by the pull bars when the pull bars are elevated, circuits adapted to be opened and closed by the contacts, a control circuit connected in series with each of said circuits, a normally unenergized control relay having a normally open armature contact, said control circuit being normally open at said normally open armature contact, and control means for energizing and deenergizing the control relay,

said control means including a normally open contact.

5 8. A teletypewriter system having in combination a teletypewriter central office with a teletypewriter, a plurality of telegraph lines, a plurality of teletypewriter stations connectable to the central office by the telegraph lines and normally disconnected from each other, instrumentalities for enabling an operator at one of the
10 teletypewriter stations to connect himself through the central office to one of the other teletypewriter stations, said instrumentalities including a control relay at the central office connected in series with said instrumentalities, and means
15 for energizing the control relay only in response to the reception of a preassigned code signal that has been preceded by a different preassigned code signal.

20 9. A teletypewriter system having a teletypewriter central office with a teletypewriter having a plurality of pull bars, a plurality of teletypewriter stations connected to the central office by a plurality of telegraph lines, normally un-

operated switching apparatus at the central office operable in response to certain preassigned code signals for switching said telegraph lines, and a control relay at the central office for rendering the operation of the switching apparatus
5 ineffective to perform any useful function.

10 10. A teletypewriter system including a teletypewriter central office with a teletypewriter having a plurality of pull bars, operating means for operating the pull bars, a plurality of teletypewriter stations, a plurality of telegraph lines
15 connecting the teletypewriter stations to the central office, normally unoperated switching apparatus at the central office operable in response to certain preassigned code signals for switching said telegraph lines, a control relay for rendering
20 the operation of the switching apparatus ineffective to perform any useful function, means for energizing the control relay in response to the operation of one of the pull bars, and means for deenergizing the control relay in response to the operation of a different pull bar.

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