

July 13, 1937.

W. T. REA

2,086,679

TELEGRAPH SYSTEM

Filed July 13, 1934

3 Sheets-Sheet 1

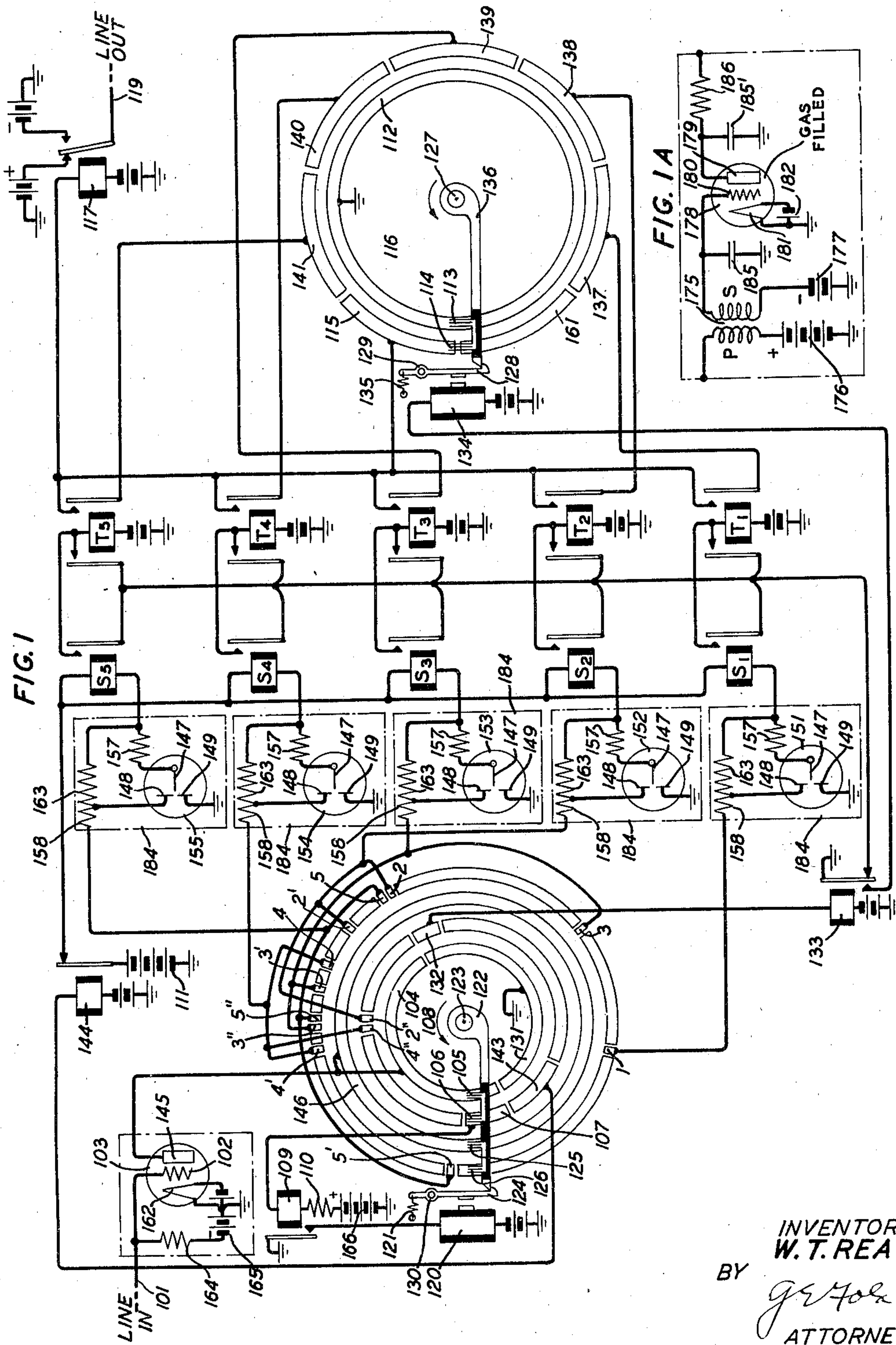
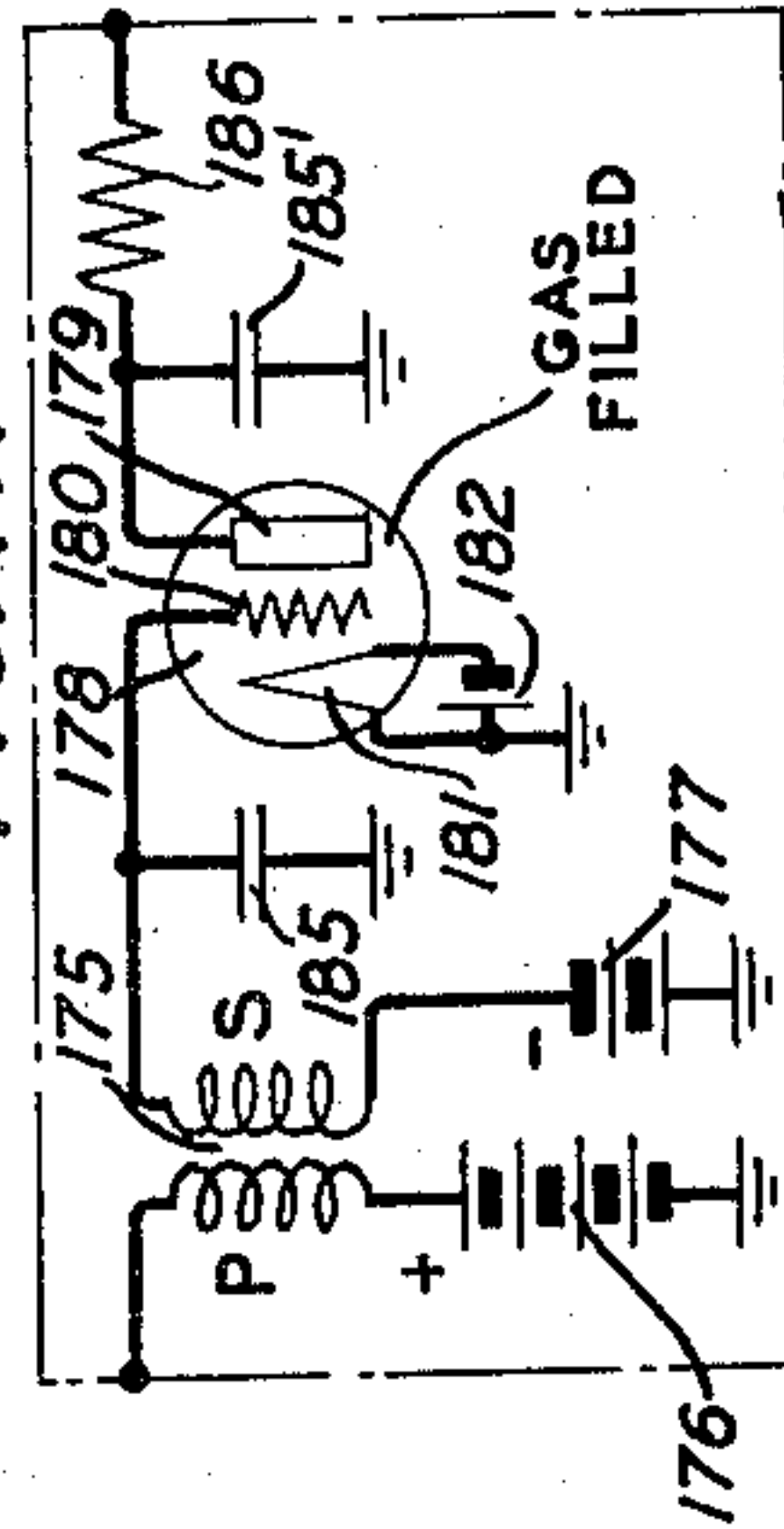


FIG. 1A



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TELEGRAPH SYSTEM

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FIG. 2

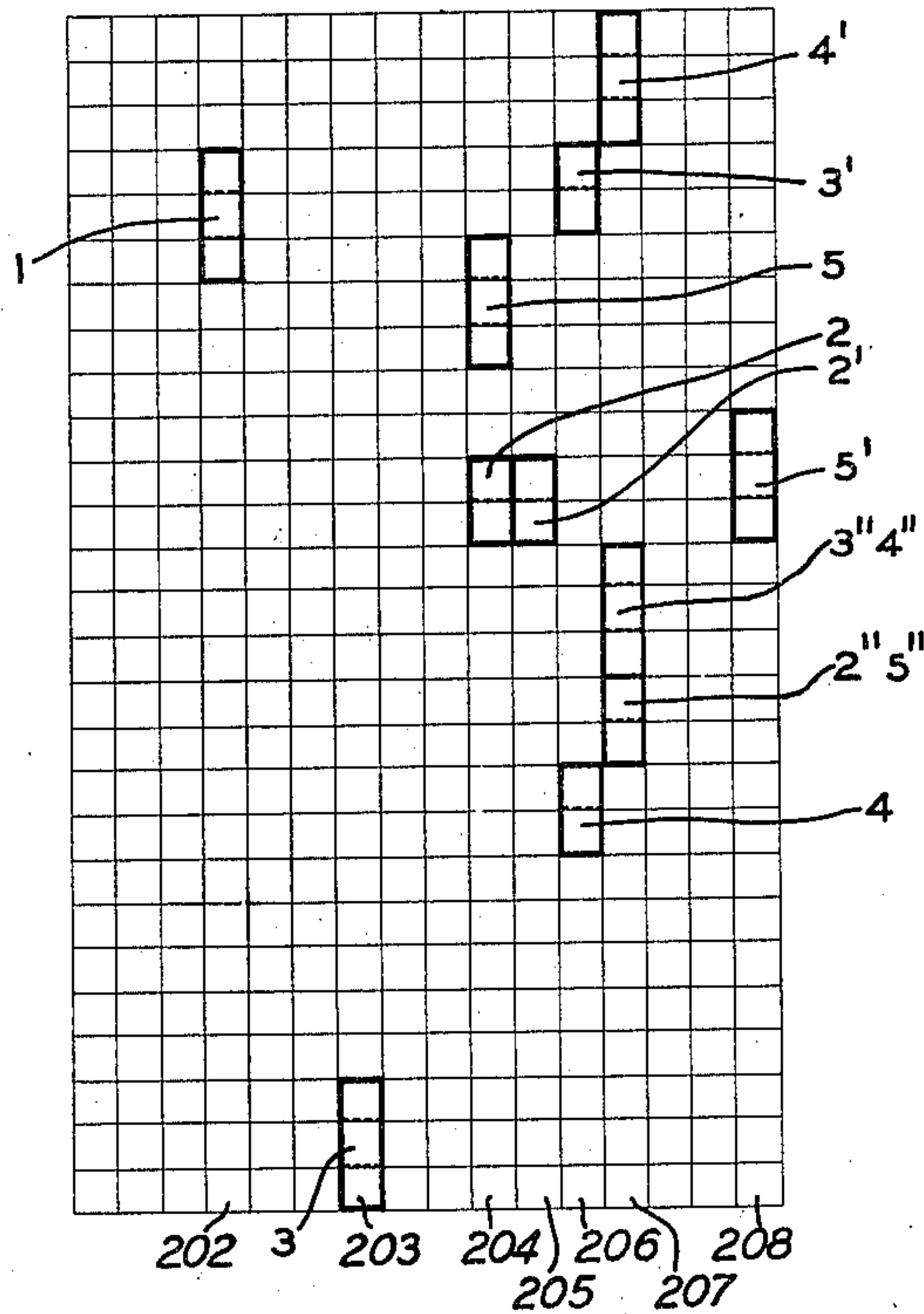


FIG. 3

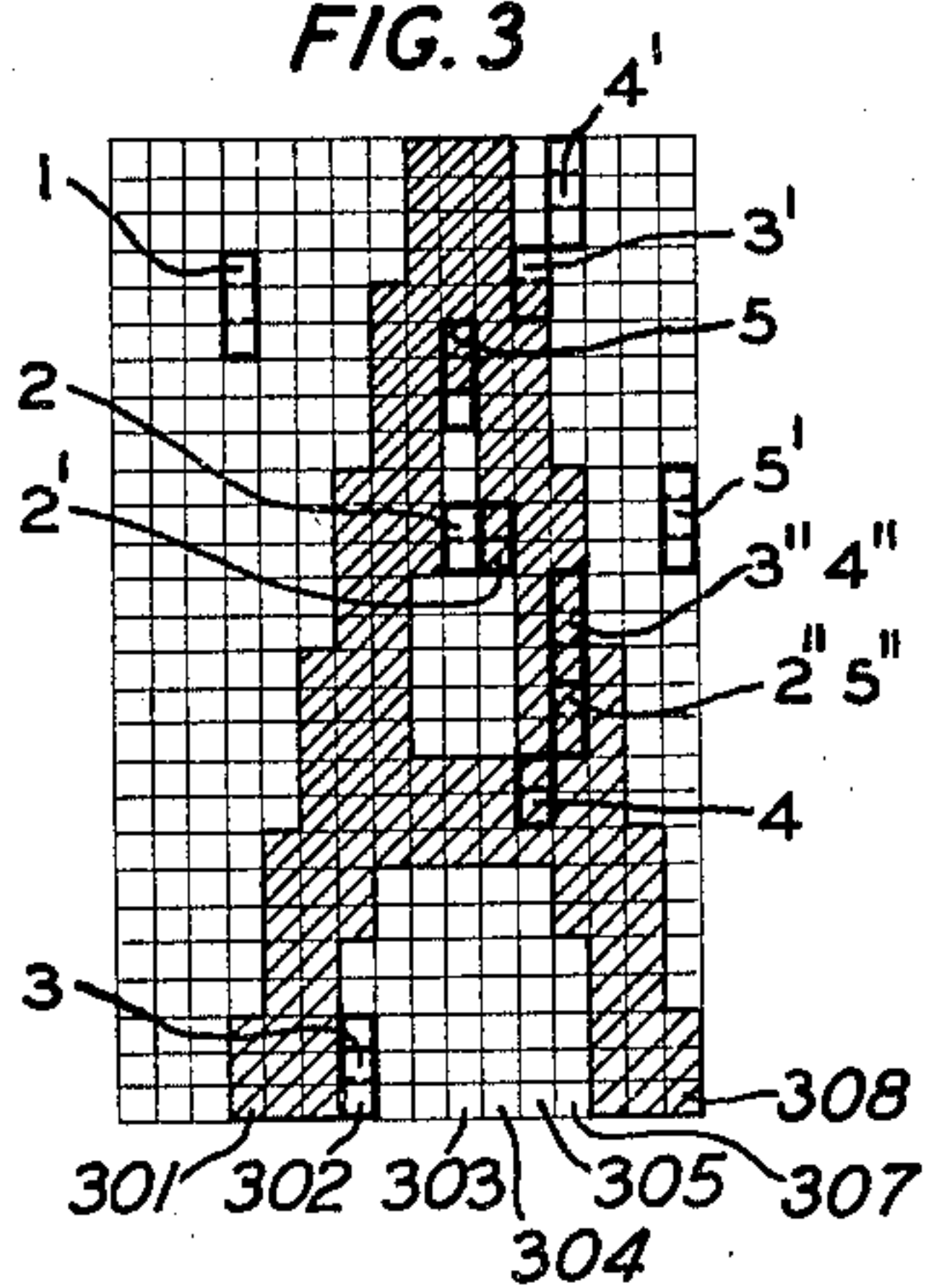


FIG. 4

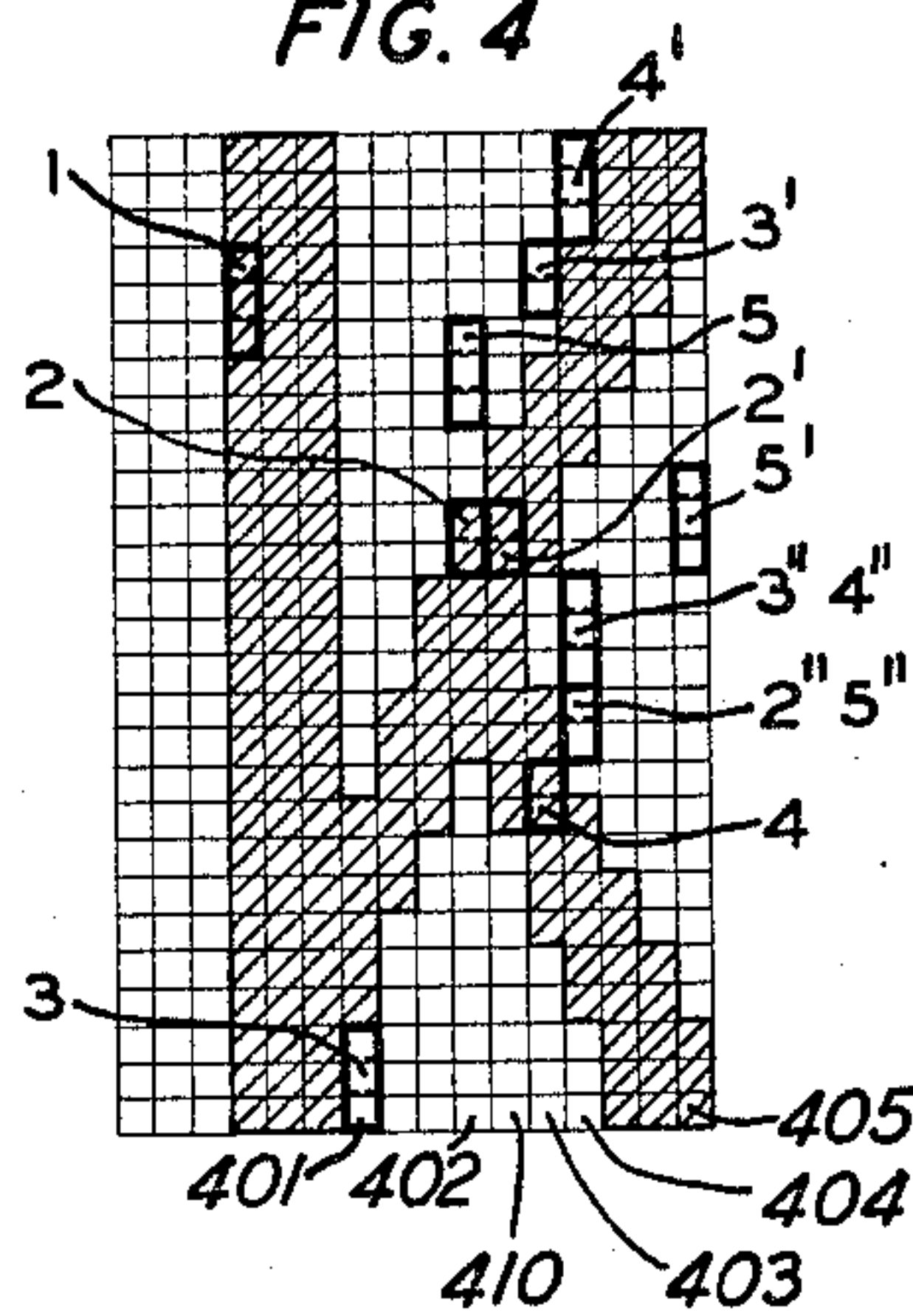


FIG. 5

	1	2	3	4	5		1	2	3	4	5
A	X	X	X	X	X	N	X	X	X	X	X
B	X	X	X	X	X	O	X	X	X	X	X
C	X	X	X	X	X	P	X	X	X	X	X
D	X	X	X	X	X	Q	X	X	X	X	X
E	X	X	X	X	X	R	X	X	X	X	X
F	X	X	X	X	X	S	X	X	X	X	X
G	X	X	X	X	X	T	X	X	X	X	X
H	X	X	X	X	X	U	X	X	X	X	X
I	X	X	X	X	X	V	X	X	X	X	X
J	X	X	X	X	X	W	X	X	X	X	X
K	X	X	X	X	X	X	X	X	X	X	X
L	X	X	X	X	X	Y	X	X	X	X	X
M	X	X	X	X	X	Z	X	X	X	X	X

SPACE

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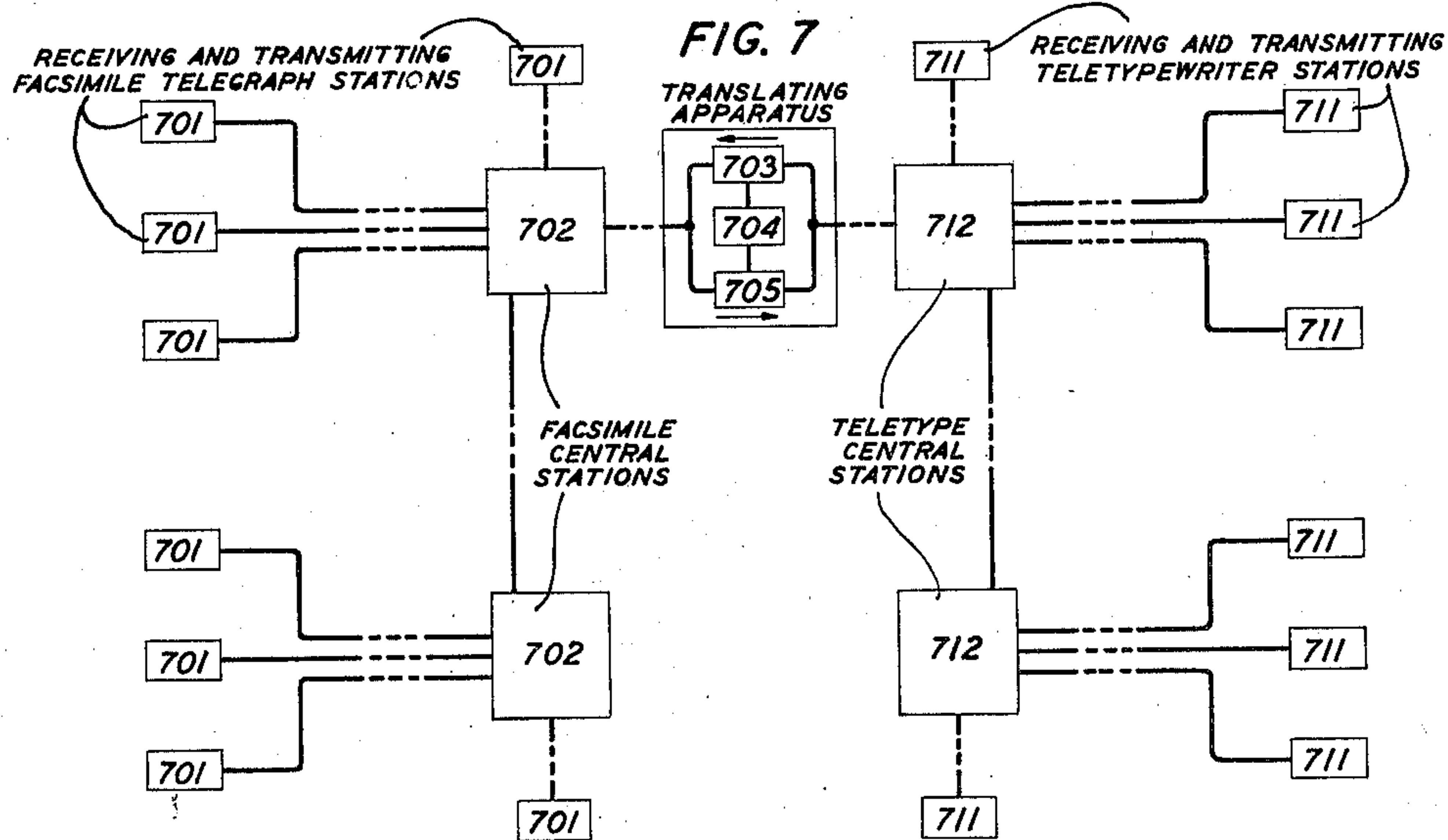
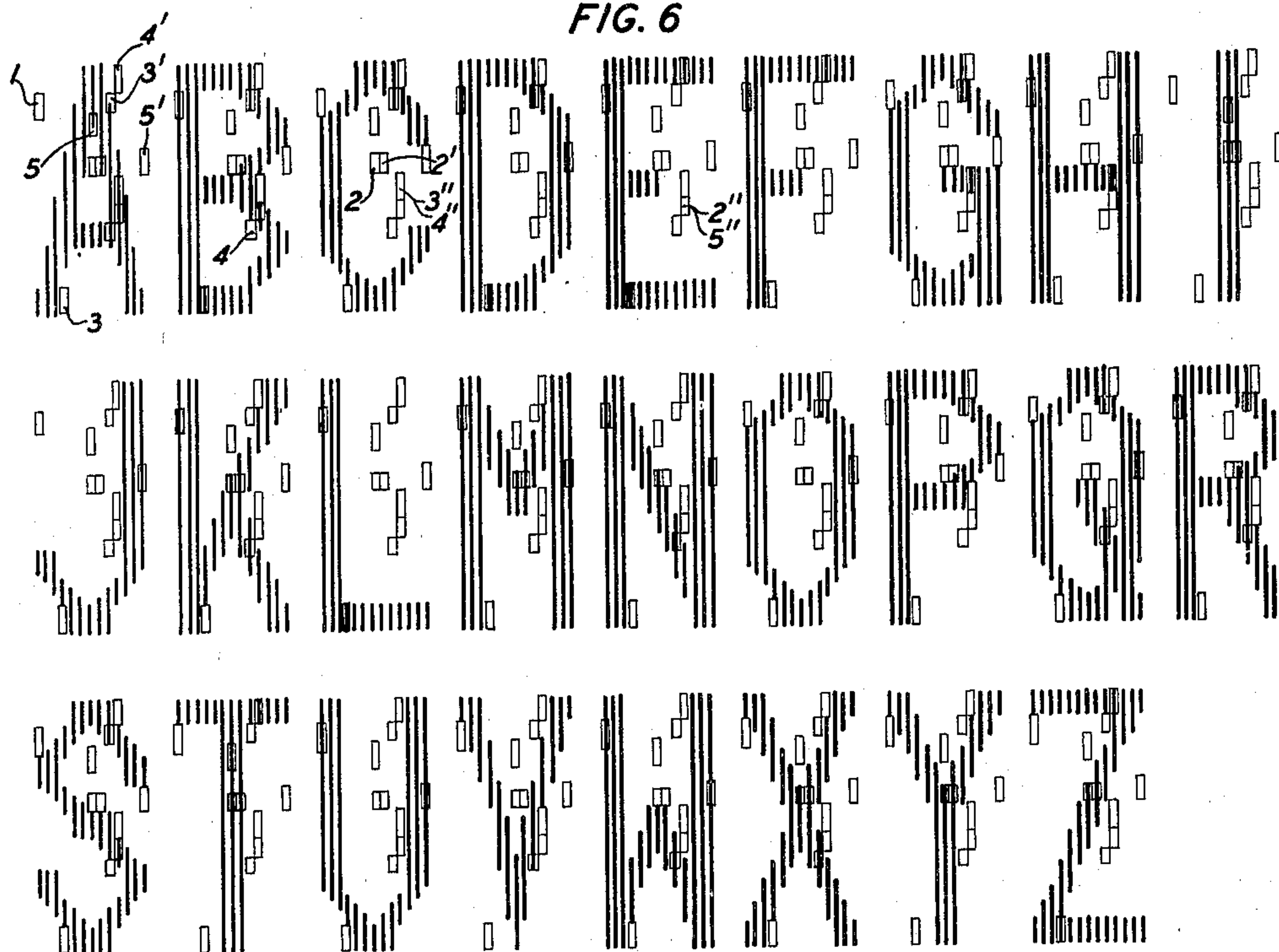
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TELEGRAPH SYSTEM

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FIG. 6



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2,086,679

TELEGRAPH SYSTEM

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Application July 13, 1934, Serial No. 735,043

5 Claims. (Cl. 178—5)

This invention relates to telegraph printing systems and more particularly to means for translating facsimile telegraph current signal impulses to Baudot permutation telegraph signal impulses.

It is sometimes desirable to interconnect facsimile telegraph systems with Baudot permutation code telegraph systems so that signals which originate in one system representing symbols may be translated into signals which represents the same symbols in the other telegraph system. British Patent No. 380,217, September 15, 1932 to W. W. Triggs discloses such systems and means for translating groups Baudot code signal impulses representing symbols into facsimile telegraph signal impulses representing the same symbols.

The object of this invention is to provide a device for translating facsimile telegraph signal impulses into Baudot permutation code current impulses.

A further object of this invention is to employ cold-cathode gas-discharge tubes to transfer impulses from one circuit to another circuit. These tubes have the advantage that they do not require a source of power to heat the cathode. In addition they do not require replacement due to cathode failure.

The invention provides a receiving distributor for selecting certain facsimile signal impulses, a transmitting distributor for transmitting Baudot permutation telegraph code impulses, and gaseous discharge tubes and relays connected between said two distributors. Both the facsimile and the Baudot telegraph systems may use the start-stop principle for synchronizing the transmitting and receiving distributors. In this case the distributors employed in the translating device of this invention are also provided with start-stop latches and magnets.

This invention provides a novel system and apparatus especially adapted for use in existing facsimile channels employing signaling circuits within the range of voice frequency and over highly perfected modern radio and other voice transmission circuits.

The invention may be more fully understood from the following description when read with reference to the accompanying drawings in which:

Fig. 1 shows diagrammatically the arrangement of apparatus and circuits employed in one embodiment.

Fig. 1A shows a modified circuit in which a hot-cathode gaseous discharge tube is employed;

Fig. 2 shows the scanning area allotted to each character in Facsimile printing telegraph systems such as described in my copending application, Serial No. 728,611, filed on June 1, 1934 and issued as Patent 2,015,155 on September 24, 1935 together with sub-areas used for translating purposes;

Figs. 3 and 4 show typical letters in these scanning areas as they normally appear with the sub-areas used for translating purposes superimposed thereon;

Fig. 5 shows a table of the various combinations of marking and spacing signal impulses in a Baudot code which represents the various letters of the alphabet;

Fig. 6 shows the shape of the various letters of the alphabet in relation to the sub-areas used for translating purposes; and

Fig. 7 shows one arrangement of the translating apparatus for interconnecting a facsimile telegraph system with a teletype telegraph system.

In general, the equipment for translating facsimile telegraph signal impulses into groups of telegraph signal impulses of a Baudot code representing the same characters consists of a detector tube, a receiving distributor rotating in synchronism with the scanning device at the sending station, five recording gaseous ionic tubes connected to the plate circuit of the amplifier or detector tube through the receiving distributor at intervals corresponding to the designated sub-areas of Fig. 2, five sensitive relays operating from the above ionic or trigger tubes, five locking or recording relays which operate from the sensitive relays, a sending distributor rotating at approximately the same speed as the receiving distributor and a sending relay operated by the sending distributor for repeating marking and spacing signals to the outgoing line.

The terms "impulses", "signal impulses", and "current impulses", as used in this patent application include carrier current and modulated carrier current impulses as well as direct current impulses.

For the purposes of this description it is assumed that the sending station in a facsimile system is sending one letter at a time such, for example, as described in British Patent 380,217, identified above. Each letter is formed by successive impulses transmitted to the line by a cam arrangement, the design of which, fundamentally, is based on a scanning of the letter in parallel lines; that is, parallel rows of small sub-areas examined in sequence. Since each letter of the

alphabet and each of the other commonly employed characters is of a distinctive shape, a different arrangement of signal impulses will be produced for each of the letters or characters transmitted. Fig. 3, for instance, shows the shape for the letter A and Fig. 4 the shape for letter K in which the shaded areas outlining the letter represent the successive intervals of time that certain impulses are transmitted to the line.

Referring to Fig. 2, it will be observed that certain definite fixed sub-areas numbered 1 to 5, 2' to 5' and 2'' to 5'' are designated on the scanning area allotted to each letter or character. These sub-areas represent the times when one or more of the five recording ionic tubes of Fig. 1 are connected to the incoming line detector. If the shape of the letter being sent is such as to cover any or all of these fixed sub-areas, the corresponding impulses will be registered by the corresponding recording tubes 151 to 155 (see Fig. 1) above mentioned, and will result in the sending distributor transmitting marking and spacing signals to the outgoing line corresponding to the letter occupying these various fixed sub-areas.

An individual receiving channel or line 101 is shown in Fig. 1 incoming from a telegraph transmitter of the facsimile type, said channel being shown terminating in an amplifier or detector tube 103. However, it is to be understood that tube 103 may be the last tube of a multi-tube amplifier. Since the specific details of such an amplifier form no part of this invention, they have not been shown. The detector 103 may be of any well known construction, but preferably is of the vacuum tube type having its grid circuit adjusted in a well known manner so that when no impulses are being received, substantially no current flows in the output circuit of the detector, but when impulses are being sent over the line to the detector by the facsimile transmitter a current flows in the output circuit of the detector.

While this particular description of this invention assumes a facsimile system operating on a start-stop basis, it will be readily understood that it could also be arranged for continuous synchronous operation. The plate 145 of the detector 103 is normally connected to plate battery 166 through resistance 110, winding of starting relay 109 and receiving distributor 108 so that the starting impulse, which always precedes the sending of a character or letter, will operate relay 109 and cause magnet 120 to release distributor arm 122 for one complete revolution after which it again is held by the latch 124. The receiving distributor 108 as well as the sending distributor 116 of Fig. 1 are shown only in schematic form since mechanisms of this kind are well known in printing telegraphy. It will be further understood in connection with said distributors that they are motor driven and that means are provided for accurate control of their speed, or for synchronizing them with the speed of similar distributors in other parts of the systems. Receiving distributor arm 122 when released by start magnet 120 should therefore be thought of as rotating in synchronism with the cam shaft of the facsimile transmitter. Similarly, when the distributor arm 136 of the sending distributor 116 is released by start magnet 134, it is assumed to rotate at approximately the same speed as receiving distributor 108.

It will be further understood that segments numbered 1 to 5, 2' to 5' and 2'' to 5'' on re-

ceiving distributor 108 are so disposed that, during the rotation of arm 122, plate 145 of tube 103 is connected to the ionic tubes 151 to 155 for recording signal impulses receiving from line 101 through the detector 103. The similarly designated sub-areas in Fig. 2 represent more clearly the intervals during which the segments just described are connected to plate 145 of detector 103. When a signal is received so that rectified current will flow in the plate circuit of detector tube 103 as arm 122 passes over any of the segments 1 to 5, 2' to 5', or 2'' to 5'', it causes ionic tubes 151 to 155 to break down and operate the corresponding recording relays S₁ to S₅ and eventually cause transmitting relay 117 to send out marking and spacing signals in accordance with the recording relays that have been operated by the received signals. The several combinations of signal impulses of a Baudot code representing various symbols are shown in Fig. 5.

The operation of translating facsimile signals into Baudot code signals will now be described. Normally the circuit of line 101 terminating in grid 102 does not have a source of current connected to it at the sending end. When, however, a character is to be transmitted a short starting pulse of current is sent over the line 101 causing relay 109 to operate over a circuit, from battery 166, through resistance 110, segment 107, brushes 105, 106, segment 104 to plate 145 of tube 103. Relay 109 in operating energizes start magnet 120 through its make contacts which in turn unlatches arm 122 which then starts to rotate in a counter-clockwise direction and in synchronism with the sending facsimile transmitter. Facsimile systems, as is well known, transmit messages by sending current impulses to the line at intervals depending on the shape of the letter or character to be sent. This is accomplished by a method of scanning in which characters or symbols are divided into any suitable number of sending units of area. Since the receiving distributor 108 of Fig. 1 is arranged to rotate in synchronism with the transmitter, the latter area of Fig. 2 may be assumed to be the same as that for the facsimile transmitter. When, therefore, the letter A is being transmitted, the shaded areas in Fig. 3 actually represent those intervals of time during which a source of alternating or direct current is connected to the line. It will thus be observed that shaded areas in this case actually overlap at least one of the sub-areas 2 to 5, 2' to 5' or 2'' to 5'' but do not touch the sub-area 1 which is near the top of vertical strip 301. The letter A therefore will be represented and retransmitted in Baudot code by marking impulses during intervals 2, 3, 4 and 5 of the code as will later be explained. Another example is found in the letter K shown on the letter area of Fig. 4. In this case the shaded areas overlap at least one of the sub-areas 1, 2, 4, 2', 4', 2'' and 4'' but do not overlap any of the sub-areas 5, 5' or 5'' which are near the top of vertical strip 402 and near the middle of strips 405 and 404, respectively. Neither do they overlap any of the sub-areas 3, 3' or 3'' located at the bottom of vertical strip 401 and near the top of strip 403 and middle of strip 404 respectively. The letter K therefore will be represented and retransmitted in Baudot code by marking impulses during the intervals 1, 2 and 4 of the code as will now be explained.

The receiving distributor arm 122, having been

started rotating in synchronism with the fac-
simile transmitter as previously explained, car-
ries brushes 105 and 106 into momentary contact
with segments 131 and 143, respectively. A cir-
cuit for relay 144 is thus momentarily established
starting from the grounded segment 131, brushes
105 and 106, segment 143, thence through the
winding of relay 144 to battery. Relay 144, in
turn, first operates and then releases. This
momentarily disconnects battery 111 from relays
S₁ to S₅ and associated ionic tubes 151 to 155.
This interrupts the discharges in these tubes and
restores them and their associated relays S₁ to S₅
to normal in case one or more may have been op-
erated during the previous cycle or revolution of
arm 122. These tubes and relays are then free
to record impulses received from segments 1
to 5, 2' to 5' and 2'' to 5'' as the distributor
arm 122 continues to rotate.

Assuming the letter A, as shown in Fig. 3, is
being translated, signal impulses will not be re-
ceived from line 101 at the time distributor arm
122 with its brushes passes over segment 1 so
that substantially no current will flow in the plate
circuit of detector tube 103 at this time. Ionic
tube 151, therefore, will remain normal and re-
lay S₁ will not operate. Arm 122 with its
brushes then moves on over segment 3 at which
time no signal impulses are received from line
101 because this segment corresponds to the sub-
area 3 at bottom of vertical row 302, which is not
shaded, as shown in Fig. 3. When arm 122
reaches segment 132, ground on segment 131 is
connected through brushes 105 and 106 to seg-
ment 132 and thence through relay 133 to battery.
Operation of relay 133 first opens ground at its
armature from its back contact, thus opening the
operating and locking circuits of relays T₁ to T₅
which causes them to restore to normal. Relay
133 at its front contact connects ground to start
magnet 134 of sending distributor 116 which
causes it to attract its armature 128 and unlatch
distributor arm 136. Since the speeds of the two
distributors are approximately the same it will be
evident that distributor arm 136 will trail be-
hind distributor arm 122 by more than a half
revolution, thus giving arm 122 with its brushes
time to pass over the segments of distributor 108
before distributor arm 136 passes over the re-
lated segments of distributor 116. Upon first
moving off normal, arm 136 with its brushes 113
and 114 immediately breaks a circuit from ground,
connected to segment 112, through segment 115
and relay 117 to battery. Relay 117, in re-
leasing, substitutes a negative for the positive
potential connected to line 119 which negative
potential serves as a spacing or start signal or
impulse. While arm 136 is moving over segment
161 to transmit the start signal impulse, further
movement of arm 122 will be described.

Receiving distributor arm 122 in moving past
segment 132 releases relay 133 which in turn
restores ground to the operating and locking cir-
cuits of recording relays T₁ to T₅ and also opens
the circuit starting magnet 134. The latch 128
pivoted at 129 on magnet 134 is thus restored to
its normal position by spring 135 so as to stop
rotation of arm 136 at the end of one revolution.
Upon further movement of arm 122, brush 126
passes over segment 2 thus closing the circuit to
ionic tube 152 from plate 145 of vacuum tube 103.
Signal impulses are not received at this time dur-
ing the transmission of letter A because the sub-
areas 2 in vertical column 303 of Fig. 3 are not
shaded by the letter A. Ionic tube 152, therefore,

does not break down. A further movement of
arm 122 brings brush 126 into contact with seg-
ment 5 thus completing a circuit for ionic tube
155 traced from the plate 145 of vacuum tube
103, ring 146 of distributor 108, brushes 125 and
126, segment 5 and resistance 158 to tube 155.
Again referring to Fig. 3, it will be observed that
sub-area 5 is shaded by letter A which indicates
that signal impulses are received, at this moment,
from line 101. Due to the action of vacuum tube
103, current will flow in its plate circuit from
grounded battery 111 through contacts of relay
144, winding of relay S₅, resistances 163 and
158, segment 5, brushes 126 and 125, and seg-
ment or ring 146 of distributor 108 to the plate
145 of tube 103. This current flowing through
resistance 163 will cause a potential drop across
it to ionize the gas in the tube 155.

These tubes 151 to 155 are of a cold-cathode
gas-filled type having three electrodes 147, 148
and 149 two of which 148 and 149 are coated or
activated so they will more readily emit electrons
in an electric field without the application of heat.
The tubes are so constructed that it requires a
higher potential to start a discharge or to ionize
the gas surrounding these electrodes than it does
to maintain the discharge. In addition, these ele-
ments are so constructed and assembled that it
requires a higher potential between elements
147 and 149 to initiate a discharge than between
elements 147 and 148. However, after a discharge
is started between elements 147 and 148, it re-
quires a much lower potential between elements
147 and 149 to start and maintain a discharge
therebetween. In addition, once a discharge is
started between elements 147 and 149, it is not af-
fected by the discharge or potential between ele-
ments 147 and 148. By connecting elements 147
and 148 to an input circuit and elements 147 and
149 to an output circuit, impulses may be re-
peated from the input circuit to the output
circuit.

Thus when a discharge has started between
electrodes 147 and 148, the potential between
electrodes 147 and 149 is sufficiently high to start
a discharge between them. The currents
through these discharges operate and hold re-
lay S₅ operated on a circuit traced from positive
battery 111, normal contact on relay 144, wind-
ing of relay S₅, resistance 157 and electrode 147
of tube 155 to ground connected to electrode 149.
Resistance 157 is provided to limit the current
through tube and associated relay. Relay S₅,
in operating, causes recording relay T₅ to oper-
ate and prepare a circuit from battery through
relay 117 to segment 141 on sending distributor
116.

Receiving distributor arm 122 continues to
move until brush 126 contacts with segment 2'.
According to Fig. 3 this sub-area located in ver-
tical strip 304 is shaded by letter A indicating
that a signal impulse is received from line 101
at this time. Ionic tube 152 which is connected
to segment 2' breaks down causing relays S₂ and
T₂ to operate as described in preceding para-
graph for relays S₅ and T₅. A further movement
of arm 122 brings brush 126 into contact with
segment 4 which in like manner causes signal
impulses from line 101 at this time to break
down ionic tube 154 and operate relays S₄ and T₄.

While the movement of receiving distributor
arm 122 has taken place as described in the above
two paragraphs, the sending distributor arm 136
has been passing over segment 161 causing relay
117 to release and send a start signal of negative

spacing current over line 119. As this arm continues to rotate, the ground connected to segment 112 will be in turn connected through brushes 113 and 114 to each of the five segments 137 to 141. This will operate relay 117 if the corresponding relays (T_1 to T_5) connected to the respective segments are in an operated position. As previously stated distributor arm 136 trails behind distributor arm 122. While arm 136 continues to pass over segment 137 further movement of arm 122 will be described.

Brush 126 on distributor arm 122 now comes in contact with segment 3'. According to Fig. 3 a portion of this sub-area located near the top of vertical strip 305 is shaded by the letter A indicating a signal impulse is received from line 101 at this moment. As previously described in connection with tube 155 the gas-filled tube 153 is caused to break down and operate relays S_3 and T_3 . The arm 122 moving further brings brush 126 into contact with segment 5'' and brush 106 in contact with segment 2'' which would cause tubes 152 and 155 to break down but as has been described they already have been broken down. Similarly these same brushes contact next with segments 3'' and 4'' respectively which also would cause tubes 153 and 154 to break down but as has been shown these too have previously been broken down, when distributor arm 122 passed over segments 4 and 3'. On further rotation of arm 122 brush 126 contacts first with segment 4' and then with segment 5'. According to Fig. 3 signal impulses are not received from line 101 at these times, but the associated tubes 154 and 155 having previously been broken down, remain so until released by operation of relay 144 during the transmission of a succeeding letter or character.

The complete rotation of distributor arm 122 has, in the manner described above, caused ionic tubes 152, 153, 154 and 155 to break down thereby causing the operation of the recording relays T_2 , T_3 , T_4 and T_5 . The locking circuit for these relays is controlled by relay 133. Relay 133 must, therefore, remain normal until arm 136 has carried brush 114 over all the segments of distributor 116 in order to prevent the release of these recording relays T_1 to T_5 before the distributor arm 127 has finished transmitting the complete signal combination.

Distributor arm 136 in passing over segment 137 fails to operate relay 117 because relay T_1 had not operated thus holding the circuit for relay 117 open and causing a negative spacing signal impulse to be sent out on line 119. The further movement of arm 136 connects ground through its brushes 113 and 114 to segments 138, 139, 140 and 141 in succession. Since relays T_2 , T_3 , T_4 and T_5 are operated as previously described, the relay 117 will operate and transmit a positive marking signal to line 119 during each of the four periods, which together with the previous period corresponding to segment 137, form a five-unit Baudot code combination corresponding to the letter A which was sent out on line 101 by a facsimile transmitter.

The combinations of marking signal impulses representing the other letters in the alphabet are shown by an X mark in the table in Fig. 5. When distributor arm 136 causes brush 114 to connect with segment 115, a circuit is closed from the ground connected to ring 112 directly to the winding of relay 117 thus always operating relay 117 to send a positive marking signal impulse on line 119 after the Baudot signals have

been sent. This commonly serves as a stop signal. The arm 136 upon returning to normal strikes the latch 123, is stopped and prevented from rotating any further.

Another example of the manner in which a letter in the facsimile system is translated into a Baudot code signal representing the same letter is illustrated in Fig. 4 which shows the facsimile letter K. In this case it will be observed that sub-area 1 in vertical strip 401 is shaded by the letter K. Likewise sub-area 2 and 2' in strips 402 and 410 and sub-area 4 in strip 403. The other fixed sub-areas do not fall within the area of the letter K so that as indicated in Fig. 5 the letter K in facsimile code is translated into Baudot code as marking signal impulses for the first, second and fourth elements of the Baudot code employed. In this manner the various letters or other characters occupy one or more of the fixed sub-areas giving a distinctive Baudot permutation code combination for each letter or other character as shown in Fig. 6. Here the various letters of the alphabet are shown on the letter space and cover the various sub-areas in accordance with table 5.

Fig. 7 shows one manner in which this invention may be used to interconnect a facsimile telegraph system and a teletype telegraph system. Here 701 represents facsimile telegraph stations which may either send or receive and record facsimile telegraph signals or they may both send and receive and record these signals. These stations may be connected to central stations 702 by telegraph lines or channels. These central stations may include switching and testing apparatus and circuits. The teletype system is shown in similar form in which 711 represents the receiving and transmitting stations while 712 represents the central stations. In addition these stations may be in a broadcast system, a news system or supplied to individual subscribers or some of them may belong to each of these systems.

The translating apparatus is shown to comprise three general elements 703, 704 and 705. The translating device for changing teletype signals into facsimile signals is represented by 703 and may be similar to the arrangement shown in British Patent 380,217, September 15, 1932 granted to W. W. Triggs. The translating apparatus (such as shown in Fig. 1) for changing facsimile telegraph signals into teletype code signals is represented by 705. A lockout device 704 is provided to prevent the operation of either 703 or 705 during the operation of the other of these devices so that there can be no interference between them.

Thus, in the arrangement shown in Fig. 7, signals which originate at any of the stations 701 and 711 of either system may be received and recorded by any or all of the other stations of either or both systems.

It will be obvious that the general principles thus disclosed may be embodied in other organizations widely different from those illustrated, without departing from the spirit of the invention as defined in the following claims.

For example, Fig. 1A shows one circuit by which some or all of the cold-cathode tubes 151 to 155 may be replaced by hot-cathode tubes. Here the primary P of input transformer 175 is connected to the distributor segments and to battery 176 which serves as the B battery for tube 103. The secondary S of this transformer 175 is connected to the grid 120 of the hot-cathode gas-discharge

tube 178 and to battery 177 which provides the bias potential of the grid 180 of this tube. The cathode 182 is heated in any suitable manner such as by current from battery 182. The operation of this circuit and tube is similar to that described for tubes 151 to 155 and their associated circuits. If a signal impulse is being received from line 101 when the primary P of transformer 175 is connected to the plate of tube 103, it will be transmitted to the grid 180 of tube 178 and oppose the bias potential of battery 177. This causes the tube to break down and start a discharge therethrough. This discharge will continue unaffected by the grid potential until the plate circuit through current regulating or limiting resistance 183 and the associated S relay to battery 111 is interrupted by relay 144. In this manner impulses received from line 101 are amplified, selected, distributed and stored by these tubes and associated relays until after being retransmitted by distributor 116. Condensers 185 and 185' may be provided to prevent stray fields from affecting the operation of tube 178.

What is claimed is:

1. In combination, a first printing telegraph system comprising a plurality of telegraph stations each having telegraph transmitting and receiving apparatus for transmitting and receiving permutation code combinations of telegraph signal impulses representing symbols, and telegraph communication channels connected between said stations, a second printing telegraph system comprising a plurality of stations having facsimile printing telegraph transmitting and receiving apparatus, and telegraph communication channels connected between said stations, translating apparatus connected between said systems comprising printing telegraph transmitting and receiving apparatus for transmitting and receiving permutation code combinations of telegraph signal impulses, a first communication channel connecting said apparatus to said first system, facsimile telegraph transmitting and receiving apparatus for transmitting and receiving facsimile telegraph signal impulses, a second telegraph communication channel connecting said facsimile apparatus to said second telegraph system, and translating means operatively connected between the receiving apparatus connected to each of said telegraph communication channels and the transmitting apparatus connected to the other of said telegraph communication channels whereby symbols transmitted in either of said systems may be properly recorded in the other system.

2. A translating system comprising an incoming telegraph line, a facsimile telegraph receiving apparatus connected to said line, selective means operatively connected to said apparatus for selecting only a certain portion of certain of the impulses received over said telegraph line, storing means controlled by said selective means for stor-

ing said selected portions of said selected impulses, a telegraph transmitting device comprising permutation members, an operative connection between said permutation members and said storing devices, and an outgoing line connected to said telegraph transmitting device.

3. In combination, a teletypewriter communication system comprising a plurality of telegraph stations connected together by communication circuits and start-stop telegraph transmitting and receiving apparatus employing permutation code combinations of telegraph signal impulses for representing symbols connectable to said telegraph communication circuits at each of said stations, a facsimile telegraph communication system comprising a plurality of telegraph stations, start-stop facsimile telegraph transmitting and receiving apparatus for transmitting and receiving start-stop facsimile telegraph signal impulses, each impulse of which represents a unit area of a symbol space, and start-stop interconnecting means for connecting said systems together comprising start-stop facsimile receiving and transmitting apparatus, start-stop teletypewriter transmitting and receiving apparatus, and an operative connection between said facsimile transmitting and receiving apparatus and said teletypewriter transmitting and receiving apparatus whereby telegraph signal impulses originating in either system representing a symbol will cause the corresponding symbol to be recorded in both of said systems.

4. A telegraph translating device comprising an incoming line, start-stop facsimile distributors connected thereto, means responsive to facsimile telegraph signal impulses received over said line for starting said distributor, a start-stop permutation code teletypewriter transmitting distributor, translating means operatively connected between said facsimile start-stop distributor and said permutation code transmitting distributor and means for starting said transmitting distributor when facsimile telegraph signal impulses are received from said incoming line.

5. In a telegraph system, an incoming line, a receiving device connected thereto for receiving telegraph signal impulses, a start-stop distributor operatively connected thereto for selecting a few of said impulses, means responsive to received impulses for starting said distributor, a plurality of gas-filled ionic tubes operatively connected to said distributor for storing said selected impulses, additional storing means connected to said gas-filled ionic tubes, a start-stop transmitting distributor for transmitting permutation code groups of telegraph signal impulses, an outgoing line connected thereto, means for starting said transmitting distributor when signals are received from said incoming line, and means operatively connected to said first distributor for controlling said gas-filled ionic tubes and said storing means.

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