July 8, 1941. L. M. POTTS 2,248,583

CODE TRANSLATING MECHANISM

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FIG. 1

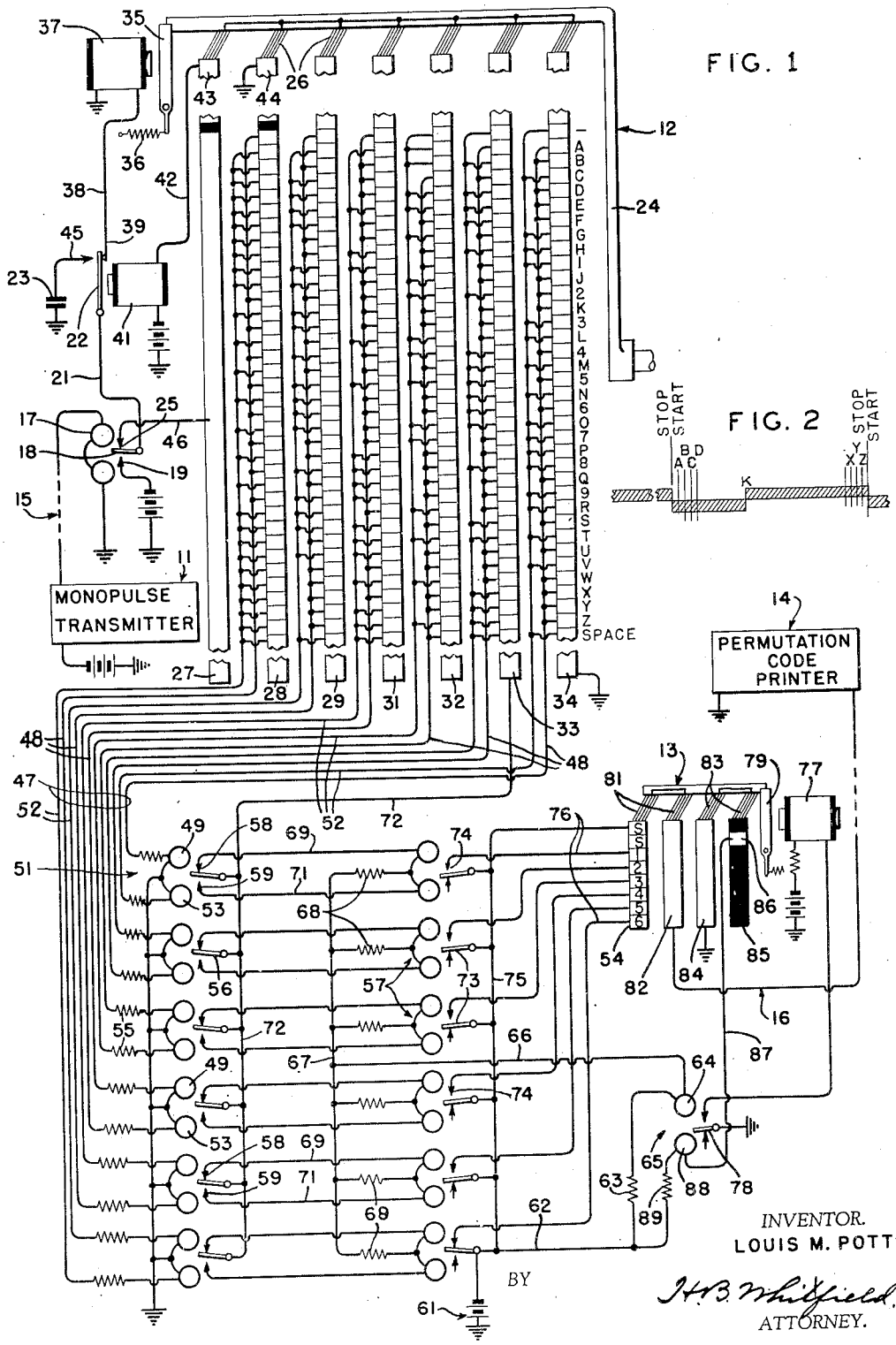

FIG. 2

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CODE TRANSLATING MECHANISM

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18 Claims. (Cl. 178—70)

The present invention relates to signal translating apparatus and more particularly to apparatus which is responsive to signals in accordance with one fundamental code for recreating signals of a different fundamental code.

In obtaining a signal translation in accordance with a preferred embodiment, the initial or starting code is of a type identified as a monopulse code whereas the ultimate or translated signals are of the type identified as a permutation code. A salient difference between the two systems of transmission is that whereas monopulse signals each have but one interval of characteristic current change, the permutation code signals have the possibility of several characteristic current changes during a complete signal. The present system embodies apparatus for converting monopulse signals directly into permutation code signals automatically and without the use of intervening permanent storage medium.

The principal object of the present invention generally stated is to provide in an instantly responsive mechanism means for converting telegraph signals whose distinguishing characteristic is based upon a periodicity change directly into permutation code or start-stop signals for operating standard permutation code telegraph apparatus.

Other objects of the present invention will be revealed in the course of the following detailed description during which reference will be had to the accompanying single sheet of drawings, like reference characters denoting corresponding parts throughout.

In the drawing,

Fig. 1 represents a schematic circuit having embodied therein certain principles of the present invention, and

Fig. 2 is a curve chart depicting one signal of the monopulse type used in operating printers of the class disclosed in U. S. Patent No. 2,177,077, issued Oct. 24, 1939, to L. M. Potts.

In Fig. 1 there is illustrated one embodiment of the present invention in a circuit diagram of a translating station apparatus in which the general reference character 11 denotes a remote station monopulse transmitter. This instrumentality may be one such as is illustrated in copending application Serial No. 102,443, filed September 25, 1936, or it may be an automatic transmitter for generating this type of signal under the supervision of a tape. The reference character 12 denotes generally a translating distributor responsive to the single characteristic impulse of monopulse code signals, and the reference character 13 denotes generally a start-stop transmitting distributor for generating permutation code signals which are made to correspond with the particular monopulse signal received during a given cycle over the aforedescribed distributor 12. The symbolic representation 14 denotes a permutation code printer which may be of the type illustrated in U. S. Patent No. 1,821,110 or any other type of recording apparatus which is responsive to a six-unit permutation code signal.

Accordingly, it will be understood that over an incoming line 15 there may be received signals of the so-called monopulse type while over a main or auxiliary outgoing line 16 there are produced signals which have the same significance as those received over line 15 but translated in terms of a conventional start-stop permutation code.

Monopulse signals may be composed of current and no-current signal conditions utilizing accordingly a biased type of receiving relay 17 whose armature 18 is normally presented against its upper contact point 25. As may be understood by referring to Fig. 2, the transmission of monopulse signals of the type contemplated involves the interruption of a normal line condition for a measured interval which is initiated at a point definite with respect to each transmission cycle and is continued until the distributors have attained a position in the cycle which corresponds to and is identified with the particular character transmitted. At the termination of this impulse normal line current condition is restored as indicated at the character K in Fig. 2. Normal line current is then maintained until the arrival of the succeeding start-stop instant when, if a succeeding character is in readiness for transmission, another line interruption is thereat repeated. As explained in said copending application, the alternative (normal and character impulse) line conditions may if preferred be comprised of positive and negative signals or they may be comprised of either polarity of current as one line condition with no current as the alternative line condition. Variations of signaling practice along these lines are not inconsistent with the structural principles disclosed in the present invention.

Under the indicated conditions of operation, therefore, current is found on line 15 and the local relay 17 is energized. Armature 18 assumes a position such as illustrated in Fig. 1 having contactual engagement with its upper contact point 25.

When no signals are transmitted, the condition

of the apparatus at the translating station is as follows: The translating distributor arm 24 is arrested with its set of brushes 26 engaging the first segments of rings 27, 28, 29, 31, 32, 33, and 34 in the distributor, and this condition is maintained by the start-stop arm 35 which is at this time relaxed because of the de-energized condition of the start-stop relay 37 and therefore under the influence of its spring 36. The circuit for energizing relay 37 may be traced from ground through the winding of said magnet 37, line 38, front contact 39 and armature 22 of a start-stop preparatory relay 41, line 21, armature 18, contact 19 to grounded battery. This circuit is now open because armature 18 is found in its upper position in contactual engagement with contact point 25. Upon the receipt over line 15 of a current change as indicated at the start-stop interval of Fig. 2, relay 17 will reverse the position of armature 18 permitting it to come into contactual engagement with its lowermost contact 19, causing to be energized the start-stop relay 37.

When relay 37 is energized, it withdraws its armature 35 which is the stop pawl for distributor arm 24 and thereupon said distributor arm is released to rotate and to accordingly permit its several brushes to sweep across the segments of the afore-enumerated rings 27, 28, etc.

As the brushes pass over the first segments, the circuit for energizing preparatory relay 41 is broken, which circuit is traceable from grounded battery through the winding of said relay 41, line 42, segment 43 of ring 27, its associated brush 26, the common brush connector line, brush 26 of ring 28, to the grounded segment 44 of said ring. As the result of the de-energization of preparatory relay 41, its armature 22 is permitted to fall away breaking engagement with its front contact 39 and making engagement with its back contact 45. When this is done, a circuit is completed for charging the condenser 23 which circuit is traceable from ground through the condenser 23, contact 45, and armature 22 which is now in engagement therewith, line 21, armature 18, contact 19, to grounded battery. Meanwhile it will be recalled that distributor arm 24 is sweeping downwardly (in accordance with the symbolic representation in Fig. 1) bridging the several segments of the rings 27, 28, etc., in successive sequences.

At some interval before the brushes 24 have completed their traversal of the several distributor rings, a change of current will occur; for example, as indicated at the character K, Fig. 2, whereupon the relay 17 will reverse the position of its armature 18, causing it again to come into contact with upper contact point 25. The instant that armature 18 engages its contact point 25 the potential which has been stored in condenser 23 is instantly released over its circuit aforedescribed, through contact point 25, line 46, the solid portion of ring 27, over the several brushes 26, and their common connector, all of the segments of rings 28, 29, 31, etc., with which the brushes 26 happen then to be in engagement; for example, as denoted at K, then over the collector lines of cable 47.

In this connection it will be noted that of the cable 47 six component lines 48 are classifiable as marking lines, these going to the windings 49 of a set of primary storage polar relays 51 while the remaining six classifiable as spacing are designated 52 and go to the windings 53 of said polar relays 51. The twelve lines, one each of the classes aforedesignated 48 and 52, are grouped into six pairs, one of each class to a pair and in accordance with this grouping are associated with the segments of rings 28, 29, etc., variously as may be seen in Fig. 1. In connection with the afore-indicated example of the letter K, it will be noted that its first four segments (counting from the right towards the left) are connected to lines 48 which have been designated as marking lines. The remaining two segments are connected to the spacing lines 52 because the signal K in a six-unit permutation code such as is herein contemplated is made up of four marking impulses in the first four positions and two spacing impulses in the remaining two positions. These components have been designated on the distributor ring 54 of distributor 13 by the labels 1, 2, 3, 4, and 5, an index classification which is conventional in telegraph practice.

The several windings 49 and 53 of the six relays 51 are electrically balanced as by the use of balancing resistances 55 so that the discharge of condenser 23 will be equally divided over the several courses, causing to be energized said relays 51 in various permutations to correspond to the distribution of the signal as predetermined by the connection of the character segments of the rings 28, 29, etc., to the lines 48 and 52.

The relays 51 have been termed primary storage relays because they in turn, through their armatures 56, establish energizing circuits for a corresponding set of secondary storage relays 57 by engagement with upper or lower contact points 58 or 59, respectively. The circuits for energizing the secondary relays 57 are traceable from grounded battery at 61, over line 62, resistance 63, through the energizing winding 64 of a relay 65, line 66 to the common wire 67, thence parallelly to the several individual resistances 68, one or the other of the windings of secondary relays 57 and their corresponding return line 69 or 71, to their respective contact points 58 or 59. Of the last mentioned alternative courses, the determination is established by the condition of the mutual armature 56; that is, whether it is in engagement with the upper contact 58 or the lower contact 59 in each instance. Thereafter the circuits continue over common conductor 72, through the last segment in ring 33 and its associated brush 26, over the common brush connector line to the brush 26 which engages ring 34, thence through the last segment of ring 34 which is grounded.

From the foregoing it will be understood that each of the secondary relays 57 assumes a position in accordance with its associated primary relay 51, and that the latter in turn is conditioned in accordance with the predetermined or established connections of its associated character segments (in a transverse row) in the translating distributor 12. This predetermined establishment of connections corresponds with the individual code of the signal and in accordance therewith the segments of permutation code transmitting distributor ring 54 will receive signaling current or not under the immediate supervision of the armatures 73, each of which is associated with one of the relays 57. That is to say, when armature 73 is in engagement with its contact point 74, then current will be communicated from grounded battery 61 over the common conductor 75 through the individual armature 73 and its contact point 74 over an individual line 76 to its corresponding segment in the transmitting distributor 13, the several segments of which comprise ring 54.

The permutation code transmitting distributor

13 is also of start-stop control and its cycle of rotation is initiated under the supervision of a start magnet 77. The energizing circuit for magnet 77 is obvious and it is completed upon the upward movement of armature 78 under the control of winding 64 of the relay 65. Since as has been described this winding is in circuit with the common return of the several windings of secondary relays 57, the movement of armature 78 is an invariable response to the transfer of each signal to the secondary relays 57. Accordingly, magnet 77 will thereupon retract the stop arm 79 from the path of the brush carrier of transmitting distributor 13, permitting the latter to enter upon a cycle of transmission and to issue over a line 16 a permutation code signal having a corresponding characteristic identified with the alphabetical character K in accordance with the instant example.

As the brush carrier of transmitting distributor 13 enters upon its cycle of rotation, brushes 81 thereof connect the solid ring 82 successively with the start and stop impulse segments and thereafter with the code impulse segments of ring 54. Meanwhile, brushes 83, also carried by the brush carrier, which bridge the distributor rings 84 and 85, starting the cycle of rotation, encounter a special segment 86, thereby connecting ground from ring 84, over line 87, through the winding 88 of relay 65, resistance 89, line 62, to grounded battery 61, causing to be energized the winding 88 and pulling armature 78 back to its retracted position, the one illustrated in Fig. 1. This de-energizes magnet 77 permitting its armature which is also the stop pawl of brush carrier 79 to resume its normal position for arresting said brush carrier when it has completed its cycle of rotation.

From the foregoing description it will be understood that relay 65 is of the polar type whose opposite windings are separately controlled; one, by the start-stop magnet energizing impulse which is received together with the transfer signals by the secondary relays 57, and the other winding of said relay 65 indicated particularly 88 being one which receives a restoration impulse under the supervision of the distributor 13 itself.

Operation

It will be remembered that in accordance with the specific embodiments described above, operation is contemplated under signaling conditions individual to transmission systems of the type more detailedly described and illustrated in the copending application referred to above. In such a system, current is normally maintained upon a line during the time that it is in service but during the interval in which the signal characteristic itself is transmitted, there may be utilized an opposite current characteristic, a current characteristic of the same polarity but of different intensity, or a no-current condition.

So long as the normal line condition is maintained; that is, so long as no signals are transmitted, relay 17 will remain in the condition as illustrated in Fig. 1 with its armature engaging contact point 25. The instant that the characteristic signal is initiated, however, said relay 17 causes its armature 18 to move to the opposite position. It is to be noted in connection with normal line condition that the distributor arm 24 is arrested with its brushes 26 in engagement with the first segments 43 and 44, of its rings 27 and 28.

As a result, relay 41 is maintained energized causing to be attracted its armature 22 which, by reason of its engagement with front contact 39, prepares the circuit for the energization of start magnet 37. The circuit for energizing start magnet 37 is not completed, however, until armature 18 of line relay 17 is moved to engage its lowermost contact point 19. This occurs at the start-stop instant as indicated on the chart, Fig. 2, but as brushes 26 move off the first segments of their several rings, the ones of said brushes relating to the first rings; namely 27 and 28, and which were instrumental in maintaining energized the preparatory relay 41, ride off the designated segments 43 and 44 and permit said relay 41 to become de-energized. As a result, armature 22 is permitted to fall back to its contact 45, breaking the circuit for energizing the start-stop magnet 37 and making instead a circuit as already described for charging the condenser 23.

Meanwhile arm 24 and the brushes 26 carried by it are traversing the several rings 27, 28, etc., downwardly, encountering each character in the order indicated by the legends at the right of ring 34. This order corresponds to the one illustrated in the copending application referred to above. At some instant during each cycle, the line current again changes, as indicated at K in Fig. 2, and as a result, line magnet 17 reverses its condition, causing its armature 18 to resume its normal position; namely, in contact with point 25, thereby withdrawing battery from the condenser charging circuit and connecting ring 27 to the condenser instead.

Instantaneously condenser 23 discharges over the several rings 28, 29, etc., and the particular ones of the marking and spacing lines 48 and 52 to the associated windings in the primary storage relay group 51. Thus, a permutative signal in a tangible form is first created in accordance with the positioning of said primary storage relay group.

When the brushes 26 traverse the final segments of their several rings, a circuit is completed by the brushes 26 of rings 33 and 34 for effecting a transfer to the secondary relay group 57 and at the same time the winding 64 of relay 65 is energized, resulting in the energization of start magnet 77 which thereupon initiates the transmitting cycle for the permutation code distributor 13 which thereupon issues, over line 16 to the remote printer 14, a six-unit permutation code signal suitable for operating this class of printers.

In relating the scope of the present invention, it is not intended to be limited by the details of the foregoing descriptions nor by the specific illustrations in the accompanying drawing except as indicated in the hereinafter appended claims.

What is claimed is:

1. A signal retransmitting system comprising a start-stop receiving distributor having a plurality of segmented rings, a plurality of primary storage means each associated with an individual one of said distributor rings, a plurality of secondary storage means each associated with one of said primary storage means, circuit connections between segments of said several rings predeterminedly associated with said primary storage means, a retransmitting distributor under the supervision of said secondary storage means, and a single charge current source communicable through segments of said receiving distributor for positioning said primary storage means

in accordance with said predetermined circuit arrangement.

2. In a signal translation and retransmission system, a receiving distributor having a plurality of segmented rings, a set of conditionable storage devices each related to and permutably connected with various segments of an individual one of said rings, a brush carrier for bridging corresponding segments of said several rings transversely, an instantly dischargeable current source, means responsive to a supervisory current for discharging said source for establishing a permutable setting upon said storage devices at an instant when said brush carrier is in alignment with ones of said segments identified with a character corresponding to said supervisory current, and a distributor responsive to the setting of said storage devices for issuing a permutation code signal.

3. In a start-stop signal distributing apparatus, a rotary member having cyclic operation, a stop element for arresting said rotary member in a predetermined position of each cycle, means under the control of signals on an incoming line for withdrawing said element from arresting position, and electro-responsive means under the supervision of an integral portion of said rotary member for restoring said stop element to its arresting position.

4. In a signal transmission system, a permutation code transmitting distributor comprising a brush carrier, an electromagnet for releasing said brush carrier cyclically, a receiving distributor including a cyclically arrestable brush carrier, means under the control of said receiving distributor brush carrier for energizing said transmitting distributor releasing electromagnet, and electro-responsive means local to said transmitting distributor to recondition in said electromagnet.

5. The method of translating a telegraph code whose signaling characteristics are dependent upon variations in periodicity of signal current changes into a telegraph code whose signaling characteristics are dependent on a permutative distribution of a fixed number of signal intervals, comprising the steps of timing the movement of a distribution device during the cyclic interval of reception of said first-mentioned type of signal, routing electrical impulses over permutative paths characteristically individual to the instant of periodicity change in each cycle, conditioning a set of storage means in accordance with said electrical impulses, and generating a permutation code signal under the control of said storage means.

6. A method of converting a telegraph code whose signaling characteristics are dependent upon variations in periodicity into a telegraph code whose signal characteristics are dependent upon permutational arrangement of a fixed number of component intervals, which comprise the steps of receiving a succession of signals over an incoming line whose signaling characteristics are dependent upon the periodicity of line changes, routing a current over a plurality of courses differing permutationally in accordance with the instant of occurrence of a signal change in said incoming line, storing component signals in accordance with said permutationally varying courses, and generating an independent code signal under the control of said storage signals.

7. In an intermediate storage device, the combination including a set of electromagnetic storage members, a distributor comprising a plurality of alignments of terminal members, circuit means individual to each of said alignments of terminal members connecting said terminal members of each alignment to ones of said storage members in accordance with a characteristic code arrangement, and means for releasing an energizing current over said several terminal members of each alignment at a predetermined instant for setting said storage members characteristically.

8. Apparatus for translating a monopulse code signal into a permutation code signal predeterminately identified therewith comprising in combination, a receiving apparatus having a plurality of terminal contactors arranged in rows, a brush carrier bridging said rows including one brush for engaging each row, a permutation code retransmitting apparatus including a set of permutation elements, and circuit connections between each of said contactors and a corresponding element in said retransmitting apparatus, said circuit connections being individually arranged for each of said transverse rows.

9. A translating device for converting monopulse code signals into permutation code signals comprising, a plurality of rows of contactors, said rows corresponding in number to the number of components of a permutation code, the contactors of said several rows arranged in transverse alignment, a set of brushes each relating to and disposed to engage said contactors transversely, and signal controlled means for discharging a current over the several brushes at an instant when said brushes come into alignment with a row of contactors corresponding to a character represented by the signal.

10. In combination with a set of primary supervision relays corresponding in number to the number of signal components of a permutation code, a distributor comprising a set of contactors arranged in a plurality of alignments, each alignment associated with one of said relays, each alignment consisting of a given number of individual contactors, corresponding contactors of each alignment comprising a row, circuit connections between the contactors of each row and their corresponding ones of said relays arranged in an individual manner for each of said plurality of rows, and means for introducing an instantaneous current charge over the several contactors of a row to said set of relays.

11. In a telegraph system, a rotary signal distributor, a group of elements, and means to simultaneously operate all of said elements in an individual manner for transmitting a permutation code signal in accordance with a position of said distributor at the instant interval at which a signal is impressed upon said distributor.

12. In a telegraph system, a plurality of registration elements, an electric condenser, means to charge said condenser once for each character to be registered on said elements, and means controlled by the discharge of said condenser to simultaneously condition all of said register elements permutatively in accordance with a character to be recorded.

13. In a telegraph system, a transmitting station including means to change the characteristic of a signaling current at intervals varying according to the character represented by a signal, a plurality of storage elements each settable in one or another of two positions, and means responsive to a single change in the signaling current to position said set of elements characteristically.

14. In a telegraph system, a signal distributing

device having cyclic operation, means to generate signals in which a single change is made intermediate each signal cycle with the change interval varying periodically according to the character represented by the signal, and means to control the character of a plurality of impulses in a manner varying according to the period in a cycle at which said change occurs.

15. In a telegraph system, a set of storage elements, a receiving distributor having a set of segmented rings corresponding in number to the number of said storage elements, a circuit from each segment of each of said rings connected in one of alternative ways through an associated one of said storage elements, and a local current source for positioning all of said storage elements for each distributive condition of said distributor.

16. The method of translating a telegraph code of a single impulse signal type into a multiple impulse permutation code signal which comprises, initiating at the start of a single impulse signal the operating cycle of a distributor having permutation code characteristics, passing bridging means successively over said permutation characteristics during reception of said single impulse signal, and transmitting the permutation combination bridged at the instant said single impulse signal terminates.

17. In a telegraph system, a set of storage elements, each element comprising a relay having marking and spacing windings, a receiving distributor having a set of segmented rings corresponding in number to the number of said storage elements, a circuit connecting each segment permutably to either the marking or spacing winding of one of said storage elements, and a local current source for permutably conditioning each of said storage elements for each distributive condition of said distributor.

18. In a telegraph system, means to transmit a single impulse signal, a distributor having permutation code characteristics, means responsive to the start of a single impulse signal to initiate the operating cycle of said distributor, a permutation code transmitter associated with said distributor, means for bridging said distributor code characteristics successively, and means to cause said permutation transmitter to transmit the code characteristic of the distributor bridged at the instant said single impulse signal terminates.

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