

Sept. 24, 1935.

W. T. REA

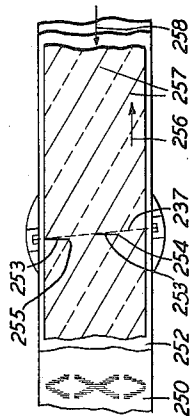
2,015,155

TELEGRAPH SYSTEM

Filed June 1, 1934

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FIG. 12



B

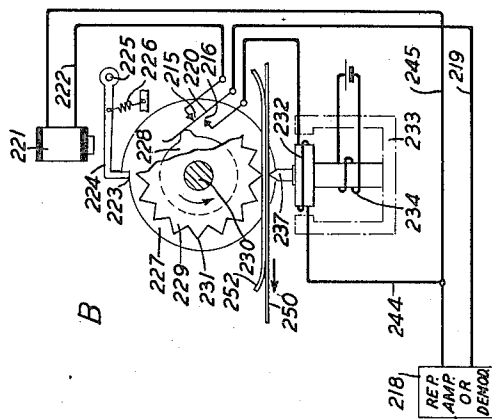
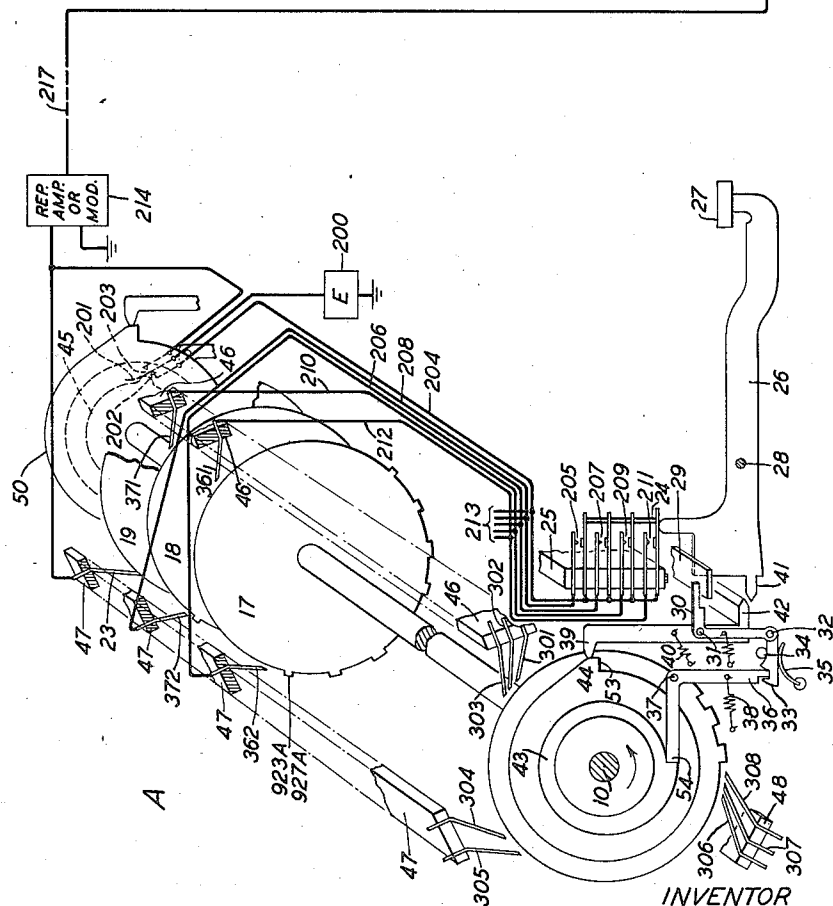


FIG. 2



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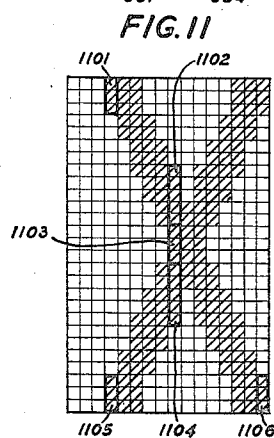
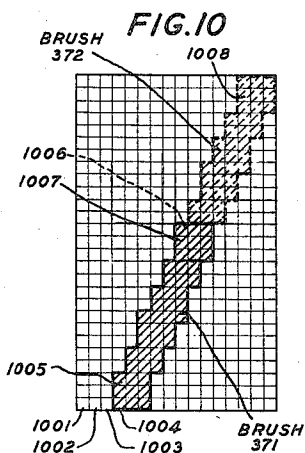
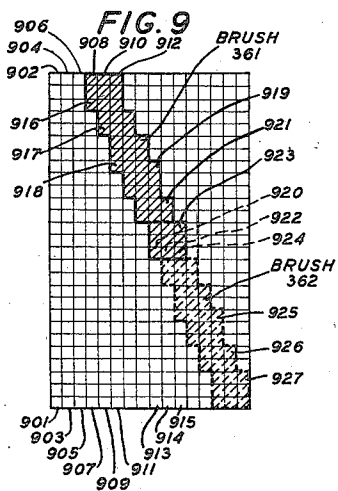
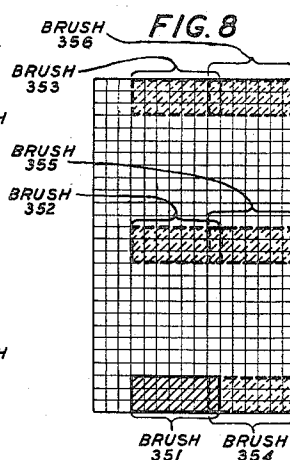
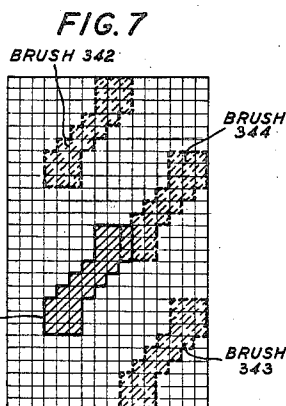
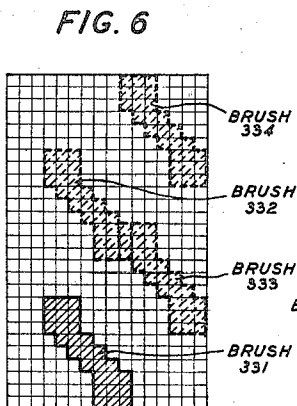
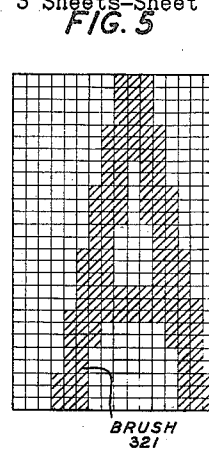
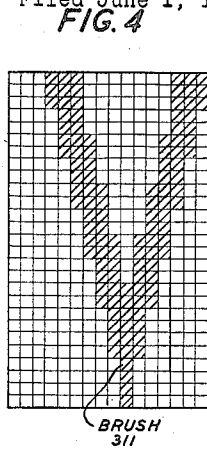
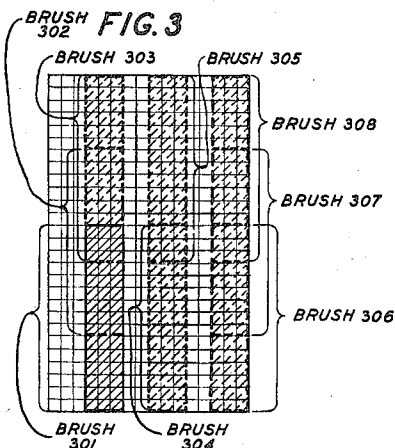
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2,015,155

TELEGRAPH SYSTEM

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3 Sheets-Sheet 3



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2,015,155

TELEGRAPH SYSTEM

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Application June 1, 1934, Serial No. 728,611

6 Claims. (Cl. 178—5)

This invention relates to improvements in facsimile telegraph printing systems and more particularly to improvements in the transmitting mechanism for transmitting telegraph facsimile current impulses representing symbols.

The object of this invention is to reduce the number of cams required and to simplify the transmitter.

This is accomplished by dividing the symbols to be transmitted into component elements many of which are similar, but occupying different positions in the symbol. A cam is provided for transmitting impulses representing each group of similar elements instead of a cam for each symbol as employed in previous transmitters. A group of transmitting brushes is provided to make contact with each cam for transmitting impulses which represent the various portions of the symbol. In addition, means are provided to select these cams and brushes and to connect them to a transmission channel in accordance with the symbol to be transmitted.

The manner in which the foregoing and other objects are attained will be set forth in the following description and in the drawings to which the description refers.

The specific and preferred form in which the invention in the present instance is embodied is illustrated in the accompanying sheets of drawings in which like characters indicate like parts throughout the several figures.

Figure 1 is a schematic arrangement showing a top view of a manually operated transmitting device utilized in the preferred embodiment of this invention. It consists essentially of a motor driven shaft upon which are mounted a number of code discs each adapted to make electrical contact with one or more brushes mounted radially around the discs. A keyboard with a lever for each character is provided and is so arranged that each time a key is operated the shaft of the code discs makes but one revolution. A group of brush selecting contacts individual to each key serves to connect the one or more brushes necessary to form the character or letter to a transmitting circuit.

In Fig. 2, A shows a left-hand perspective view of the transmitting device, with particular reference to the cam arrangement for starting and stopping said device, and the manner in which the code discs and associated brushes together with the brush selecting contacts send out impulses corresponding to the character to be transmitted.

Also in Fig. 2, B represents the elements of any well-known receiver adapted to operate in cooperation with the transmitter or sender shown at A in Fig. 2, and adapted when thus operated to produce a start-stop receiving action in which

every character or symbol is placed in a corrected position upon the record tape.

Figs. 3 to 10, inclusive, show schematic diagrams of the shapes that must be transmitted to form the numerals, letters of the alphabet and other characters. The combination of code discs and brushes shown in Figs. 1 and 2, connect energy to the transmitting circuit at intervals corresponding to the unit areas of the character or symbol space that go to make up the above mentioned characters or symbols. These unit areas are illustrated by the solid and broken lines within the unit areas of the symbol spaces. For the purpose of illustration the area of each figure is divided into 16 vertical strips of equal area with the first three strips reserved for the space area and the remaining 13 strips for the letter area.

Figs. 9A and 10A show in detail the code discs and brushes that produce the shapes shown in Fig. 9 and Fig. 10, respectively. The total circumference of each of these code sending discs is laid off in 16 equal angular sectors and the periphery of each divided into 26 angular units each corresponding to a unit area of the corresponding vertical strip in Figs. 9 and 10. Raised surfaces are placed on the periphery of code discs in such a manner that when rotating one complete turn, the raised surfaces contact with an impulse transmitting brush and connect energy to the transmission line. These marking energy impulses correspond to the unit area spaces which have the solid lines drawn in them as shown in Figs. 9 and 10. The same raised surfaces contacting with additional impulse transmitting brushes cause the transmission of marking impulses corresponding to the area spaces having the dotted lines drawn in them as shown in Figs. 9 and 10. All solid and dotted line shapes in Fig. 3 to Fig. 10 therefore represent marking current produced in the line by impulse transmitting brushes mounted radially around the eight fundamental code discs.

Fig. 11 represents one of the letters of the alphabet, namely the letter X resulting from the sending of the two shapes of Fig. 9 and the two shapes of Fig. 10. This illustrates the manner in which the components of the symbols shown in Figs. 3 to 10 may be combined to produce the characters of the alphabet.

Fig. 12 represents a diagram of the printing elements of the receiver of Fig. 2, showing the record tape, printing armature member and a development of the printing edges of the printing wheel.

In the specific embodiment of this invention a simplified form of transmitter for the facsimile printer is diagrammatically represented in Fig. 1 in which code discs 11 to 19, inclusive, are shown mounted on a shaft 10 and adapted to rotate under control of friction clutch 21 driven by motor 20. These code discs are electrically

connected by the metal shaft on which they are mounted. This shaft and cams may be insulated from the clutch 21 and motor 20 by insulating ring 52. The associated brushes 301 to 372 are mounted in members 46, 47 and 48 (see Figs. 1 and 2) and serve to control the opening and closing of the transmission circuit (see Fig. 2) for transmitting spacing and marking current to the line as will hereinafter be described.

A further portion of this invention resides in the provision of banks of contact springs 24 in mounting 25 arranged so that each letter or number key such as 27 when operated causes the corresponding spring contacts to close, thus preparing a path for closing the circuit to the transmission line 217 through certain code discs. For example, the keys for letters A and V require one contact each while the key for the letter B requires nine make contacts. The letter X requiring four make contacts 24 is shown in detail in Fig. 2. A side view is shown with detailed electrical connection to the brushes for the purpose of giving a more definite description of the manner in which these contacts in combination with the code discs and brushes function to transmit the signals which form a letter, number or other character or symbol.

To more effectively control the transmission of letters and other characters, a start-stop mechanism may be provided in which two sets of control cams and levers are mounted at either end of shaft 10, one set consisting of cams 49 and 50 which are mounted at right end of shaft 10 (see Fig. 1), and the other set consisting of cams 43 and 44 and levers 39, 35, 36 and 39 mounted at the left end. Both sets are identically alike and work in unison so that one set may be omitted if desirable. Further description of their operation is therefore confined to cams 43 and 44 and associated levers which are shown in detail in Fig. 2.

The arrangement of the key board is shown in Fig. 1. This simplified form of transmitter closely resembles that of a typewriter. In construction and operation, however, it is materially different. Key levers such as 26 are pivoted at 28 and when depressed function to operate the bank of contact springs 24 mounted opposite said lever. The depressing of lever 26 also raises bail 29 (see Figs. 1 and 2) which in turn actuates lever arm 30 mounted and pivoted at the end of bail 29. This action finally results in the actuation of stop latch 36 (shown in Fig. 2) allowing the code disc assembly to rotate under the force exerted by the motor 20 through clutch 21. Every time this or any other key is operated the cam and disc assembly is made to take one revolution and is stopped again by stop latch 36. During this revolution of the code disc assembly, impulses are transmitted to the line 217 by the code discs and their associated brushes, through the make contacts on the particular key lever that is operated. The code discs 11 to 18 are cut in accordance with the well-known principle of prescanning wherein the characters or symbols to be sent are divided into any number of units of area. The several unit areas thus created are assigned in the order of scanning to the periphery of a single code disc such as for the letter A in Fig. 5 or they may be assigned to a combination of two or more code discs as in the letter X in Fig. 11. Signal impulses are sent representing say, the dark unit areas of the symbol whenever the projections on the discs pass under their respective brushes. The discs and brushes

are selected by the particular key which is depressed so that the impulses representing the desired symbol will be transmitted. In previous systems of this kind the signal impulses representing each character were controlled by a code disc individual to each of the characters to be transmitted. All the code discs or combinations of code discs have a short blank space and character space, with the short blank space formed by the first sectors of each disc. For example, as shown in Fig. 9A, the sectors following the three radii 901A, 903A and 905A, respectively, are blank and do not make contact with any of the brushes. Code disc 19 is used as a supply cam to connect the cams to the transmitting circuit.

The code discs are mounted on shaft 10 (Fig. 2) so that all starting arcs are in alignment. The space preceding each character thus provides an interval in which cam 45 shown (Fig. 2), together with switch springs 201, may send a start signal preceding the sending of each character.

Transmitter operation

When the transmitter of Fig. 1 is placed in operation, motor 20 is started and runs continuously so that it is ready to rotate shaft 10 through clutch 21 whenever one of the levers such as 26 is operated to transmit a character. Referring to Fig. 2, a detailed description will now be given. Assume that the operator depresses key 27 shown in Fig. 2 to send the letter X. Lever 26 being pivoted at 28 raises bail 29 and operates springs 24 to close contacts 205, 207, 209 and 211 to prepare a circuit for transmitting impulses produced by code discs 17, 18 and supply cam 19 as will further be described. The raising of bail 29 pushes lever 30 upward. The upward movement of lever 30 which is pivoted at 31, acts to move pivot 32 and pawl to the right. Pawl 33 being held against the end of stop latch lever 35 by spring 35 causes lever 36 to also be pulled to the right against the action of spring 38. Pawl 33 in moving to the right is pushed downward by screw 34 which causes pawl 33 to disengage stop latch lever 36 after the other end 54 of lever 36 is all the way out of the notch in cam 43.

Withdrawing the end 54 of stop latch lever 36 from cam 43 permits shaft 10 with its code discs 11 to 19 to rotate under control of motor 20 through friction clutch 21 shown in Fig. 1. As will be shown, the code disc assembly makes one revolution and then is stopped by stop latch 36. The cam and disc assembly start to rotate in a counter-clockwise direction and almost immediately locking lever 39 drops from the elevation 53 on cam 44 under action of spring 42. This lever being pivoted at 31 moves bar 42 to the right causing it to engage the under surface of projection 41 on key lever 26 and prevent the latter from releasing until near the end of the rotation of the code disc assembly. Bar 42 also engages the upper surface of all the remaining projections 41 on the other key levers and prevents the operation of any of these keys until near the end of the revolution of the cams. Thus after a key is operated another key cannot be operated until the signals corresponding to the first key have been transmitted. Just before the assembly stops rotating, locking lever 39 is again moved outward by the elevation 53 on cam 44 causing projection 42 to be withdrawn from under projection 41 of lever 26 so key 27 releases by virtue of the spring action of its contact spring armature. The other keys are also released so that they may be operated at this time. The release of key 27 opens contacts 205, 207, 209 and

211 and permits lever 30 and its pawl 33 to re-engage stop latch lever 36. The transmitter is then ready to send the next character.

During the rotation of the code disc assembly all the impulse transmitting brushes make contact with the code discs at predetermined intervals for transmitting impulses, but only certain combinations of brushes are effective as determined by the contacts closed by the particular key corresponding to the character being transmitted. Thus the character component corresponding to a given brush may be combined with other components to form the character being transmitted.

The manner in which the code discs control the transmission of these character components will now be described with reference to Figs. 9, 9A, 10, 10A and 11. As shown in Figs. 3 to 11, the space allotted to each character is divided into 432 unit areas arranged in 16 vertical areas of 27 units each. The 16 vertical areas correspond to the 16 angular sectors on the code discs as shown in Figs. 9A and 10A. Each angular sector may be thought of as being divided into 27 angular units, and each corresponding, therefore, to a unit area in Fig. 9 and Fig. 10. The circumference of each code disc is recessed or insulated at all points that correspond to the blank unit areas of Fig. 9 and Fig. 10, thus leaving a raised or conducting surface as at 916A in Fig. 9A, for example, corresponding to the lined unit areas of Fig. 9 and Fig. 10.

The transmission of impulses representing these unit areas begins with the first unit area 901 as shown in Fig. 9 and proceeds vertically to area 902. Since all of the unit areas in this strip are blank, the 27 units of the first sector of the corresponding transmitting disc 17, as shown in Fig. 9A, between points 901A and 903A are recessed. The transmission then proceeds by transmitting the impulses corresponding to the next vertical section beginning with unit area 903 and ending with unit 904 and similarly for the following section beginning with unit area 905 and ending with unit 906. These first three sections as just described always constitute the space between one character and the next one and are, therefore, blank so that the corresponding sectors between 901A, 903A, 905A, and 906A of the cam 17 as shown in Fig. 9A are recessed. Scanning continues from unit area 907, Fig. 9, and continues for 24 blank unit areas. These blank areas are followed by 3 lined unit areas 916. The corresponding portion 916A—920A of the corresponding transmitting cam 17 is raised or conducting as shown in Fig. 9A. Continuing in this way and scanning each vertical area beginning at 909, 911, etc., Fig. 9, it is obvious from Fig. 9A that raised portions on the disc 17 correspond to the lined areas 917, 918, etc. of Fig. 9. These shaded areas 916, 917, etc., to 919, 921 and 923, therefore, represent the intervals of time that the impulse transmitting brush 361 is in contact with the disc 17 during one complete revolution of the disc assembly. These same elevations on disc 17 also come in contact with impulse transmitting brush 362 but due to being located approximately $4\frac{1}{2}$ sectors behind brush 361 the brush closures are represented by the dotted line areas 920, 922, 924, etc., to 925, 926, and 927 in Fig. 9.

Having described the cutting of disc 17 and shown that the contact of the brushes 361 and 362 with the elevated portions of this disc transmit impulses representing unit areas of the shape illustrated in Fig. 9, it will be readily understood

that a similar number of contact closures between brushes 371, 372 and disc 18, shown in Fig. 10A, represent the unit areas of the shape shown in Fig. 10. Since both discs are mounted on the same shaft 10 and electrically connected, these disc and brush closures representing these figures will occur during the same revolution of the disc assembly.

The superimposing of one shape upon the other is accomplished by closing the transmitting circuit to whatever brushes are required to produce the shapes necessary to form the desired letter or character. In the case of the above example for the letter X the key lever 27, see Fig. 2, has associated with it four make contacts 24 that connect the common lead 204 with the impulse transmitting brushes 361, 362, 371, and 372 over leads 206, 208, 210, 212 during the sending of the letter X. These leads are likewise multiplied as at 213 to make contacts on other keys as determined by the shape required. Fig. 11 thus shows the letter X resulting from superimposing the shape in Fig. 9 upon the shape in Fig. 10. The unit areas 1101 and 1102 in this case are produced by disc 9A and transmitting brush 361 while unit areas 1105 and 1104 are produced by disc 10A and transmitting brush 371. Unit area 1103 in this example is a result of disc 9A and brushes 361 and 362, also of disc 10A and brushes 371 and 372. In other words, all four brushes are contacting with the discs during this interval.

In this manner, by providing various combinations of contacts on each key and a disc for each of the Figs. 3 to 10, inclusive, each of which is adapted to contact with a number of impulse transmitting brushes, it is possible to send any of the characters, letters or numbers given in the following table:

Table 1

Character	Brush number (Fig. 3 to Fig. 10)
A	321
B	353-352-351-334-333-344-343-303-301
C	334-343-342-331-302
D	353-351-334-343-303-301-307
E	353-356-352-351-354-303-301
F	353-356-352-303-301
G	355-334-343-342-331-302-306
H	352-355-303-301-303-306
I	305-304
J	343-331-308-307
K	303-301-372-371-362
L	351-354-303-301
M	303-301-308-306-372-361
N	303-301-308-306-361-362
O	334-343-342-331-302-307
P	353-352-334-344-303-301
Q	334-343-342-331-302-307-362
R	353-352-334-344-303-301-362
S	334-333-343-342-332-331
T	353-356-305-304
U	343-331-303-302-308-307
V	311
W	303-301-308-306-371-362
X	372-371-361-362
Y	304-372-361
Z	353-356-351-354-372-371
1	305-304
2	351-354-334-344-342-371
3	334-333-344-343-342-331
4	352-355-303-305-304
5	353-356-352-333-343-331-303
6	334-333-343-342-341-331-302
7	353-356-372-371
8	334-333-344-343-342-341-332-331
9	334-344-343-342-332-331-307
0	334-343-342-331-302-307
.	343
'	354

This table gives in detail the particular impulse transmitting brushes that must be connected to the common lead 204 for each letter or character to be transmitted and, in effect, representing the number of make contacts that must be associated

with each key to accomplish the purpose of this invention.

Transmission circuit

The transmission circuit for the transmitter may be traced from ground through a source of electrical energy 200, contacts 202, conductor 204, closed key contacts 24 such as 205, 207, 209 and 211 to the selected transmitting brushes of cams 11 to 18, through shaft 10 to supply cam 19, and associated supply brush 23, and repeater, amplifier, modulator and/or filters 214 to line or channel 217. Source 200 may be a battery, an alternator, oscillator, a transformer winding, or any other suitable source of electrical energy. It may supply alternating current having the desired carrier frequency for transmission over any channel of a multichannel system. Device 214 may be any suitable repeater, amplifier, or modulator either singly or in combination and may include suitable networks such as filter and/or phase correctors. In the case of short lines it may be omitted. Device 214 may employ electromechanical, thermionic tube or gaseous tube relays either singly or in combination. 218 represents a device connected to the receiving end of the line or channel 217 for changing the impulses received therefrom into impulses suitable for the operation of the receiving apparatus. Device 218 may be similar to device 214 and contain the same or similar apparatus. Line or channel 217 may include any type of communication channel or system. Since these transmission systems, circuits, and apparatus function in their usual manner and since their specific structure or arrangement forms no part of the present invention, specific details of these systems and apparatus have not been disclosed or described.

Operation of receiver

Assuming by way of example that the letter X is being transmitted, that the printing wheel 229 of the receiver is revolving in a counter-clockwise direction as seen in Fig. 2, and that the tape is moving from right to left, no mark will be made on the tape as long as spacing current or impulses are received from line 217. When, however, the first marking signal is received, as will be the case when the brush 371 of Fig. 2A makes contact with code disc 18 current through coil 232, which is suspended in the magnetic field of electromagnet 233 having winding 234, will propel the knife edge 237 upward, forcing the tape against the spiral edges 231 of the printing wheel 229, thus causing a vertical mark to be made on the tape just as long as the marking signal continues, as will be further explained. As soon as brush 371 in Fig. 2 ceases to contact with code disc 18, the current in the receiver winding 232 is reduced or reversed so that it draws the knife edge or platen 237 downward away from the tape and printing wheel, thus leaving the tape blank as long as the spacing signal continues. In this way lines are printed upon the tape 250, corresponding to the lines of Fig. 11, which as previously described represent the time during which the brushes 361, 362, 371 or 372 actually make contact with the code discs 17 and 18.

From Fig. 12 it will be seen that the spiral printing edges 231 which have been developed and represented in this figure by lines 257, are so arranged that two of the spirals intersect a line drawn perpendicular to the edge of the tape. Lines 257 have a motion over tape 250 in the direction of the arrow 258, due to rotation of wheel 229, while tape 250 has a slower motion in the

direction of arrow 258 due to the tape feed roller (not shown).

If the knife edge 237 is forced upward by a marking signal when the knife edge is in the relative position shown in dotted lines of Fig. 12, two dots will be printed on tape 250 at points 254 and 255 which represent the points at which the knife edge and spiral edges intersect. Repeating the marking signal a brief interval later, another pair of dots will be printed on tape 250 but above the first pair because of the movement of the tape and spiral edges. In transmitting a letter such as X, by way of example, the unit areas 1102, 1103 and 1104 of Fig. 11 combine to form one long marking signal, as previously described, which holds knife edge 237 in a raised position so that each spiral line 257, Fig. 12, will move to the right a distance such that any intersecting point will in effect move vertically. If an incoming signal is received when the printing edge 231 occupied the position shown dotted, a vertical line will be marked on the tape from 254 almost to 255, due to the movement to the right of spiral edge 257 making continuously with platen 237. A vertical line will also be drawn from 255 to the top edge of the tape 250 and from the bottom edge of the tape almost up to 254 as seen in the letter X at the left side of the tape. Owing to the comparatively slow motion of the tape, the lines printed thereon do not exactly coincide with the edge 237 but are normal to the edge of the tape as are lines 253 in the Fig. 12.

The letter X made up of the unit areas of Figs. 9 and 10 as shown in Fig. 11 may, in the manner indicated above, be so recorded on the tape as vertical lines that will correspond to the line areas of Fig. 11 and will be transmitted by engagement of the impulse transmitting brushes 361, 362, 371, 372 with the cams 17 and 18. As previously described, all blank unit areas in Fig. 11 result in the sending of spacing signals which withdraws the knife edge 237 (Fig. 2) from pressing against the printing wheel 229 so that no mark is made upon the tape. Rotation of discs 17 and 18 will thus transmit marking signaling impulses spaced by proper blank or spacing signal impulses to develop the letter X in one complete and two fractional characters on the tape 250. In the same manner each character transmitted is developed by successive impulses received from one or more selective code discs by the coil 232 of the receiver.

Due to the overlap of the spiral printing edges or ridges 231, a double record will be produced on tape 250 shown in Fig. 12 which permits wide variations in the speeds of the transmitter and receiver without loss of signals. This is due to the fact that at least one complete character is always received and recorded. The position of the letters or numbers on the receiving record indicates the degree of synchronism between the sending and receiving apparatus. If both sending and receiving mechanisms are in synchronism then the message will be printed exactly in the middle of the tape and the two fractional rows of characters will appear at top and bottom of tape. Should the speed of wheel 229 of Fig. 12 be faster than the speed of the code discs in the sending mechanism the message and its two fractional rows will tend to run off the upper edge of the tape. If the speed of wheel 229 is slower, the message and its two fractional rows will tend to run off the lower edge of the tape and by suitable means, not shown, the operator may regu-

late the speed of the receiver to restore the receiver to synchronous speed.

Start-stop operation

5 In case it is desired to operate the system on a start-stop basis certain cams and contacts must be provided which will now be described. Referring to Fig. 2 the receiver, shown at rest, is of the start-stop type which requires starting each time a character is to be printed. Assuming that the code disc assembly of Fig. 2 starts making a revolution to transmit a character, spring 201, operated by cam 45, closes the transmitting circuit momentarily which transmits a marking impulse to line 217. This impulse when received causes either directly or indirectly, the operation of the receiver starting magnet 221. The circuit shown may be traced from the lower winding terminal of magnet 221 over lead 222, normal contact 215 and armature spring 220 of the receiver, lead 219, to the demodulator 218, and back over lead 245 to top winding terminal of magnet 221. The operation of magnet 221 causes the withdrawal of stop latch 224 from notch 223 of stop cam 227 and permits the cam 228 and printing wheel 229 mounted on shaft 230 to rotate in a counter-clockwise direction under the action of a continuously operated motor and its clutch (not shown). The printing wheel 229 revolves in synchronism with the code disc assembly of the transmitter and at end of one revolution stop latch lever 224 is drawn into notch 223 of stop cam 227 by spring 226 awaiting transmittal of the next character.

As soon as shaft 230 of receiver shown in Fig. 2 has started to revolve, the armature spring 220 and its upper contact 215 almost at once breaks the start magnet circuit and its lower contact 216 closes a local operating circuit for coil winding 232 of the receiver.

40 The mechanism of the receiver is constructed in accordance with well-known features of receivers of this type and is, therefore, not shown in all its details. It will be understood that the shaft 230 of Fig. 2 is driven by a motor and gearing under speed control equipment usual with such receivers and that if the speed of the receiver is not in synchronism with that of the transmitter, made apparent from an inspection of the printed tape at the receiver, adjustment of the motor control apparatus (not shown) will vary the speed of the equipment in such manner as to accelerate or retard the operation of the receiver to secure accurate synchronization. Likewise the shaft 230 is geared to the shaft of a feed roller (not shown) which has a companion presser roller suitably urged towards the feed roller. Between these two rollers the tape 250 and inking tape 252 are driven to the left under the printing wheel 229. Tape 250 constitutes the record receiving surface and tape 252 a pigment carrying tape similar to the ink ribbon of a typewriter.

This improved system of telegraphy described above in which marking and spacing signals on a start-stop basis have been used for the transmitted signal, could just as readily have employed voice frequency signals. Furthermore, the invention is adapted to transmission over telephone, telegraphy, phantom, carrier current and radio communication channels and may be applied to any system in which the transmission signal for a given character is controlled by a single code disc of the prescanning type. The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The embodiment

presented is therefore to be considered illustrative rather than restrictive, the scope of the invention being indicated by the following claims.

What is claimed is:

1. In a facsimile telegraph transmitter for transmitting symbols over a telegraph channel, a plurality of cams for transmitting telegraph current impulses representing portions of symbols and a plurality of transmitting brushes individual to each of said cams for transmitting the various portions of said symbols represented by said impulse transmitting cams, and means for selecting and connecting said cams and brushes to a telegraph channel in accordance with the symbols to be transmitted thereafter.

2. A facsimile telegraph transmitter comprising a plurality of rotatable cams having raised portions to transmit current impulses representing lines which form portions of numerals and characters of the alphabet, means for rotating said cams, a plurality of brushes contacting with said raised portions on each of said cams for transmitting impulses representing said lines located in different positions in said numerals and characters, and means for selecting and connecting said cams and brushes to a telegraph transmission channel in accordance with the characters to be transmitted.

3. A telegraph transmitter for transmitting impulses which represent unit areas of symbols which comprises a plurality of cams for transmitting impulses representing components of symbols, a plurality of impulse transmitting brushes contacting with each of said cams for transmitting said impulses at the proper time, and means for selecting said cams and brushes in accordance with the desired symbol.

4. A facsimile telegraph transmitter for transmitting telegraph signal impulses representing a plurality of symbols which comprises a group of cams of lesser number than the number of said symbols for transmitting telegraph signal impulses representing components of said symbols, a plurality of transmitting brushes contacting with each of said cams for transmitting said signal impulses at the desired time, and means for selecting said cams and brushes in accordance with the desired symbol.

5. A facsimile telegraph transmitter for transmitting telegraph current impulses representing symbols over a telegraph channel comprising a plurality of cams for transmitting impulses representing portions of said symbols, a plurality of impulse transmitting brushes individual to each of said cams for transmitting the various portions of the symbols represented by said impulse transmitting cams, a group of keys for selecting said cams and brushes and a plurality of contacts cooperating with said keys for connecting said cams and brushes to said telegraph transmission channel.

6. A facsimile telegraph transmitter comprising a plurality of rotatable segmented discs having conducting and insulating segments to transmit current impulses each impulse of which represents a unit area of a small portion of symbols to be transmitted, means for rotating said discs, a plurality of brushes cooperating with said segments on each of said discs for transmitting impulses representing the portion of said symbols located in different positions of the symbols and means for selecting and connecting said discs and brushes to a telegraph transmission channel in accordance with the characters to be transmitted.

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