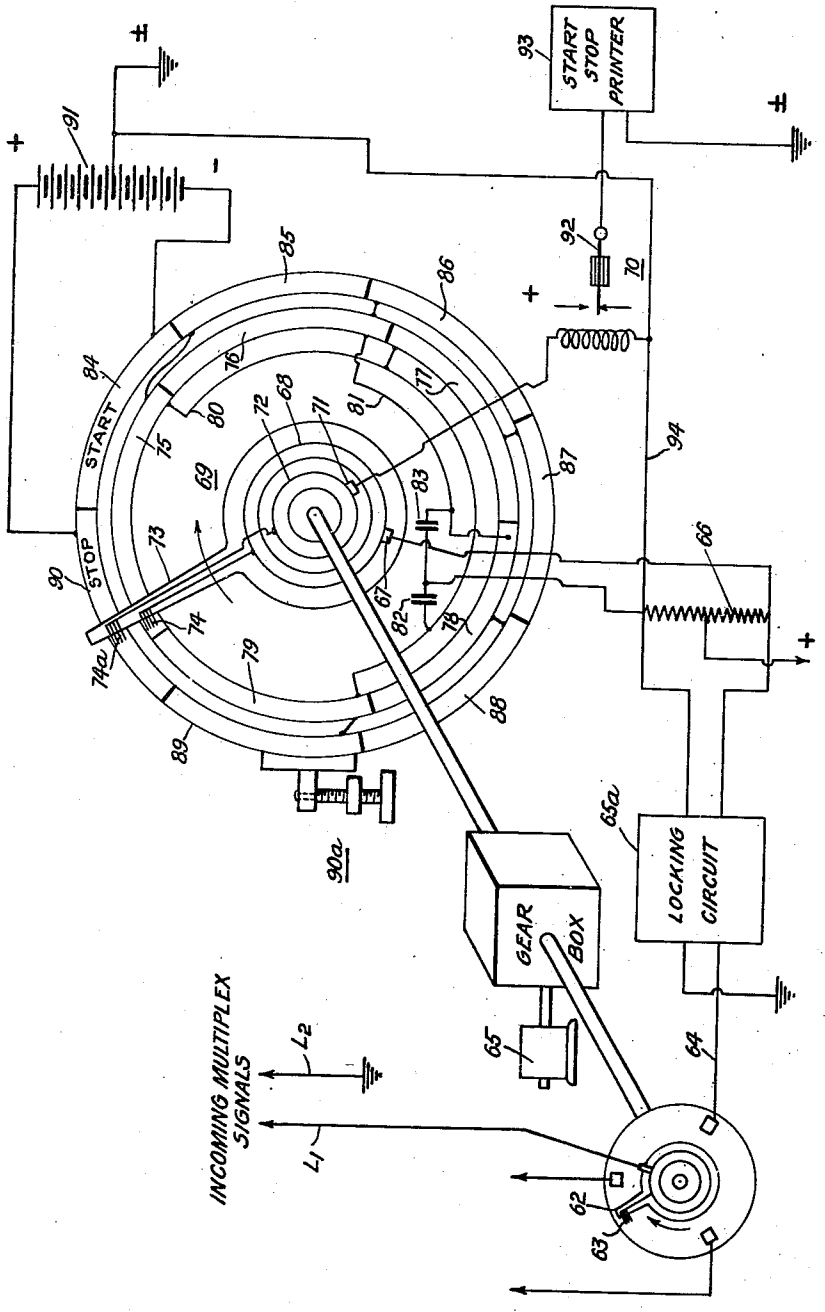
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CONVERSION OF SYNCHRONOUS TYPE SIGNALS TO START STOP SIGNALS

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INVENTOR
Richard E. Mathes
BY H. G. Grover
ATTORNEY

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CONVERSION OF SYNCHRONOUS TYPE SIGNALS TO START STOP SIGNALS

Richard E. Mathes, Silver Spring, Md., assignor to Radio Corporation of America, a corporation of Delaware

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2 Claims. (Cl. 178—70)

This invention relates to electric telegraphs utilizing the Baudot code which, as is well known, has signal units of equal time-length and it is a division of my pending application filed November 26, 1942, Serial No. 467,030.

There are two well-known methods of using this Baudot code. In one, the code characters follow each other with no intervening time space. This requires use of a commutator and brush arrangement, called a distributor, at both the transmitter and the receiver and means must be employed to keep the receiving distributor in synchronism and in phase with the transmitting distributor.

In the other method, two additional code units, in effect, are added to each code character. One is a start unit and the other a stop unit.

The first method is generally employed in multiplexing by combining several telegraph channels into one composite channel for transmission either by radio or by wire, though, of course, it is equally capable of use in single channel systems.

The second method is more generally used in single channel systems.

There are times when it is desirable to multiplex start-stop signals with synchronous signals and also to use start-stop printers for printing synchronous signals.

An object of the invention is to convert synchronous type signals into start-stop signals by adding the starting and stopping units to each code character for operation of a start-stop printer.

Another object is to convert synchronous signals into start-stop signals by means of a local distributor.

Another object is to convert synchronous signals into start-stop signals by means of a two ring distributor having two additional segments in one ring.

Another object is to convert synchronous signals into start-stop signals by means of a distributor having a segmented synchronous signal ring and a segmented adaptor ring with two additional segments therein.

Other objects will appear in the following description, reference being had to the drawing, in which:

The single figure of the drawing is a diagrammatic illustration of apparatus for converting synchronous type signals into start-stop signals.

In the drawing a receiving circuit is shown for receiving synchronously transmitted signals of a three-channel system and converting the signals of one channel into start-stop signals so that these may be printed on a start-stop printer, but, of course, similar apparatus could be used to convert the signals of all three channels into start-stop signals, if desired.

In the drawing the composite signals sent out by a synchronous distributor, such for example as shown in Fig. 1 of my said pending application, come in over lines L_1, L_2, the latter being grounded, and the multiplex distributor arm **62** carrying brush **63** separates the composite signals and sends each channel signal out over the three individual channel conductors, as is well known in the art. The channel **64** is the only one that need be considered and it will be assumed to receive the signals sent out by a start-stop sender at the transmitter, though they could equally well be the signals from a synchronous type sender.

The distributor arm **62** will be rotated in synchronism with the transmitter distributor by well-known means, generally indicated by motor **65**, and synchronized and phased in well-known ways (not shown). The five start-stop code units assumed to be sent out by the transmitter will be received in succession with no time separation between the end of one code character and the beginning of the next, as explained in my said application. Since these are to be used to operate a start-stop printer, means is provided for inserting start-stop signals in appropriate places in the cycle.

The five synchronous code units will be sent into a locking circuit **65***a* for regeneration of the signals. Such a locking circuit is well known in the art and is therefore indicated herein only in block diagram. A suitable locking circuit is shown in detail in the patent to John W. Cox, No. 2,264,510, December 2, 1941, and the theory of operation is described therein. It will be sufficient to say herein that the terminals of the locking circuit produce a potential drop across resistance **66** of one polarity for marks and another polarity for spaces and that the drop contines until the locking circuit is thrown from one position to the other. The positive terminal of the supply voltage is connected to the midpoint in this resistance. One terminal of resistance **66** is connected to brush **67** contacting with slip ring **68** on a distributor generally indicated at **69**. The other terminal of resistance **66** is connected through the coil of relay **70** to brush **71** engaging slip ring **72**. Slip rings **68** and **72** are secured in any way to arm **73** of the distributor **69**, which rotates at one-fifth the speed of the distributor arm **62**. Distributor arm **73** carries

brush 74, adapted to engage the five equally-spaced contacts 75, 76, 77, 78 and 79, when multiplex distributor brush 63 is on contact 64. The five contacts are shown virtually as segments of a circle, separated at the ends by strips of insulation, but in practice these segments would be shortened so that they would be one-half to one-fourth the angular length of the time signal, as is usual in telegraph distributors. Contact 75 is connected by a conductor 80 with contacts 77 and 79, while contact 76 is connected by conductor 81 with contact 78.

The upper end of resistance 66 is connected through condenser 82 to conductor 80 and through condenser 83 to conductor 81.

Distributor 69 has seven arcuate contacts 84, 85, 86, 87, 88, 89 and 90, shown as having substantially equal length and separated by strips of insulation at adjoining ends. These contacts are preferably arranged to be adjustable as a unit around the inner contacts 75 to 79, inclusive. This is indicated conventionally by the screw mechanism 90*a*. These contacts preferably would be shortened in practice in the same way as contacts 75 to 79. Contact 84 constitutes the start contact and lags contact 75 in relation to the rotating arm 73, but overlaps such contact. This contact is connected to the minus terminal of the telegraph supply battery 91. Contact 85 is connected to the inner contact 75, contact 86 to the next inner contact 76, contact 87 to inner contact 77, contact 88 to inner contact 78, contact 89 to inner contact 79 and contact 90 to the positive terminal of battery 91.

The relay 70 is polarized because it has been assumed that the locking circuit 65*a* places alternate plus and minus potentials in resistance 66. Of course, on-and-off potentials could have been produced in this resistance by the locking circuit and in that case the relay would be non-polarized and biased to one position. The tongue 92 of the polarized relay 70 in one position engages with the positive terminal and in the other position with the other terminal that has no potential. The start-stop printer 93 has been assumed to work on on-and-off current, but it could equally well operate on plus and minus current, in which case the blank terminal of relay 70 would be connected to a minus potential. The tongue 92 of the relay is connected in the usual way to one terminal of the start-stop printer 93, the other terminal of this printer being grounded to the plus and minus terminal of battery 91.

The operation of the receiving circuit may be described as follows:

The incoming synchronous signals are separated by the distributor arm 62 in a well-known way and produce plus or minus potential drops in resistance 66 and these potentials will be produced in synchronism with the movement of the rotating distributor arm 73. When brush 74*a* on distributor arm 73 engages outer contact 90, current will flow from battery 91 through contact 90, brush 74*a*, slip ring 72, brush 71 and the coil of relay 70, back to the mid-terminal of the battery. This will throw the relay tongue 92 against the positive contact, which will produce a stop signal for the start-stop printer. The first code unit of a character will be received soon thereafter and will produce a potential in resistance 66 while the distributor brush 74 is on contact 75. This will produce current flow through brush 67, relay ring 68, brush 74, contact 75, conductor 80 and condenser 82 to the other terminal of the resistance. The polarity of the charge in condenser 82 will, of course, depend upon the character of the signal being received. If it is a mark, the condenser will be charged with one polarity and if a space, an opposite polarity.

The brush 74*a* next engages contact 84 and current flows from the midpoint terminal of battery 91 to the lower end of the coil of relay 70, through brush 71, ring 72 and brush 74*a* to the minus terminal of the battery. This will energize relay 70 in an opposite direction and throw tongue 92 against the blank contact. This constitutes the start signal (no current) of the printer and the printer will start in a way well known in the art. Before the printer has reached the first code position, brush 74 of the distributor will have left contact 75 and engaged contact 76. At this time signal potential still existed in resistance 66, but it was cut off from the condenser when the brush 74 left contact 75. This will produce charging current of either one polarity or the other from the lower terminal of resistance 66 through brush 67, ring 68, brush 74, contact 76, conductor 81 and condenser 83 to the other terminal of resistance 66. The first and second signals of the code character are now stored in condensers 82 and 83 before the distributor brush 74*a* engages outer contact 85. When contact 85 is engaged by the brush 74*a*, condenser 82 will discharge through conductor 80, contact 85, brush 74*a*, distributor ring 72, brush 71 and the coil of relay 70 back through conductor 94 to the other terminal of the condenser. The relay tongue 92 will then be positioned either against the positive contact or the blank contact, depending upon the polarity of the signals stored in this condenser. The tongue 92 stays in its operated position until moved to the opposite position, as well known in the art. While brush 74*a* has reached the middle of contact 85, the start-stop printer 93 will be in position for receiving the first code unit, and will operate the first selector bar in one direction or the other.

When the distributor arm 73 passes off of inner contact 76, it will engage contact 77 and charge condenser 82 in a way already described. Slightly before this time brush 74*a* will engage the outer contact 86 and permit the discharging of the second code unit stored in condenser 83 through the coil of relay 70. This will pass through conductor 81, contact 86, brush 74*a*, slip ring 72, brush 71, the coil of relay 70 and conductor 94 to the other terminal of the battery. This will position the tongue 92 against either the positive contact or the blank contact, dependent upon the signal. The start-stop printer reaches the second code position when the brush 74*a* is in the middle of contact 86 and the second selector bar will be thus moved in response to either a mark or a space signal.

When the distributor arm moves the brush 74*a* onto outer contact 87, condenser 82 discharges through the coil of relay 70 and throws the tongue 92 onto the positive contact for a mark or onto the blank contact for a space. This is the stored signal of the third code unit and will cause the printer 93 to move the third selector bar when the third code position of the printer is reached.

As the distributor arm 73 continues to rotate, brush 74 engages contact 78 and the incoming fourth signal is stored in condenser 83. The distributor arm 73 next brings brush 74*a* onto outer contact 88 and the fourth signal unit just

stored in condenser **83** discharges through the coil of relay **70** in position to cause the selection of the fourth selector bar in printer **93**.

The distributor arm **73** then brings brush **74** into engagement with inner contact **79** and stores the fifth signal code unit in condenser **82** and when brush **74***a* engages the fifth contact **89**, this condenser discharges through the coil of relay **70** to produce the movement of the fifth selector bar in the start-stop printer.

When the distributor brush **74***a* engages the outer contact **90**, a stop signal is produced in the start-stop printer **93**, as already described. The reception of one character and its printing has now been completed. The signal code units of the second character will be stored and cause the operation of the printer **93**, in the way already described.

It usually will not be necessary to store the fourth and fifth code units in the condenser, as the brush **74***a* will usually be on the outer contacts **88** and **89** to permit the received signal current to pass directly through the coil of relay **70**. However, it is preferable to connect all five contacts to condensers **82** and **83** and to interconnect the inner contacts with the outer ones, as described, so that the printer will operate either directly from the received signals or from such signals stored in the condensers, and it is immaterial where one commences and the other leaves off.

I have shown one embodiment for converting synchronous signals at the receiver into start-stop signals, but it will be apparent that various modifications may be used without departing from the spirit of the invention.

Having described my invention, what I claim is:

1. In apparatus for converting to start-stop signals the synchronous code unit signals received over a single channel from a composite channel of a time division multiplex system, a series of segments containing one segment for each synchronous code unit signal, a second series of segments having one segment for each synchronous code unit signal and also for a start and a stop signal, a connection between each segment of the first series and a separate one of the segments of the second series, a connection between the remaining start and stop segments to different potentials in the source of supply, a condenser having one terminal connected to alternate segments of the first series, a second condenser having one terminal connected to the remaining segments of the first series, a line relay having a coil with one terminal connected to an intermediate potential in the source of supply, a signal output device connected to said single channel having one terminal connected to the remaining terminals of said condensers, means for connecting the other terminal of said output device in succession to the segments of the first series in synchronism with the assignment of said composite channel to the single channel and means running synchronously with the first-mentioned means for connecting the segments of the second series in succession to the coil of said relay.

2. In apparatus for converting to start-stop signals the synchronous code unit signals received over a single channel from a composite channel of a time division multiplex system, a series of segments containing one segment for each synchronous code unit signal, a second series of segments having one segment for each synchronous code unit signal and also for a start and a stop signal, a connection between each segment of the first series and a separate one of the segments of the second series, a connection between the remaining start and stop segments to different potentials in the source of supply, a condenser having one terminal connected to at least the first and third segments of the first series, a second condenser having one terminal connected at least to the second segment of the first series, a line relay having a coil with one terminal connected to an intermediate potential in the source of supply, a signal output device connected to said single channel having one terminal connected to the remaining terminals of said condensers, means for connecting the other terminal of said output device in succession to the segments of the first series in synchronism with the assignment of said composite channel to the single channel and means running synchronously with the first-mentioned means for connecting the segments of the second series in succession to the coil of said relay.

RICHARD E. MATHES.