Nov. 16, 1965 S. H. BINGHAM 3,218,453

RAILWAY SIGNAL SYSTEM

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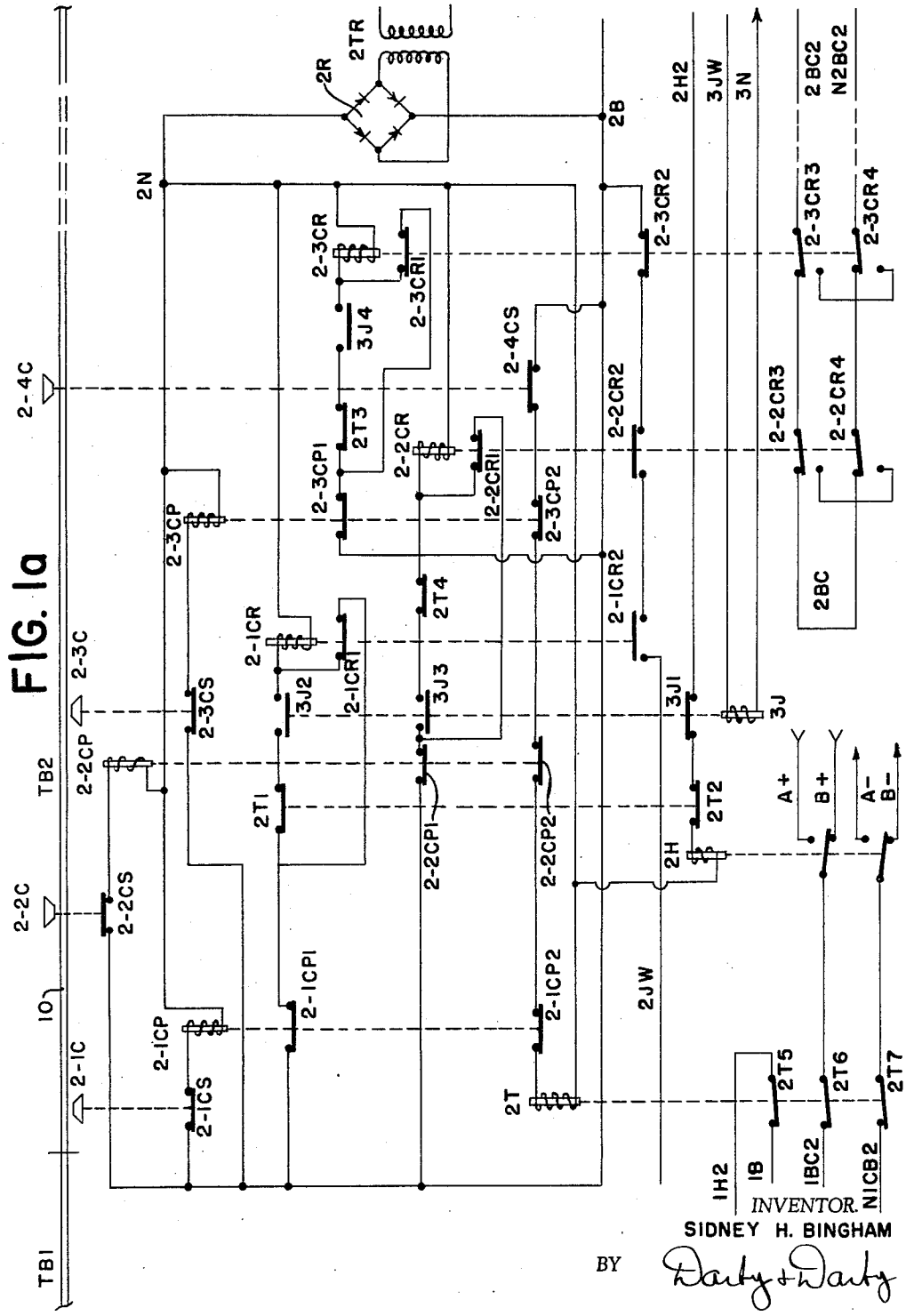


FIG. 1a

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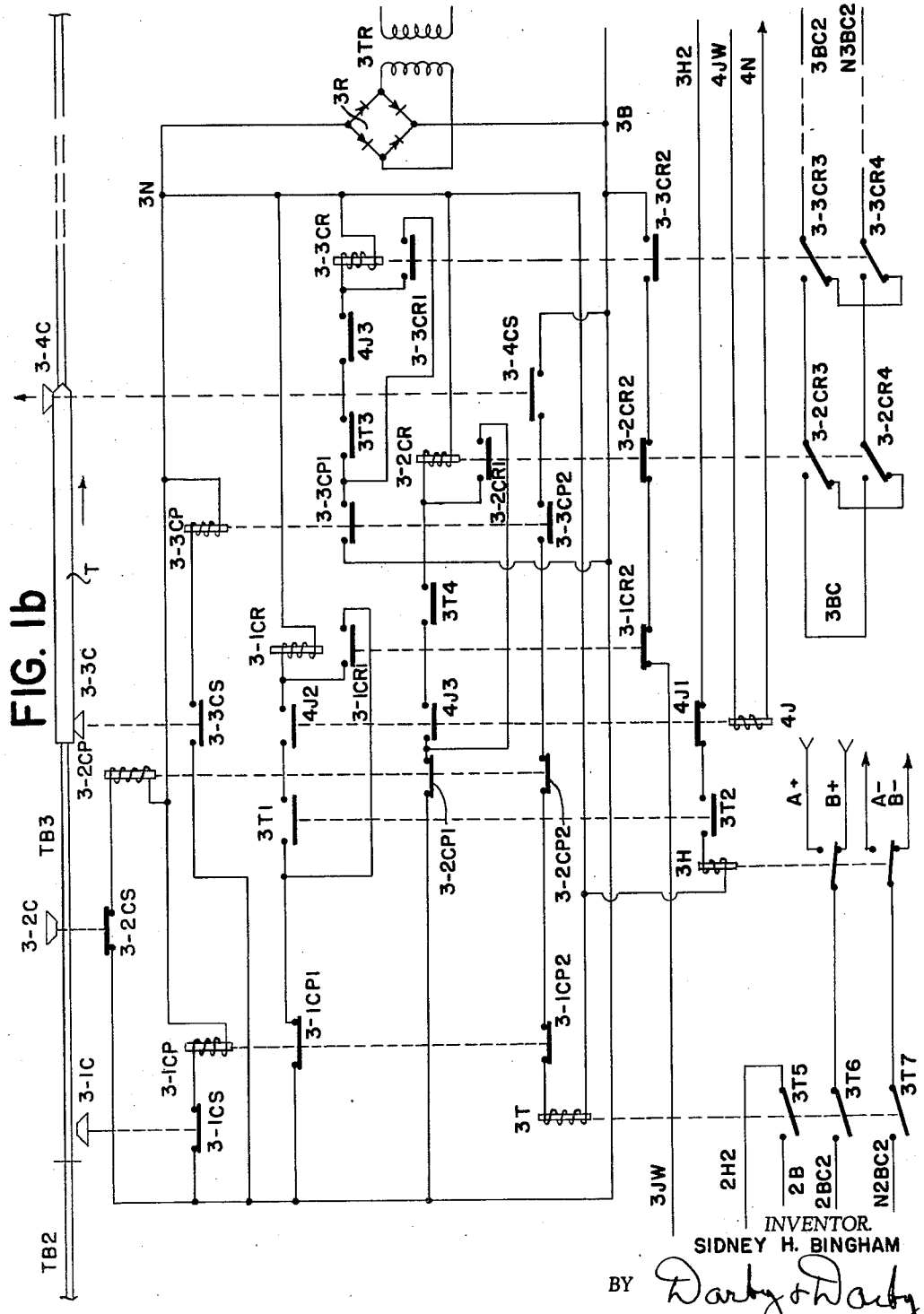


FIG. 1b

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RAILWAY SIGNAL SYSTEM

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This invention relates to a cutoff circuit for use when a wire loop or transmitting block conductor is used for transmitting the intelligence from the wayside locations to a moving train. It is equally applicable with tone modulated carrier currents, direct current code, alternating current codes or any other form of intelligence that is transmitted over a loop, to a moving train.

The entire length of the transportation system is arranged in a number of sections which shall be referred to as blocks. The physical length of the blocks may vary depending upon the needs, the location of the stations, switching arrangements, speed, headway, the grades and alignments.

This invention is intended to be used in conjunction with the conventional and improved systems of cab-indicated speed control, speed control or automated contral systems using a wire loop or block conductor for the transmission of a signal or intelligence from the wayside to a moving train. It is not to be considered a modification of the equipment that generate or interpret the intelligence transmitted by such control systems. For purposes of explaining the fundamentals of this invention a loop is used to transmit the intelligence from the wayside to the moving train.

An object of this invention is to restrict the intelligence to the individual train that is intended, as it proceeds through the block, and to cut off the transmssion of the intelligence to a following train if it enters the same block.

The cutoff circuit may be operated by means of microswitches, photoelectric cells, mechanical switches, mercury switches or any other type of device that is capable of initiating the act of terminating the flow of electric current when actuated by the passage of a train and permit the flow of electric current to be established after the train has completed its passage. Such switches or devices hereafter will be known as contactors.

The use of this invention is not limited to any particular type of system of transportation.

One object of this invention is to provide a railway signal system divided into signal blocks each having a signal loop extending throughout the length of the block in combination with means controlled by the train in the block so that the loop is successively shortened, preferably at regularly spaced points to cut off the signal to a following train if it enters the same block.

Another object of this invention is to provide in such a loop system certain arrangements whereby a train proceeding in a block behind a train in the succeeding block is supplied with distinctive signals which insure an indication for reduced speed or effect control for operation at a reduced speed.

Another object of the invention is to provide in such a loop system having circuits which supply a different signal either indicating normal operating speeds or controlling the train to cause normal operating speeds when that train is in the second block back to the rear of a block in which another train is operating.

The combination circuit of this invention consists of an interconnected assembly of subcircuits which individually are quite simple. The interconnection between the subassemblies for each signal block provides the control which is the object of this invention, namely, the progressive shortening of the signal loop for each block as the train is passing through the block so that indication or control signals cannot be received by a second train in the same block. Through automatic equipment on the train, which forms no part of this invention, the following train will either be shut down completely, reduced in speed or otherwise controlled as determined by the lack of signals from a wayside station, so that rear end collisions cannot occur.

In view of the foregoing, other objects of this invention will be apparent to those skilled in the art.

In the accompanying drawings:

FIGURE 1*a* represents the control circuits for what has been selected to be the second signal block of a railway signal system in accordance with this invention; and

FIGURE 1*b* represents the control circuits for the succeeding block which is the third block of the signal system.

The two FIGURES 1*a* and 1*b* placed end to end diagrammatically illustrate the circuits which control the signal loops for the second and third blocks and in part for the first and fourth blocks. A figure similar to FIGURE 1*a* placed to the left thereof would have the same elements and interconnections as shown in FIGURE 1*a* which circuits would be for the first signal block of the system. Similarly, a duplication of FIGURE 1*a* placed to the right thereof would provide the circuits for the fourth signal block.

As assumptions to facilitate the understanding of the operation of the system it will be taken that the train is traveling from left to right and is in the third signal block TB3 (see FIGURE 1*b*). Also, that the train is at least long enough to operate at times two contactors at once as shown.

The system is disclosed as applied to a mono-railway but is obviously not limited thereto. Also, it can be used on trains having rubber tired wheel. In view of this assumption, the rail system is shown as a single beam **10**. Disposed along the beam are a series of contactors which, for example, may be placed 100 feet apart in a thousand-foot signal block and being alternately positioned (but not necessarily so) on opposite sides of the beam and are shown diagrammatically at **2–1C**, **2–2C**, **2–3C** and **2–4C** for the block TB2 and at **3–1C**, **3–2C**, **3–3C** and **3–4C** for the block TB3. Obviously, in a thousand-foot block with one-hundred-foot spacing between the contactors, there would be ten such contactors for each block with five on each side of the beam. In order to simplify this disclosure as much as possible only four contactors for each block are shown. The last contactor in each block is positioned so that it is actuated so long as the train is in the block.

As suggested hereinbefore, these contactors can take a number of different forms and their main characteristic can be simply that the train will successively operate them as it passes through the block and maintain them operated until it passes each of them.

For the system selected for illustrative purposes, the electric power for the system is supplied separately for each block. This power is supplied through the transformer 2TR for the block TB2 and through transformer 3TR for the block TB3. These transformers respectively energize full wave rectifiers 2R and 3R whose output terminals are respectively connected to the respective block circuits at the points 2N and 2B and 3N and 3B.

The system is disclosed as being supplied with an A signaling code of a B signaling code and, in the case illustrated in the drawings, when each H relay is energized the A signal code is being transmitted and when it is de-energized the B signal code is being transmitted. By suitable circuitry additional signal codes could be provided to supply additional intelligences.

It is necessary of course that the signal loops 2BC and 3BC extend throughout the length of the related blocks and that there will be a set of CR contacts in each loop

for each CR relay with the exception of the first CR relay in each block, which can be considered a detection relay. More specifically, relay 2–1CR in block TB2 and relay 3–1CR in block TB3 do not, as shown, have contacts in the signal loops 2BC and 3BC respectively.

For a start of the description of the operation of the circuit, it will be assumed that the train T is in block TB3 and has actuated contactors 3–3C and 3–4C as shown. This actuation of both contactors and will open the normally closed switches 3–3CS and 3–4CS forming part thereof. Switch 3–3CS is in series with the repeater relay 3–3CP, which is thus de-energized. Relay 3–3CP is connected in an obvious manner across the voltage terminals 3N and 3B so that when switch 3–3CS opens it is de-energized. The de-energization of relay 3–3CP causes switches 3–3CP1 and 3–3CP2 to open, the former breaking the circuit to the 3–3CR relay so that its holding circuit through switch 3–3CR1 is opened. Thus, as shown, switches 3–3CR3 and 3–3CR4 are closed to short circuit the signal loop 3BC up to that point. Switch 3–3CP2 opens the circuit of the track relay 3T as shown.

A similar operation occurred previously when contactor 3–2C was operated to open its switch 3–2CS thereby breaking the circuit to the repeater relay 3–2CP whereupon switch 3–2CP1 opened breaking the circuit to the relay 3–2CR. The de-energization of this relay closed switches 3–2CR3 and 3–2CR4 shortening the signal loop 3BC up to that point. This illustrates that as each CR relay is successively de-energized it remains de-energized and the short circuits of the signal loop occur successively and remain so, as shown.

Referring to FIGURE 1*a*, there is shown the condition that all of the CR switches in the signal loop 2BC are shown closed so that this signal loop is continuous up to switches 3T6 and 3T7. However, these switches do not close until the track relay 3T is energized. This relay cannot be energized until the train T has completely passed into the next block whereupon the circuit for track relay T3 is completed at switch 3–4CS. As a result track relay 3T is energized and switches 3T5, 3T6 and 3T7 are closed. Signal loop 2BC is now receiving code B. The closing of switch 3T5 completes the circuit to the relay 2H with the result that the code signal for the block TB1 is changed from code B to code A. The code A signal permits the train in block TB1 to proceed normally. At this point it may be noted as is apparent that code B indicates reduced speeds.

It is also apparent at this point, that, as illustrated, protection is provided to effect a single block overlap signal system but this system is not restricted to this particular condition. As those skilled in the art will understand, by modifying the circuits this system can be used to provide rear end protection using no overlap, or 2 or 3, and so forth block overlaps.

Attention is called to the fact that the circuit to the 2H relay cannot be completed if relay 3J is energized. Energization of this circuit is controlled by the CR contacts 3–1CR2, 3–2CR2, 3–3CR2, and so forth. Thus the circuit to the 3J relay is not completed until the train T has completely passed out of block TB3 into block TB4. The particular function of the J relays under the control of the CR relays is to assure that the train has left, in this example block TB3, and is operating in block TB4.

This invention may be used on conventional railroads, bus lines and other means of transportation where an established private-right-of-way is used.

It may be used on an automated transportation system or a manual system as desired.

In a manually operated rapid transit system using a wire loop or block conductor, a means of restricting the intelligence that is being transmitted so that it may be received by the first train operating in the block only is a safety measure that cannot be overlooked. On an automated transportation system using a loop or a block conductor for the transmission of the intelligence from the wayside to the moving train over a wire loop or block conductor, the restriction of the intelligence to the first train is of equal importance. In all automated systems presently proposed, a monitor will be stationed on the train. The monitor will be able, when a train has been brought to a stop, to manually operate the train at a low speed until a clear indication has been received or until the preceding train has been reached.

Any signal or automated control system, using a wire loop or block conductor that does not have a cut-back circuit as a part of its controls must be considered an unsafe system.

In the above described it will be apparent to those skilled in the art that the subject matter of this invention is capable of modification in detail without departing from the basic principles herein disclosed. It is intended, therefore, that the described species of the invention is considered as exemplary rather than restricted and that the claims appended hereto define the protection desired.

What is claimed is:

1. A vehicle transportation signaling system for a right of way including at least one track on which a vehicle is guided, said right of way being divided into successive signal blocks and said signaling system comprising:
   - a respective coded vehicle control signal source for each said signal block,
   - a respective signal loop for each signal block, each said loop being coextensive with its corresponding block and separate from the tracks thereof, each said signal loop also being adapted to receive and convey the control signal from the signal source for the corresponding block,
   - and a control system for each signal block including a plurality of actuators spaced along said block and actuated by a vehicle passing therethrough, said actuators upon actuation successively rendering portions of the corresponding signal loop for the block to the rear of the actuator actuated by the vehicle ineffective for the conveyance of the vehicle control signal while maintaining the portions of the loop of the block forward of an actuator actuated by the vehicle effective for conveyance of the vehicle control signal.

2. In the combination of claim 1 means in each control system for reestablishing the full effectiveness of each loop for conveyance of the vehicle control signal when the vehicle has completed its passage of the associated block.

3. The combination of claim 1 wherein means are provided in each control system for changing the code of the signal supplied to its corresponding signal loop while the vehicle is in a succeeding block.

4. In the combination of claim 1 means in each control system for reestablishing the full effectiveness of each loop for conveyance of the vehicle control signal when the vehicle has completed its passage of the associated block and means in each control system for changing the code of the signal supplied to its corresponding signal loop while a vehicle is in a succeeding block.

5. In the combination of claim 1 means in each control system for changing the code of the signal supplied to its corresponding signal loop while a vehicle is at a predetermined location in a succeeding block and means for changing the code signal back to its original coding after the vehicle has completely passed into said succeeding block.

6. In the combination of claim 1 means in each control system for reestablishing the full effectiveness of its corresponding loop for conveyance of the vehicle control signal when the vehicle has completed its passage of the associated block and means in each control system for preventing the operation of said first means of the preceding block until the vehicle has cleared the block associated with each control system.

7. A signaling system for a monorail vehicle transportation system having a right of way which is divided into successive signal blocks, said signaling system comprising:

a respective means for each signal block for producing a vehicle control signal,

a respective control signal conveying means for each signal block adapted for connection to the corresponding control signal producing means for the block, each said signal conveying means being substantially coextensive with its corresponding signal block and at least a portion thereof including means different from the monorail of the block,

and a signal control system for each block, said control system including;

a plurality of control means spaced along a block, each control means being actuable by a vehicle located at a predetermined relationship therewith, and

means connected between selected control means and the respective signal conveying means of the block to render sections of the signal conveying means to the rear of the control means actuated by the vehicle ineffective to convey the control signal while maintaining the signal conveying means of the block forward of the last actuated control means effective to convey said control signal in accordance with the position of the vehicle within the block.

8. A signaling system for a rail vehicle transportation system having a right of way which is divided into successive signal blocks, said signaling system comprising:

a respective means for each signal block for producing a vehicle control signal,

a respective control signal conveying loop for each signal block including electrically conductive means

which are generally coextensive with at least a portion of the corresponding signal block and are separate from the rail thereof, each said loop being adapted for connection to the corresponding control signal producing means for the block,

and a signal control system for each block, said control system including;

a plurality of control means spaced along the right of way of the signal block, each control means being successively actuated by a vehicle as it passes from the entrance to the exit of the block, and

switching means connected between selected control means and the signal conveying loop of the block for successively changing the signal conveying characteristics of portions of the signal conveying loop of the block to the rear of the vehicle in response to successive actuation of said selected control means while maintaining the signal conveying characteristics of the signal conveying loop of the block forward of the vehicle.

References Cited by the Examiner

UNITED STATES PATENTS

1,936,618	11/1933	Cartelli	246—187 X
2,084,879	6/1937	Weise	104—153
2,488,815	11/1949	Hailes.	
2,706,813	4/1955	Sorensen	246—28 X
3,041,448	6/1962	Pascoe et al.	246—187 X

FOREIGN PATENTS

553,123	2/1923	France.

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