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ELECTRONIC CONTROL AND SURVEILLANCE SYSTEM FOR RAILWAY TRAINS

Original Filed Jan. 16, 1967

2 Sheets-Sheet 1

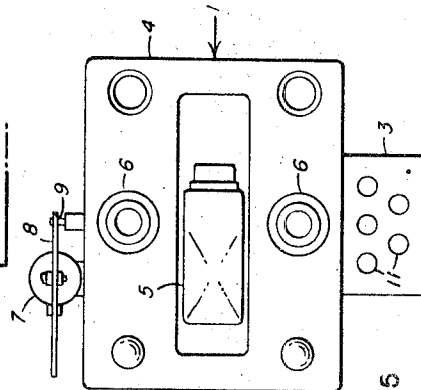
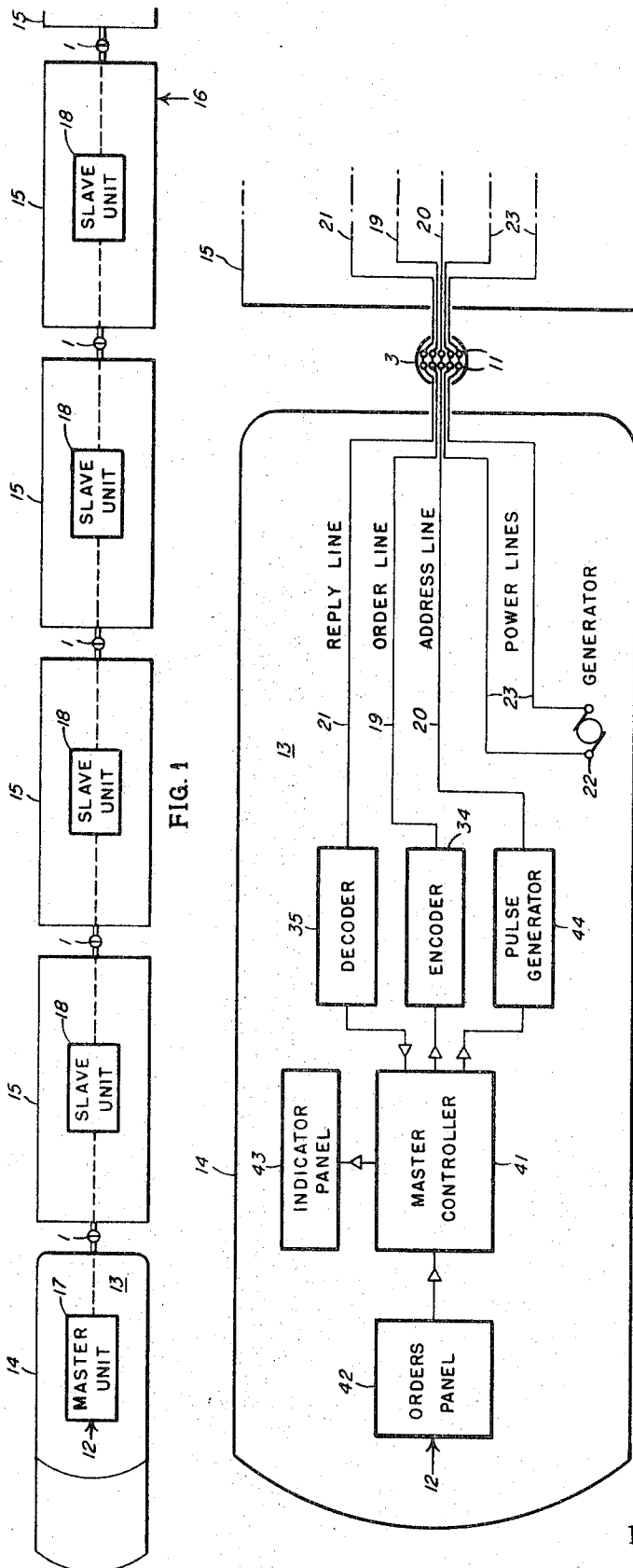


FIG. 5

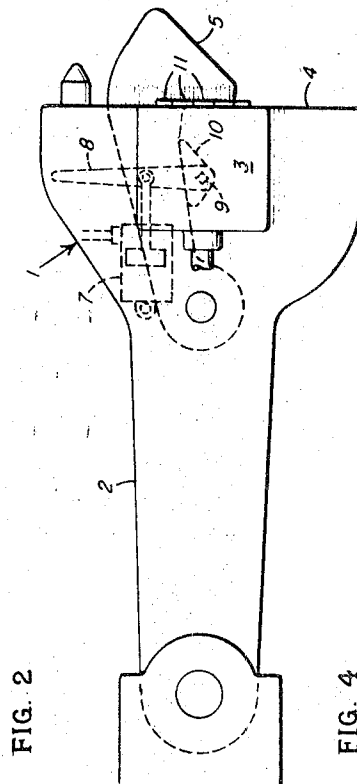


FIG. 2

FIG. 4

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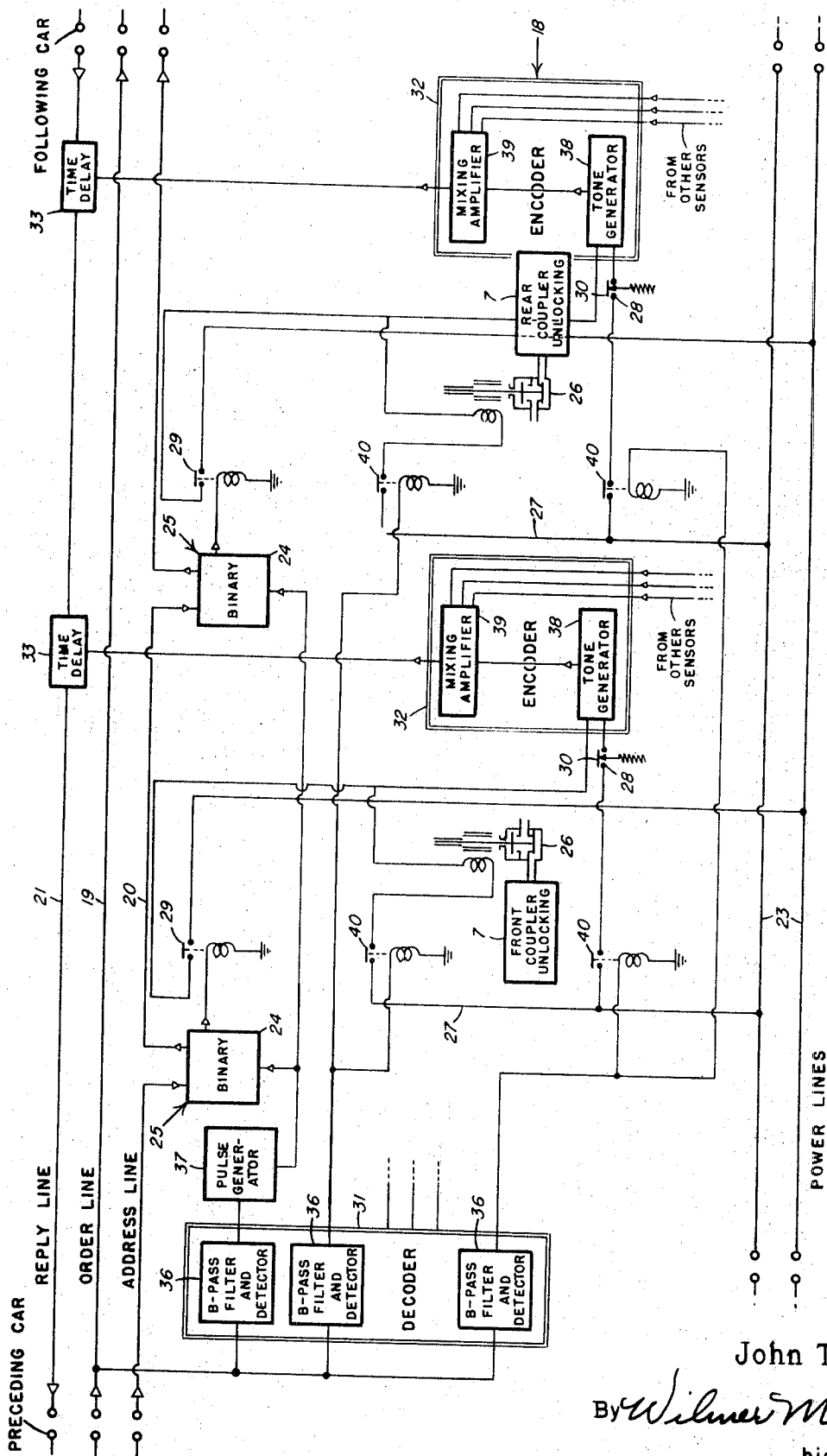


FIG. 3

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3,532,228

ELECTRONIC CONTROL AND SURVEILLANCE SYSTEM FOR RAILWAY TRAINS

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Continuation of application Ser. No. 609,612, Jan. 16, 1967. This application Apr. 25, 1969, Ser. No. 820,043
Int. Cl. B61g 1/08, 1/16, 3/08

U.S. Cl. 213-212

15 Claims

ABSTRACT OF THE DISCLOSURE

An electronic control and surveillance system for selectively controlling any operating and information supplying device in the train on the basis of their position therein, the system including an electronic master unit suitably in the lead locomotive and a slave unit in each car and communicating with the master unit over a common carrier for receiving orders and addresses from and transmitting information to the master unit, the slave units including means for applying an order from the master unit for activation of a device of a given type to all devices of that type in the train, and each slave unit including at least one of a plurality of binaries sequentially addressable by the master unit and each discrete to a device of any given type for preventing activation of that device except when addressed by the master unit.

This application is a continuation of U.S. application Ser. No. 609,612, filed Jan. 16, 1967, now abandoned.

THE PRIOR ART

Automatic mechanical coupling of passenger and freight cars and mechanical, electrical and air coupling at least of subway cars has long been standard practice. However, in uncoupling it is still necessary manually to unlock the mechanical couplers and disconnect the air lines of freight cars. Even the most recent developments in combined mechanical, electric and air couplers require each coupler to have its own controls, and the practice is to locate these controls in the cars on which the couplers are mounted. As indicated by the patents to Horak No. 1,414,187, De Haven No. 2,056,834, and Lunde No. 3,072,074, there have been proposals for enabling the uncoupling or unloading of individual cars in a train to be controlled from the locomotive. However, these proposals involve either a separate line from the locomotive to each device or in De Haven a series of relays for delay in the transmission from car to car so that an operator by precise timing can activate a device in a particular car. While these proposals conceivably might be applicable to a train made up of a few cars, even then they would not be too practicable and, plainly, the complexity of wiring or preciseness of timing they require would not suit them for the long freight trains which are now commonplace.

Train length is but one of the factors that an automatic control system practical for freight trains must take into account. Some one and a half million freight cars are now in service, almost all in interchange, and, except for unit trains, the cars making up a train will vary from run to run. Thus, however much the railroads might benefit from automatic control of freight trains, the feasibility of such control by master units in locomotives requires that the slave units in the individual freight cars be compact, trouble-free and compatible with any master unit.

SUMMARY OF THE INVENTION

In the system of the present invention couplers or other automatically operable equipment of one or more of the cars making up a train are selectively controllable electronically by a master unit at a locomotive cab or other

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convenient control station through slave units in the individual cars on the basis of the relative positions of the cars in the train, without dependence either on separate connections to the master unit or on inbuilt or preset differences between the slave units and regardless of the length of the train. It therefore is the primary object of the invention to provide an electronic system for controlling the operation of automatically operable devices on a railway train, whereby a master unit communicating with slave units at individual cars over carriers common thereto, at any time can select and cause to operate operating devices at any desired point in the train.

Another object of the invention is to provide an electronic system for railway trains which, with slave units at the cars communicating over carriers common thereto with a master unit at a control station, is effective at any time in a train of any length, to select and activate operating or information supplying devices for enabling any such devices to be controlled or surveillanced, as appropriate, from the control station.

Other objects and advantages of the invention will appear hereinafter in the detailed description, be particularly pointed out in the appended claims and be illustrated in the accompanying drawings, in which:

FIG. 1 is a schematic side elevational view of a railway train to which the improved system of the present invention has been applied;

FIG. 2 is a schematic plan view on a larger scale showing the master and slave units of the system respectively in a locomotive and typical car of the train;

FIG. 3 is a diagrammatic view of the circuitry of a typical slave unit;

FIG. 4 is a bottom plan view of an automatically uncouplable coupler exemplary of operating devices controllable by the system; and

FIG. 5 is a front elevational view of the coupler of FIG. 4.

DETAILED DESCRIPTION

Referring now in detail to the drawings in which like reference characters designate like parts, the improved electronic train system of the present invention is applicable to either freight or passenger cars and in its essentials will be the same for both. However, in view of the far greater importance of freight than passenger traffic to the economy of the railroad industry, it undoubtedly will be for freight train application that the present system will have the more appeal. It therefore will be with particular reference to freight trains that the improved system will be described as exemplary of the invention.

To qualify for interchange service, as most must, a freight car must be equipped with one or another of the present A.A.R. standard couplers. This poses an immediate problem, since, although automatic in mechanical coupling, none of these couplers is adapted for automatic uncoupling. This problem has a ready solution in the automatically uncouplable but otherwise standard coupler disclosed in Cope Pat. No. 3,245,553, but if the connection and disconnection of cars is to be fully automatic, even that coupler would have to be modified to incorporate air couplers suitably mounted in or on its head for connection and disconnection on mechanical coupling and uncoupling.

A further problem presented by freight cars is that, except for mechanically refrigerated refrigerator cars, the only power they usually have available is the compressed air received through the air lines for operating their brakes. This will not suffice, if, as in the coupler of the Cope patent, the application of actuating air to the coupler is controlled by a solenoid actuated valve. Each car might be equipped with a generator driven off an axle, but this would render the system inoperative except

when the train was moving and individual battery power, while circumventing this difficulty, would require maintenance. Nor, since limited in use to electrified lines, would individual pantographs for tapping line power be suitable.

A more satisfactory solution and the one here contemplated is to supply the cars with electric power from the one or more locomotives in the particular train. This in turn involves electric coupling of the cars, indicating that they should be equipped with combined mechanical, air and electric couplers. The preference, as the best now available, is for an automatically uncouplable combined coupler having a hook type head and a standard shank, such as shown in Cope application Ser. No. 493,383, filed Oct. 6, 1965, now U.S. Pat. No. 3,405,811, issued Oct. 15, 1968. In accordance with this preference, the exemplary coupler shown in FIGS. 4 and 5, is a hook type coupler 1 having a shank 2 similar to that of the standard type H coupler, and mounting an electric coupler 3 on the underside of the head 4. The head 4, for mechanical coupling, mounts a pivoted hook 5, which is normally spring-held in coupling position and also mounts air couplers 6. The coupler is unlockable or uncouplable automatically by an air cylinder unit 7 mounted on the top or underneath the head 4 and connected by a lever 8 to a mounting shaft 9 fixed against turning to an unlocking cam 10 engaging the hook 5. In emergencies the coupler is unlockable by manual actuation of the lever 8.

As will be explained later, the electric coupler 3 needs no more than five contacts 11 and is adaptable for mounting either in, or as illustrated, below the head. While no provision is shown for holding the contacts 11 retracted in coupling until the mechanical coupling is completed and retracting them in uncoupling in advance of mechanical uncoupling, if otherwise arcing will occur, the contacts can be mounted for advancing and retracting relative to the head and advanced to contact position after mechanical coupling and retracted from that position before mechanical uncoupling by any suitable means, such as the air pressure advance-spring return arrangement, disclosed in Gobrecht Pat. No. 3,263,823.

The improved electronic train system of the present invention, designated generally as 12, enables the uncoupling of an automatically uncouplable coupler, such as the coupler 1, or the operation of any other automatically operable or activatable operating or information supplying device at any point in a train to be controlled or ordered at any time from a conveniently located control station 13, such as the cab of the train's head locomotive 14. Enabling such control to be exercised regardless of the number of cars 15 in the particular train 16, the system 12 is comprised of a master unit 17 at or in the locomotive cab or other control station 13 and a slave unit 18 at, in or on at least some and preferably each of the cars. Communication between the master unit 17 and slave units 18 may be by radio within approved frequency bands or by wire, but in either case known multiplexing techniques, such as frequency division, pulse code or pulse amplitude multiplexing, preferably are employed to minimize the number of carriers or lines of communication by incorporating in the units components suitable for the selected technique.

By using multiplexing to the ultimate, all communications between the master and slave units could be transmitted over one line or carrier. However, depending on the functions to be performed, the communications are of either two or three distinct types and, to simplify the explanation of the system, each will be considered as having its own discrete line or carrier. On this basis, were the system required merely to exercise control over operating devices, two communication lines or carriers would suffice, one an order line or carrier 19 and the other an address line or carrier 20. However, for surveillancing to check on the performance of the operating devices, as well as to obtain information at any time on demand as to any

part of interest of any car, the system also should include a reply line or carrier 21. Whether two or the preferred three, the communications lines between the master unit and the slave units will be the same for or common to all of the slave units.

To eliminate the need for a transceiver in each unit, the illustrated embodiment has as the communications lines 19, 20 and 21 separate wires or lines running or leading from the master unit to the slave unit in the rear car through the slave units in the intervening cars. If, as most suitably, the electric power for operating or activating the automatically operable or activatable couplers or other operating devices in the various cars, is supplied from a generator 22 in the locomotive 14, the electric lines 23 from the generator through the train to the last car, may also serve as communication lines of the system, but, to simplify both the system and its explanation, the communication lines 19, 20 and 21, have been shown as separate from the electric lines. In keeping, the electric coupler 3 illustrated as exemplary of those by which the between-car electric connections are made, is shown with five contacts 11, one for each of the electric and communication lines.

The system 12 depends for its selective ability at any time to enable an automatically operable or activatable operating device at any point in the train to be operated or information as to any part of interest of any car to be obtained, upon including in the slave unit 18 of each car at least one transistor-pair or other suitable binary or so-called "flip-flop" 24 as a control element and connecting the binaries of the several slave units in series to form a shift register 25. Flip-flop and shift register circuits are well-known in the computer art, as discussed, respectively, on pages 187 and 308 of Digital Computer Principles, McGraw-Hill Book Company, 1962. As automatic uncoupling will usually be of prime importance and knowledge of which of the cars' two couplers is at the front is therefore needed, the illustrated system, instead of relying on some other means, such as an inertial switch, obtains an answer to that question by including in each slave unit 18 two binaries 24, one for each coupler. Once connected to form the shift register 25, the binaries 24 act in their response to pulses like those in a shift register of a computer, each shifting in sequence to a "1," "on," or "go" position or condition in response to an address pulse from the preceding binary or, in case of the lead binary, the locomotive and all shifting simultaneously to a "0," "off," or "no-go" position or condition in response to a shift pulse and any of the binaries transmitting a pulse to a succeeding binary following a shift pulse only when shifted by the latter from the "1" to the "0" position. In the improved system the address pulses for sequentially shifting the binary to the "1" position are transmitted over the address line 20 and the shift pulses are ordered over the order line 19. As in a computer, the address and shift pulses in the present system will be staggered timewise or non-synchronous so that any address pulse transmitted over the address line 20 will be transmitted in the interval between shift pulses and the frequencies of the pulses will be such as to insure time for a binary to shift in the time lag between any two time-adjointing pulses.

To be operated from or furnish information to the master unit 17, an operating or information or data supplying device in a car preferably will be electrically activated. However, even if this preference is adhered to, no objectionable limits are imposed on use of the system. Thus, among operating devices, there may be automatically uncouplable couplers, such as the coupler 1, which, while unlocked by air pressure, have the air supply to the unlocking unit 7 controlled by a solenoid actuated valve 26, a similarly actuated coupler centering device, an electrically driven boxcar door or hopper car slide gate or a drop bottom door or almost any other operating device with which a railroad car is or may be equipped.

The range of the preferred information supplying devices is comparable, extending from electrical switches or other devices for sensing various conditions, such as the temperature of a journal or a refrigerator car, height of lading in a hopper car or closed or open condition of a door or gate, to a memory unit programmed to identify a car by railroad and serial number or other identification discrete thereto.

The binaries 24 selectively control when the operating or information supplying devices in the train are in condition to act by each being so associated with one or more devices as to prevent their operation except when it is in the "on" condition and all being addressable sequentially to place them individually in their "on" condition.

In the illustrated embodiment, such control is suitably exercised on the preferred electrically activatable devices by connecting each binary to control the supply of electric power to certain of the devices from the electric lines 23 or other power source. This is accomplished by in effect connecting or wiring each binary in series with the one or more electric or electrically actuated or driven operating or information supplying devices it is intended to control in an electrical circuit 27 supplied from the lines 23, in which the devices, if a plurality and intended to act separately, are wired or connected in parallel with each other. Each binary is so connected in its circuit 27 as to make power available for any of the devices connected therein only when it is in its "on" condition. Using a coupler 1 as exemplary of one or more operating devices and a sensing device 28 as exemplary of information supplying devices, neither one nor the other thus will be in a condition to or can act unless the binary in the particular circuit is in its "on" condition.

In the exemplary slave unit circuitry illustrated in FIG. 3, each of the binaries 24 is not itself directly connected in the circuit 27, instead of its "on" condition supplying D.C. power for energizing a solenoid actuated switch 29 connected in series with the solenoid actuated valve 26 of the coupler 1 and a switch 30 of a two-position sensing device 28, the latter switch being open in one and closed in the other of the sensing device's positions.

In addition to its one or more binaries 24, each slave unit 18 includes a decoder 31 and either a single encoder 32 or one for each binary circuit. Encoders and decoders are well-known in the computer art, as discussed, respectively, on pages 494 and 302 of the afore-mentioned Digital Computer Principles. The decoders 31 of all of the slave units are connected to the common order line 19. In turn the encoders of all units are connected to the common reply line 21, each through a magnetorestrictive or other suitable time delay 33 discrete thereto. Time delay circuits are also well-known in the art and are discussed at length on page 178 of Digital Computer Principles. Connected in series along the reply line 21, the time delays 33 preferably are predetermined each to delay the arrival of a message or composite signal from its encoder 32 at the preceding or next ahead time delay until the latter has passed or been cleared of the message from its own encoder, thus providing a sequential transmission from the encoders in accordance with their relative positions in the train even though messages at all are initiated simultaneously.

The forms of the decoders 31 and encoders 32 in the slave units 18 and cooperating components of the master unit, an encoder 34 in the order line 19 and decoder 35 in the reply line 21, of course will depend upon the particular multiplexing technique employed in the system. In the illustrated circuitry in which frequency division multiplexing is used to discriminate between orders from the master unit 17, the order for the action of each type of operating device and information supplying device throughout the train may have a discrete tone and the decoder suitable means, such as a bandpass filter and detector for each tone, for differentiating between them, or, if many different orders need be sent, a few tones can be

used for transmitting many different orders by using a particular combination of tones for each order and suitable filters and detectors.

Consistent with the use of the order line 19 for transmitting different orders using multiplexing techniques, in the illustrated circuitry, an order for shift pulses is transmitted from the master unit 17 as a discrete tone or combination of tones and the shift pulses themselves are generated by a pulse generator 37 in each slave unit. Each of the slave unit encoders 32 includes a tone generator 38 connected to each sensing device 28 for generating the tone or combination of tones discrete thereto and a mixer-amplifier 39 for mixing and amplifying as necessary the tones of the one or more sensing units before transmitting them over the reply line 21 to the encoder 34 of the master unit 17 through the related time delay 33. Each filter and detector 36 of the decoder 31, on receipt of the order for which it is tuned, may apply that order to the particular operating or information supplying device to which it pertains, suitably by energizing a solenoid actuated switch 40 in the circuit 27 in series with and discrete to the particular device, the switch normally being open and closed when the order for that device is received.

Each device itself or the solenoid or other electric element to which it responds thus being connected in series with both the binary switch 29 and the switch 40 controlled by its detector 36, no operating or information supplying device of any type in any car can act in response to an order from the master unit 17 on the order line 19 for action by all devices of that type, unless the related or associated binary 24 in the slave unit 18 of that car is in the "on" or "go" condition. Consequently, since the master unit 17 can control which of the binaries is in the "on" condition at any given time by using all the binaries as a shift register, it can select the point or points in the train at which a device of a particular type will act in response to an order sent on the order line 19 for action by all devices of that type.

The master unit 17, if it is only to order action by a coupler or other operating device 1 at a particular point or points in the train, must be adapted to apply the address and shift pulses to the binaries required for them to function as a shift register and to discriminate by types of devices in its orders. If, as preferred, it also is to be adapted to retrieve or obtain information from sensing or other information supplying devices 28, the master unit also must be adapted to receive and read out the information from each such device. As electronic components capable of performing these functions are well known, a detailed description of a suitable master unit would be superfluous and a general description of the unit as a whole will suffice. For compatibility with the illustrated exemplary slave unit 18, the exemplary master unit 17 is box-illustrated as having a master controller 41, which may be a special purpose computer adapted to store and read out information from the information supplying devices 28 and programmable either instantaneously or after any desired time interval to order any desired action at any point in the train in the manner heretofore explained. As is well-known in the computer art, special purpose computers are merely those computers designed for solving a specific type of problem, usually containing a built-in program. For instantaneous or delayed programming, there is provided an order panel 42 which will be fitted with suitable controls for enabling the engineer or other operator to feed to the master controller the desired order or orders for performance at the desired time or times at the selected point or points in the train. An indicator panel 43, fed from the master controller 41 and fitted with lights or other suitable visual indicators, has been provided for visually indicating to the operator particular conditions throughout the train at any desired time. The order and address lines 19 and 20 from the master unit to the slave unit 18, are shown

as leading from the master controller 41 with the encoder 34 of the master unit in the order line and a pulse generator 44 for generating the address pulses in the address line, the encoder and pulse generator of course being compatible with the corresponding components in the slave units. The last of the illustrated components of the master unit is the decoder 35 in the reply line 21 which decodes the replies, messages or signals from the encoders 32 of the slave units 17 and then sends them to the master controller 41.

For optimum benefit from the improved electronic train system 12 of the present invention, all of the cars of the train should be equipped with identical or compatible automatically uncouplable combined couplers and all equipment of the same type should be so connected to the slave units as to be responsive to the same order. By using radio instead of wire communication between the master and slave units 17 and 18 and spotting compatibly equipped cars at points in the train critical to the particular run, automatic control sufficient for many purposes can be exercised without including all of the cars in the system. However, compatibility throughout the train is preferred and, assuming it exists, the shift register 25 upon which the system's selective control is dependent will function in exactly the same way whether the train has only one, the illustrated four, or any other number of cars.

As typical of the operation of the system for interrogation or surveillancing, the engineer presumably, will want to obtain all of the information available from all of the cars as soon as the train is made up. To do so he will call from the order panel 42 for the master unit to transmit on the address line 20 a series of pulses or "bits" greater in number than the maximum possible number of cars in the train and to order simultaneously on the order line 19 a number, less by one, of time-offset or nonsynchronous shift pulses, with the result that all of the binaries 24 will be placed in their "on" condition. An order placed simultaneously or later for all of the information supplying devices 28 to act, in this "on" condition of all of the binaries, will cause all of those devices to indicate their conditions by sending or failing to send the signals discrete to their types to the related encoders 32, each of which in turn will send a coded mixture of the signals received by it to the related time delay 33. By delays produced by the time delays in passing the mixture or message to the reply line 21, the coded message from the information supplying devices controlled by each binary will be received by the master unit as a separate message and the messages controlled by the several binaries will be in a sequence corresponding to the binaries' relative positions or sequence from the front of the train. The signals being separate, the master unit not only can discriminate among binary circuits in the formation received but give a count of the actual number of cars in the train.

An uncoupling operation to cut out a string of cars at a stop along the run typifies the operation of the system in automatically controlling the operation of operating devices. Assuming that in making up the train the string is placed at the end and that it includes all cars beyond the n th car, the uncoupling point will be between the n and $n+1$ cars. If the couplers 1 are of the type that will uncouple on unlocking of one of the mated couplers, the unlocking of the rear coupler on the n car or front coupler on the $n+1$ car will suffice and the illustrated coupler is of this type. However, while the same in individual unlocking, the most recent hook type couplers such as shown in Cope application Ser. No. 493,383, are of an ultra-safe type that will not uncouple unless both mated couplers are unlocked. Assuming the couplers are of this latter type, the master unit on order from the engineer will transmit two directly sequential address pulses on the address line 20 to the first binary and, after first such pulse, there being two binaries per car, initiate the

application of $2 \times n$ shift pulses to all of the binaries, as a consequence of which the binaries of the two couplers to be uncoupled, and only those binaries, will be placed in their "on" condition. An uncoupling order transmitted on the order line 19 at that time therefore will unlock only those two couplers and on the transmission of such an order the string of cars destined for the particular stop will be uncoupled and cut from the train. It will of course be understood that between the initial order for information and the order for uncoupling, the shift register 25 will have been cleared by applying thereto a sufficient number of shift pulses to place all of the binaries in their "off" condition.

In operating the system, extraneous signals interfering with communication between the master and slave units may possibly be produced at junctions of the electric couplers 3 or elsewhere. To guard against such interference it therefore is desirable to equip the several units with suitable components for filtering out or otherwise squelching such signals. Also, while the improved system has been described as an in-train system, the addition of a suitable transmitter to the read out side of the master controller 41 of the master unit 17, would provide a ready means for enabling much or all of the information the master unit is adapted to receive from the cars in the train, to be transmitted to a data processing center for correlating with like data from other trains. This would eliminate the need for resort for such information to transmissions from stationary data supplying devices located at trackside and obtaining their data by scanning passing trains.

From the above detailed description it will be apparent that there has been provided an improved electronic train system by which electrically responsive operating and information supplying devices at any point in a train of any length can be caused at will to act automatically from a locomotive cab or other control station. It should be understood that the described and disclosed embodiment is merely exemplary of the invention and that all modifications are intended to be included that do not depart from the spirit of the invention and the appended claims.

What is claimed is:

1. An electronic system for selectively activating devices in a railway train from a control station, comprising:
 - a control station, said station including a master unit for at least transmitting orders and addresses;
 - a railway train having a locomotive and a plurality of cars connected to said locomotive;
 - a plurality of activatable means of a given type on said train;
 - a slave unit on at least two of said cars and communication means interconnecting said master unit and said slave units on said train, each of said slave units being responsive to said orders and addresses from said master unit for activating in said train remote from said control station each of said plurality of activatable means;
 - carrier means common to said slave units for carrying at least said orders and addresses therebetween and said master unit, said slave units including means for applying an order from said master unit to said activatable means, and said slave units each including a plurality of binaries arranged in series and being sequentially addressable by said master unit and each binary being discrete to certain of said activatable means, each of said binaries being effective except when addressed by said master unit to prevent activation of the activatable means discrete thereto by said order applying means.
2. An electronic system for selectively activating devices in a railway train from a control station, comprising:

- a control station, said station including a master unit for at least transmitting orders and addresses;
- a railway train having a locomotive and a plurality of cars connected to said locomotive;
- a plurality of types of activatable means on said train;
- a slave unit on at least two of said cars and communication means interconnecting said master unit and said slave units on said train, each of said slave units being responsive to said orders and addresses from said master unit for activating in said train remote from said control station any of said plurality of types of activatable means;
- carrier means common to said slave units for carrying at least said orders and addresses therebetween and said master unit, said slave units including means for applying an order from said master unit for activation of activatable means of a given one of said plurality of types to all activatable means of said given type in said train, and said slave units each including a plurality of binaries arranged in series and being sequentially addressable by said master unit and each binary being discrete to certain of said one given type of activatable means, each of said binaries being effective except when addressed by said master unit to prevent activation of the activatable means discrete thereto by said order applying means.
3. An electronic system according to claim 1, wherein said activatable means comprises automatically uncouplable couplers between cars of the train.
4. An electronic system according to claim 3, wherein each of the couplers has one of the sequentially addressable means discrete thereto.
5. An electronic system according to claim 1, wherein said activatable means comprises automatically uncouplable couplers on each car, and each slave unit includes a binary for each coupler.
6. An electronic system according to claim 1, wherein the carrier means common to the slave units include an order carrier and an address carrier for carrying from the master unit respectively orders to the order applying means and addresses to the binaries of the slave units.
7. An electronic system according to claim 2, wherein the activatable means comprises means of more than one type on at least certain of the cars of the train, and the master unit and the slave units on at least said certain cars include means respectively for transmitting and discriminating between multiplexed orders each discrete to activatable means of one type.
8. An electronic system according to claim 7, wherein the master unit communicates with the binaries of the slave units by transmitting address pulses over the address carrier and ordering shift pulses non-synchronous with the address pulses over the order carrier.
9. An electronic system according to claim 8, wherein each slave unit includes a pulse generator for generating the shift pulses on order from the master unit.

10. An electronic system according to claim 8, wherein the activatable means on at least certain of the cars of the train include operating means and information supplying means, the carrier means include a reply carrier, and each information supplying means has means associated therewith for generating a signal discrete thereto for transmittal to the master unit over the reply carrier on order therefor by the master unit.

11. An electronic system according to claim 10, including a time delay for each binary for receiving signals from any information supplying means controlled thereby, said time delays being arranged in series along said reply carrier for receiving the signals from any information supplying means controlled by its own and all succeeding binaries and passing said signals to a time delay of any immediately preceding binary after a delay predetermined to clear said last-named time delay of any previously received signals, thereby enabling the master unit to receive separately and in the sequence of the binaries signals from the information supplying devices controlled by each binary.

12. An electronic system according to claim 11, wherein there are a plurality of information supplying means of different types in at least certain of the cars, and the slave units of said certain cars and the master unit include respectively encoder and decoder means for multiplex communication over the reply carrier.

13. An electronic system according to claim 1, wherein the carrier means common to the slave units are separate order, address and reply lines extending through the train from the master unit to the last slave unit and between-car connected by electric couplers.

14. An electronic system according to claim 13, wherein the electric couplers are each part of a combined mechanical, air and electric coupler automatically uncouplable by an associated slave unit on order from the master unit.

15. An electronic system according to claim 14, wherein the activatable means in the train including the combined couplers are electrically activatable, and power for activating the activatable means is supplied from a common source in the train through common power line means to all of the activatable means with the between-car connection of the power line means made by the electric couplers.

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