

[54] DISPATCHING SYSTEM CIRCUIT

[75] Inventors: **Ronald Louis Lach**, Arlington Heights; **William Jean Brier**, Skokie, both of Ill.

[73] Assignee: **Elec-Tro-Tec, Inc.**, Elk Grove Village, Ill.

[22] Filed: **Apr. 10, 1974**

[21] Appl. No.: **459,549**

[52] U.S. Cl. **317/137; 340/51**

[51] Int. Cl. **H01h 47/00; G08g 1/00**

[58] Field of Search **317/137, 139, 140; 340/51**

[56] **References Cited****UNITED STATES PATENTS**

3,206,722	9/1965	Gustus et al.	340/51
3,588,808	6/1971	Gustus	340/51

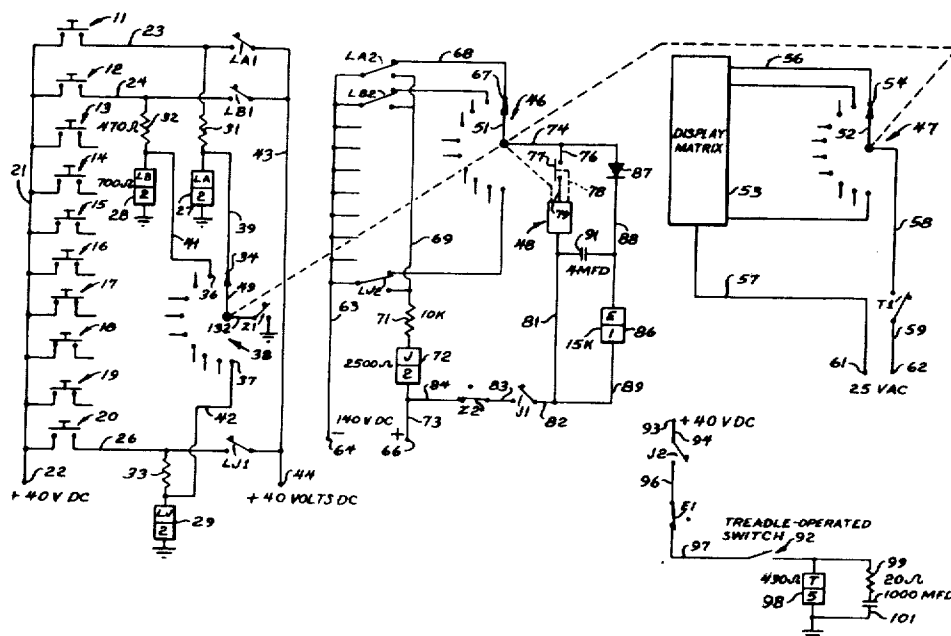
Primary Examiner—L. T. Hix

Attorney, Agent, or Firm—John K. Lucas; Robert A. Brown

[57] **ABSTRACT**

Improvements in a dispatching system control circuit for use in a known dispatching system operable to efficiently direct the movement of dispatched units to a plurality of serving stations, the system having actuating means at each of the serving stations for producing electrical request signals and a plurality of instructing means, preferably numerical indicating signs, each for directing movement to an associated serving station, the improvements in the circuit comprising electromechanical relays for enabling full utilization of the terminal outlets of a stepping relay for receiving request signals from the serving stations, thereby minimizing the cost of the circuit components. The circuit also preferably includes an electronic timer operable to initiate operation of the stepping relay at regular time intervals.

4 Claims, 8 Drawing Figures



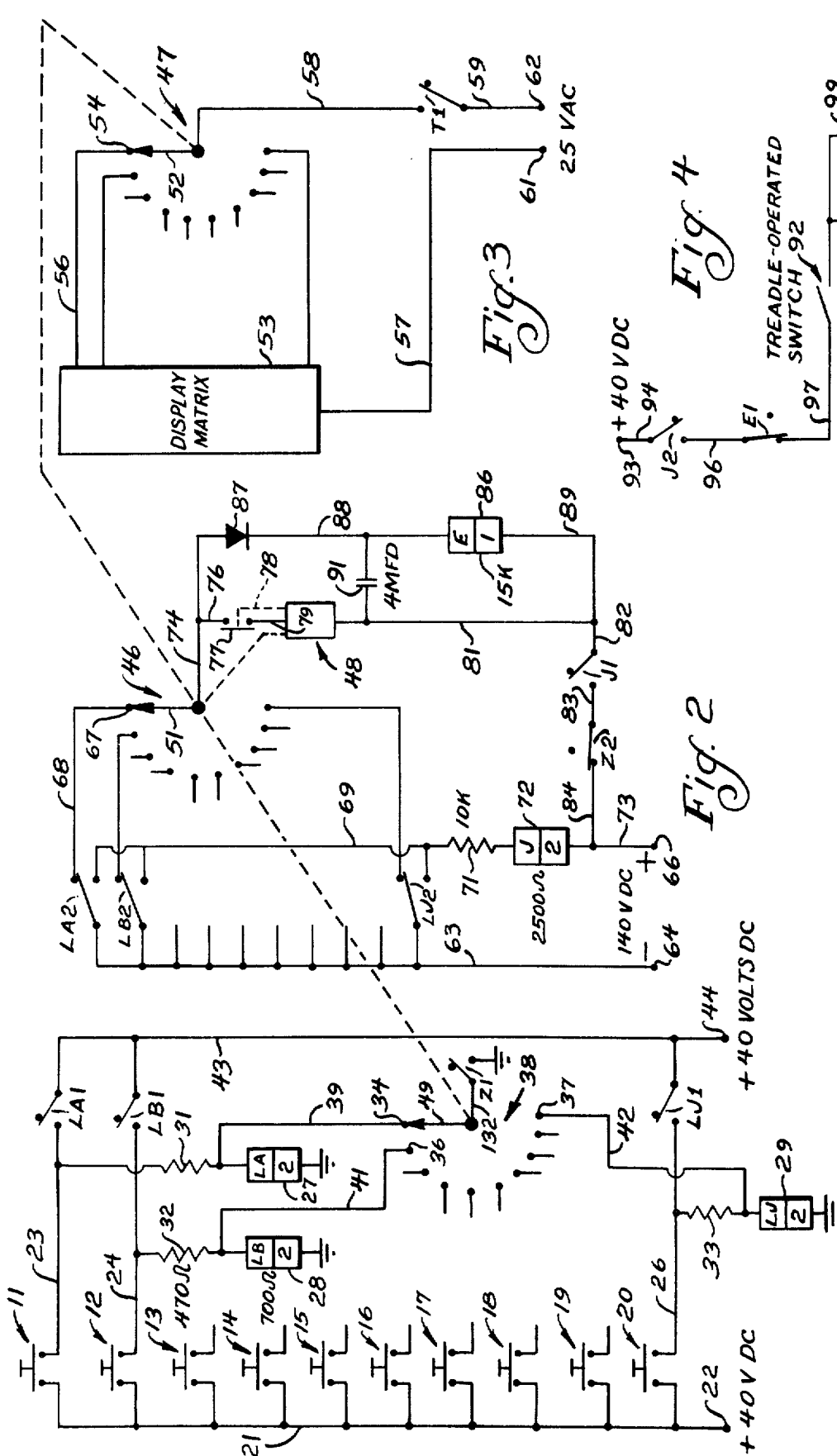
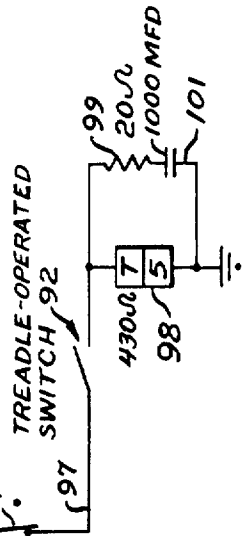


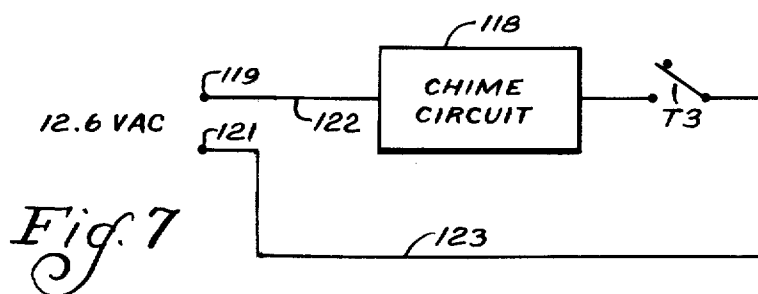
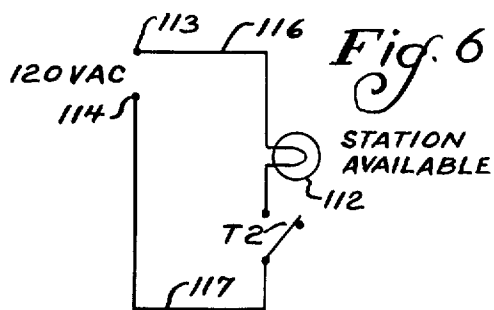
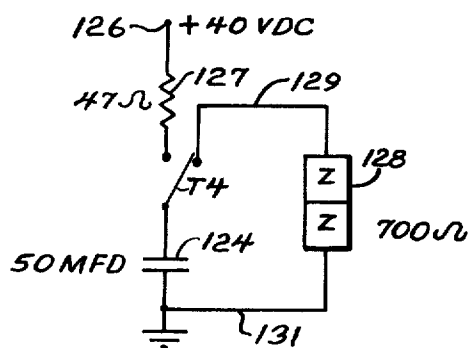
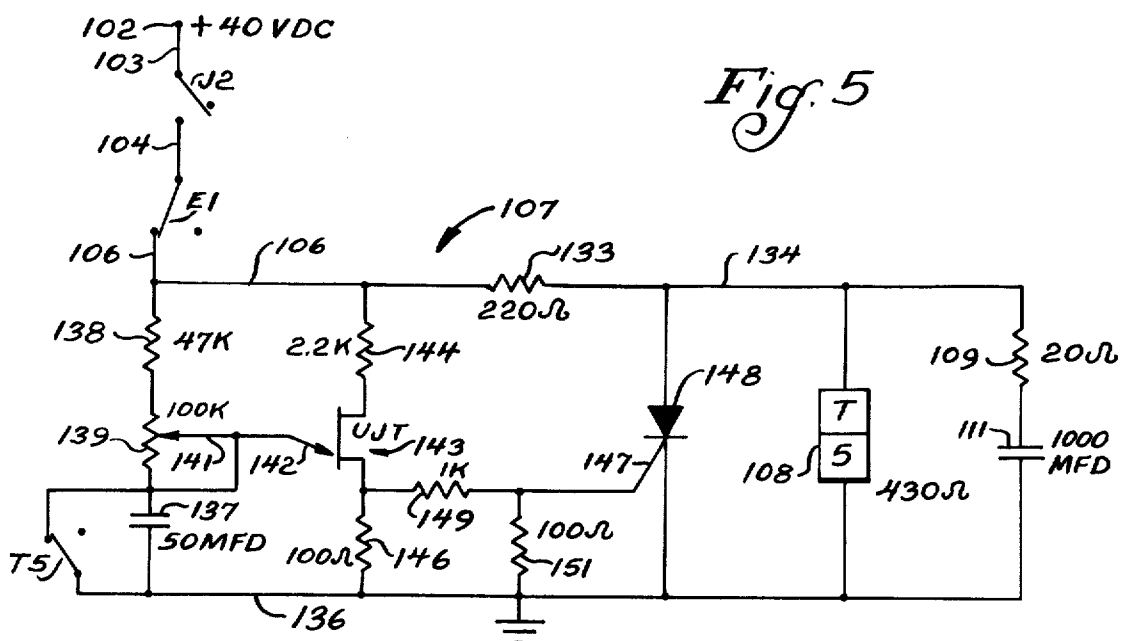
Fig. 1

Fig. 2

Fig. 3

Fig. 4





DISPATCHING SYSTEM CIRCUIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to dispatching systems and, more particularly, to improvements in a control circuit for use therein.

2. Description of the Prior Art

Electronic dispatching systems, particularly suitable for use in drive-in banks and the like, have been provided for efficiently controlling the movement of vehicular or pedestrian traffic or other moving units from a dispatching or entrance station to a plurality of serving or receiving stations by accepting electrical request signals or teller calls from the latter as they are generated and subsequently presenting instruction messages at the dispatching station in a predetermined sequence, the messages being preferably presented by means of visual displays of numerical indicia corresponding to the serving stations. See, for example, U.S. Pat. No. 3,206,722, which issued on Sept. 14, 1965 to O. T. Gustus et al; and U.S. Pat. No. 3,588,808, which issued on June 28, 1971 to R. T. Gustus.

The dispatching systems typified by the disclosures of these patents contain control circuits each having plural actuating means each at an associated serving station for producing electrical request signals, plural latching relays or other switching means each in circuit with an associated one of the actuating means for actuation in response to a request signal produced by the latter, instructing means for each of the serving stations, each of the instructing means being operated in response to actuation of an associated latching relay, and a stepping relay having a three group set of stepping switches stepping in unison in response to energization of the stepping relay, the first group being in a circuit operable to control the positioning of the set, the second group being in circuit with the instructing means for selective energization thereof in accordance with the positioning of the set, and the third group being in circuit with the latching relays and being operable to return the latter to their un-actuated positions, thereby cancelling the effect of a request signal produced by the actuating means at a serving station following operation of its associated instructing means.

However, as those familiar with dispatching system control circuits will appreciate, circuits typified by the disclosures in the foregoing U.S. patents each include a stepping relay having alternately interconnected relay outlets or terminals in order to provide resting positions for the stepping switch wiper, thereby allowing only one-half of the stepping switch outlets or terminals to be connected to actuating means at the serving stations for receiving request signals or teller calls. This circuit design requires the use of a stepping relay having twice as many terminals or outlets as there are serving stations, representing an unnecessary cost, particularly when the dispatching system is utilized to direct moving traffic, pedestrians or other units to a large number of serving stations. If the alternately connected terminals of the stepping relay were not provided in a typical prior known dispatching system circuit, the stepping switch would step or hunt continuously during circuit conditions where no request signals are stored in the dispatching system, thereby causing the instructing means to be sequentially energized in accordance with

the rotation of the stepping relay wiper, resulting in erroneous instructions.

SUMMARY OF THE INVENTION

The present invention comprises improvements in a dispatching system control circuit which enable full utilization of the stepping relay terminals or outlets for connection to the serving stations to receive request signals, thereby providing a more economical and efficient control circuit. The present invention accomplishes this full utilization of the stepping relay terminals by providing first electromechanical relay means or other suitable switching means in a circuit with all of the latching relays to be operated in response to actuation of any of the latter, operation of the first relay means serving to complete an energizing circuit for the stepping relay to initiate stepping or hunting thereof; second relay means in parallel circuit with the stepping relay for simultaneous energization therewith, the first and second relay means cooperating to complete an energizing circuit to enable initiation of operation of the instructing means in response to de-energization of the stepping relay; and third relay means in circuit with the third group for controlling the latter to de-actuate an actuated latching relay following operation of the instructing means associated with the latter. The present invention therefore provides means for indicating to the circuit when the stepping relay is stepping or hunting, and when it is stopped, and for operating the instructing means after the stepping relay has stopped to a predetermined operating position corresponding to one of the serving stations. The present invention also includes means for cancelling the effect of a request signal produced by the actuating means at each serving station following operation of its associated instructing means.

In addition to the foregoing, the present invention comprises an improved dispatching system control circuit wherein an electronic timer is provided to repetitively initiate operation of the stepping relay at regular preselected time intervals in response to simultaneous actuation of plural latching relays, the timer being further operable to maintain operation of each instructing means for a preselected time interval.

Accordingly, it is an important object of the present invention to provide a novel and improved control circuit for use in a known dispatching system.

Yet another important object of the present invention is to provide an improved control circuit for a dispatching system to enable full utilization of the terminals or outlets of a stepping relay contained therein.

Numerous other objects and advantages of the present invention will be apparent from the following description, which, when taken in conjunction with the accompanying drawings, discloses a preferred embodiment thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1, 2 and 3 are schematic diagrams, employing detached relay contact notation, illustrating some of the features of the preferred embodiment of the present invention;

FIG. 4 shows the operation of a treadle-operated switch or other switching means actuated in response to the presence of a unit to be dispatched;

FIG. 5 illustrates the use of an electronic timer for initiating operation of the instructing means at regular preselected time intervals:

FIGS. 6 and 7 illustrate visual and audible indicating devices controlled by the dispatching system circuit; and

FIG. 8 illustrates the relay circuit used to control de-actuation of an actuated latching relay.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the preferred embodiment of the present invention, reference is initially made to FIGS. 1, 2 and 3. As shown therein, the present invention comprises improvements in a control circuit for use in a known dispatching system, the circuit having ten known actuating means illustrated as pushbutton switches and designated by reference numerals 11-20 in FIG. 1, suitable for use with a conventional stepping relay having ten terminals or outlet positions, each of the actuating means being connected to a common power line 21 in turn connected to a power terminal 22 supplied with a source of electrical energy, preferably on the order of 40 volts DC. Each of the actuating means produces electrical request signals either manually or automatically, as described in the previously mentioned U.S. patents, on associated output lines, only a few of these lines being illustrated for purpose of simplifying the drawings. Actuating means 11, 12 and 20 are respectively connected to lines 23, 24 and 26, each of these lines being connected to an associated latching relay or other switching means 27, 28 and 29 through resistors 31, 32 and 33, respectively, the other terminal of each latching relay being connected to ground. It will be noted that the lines 23, 24 and 26 can comprise wire connections or, in the alternative, radio control links between a transmitter at each of the remote serving stations and receiving equipment at the centrally located control circuit.

In the drawings, detached relay contact notation is utilized for simplification. Each relay is designated by a one or two letter symbol preceding a slash and a numeral indicating its number of contacts; each contact is designated by the letter symbol and a number without the slash. For example, the LA/2 relay has relay contacts LA1 and LA2, all of these contacts being transferred upon energization of the LA/2 relay coil. The figures illustrate the relay contacts in their rest positions corresponding to the de-energized conditions of their respective relay coils. Also for simplification, only three of the latching relays are shown and described; however, it should be noted that identical circuitry (not shown) is provided for connecting a similar latching relay to each of the actuating means 13-19. Of course, latching relays corresponding to serving stations can be utilized as desired, their total number being limited by the number of relay outlet terminals of the stepping switch. It should be further noted that the voltages and component types and values illustrated in the drawings correspond to those typically available and suitable for use in the preferred embodiment of the present invention, their selection being a matter of design choice.

A latching relay LA/2 denoted by a numeral 27, a latching relay LB/2 denoted by numeral 28 and a latching relay LJ/2 denoted by numeral 29 are connected to relay terminals or outlets 34, 36 and 37 of one group 38 of a three group set of stepping relays by means of

lines 39, 41 and 42, respectively. Lines 23, 24 and 26 are respectively connected to the LA1, LB1 and LJ1 contacts associated with the LA/2, LB/2 and LJ/2 latching relays, these contacts in turn being connected to a common line 43 connected to a power terminal 44 supplied with electrical energy on the order of 40 volts DC. Operation of one of the actuating means 11-20 serves to actuate its associated latching relay in a known manner, that latching relay establishing an actuation holding circuit by means of line 43. For example, closure of actuating means or switch 11 energizes the LA/2 relay, which in turn causes the LA1 contact to close to provide through line 43 a holding circuit operable to maintain the LA/2 relay energized upon opening of that switch.

FIG. 2 illustrates the circuit connections to another group 46 of the three group set of stepping switches, the third group 47 being illustrated in FIG. 3. Again, for purposes of simplification, only the circuit connections for three of the relay outlet terminals are shown. Each group of the three group set of stepping switches has plural relay outlet terminals, each terminal being associated with one of the latching relays, and also an instructing means for each of the serving stations. The three group set of stepping switches rotatably step in unison in response to energization of a stepping relay 48 (FIG. 2) in a known manner, the stepping relay causing simultaneous rotation of stepping switch wipers 49, 51 and 52 of the groups 38, 46 and 47 illustrated in FIGS. 1, 2 and 3, respectively. The known mechanical interconnections among groups 38, 46 and 47 are signified by the dotted lines in FIGS. 1-3.

With reference to FIG. 3, the set of stepping switches 47 is operable to energize a known display matrix 53 for selectively energizing the instructing means preferably illuminated numerical indicating signs (not shown), in accordance with the rotary position of the wiper 52 in engagement with the relay outlet terminals typified by a terminal 54, the terminals being connected to the display matrix by means of lines typified by a line 56. The display matrix is energized over a line 57 and a line 58. A T1 contact associated with a T/5 relay (shown in FIGS. 4 and 5 and described hereinafter) is effective to at times connect line 58 with a line 59. The lines 57 and 59 are connected to power input terminals 61 and 62, respectively, to receive therefrom voltage on the order of 25 volts AC.

With reference to FIG. 2, one single-pole double-throw contact of each of the latching relays is connected to a common line 63 in turn connected to a negative terminal 64 of a power source including a positive terminal 66 for supplying electrical energy on the order of 140 volts DC. One terminal of each of these latching relay contacts is connected to a relay outlet terminal typified by a terminal 67 in the group of stepping switches 46 by means of a connecting line 68; the other contact terminal is connected to a common line 69 through a resistor 71 to a J/2 electromechanical relay or other switching means designated by numeral 72 receiving power input from terminal 66 through a line 73. The J/2 relay comprises relay means in a circuit with all of the latching relays to be operated or energized in response to actuation of any of the latching relays, operation of the J/2 relay serving to complete an energizing circuit for the stepping relay to initiate stepping or hunting thereof.

For example, assuming operation of the LB/2 relay (FIG. 1) in response to closure of its associated actuating means 12 with resultant transfer of the LB2 relay contact (FIG. 2), an energizing circuit is provided for the stepping relay 48 by means of line 63, the LA2 contact associated with a non-actuated latching LA/2 relay and its associated connecting line 68, terminal 67, wiper 51 of the group of stepping switches 46, a line 74, a line 76, the stepping relay contacts 77 operate in a known manner by the coil of the stepping relay 48 (the control relationship being designated by the dotted line 78), a line 79, a line 81, a line 82, a now closed J1 contact of the J/2 relay, a line 83, a closed Z2 contact of a Z/2 relay (to be described later), a line 84, and the line 73 connected to power terminal 66. The wiper 51 will hunt or step around the outlet terminals in a known manner until it makes connection with a terminal disconnected from the power line 63 by opening of the latching relay contact associated with that terminal. In the described example, the wiper 51 will rotate or step to the contact connected to the LB2 latching relay contact, and will remain there due to termination of the power supply to the stepping relay coil 48 by operation of that latching relay contact. Of course, the wiper 51 will not rotate at all if it is already connected to the specific terminal associated with the actuated latching relay.

The present invention further comprises a second relay or other switching means E/1 denoted by reference numeral 86 in FIG. 2, essentially connected in parallel circuit arrangement with the stepping relay coil 48, for simultaneous energization therewith, through an isolating diode 87 and lines 88 and 89, a capacitor 91 being provided to eliminate contact bounce. The E/1 relay 86 is energized while the wiper 51 of the group of stepping switches 46 is rotating or hunting, the E/1 relay being de-energized upon de-energization of the stepping relay 48.

With reference to FIG. 4, which illustrates the operation of the present invention in conjunction with a treadle-operated switch 92 or other switching means operatively closed in response to the presence of a unit to be dispatched, the J2 and E1 contacts of the J/2 and E/1 relays, respectively, are connected from a 40 volt DC power input terminal 93 through lines 94, 96 and 97 to the treadle-operated switch 92, and to a T/5 relay 98 in turn connected to ground, the T/5 relay being shunted by a resistor 99 and a capacitor 101.

FIG. 5 illustrates an alternate connection to the J2 and E1 contacts from a 40 volt DC power input terminal 102 through lines 103, 104 and 106, and an electronic timer generally illustrated by reference numeral 107, to a T/5 relay 108 in turn connected to ground, the T/5 relay being shunted by a resistor 109 and a capacitor 111. The timer 107 is an alternate form of control switch means which can be used instead of the treadle-operated switch 92 shown in FIG. 4.

Upon de-energization of the stepping relay 48, the J/2 and E/1 relays cooperate, by means of their respective J2 and E1 contacts, to complete an energizing circuit for the control switch means, which can alternatively comprise the treadle-operated switch 92 (FIG. 4), or the timer 107 (FIG. 5). The J2 contact closes in response to actuation of any of the latching relays, and the E1 contact closes in response to termination of the hunting or stepping of the stepping relay 48.

Assuming the treadle-operated version 92 of the control is used (FIG. 4), a supply circuit from the power terminal 93 is provided to energize the T/5 relay over line 94, the closed J2 contact, line 96, the closed E1 contact and line 97. Energization of the T/5 relay serves to close its T1 contact (FIG. 3) to provide power to the display matrix 53 for actuation of the instructing means (not shown). With additional reference to FIG. 6, the closure of a T2 contact of the T/5 relay serves to provide a supply circuit to a station available indicating lamp 112 from 120 volt AC power input terminals 113 and 114 over lines 116 and 117, this lamp being provided to direct the attention of a pedestrian or driver of a dispatched vehicle or other dispatched unit to the instructing means operated by the display matrix 53. In addition, as shown in FIG. 7, a chime circuit 118 is also desirably provided to be actuated by closure of a T3 contact from a low voltage AC source at terminals 119 and 121 over lines 122 and 123 for a similar purpose.

With reference to FIG. 8, actuation or operation of the T/5 relay serves to transfer a T4 contact associated therewith to charge a grounded capacitor 124 from a power input terminal 126, connected to a 40 volt DC supply, through a resistor 127. Upon de-energization of the T/5 relay, either upon opening of the treadle-operated switch 92 or by operation of the timer 107 (described later), its associated contacts transfer to their rest positions. The return of the T4 contact to its rest position illustrated in FIG. 8 provides a discharge path for capacitor 124 through a Z/2 relay 128 and through lines 129 and 131, thereby causing the Z/2 relay to operate for a predetermined time interval, preferably on the order of 250 milliseconds for the illustrated component values. With additional reference to FIG. 1, momentary energization of the Z/2 relay serves to ground a Z1 contact connected by means of a line 132 to the wiper 49 of the group of stepping switches 38, thereby providing a ground condition thereon to de-actuate an actuated latching relay following operation of its associated instructing means. As shown in FIG. 2, the Z2 contact returns to its closed rest position to enable completion of the previously described energizing circuit for the stepping relay 48 after de-actuation of a latching relay has occurred, in order to prevent erroneous de-actuation of the latching relay connected to the next relay outlet terminal.

It should be noted from FIG. 4 that the resistor 99 and capacitor 101 maintain energization of the T/5 relay 98 for a short time delay following opening of the treadle-operated switch 92, during which the capacitor discharges through resistor 99 and the T/5 relay coil. The purpose of this time delay is to maintain energization of the instructing means for a short time interval following departure of the pedestrian or other dispatched unit from the entrance or dispatching station to prevent confusion resulting from an immediate operation of another instructing means in response to an immediate reclosure of the switch 92.

The electronic timer 107 illustrated in FIG. 5 serves to maintain operation of each instructing means for a preselected time interval, the timer being further operable, in response to simultaneous actuation of plural latching relays corresponding to the simultaneous storage of multiple request signals or calls, to re-initiate operation of the instructing means after a predetermined time interval has elapsed following termination of each operation thereof. Although request signals can be en-

tered into the control circuit at any time, even simultaneously, the stepping relay 48 steps sequentially to energize the instructing means associated with each relay outlet terminal as determined by operation of the control switch which, as noted earlier, comprises either the treadle-operated switch 92 (FIG. 4) or the timer 107 (FIG. 5).

Upon closure of both the J2 and E1 contacts, the timer circuit 107 (FIG. 5) is energized to cause actuation of the T/5 relay through line 106, a resistor 133 and a line 134 upon charging of the capacitor 111 through the resistor 109. The timer 107 operates to maintain actuation or energization of each instructing means for a preselected time interval. Upon transfer of the T/5 relay 108, its associated T5 relay contact transfers to disconnect a ground line 136 from the ungrounded terminal of a capacitor 137, thereby enabling that capacitor to become charged through a resistor 138 and a variable resistor 139, the adjustment of that resistor serving to determine the "on" time of operation of each instructing means, which is preferably on the order of 5 seconds. A wiper contact 141 of the variable resistor 139 is connected to an emitter 142 of a unijunction transistor 143, that transistor being connected to line 106 through a resistor 144, and to the ground line 136 through a resistor 146. Resistor 146 is connected to a gate lead 147 of an SCR 148 by means of a resistor 149, the gate lead 146 in turn being grounded to lead 136 through resistor 151. The SCR 148 is connected in parallel with the T/5 relay.

In the operation of the timer 107, when the emitter 142 of the unijunction transistor 143 reaches the transistor firing voltage in response to charging of the capacitor 137 to a predetermined voltage, the rate of charge being determined by the setting of the variable resistor 139, transistor 143 discharges capacitor 137 through resistor 146 and line 136, thereby causing the voltage on the gate lead 147 of SCR 148 to rapidly rise to gate or trigger the latter into conduction to effectively short-circuit or de-energize the coil of the T/5 relay.

After de-energization of the T/5 relay with resultant transfer of its associated contacts and request signal cancellation, described earlier, the timer will re-initiate operation of the instructing means (provided at least one additional request signal is stored in the circuit) following a predetermined time interval during which the capacitor 111 charges through resistor 109 to raise the voltage on line 134 to the pull-in voltage of that relay, the stepping relay wipers having stepped to their next operating position during that time interval.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it is apparent that various changes may be made in the form, construction and arrangement of its component parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form described being merely a pre-

ferred embodiment thereof.

We claim:

1. For use in a dispatching system circuit having: a plurality of actuating means each at an associated serving station for producing electrical request signals; a plurality of latching relays each in circuit with an associated one of the actuating means for actuation in response to a request signal produced by the latter; a plurality of instructing means each associated with one of the serving stations, each of the instructing means being operated in response to actuation of an associated latching relay; control switch means for initiating operation of the instructing means; a stepping relay in a circuit for energization thereof and a three group set of stepping switches stepping in unison in response to energization of the stepping relay, each group having plural relay outlet terminals each associated with one of the latching relays; the first group being in a circuit with the stepping relay and the latching relays for controlling the positioning of the set, actuation of each latching relay serving to interrupt the stepping relay circuit for de-energization thereof at a predetermined position; the second group being in circuit with the instructing means for selective energization thereof in accordance with the positioning of the set; the third group being in circuit with the latching relays and being operable to return the latter to their un-actuated positions; the combination comprising: first relay means in a circuit with all of the latching relays to be operated in response to actuation of any of the latter, operation of said first relay means serving to complete an energizing circuit for the stepping relay to initiate stepping thereof; second relay means in parallel circuit with the stepping relay for simultaneous energization therewith, said first and second relay means cooperating to complete an energizing circuit for the control switch means in response to de-energization of the stepping relay; and third relay means in circuit with the third group for controlling the latter to de-actuate an actuated latching relay following operation of the instructing means associated with the latter; whereby electrical request signals produced by each of the serving stations control operation of the instructing means associated therewith.

2. The combination of claim 1, wherein said third relay means is operable to enable completion of the stepping relay energizing circuit after de-actuation of an actuated latching relay has occurred.

3. The combination of claim 1, including an electronic timer operable to maintain operation of each instructing means for a preselected time interval.

4. The combination of claim 3, wherein said timer is further operable, in response to simultaneous actuation of plural latching relays, to re-initiate operation of the instructing means after a predetermined time interval has elapsed following termination of each operation thereof.

* * * * *