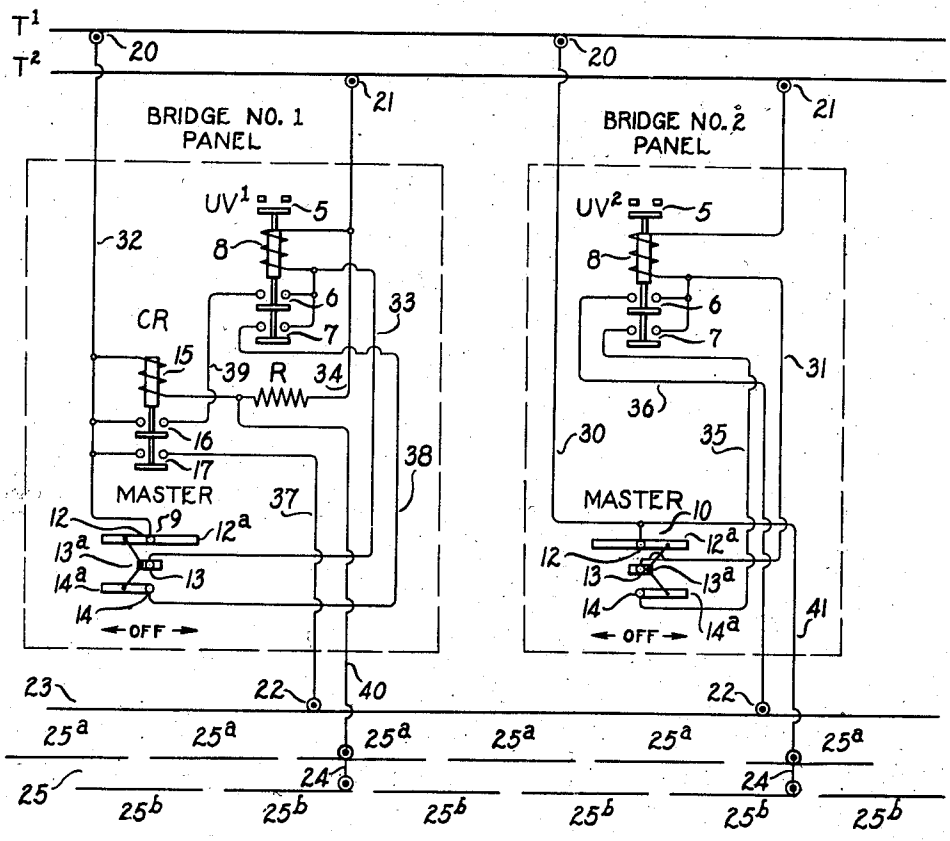
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CONTROLLER FOR ELECTRIC TRAVELING MACHINES

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CONTROLLER FOR ELECTRIC TRAVELING MACHINES

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This invention relates to controllers for electric traveling cranes and other traveling machines.

In practice it frequently is desired to have a number of traveling cranes on the same set of tracks and in some instances it is important to maintain the cranes a given minimum distance apart for reasons other than prevention of collisions. The minimum safe spacing may vary in different instances and where minimum spacing is desired for protection against concentration of weight it may be necessary to maintain the desired spacing at numerous points or at all points along the common runway. Also it is sometimes desired to limit the approach of one traveling machine to another even though they travel different tracks and in instances even where they travel in different planes but yet have parts which may interfere.

The present invention has among its objects to provide flexible and reliable control means to so limit cranes and other traveling machines in their approach one to another, without otherwise interfering with their operation.

Another object is to provide control means of the character stated which may be readily designed to meet different conditions, as for example maintaining a given minimum spacing at any or all points along the common runway.

Another object is to provide control means of the character stated which will be equally effective regardless of whether the approach of two cranes is due to operation thereof in opposite directions or to overtaking of either by the other.

Various other objects and advantages of the invention will hereinafter appear.

One embodiment of the invention is depicted in the accompanying drawing which shows diagrammatically portions of controllers for two cranes and the showing of the drawing will now be described, it being understood that it is susceptible of various modifications without departing from the scope of the appended claims.

Referring to the drawing, the control shown therein is especially designed for crane control systems wherein travel of each crane is dependent upon energization of an individual so-called under-voltage relay, and the drawing shows two such relays designated UV^1 and UV^2, respectively. These relays are shown as representative of the control panels of two bridges, it being understood that the panels may be of any one of the well known types which upon energization of its under-voltage relay may be manipulated to effect movement of its bridge in either direction and which upon deenergization of its under-voltage relay automatically stops the travel of its bridge. Each relay has contacts 5 representative of the desired main contacts thereof and additionally has auxiliary contacts 6 and 7 for purposes hereinafter set forth. These relays which have operating windings 8 are shown as deenergized, and it may be assumed that this has resulted from failure of power.

Also the drawing shows the two controllers as comprising master switches 9 and 10, but it shows only those contacts of each master switch required for control of the elements shown. As will be understood, each master switch is movable in reverse directions from an intermediate off position, as indicated in the drawing, to effect reverse movements of its respective bridge. It is assumed that the master switches move in like directions to effect travel of their respective bridges in like directions. Also it will be understood that ordinarily the master switch contacts effect reversals through electromagnetic reversing switches and that each master switch has contacts affording through the medium of electromagnetic means selection of any of a number of speeds. Such contacts of the master switches have been omitted for simplicity of illustration. The master switches are schematically shown as of the drum type and the contacts thereof which have been shown comprise in each instance stationary contacts 12, 13 and 14 and cooperating segments. Each of the contacts 12 in all positions of its respective drum is engaged by a segment 12^a. Each of the contacts 13 in the off position of its respective drum is engaged by a short segment 13^a, such segment disengaging its respective contact when its respective drum is moved to a running position in either direction. The contact 14 of drum 9 is in the off position of said drum engaged by a segment 14^a and the contact 14 of drum 10 is in the off position of the latter drum engaged by a segment 14^b. In each case the contact 14 is engaged by its segment throughout movement of its drum in one direction from off position, whereas it is disengaged by its segment when its drum is moved in the opposite direction from off position. However, the drums differ in that the segments 14^a and 14^b thereof are reversed so that in one contact 14 is engaged throughout movement of the drum clockwise from off position, whereas the contact 14 of the other is engaged throughout counterclockwise movement from off position.

The control for bridge No. 1 additionally includes a relay CR having an operating winding

15 and contacts 16 and 17. This relay, as will later appear, controls the under-voltage relays of the controllers for both bridges. As shown the relay CR is deenergized and it may be assumed that this has resulted from failure of power.

Power is supplied by trolley wires T^1 and T^2 and the winding 15 of relay CR is connected across said trolley wires through a resistance R which prevents a short-circuit when the winding is shunted as hereinafter set forth. Each controller has trolley wheels 20 and 21 engaging trolley wires T^1 and T^2, respectively.

Also each controller has a trolley wheel 22 to engage a trolley wire or track 23 and each controller has a trolley wheel 24 to engage a split or sectional trolley rail 25. The rail 25 comprises a series of aligned but spaced sections 25^a and a series of aligned but spaced sections 25^b. The series of sections 25^a and 25^b are arranged in a parallel spaced relation and the sections 25^a are staggered with respect to sections 25^b whereby each trolley wheel 24 always engages either a section 25^a or a section 25^b.

Assuming the master switches to be positioned as illustrated, supply of power by the trolley wires T^1, T^2 will energize the relays UV^1 and UV^2 independently of the relay CR and will also energize relay CR, thus making ready for use of the controllers of both bridges. Referring to the controller for bridge No. 2, circuit may be traced from trolley wire T^1 and wheel 20 by wire 30 to contact 12 of drum 10, and thence through segment 12^a, segment 13^a, contact 13 by wire 31 to and through winding 8 of relay UV^2 to trolley wire T^2. Similarly circuit may be traced from trolley wire T^1 by wire 32 to the master switch 9 of bridge No. 1 and thence through said master switch by wire 33 to and through the winding 8 of relay UV^1 to trolley wire T^2. Additionally circuit may be traced from trolley wire T^1 by wire 32 to and through the winding of relay CR and resistance R in series to wire 34 and trolley wire T^2.

The relays UV^1 and UV^2 upon responding establish for themselves maintaining circuits. Contacts 7 of relay UV^2 establish a maintaining circuit for said relay extending from wire 31 through said contacts by wire 35 to contact 14 of master switch 10, and thence through segments 14^b and 12^a to contact 12, which as previously explained is connected to trolley wire T^1. This maintaining circuit is of course dependent upon movement of the master switch in a given direction from off position, and if the master switch is moved in the opposite direction from off position the maintaining circuit is interrupted. However, contacts 6 of relay UV^2 establish for said relay an alternative maintaining circuit through the contacts of relay CR. This maintaining circuit extends from wire 31 through contacts 6 of relay UV^2 by wire 36 to trolley wheel 22 by trolley rail 23 to trolley wheel 22 of the controller for bridge No. 1, by wire 37 through contacts 17 of relay CR to wire 32, and thence to trolley T^1. Thus if it be assumed the bridge No. 2 only moves toward bridge No. 1 when the master switch 10 is moved to disengage contacts 14 and 14^b the relay UV^2 will be dependent upon relay CR for continued energization when bridge No. 2 is moved toward bridge No. 1.

Considering now the maintaining circuits for relay UV^1 its contacts 7 establish a maintaining circuit through the master switch 9 independently of relay CR. This circuit extends from wire 33 through contacts 7, by wire 38 to and through the contacts 14, 14^a, 12^a and 12 of the master switch 9, by wire 32 to trolley wire T^1. This maintaining circuit is continued if the master switch 9 is moved in a given direction from off position but is interrupted if the master switch is moved in a reverse direction from off position. However, relay UV^1 establishes for itself a second maintaining circuit extending from wire 33 through contacts 6 of said relay by conductor 39 to and through the contacts 16 of relay CR to trolley wire T^1. Thus if it be assumed that bridge No. 1 only moves toward bridgt No. 2 when the master switch 9 is moved to disengage contacts 14 and 14^a the relay UV^1 will be dependent upon relay CR for continued energization when bridge No. 1 is moved toward bridge No. 2.

Consequently if both bridges are set in motion to approach one another the relay CR affords a means for deenergizing both relays UV^1 and UV^2 to arrest both bridges. Relay CR is made effective for this purpose by deenergizing the same by a short-circuit for its winding 15 controlled by the sectional trolley rail. When the trolley wheels 24 of both controllers contact simultaneously either a section 25^a or a section 25^b, a circuit is completed from a point between winding 15 and resistance R by wire 40 to trolley wheel 24 of the control of bridge No. 1 through a section of the trolley rail to trolley wheel 24 of bridge No. 2 by wires 41 and 30 to the trolley wire feeding winding 15. Thus winding 15 is short-circuited to drop out relay CR, with the results aforedescribed, and as will be apparent the bridges will be stopped to maintain a spacing thereof determined by the construction of the sectional trolley rail. As shown the sections are of uniform length and the staggering is such that stopping will be effected with the bridges spaced a distance corresponding to the full length of one section down to one-half the length of one section as a minimum.

If one bridge is moved toward the other while the latter is stationary when the relay CR upon dropping out only deenergizes the under-voltage relay of the moving bridge, this being all that is necessary. Likewise if both bridges are moving in the same direction too close an approach will only result in deenergizing the under-voltage relay of the following bridge. The leading bridge will continue its movement because of the maintaining circuit for its under-voltage relay through its master switch contacts 14 and 14^a or 14^b, as the case may be, and when the short-circuit of the CR relay winding is again interrupted said relay will be again energized to energize the under-voltage relay of the following bridge.

Obviously the sectional rail 25 may be readily modified to meet different requirements as to spacing of the bridge and as to points where spacing is especially important, etc.

What we claim as new and desire to secure by Letters Patent is:

1. In a controller for traveling machines, in combination, a controller for a first machine to be carried by such machine, means to be carried by a second machine and having a trolley rail interconnection with said controller whereby said means may cause said controller to stop the first machine, and means mechanically acting to effect the aforementioned action of said means upon predetermined approach of the first machine towards the second machine, said controller restricting influence thereon by the first mentioned means to a single direction of travel of the first

machine, thereby to render the first machine free for reverse travel irrespective of the condition of the first mentioned means.

2. In a controller for traveling machines, in combination, a controller for a first machine to be carried by such machine, means to be carried by a second machine and having a trolley rail interconnection with said controller whereby said means may cause said controller to stop the first machine, and means mechanically acting to effect the aforementioned action of said means upon predetermined approach of the first machine towards the second machine, said controller restricting influence thereon by the first mentioned means to a single direction of travel of the first machine thereby to render the first machine free for reverse travel irrespective of the condition of the first mentioned means, the second mentioned means also mechanically acting to effect normal setting of the first mentioned means upon reverse travel of the first machine following stopping thereof by operation of the first mentioned means.

3. In a controller for traveling machines, in combination, a controller for a first machine to be carried by such machine, means to be carried by a second machine and having a trolley rail interconnection with said controller whereby said means may cause said controller to stop the first machine, and means comprising a sectional trolley rail common to the machines to effect operation of the first mentioned means when any section of said sectional rail is engaged by the trolleys of both machines and to effect restoration of the first mentioned means to normal condition when the active rail section is no longer engaged by the trolleys of both machines, said controller restricting influence thereon by the first mentioned means to a single direction of travel of the first machine thereby to render the first machine free for reverse travel irrespective of the condition of the first mentioned means.

4. In a controller for reversible traveling machines, individual controllers for a first machine and a second machine to be carried by said machines respectively, means carried by one machine and having interconnections with both of said controllers whereby said means may cause said controllers to stop their respective machines, and means mechanically acting to effect operation of the first mentioned means upon predetermined approach of either machine towards the other, each of said controllers restricting to a single direction of travel of its respective machine influence thereon by such operation of the first mentioned means whereby such operation of the first mentioned means will influence both controllers or will influence the same only selectively, according to operating conditions.

5. In a controller for a plurality of traveling machines, the combination with individual controllers for the machines, each including a normally energized relay to be deenergized to effect stopping of its respective machine, one of said controllers having a device operable with tendency to deenergize all of said relays and each of said controllers having means to render its relay independent of said device during movement in a given direction of its respective traveling machine, control means for said device including mechanical means by which approach of the traveling machines one to another is detected to render said device operative unless within a given zone of travel of the machines a given minimum spacing of the machines is maintained.

6. In a controller for a plurality of traveling machines, the combination with individual controllers for the machines, each including a normally energized relay to be deenergized to effect stopping of its respective machine, one of said controllers having a device operable with tendency to deenergize all of said relays and each of said controllers having means to render its relay independent of said device during movement in a given direction of its respective traveling machine, of control means for said device, comprising a sectional trolley rail common to said individual controllers, the sections of said rail being in parallel rows with the sections of one row in staggered relation to the sections of another row.

7. In a controller for a plurality of reversible traveling machines, in combination, a sectional trolley rail, an individual trolley wheel for each traveling machine to engage said trolley rail, electroresponsive means operable when the trolley wheels of two machines engage the same section of said trolley rail, and individual controllers for the traveling machines, each of said controllers comprising a stopping element through the medium of which its respective machine may be stopped and an element to place the stopping element under the control of said electroresponsive means when its respective machine moves in one direction and to render such stopping element free from influence by said electroresponsive means when the same machine moves in reverse direction, whereby when the trolley wheels of two machines engage the same section of said rail one or both of such machines will be stopped according to operating conditions.

8. In a controller for a plurality of reversible traveling machines, in combination, a sectional trolley rail comprising parallel rows of sections with the sections of the rows in staggered relation, individual sets of trolley wheels for the traveling machines, each set to engage the parallel rows of trolley rail sections, electroresponsive means operable when trolley wheels of two machines simultaneously engage any individual section of said trolley rail, and individual controllers for the traveling machines, each of said controllers comprising a stopping element through the medium of which its respective machine may be stopped and an element which when the respective machine moves in one direction places the stopping element under the control of said electroresponsive means and which for reverse operation of the same machine renders its stopping element free from influence by said electroresponsive means, whereby when the trolley wheels of two machines engage any individual section of said rail one or both of such machines will be stopped according to operating conditions.

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