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SAFETY MECHANISM FOR CRANES

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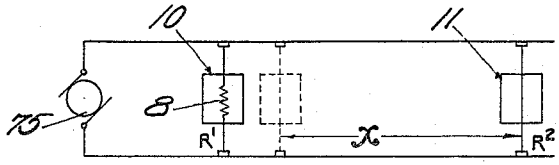


Fig. 2.

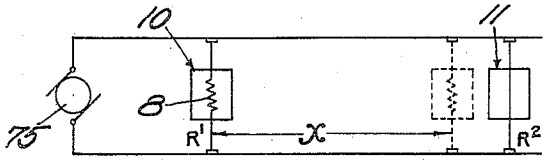


Fig. 3.

Fig. 1.

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SAFETY MECHANISM FOR CRANES

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This invention relates to crane installations and more particularly to safety mechanism for stopping the cranes to prevent collision. In factories where travelling cranes are employed for conveying different objects from various points to a common place for assembly together, collision between two cranes often occurs. It is an object of the present invention to provide a safety mechanism for cranes which will render their operating mechanism inoperative and bring them to a stop when they have been moved toward one another to predetermined relative positions and thereby prevent their collision.

Before explaining in detail the present invention, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawing, since the invention is capable of other embodiments and of being practised or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention beyond the terms of the several claims hereto appended as considered in view of the prior art and the requirements thereof.

The invention will be more clearly understood from the following description in conjunction with the accompanying drawing, in which:

Fig. 1 is a plan view of a portion of a crane installation embodying the invention, and

Figs. 2 and 3 are diagrams illustrating the operation of the safety mechanism.

The crane installation embodying the invention may comprise cranes 10 and 11 supported for movement along parallel tracks 12 (only one of which is shown in Fig. 1) by wheels 13 mounted upon axles 14 rotatably mounted in the frame of the cranes. Each of the cranes 10 and 11 is provided with suitable mechanism for moving them toward and away from one another along the rails 12. This mechanism may comprise a motor 20 mounted upon the frame of each crane and having an armature shaft carrying a pinion 21 adapted to engage a gear 22 mounted upon a shaft 23 which is rotatably mounted in the frame of the crane. The shaft 23 is provided at its ends with a pinion 24 adapted to engage a gear 25 mounted upon the end of one of the wheel axles 14.

In the form illustrated, the mechanism for driving the cranes is supplied with electrical power from a switch 30 which is connected with suitable feed lines 31. Leads 32 and 33 are connected between the switch 30 and T-rails 34 and 35, respectively. Contact shoes 36 and 37 are mounted to move with the crane 10 and are adapted for engagement with the T-rails 34 and 35, respectively. These shoes are connected by leads 38 and 39 with the terminals 40 and 41 which are adapted to be engaged by the arms 42 and 43 of a switch. The arm 42 is connected by a lead 45 with a switch 46 of an auxiliary contactor A and the arm 43 is connected by a lead 47 with the motor 20. The other terminal of the motor is connected by a lead 48 with a contact shoe 50 movable with crane 10 and adapted to engage a T-rail 51. A lead 52 connects the switch 46 with the lead 48. A lead 4 connects the coils 5 of the auxiliary contactor A and a switch 6 of a controlling relay which is connected by a lead 4′ with the lead 47. The other side of the coil 5 is connected with the lead 45 by a lead 9. A contact shoe 60 carried by the crane 11 is adapted for engagement with the T-rail 51 and is connected by a lead 61 with one terminal of the motor 20 on the crane 11. The other terminal of this motor is connected by a lead 62 with a contact shoe 63 carried by the crane 11 and adapted for engagement with the T-rail 35. Each of the motors 20 is connected by leads 59 to the controller for the respective cranes.

In accordance with the invention, a control circuit is provided which includes electrically actuated mechanism for rendering the crane-operating means inoperative and which is so arranged that its resistance is varied in response to the relative movement of the adjacent cranes to decrease the energy supplied to the mechanism so as to render it inoperative and thus render the crane-operating means inoperative. One form of control circuit may comprise a conductor 65 ar-

ranged for engagement by a contact shoe 66 carried by the crane 10 and connected by a lead 67 with a coil 8 of the controlling relay C which, when energized, maintains the switch 6 thereof closed. When the coil 8 is deenergized, the switch 6 is opened by a spring 7. The coil 8 is grounded through a lead 69. A contact shoe 70 carried by crane 11, is adapted for engagement with the conductor 65 and is grounded through leads 71 and 72. Thus, the contact shoes 66 and 70 form part of two separate circuits which are connected in parallel to the conductor 65 of the control circuit, each of these parallel circuits being grounded respectively through leads 69 and 72 and completed through the track 12 which is grounded as at 73 and 74. The control circuit is supplied with power from a generator 75 which is connected through the leads 77 and 78 to the conductor 65 and track 12 respectively. The power supplied to the control circuit is controlled by a suitable current limiting resistance 76.

In operation the cranes 10 and 11 are moved along the tracks 12 towards and away from each other by power supplied through the leads 31. At the same time energy is supplied to the control circuit by the generator 75 and this energy is limited by the resistance 76 thus maintaining the energy supplied constant. As the cranes are moved relatively along the tracks 12, the contact shoes 66 and 70 move along the conductor 65 thus decreasing or increasing relatively, depending upon the direction of travel, the resistance of the parallel circuits connected thereto. The arrangement is such that when the cranes 10 and 11 have moved to a predetermined position apart, the relative resistance of the circuits connected in parallel is varied to such an extent as to decrease the energy passing through the coil 8 thus permitting the switch 6 to be opened mechanically by the spring 7 to shut off the power supplied for operating the cranes.

The operation of the control circuit will be best understood by reference to Figs. 2 and 3 wherein the resistance of the parallel circuits carried in part by the cranes 10 and 11 are designated as R^1 and R^2, respectively. If we assume as illustrated in Fig. 2, that the crane 10 remains stationary while the crane 11 is moved from the full-line position to the dotted-line position a distance x to bring the cranes to their relative stop positions, the resistance R^2 is diminished by the amount of resistance of an x length of the conductor 65 while the resistance R^1 remains the same. As a result, the current passing through the parallel circuit carried in part by the crane 11 is greatly increased passing through the parallel circuit carried in part by crane 10 is diminished so as to deenergize the coil 8 and permit the switch 6 to open. On the other hand, as illustrated in Fig. 3, if the crane 11 remains stationary and the crane 10 is moved a distance X to bring it to its closest desired position relative to crane 11, the resistance R^1 is increased by an amount equal to the resistance of an x length of the conductor 65 while the resistance R^2 remains the same. As a result the major portion of the current supplied to the conrol circuit passes through the parallel circuit carried by the crane 11 and the current passing through the circuit carried by the crane 10 is reduced to such an extent as to de-energize the coil 8 and permit the switch 6 to open. It will be clear from the above explanation that if the cranes 10 and 11 are moved relatively toward each other to predetermined positions, regardless of the positions of the cranes relative to the conductor 65, the resistance of the two parallel circuits, carried in part respectively by the cranes, will be varied so as to de-energize the coil 8 and permit the switch 6 to open and stop the cranes and prevent their collision. The cranes can be caused to stop at any predetermined position apart by raising or lowering the voltage supplied to the control circuit.

The present invention is especially advantageous for use in automobile plants where overhead cranes travelling on the same tracks are employed for handling automobile bodies and chassis. For instance, the crane 10 may be a chassis crane operating to lift and convey a chassis from one point to another along the assembly line, while the crane 11 may be a body crane for conveying bodies on the same assembly line, the paths of travel of the body and chassis cranes overlapping. Thus, it frequently happens that one crane will overrun the other, resulting in collision and dangerous accidents. The present invention provides a construction in which one crane can approach the other only a certain predetermined distance, such as a minimum of ten feet.

We claim:

1. In a crane installation having a track adapted to movably support a plurality of cranes, and actuating means for moving said cranes toward and away from one another, the combination therewith of an electrical control for adjacent cranes including an electrically actuated mechanism adapted when the energy supplied thereto is decreased a predetermined amount to render said actuating means inoperative, and means responsive to the relative movement of said cranes for varying the resistance of said circuit to decrease the energy supplied to said mechanism to render said actuating means inoperative when said cranes move to predetermined relative positions.

2. In a crane installation having a track adapted to movably support a plurality of cranes, and actuating means for moving said cranes toward and away from one another,

the combination therewith of an electrical control circuit for adjacent cranes including an electrically actuated mechanism adapted when the energy supplied thereto is decreased a predetermined amount to render said actuating means inoperative, a source of power for said control circuit, means for maintaining constant the energy supplied to said control circuit, and means responsive to the relative movement of said cranes for varying the resistance of said circuit to decrease the energy supplied to said mechanism to render said actuating means inoperative when said cranes move to predetermined relative positions.

3. In a crane installation having a track adapted to movably support a pair of cranes, and actuating means for moving said cranes toward and away from one another, the combination therewith of an electrical control system for adjacent cranes including a pair of circuits connected in parallel, one of said circuits including mechanism for rendering said actuating means inoperative, and means for varying the relative resistance of said parallel circuits in response to the relative movement of said cranes so as to actuate said mechanism to render said actuating means inoperative when said cranes move to predetermined relative positions.

4. In a crane installation having a track adapted to movably support a pair of cranes, and actuating means for moving said cranes toward and away from one another, the combination therewith of an electrical control system for adjacent cranes including a pair of circuits connected in parallel, one of said circuits including mechanism for rendering said actuating means inoperative, a source of power for said control circuit, means for maintaining constant the energy supplied to said control circuit, and means for varying the relative resistance of said parallel circuits in response to the relative movement of said cranes so as to actuate said mechanism to render said actuating means inoperative when said cranes move to predetermined relative positions.

5. In a crane installation having a track adapted to movably support a pair of cranes, and actuating means for moving said cranes toward and away from one another, the combination therewith of an electrical control system for adjacent cranes including a conductor, a pair of contacts engaging said conductor and movable relatively with said cranes, a circuit connected with each of said contacts to provide a pair of circuits connected in parallel to said conductor, electrically actuated mechanism connected in one of said parallel circuits for rendering said actuating means inoperative whereby when said cranes move to predetermined relative positions the relative resistance of said parallel circuits is varied to actuate said mechanism and render said actuating means inoperative.

6. In a crane installation, the combination of a track adapted to movably support a plurality of cranes, actuating means for moving said cranes toward and away from one another, an electrical control for adjacent cranes including electrically actuated mechanism adapted when the energy supplied thereto is decreased a predetermined amount to render said actuating means inoperative, a source of power for said control circuit, and means for varying the energy supplied to said mechanism in response to the relative positions of said cranes in such a manner that said actuating means is rendered inoperative when said cranes move to predetermined relative positions.

In testimony whereof we affix our signatures.

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