Sept. 24, 1968 W. J. SAXONMEYER 3,402,677

SIGNAL PRODUCING MEANS FOR USE WITH A RAILWAY CAR HANDLING MECHANISM

Filed Feb. 7, 1966 5 Sheets-Sheet 1

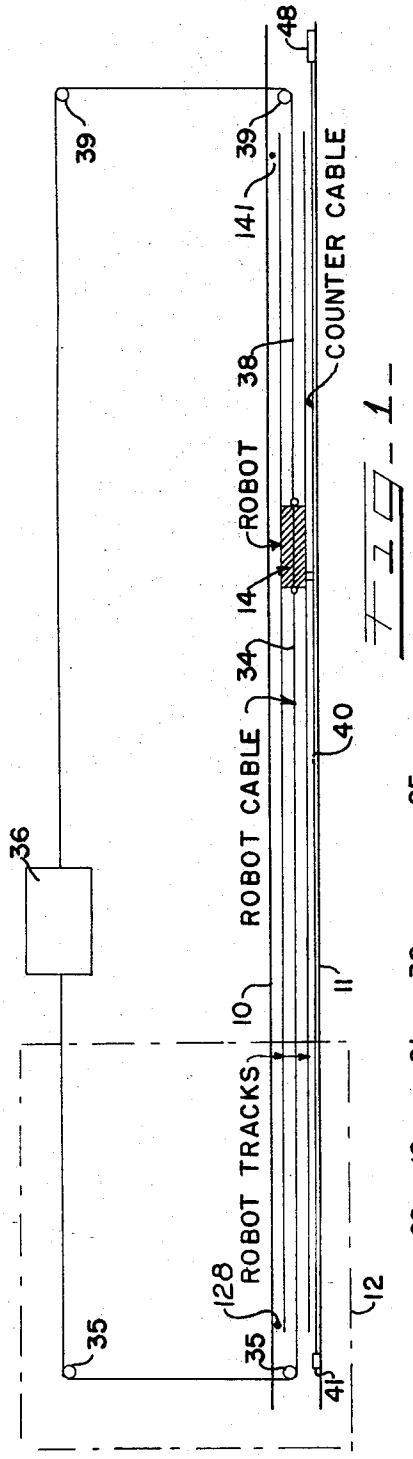


FIG. 1

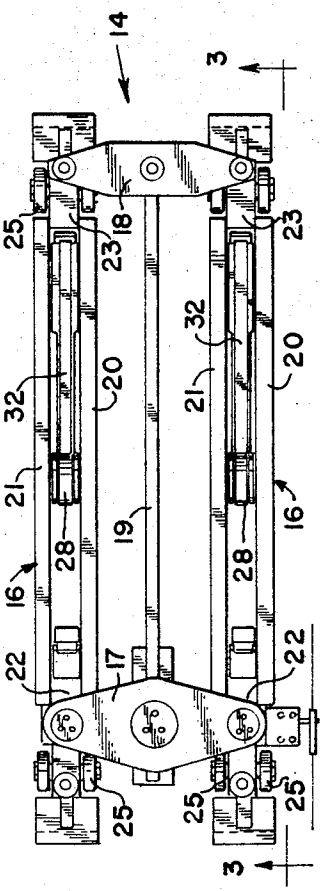


FIG. 2

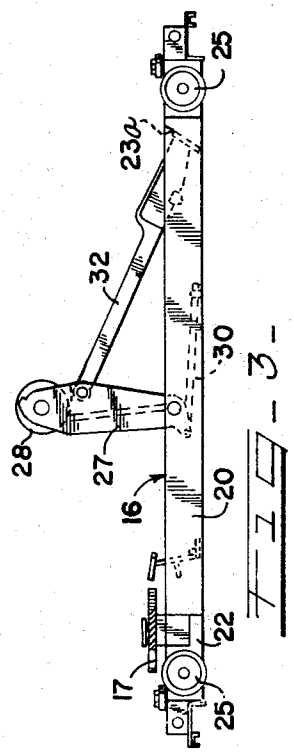


FIG. 3

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Sept. 24, 1968 W. J. SAXONMEYER 3,402,677

SIGNAL PRODUCING MEANS FOR USE WITH A RAILWAY CAR HANDLING MECHANISM

Filed Feb. 7, 1966 5 Sheets-Sheet 2

FIG. 4

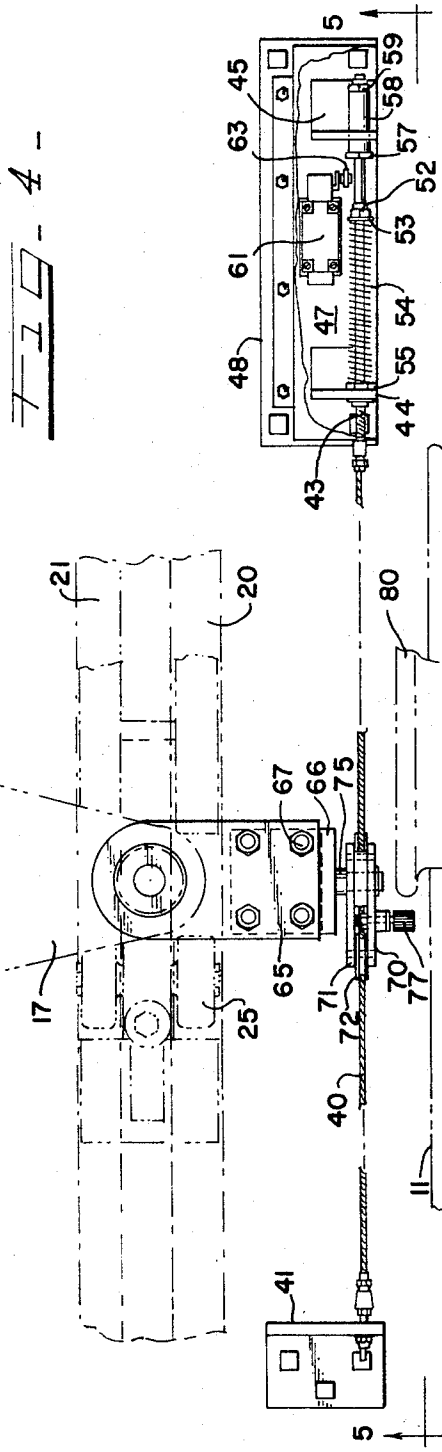
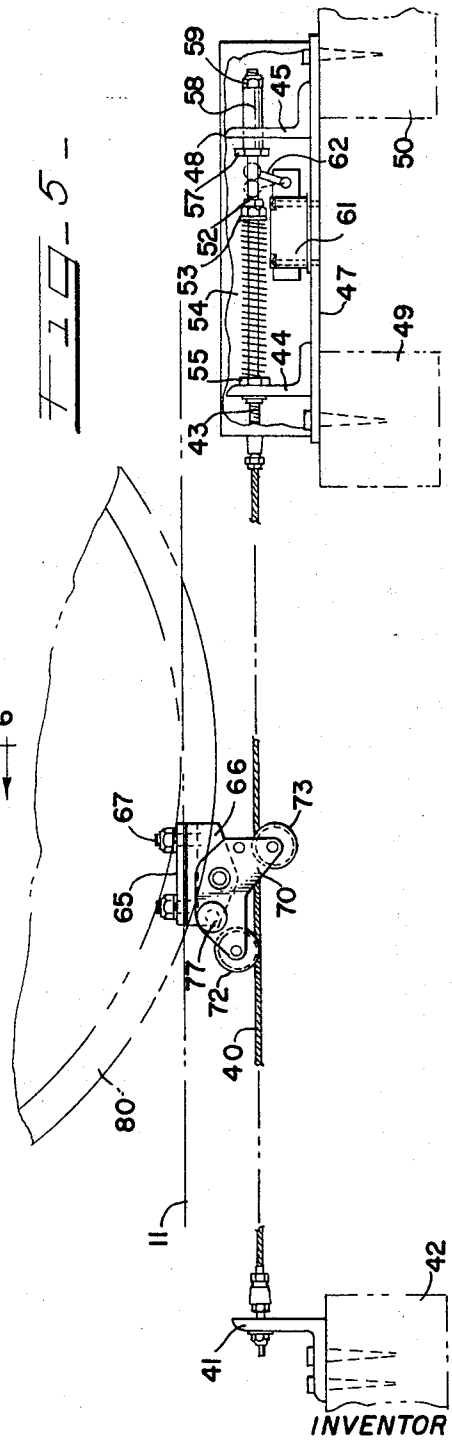



FIG. 5

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SIGNAL PRODUCING MEANS FOR USE WITH A RAILWAY CAR HANDLING MECHANISM

Filed Feb. 7, 1966 5 Sheets-Sheet 3

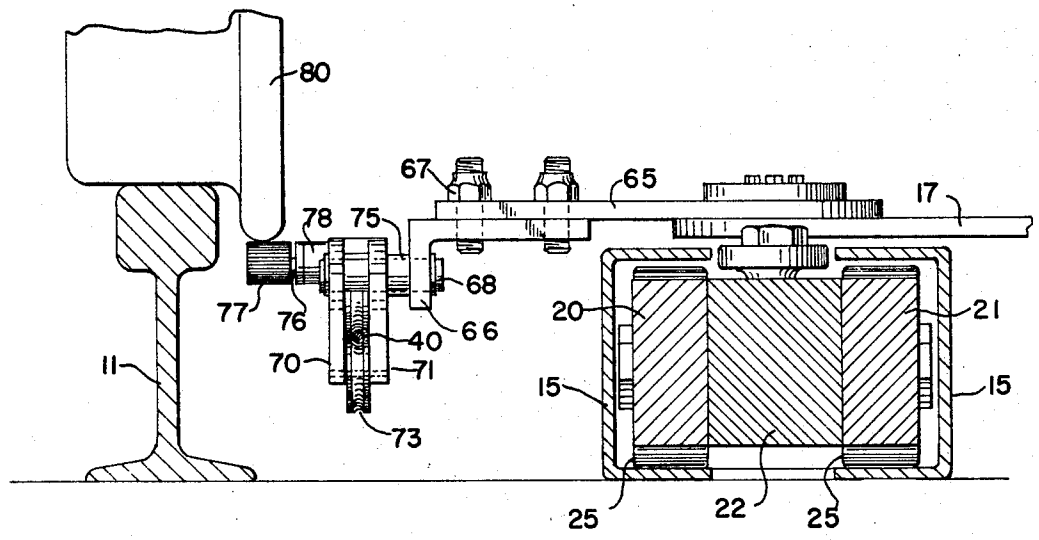


FIG-6-

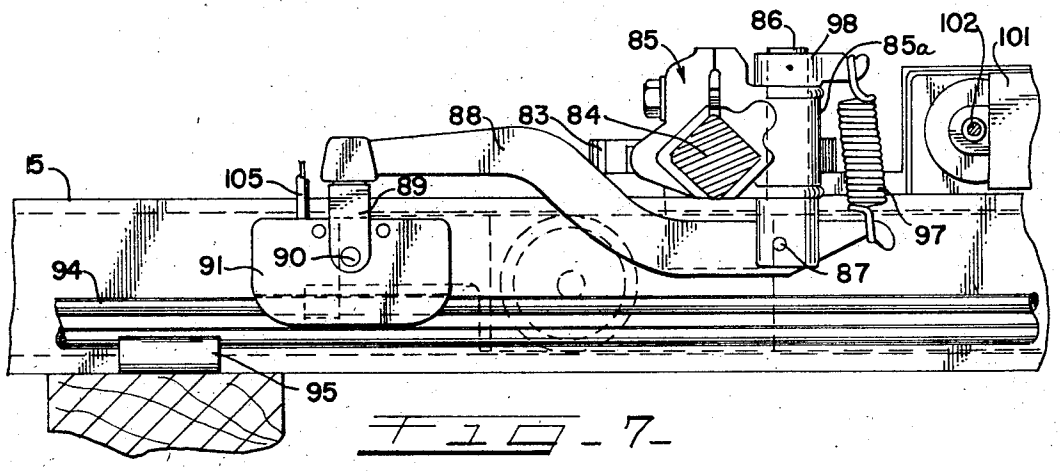


FIG-7-

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SIGNAL PRODUCING MEANS FOR USE WITH A RAILWAY CAR HANDLING MECHANISM

Filed Feb. 7, 1966 5 Sheets-Sheet 4

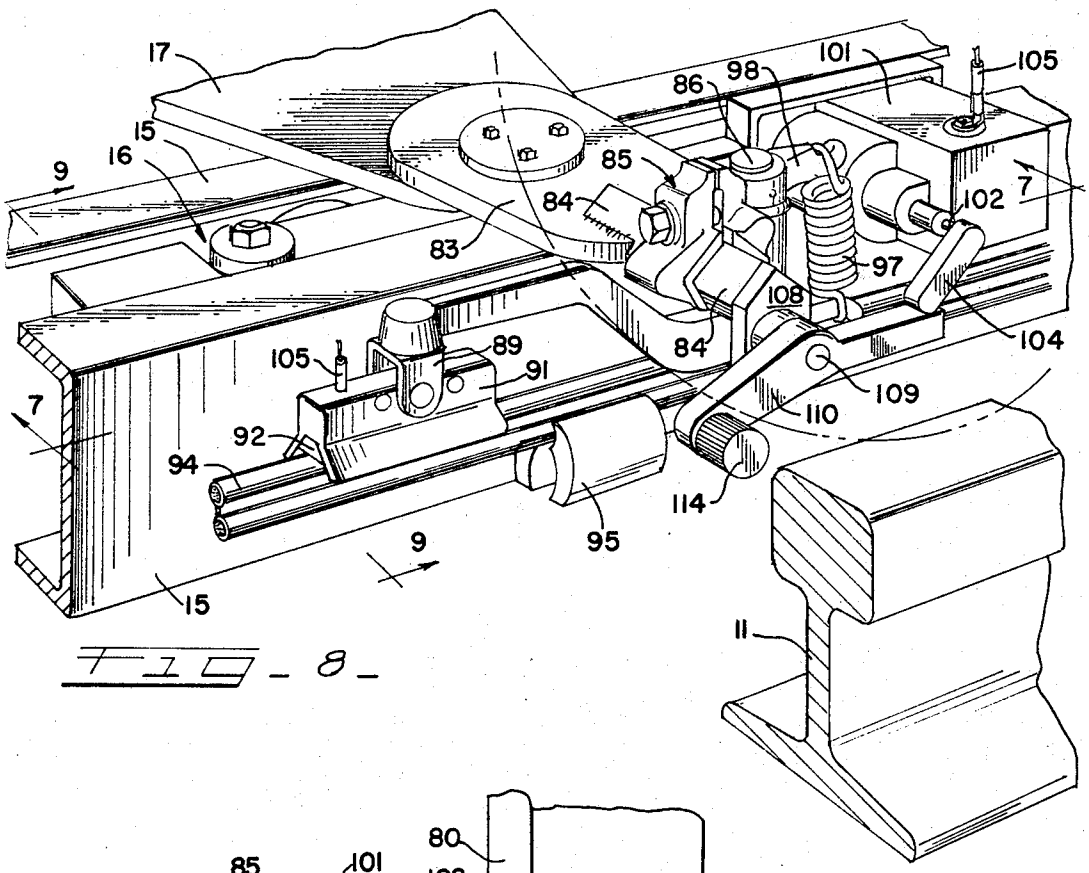


FIG. 8

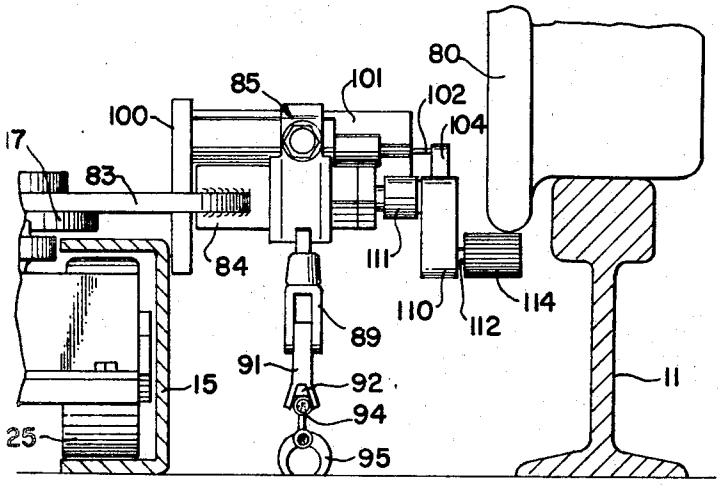


FIG. 9

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SIGNAL PRODUCING MEANS FOR USE WITH A RAILWAY CAR HANDLING MECHANISM

Filed Feb. 7, 1966 5 Sheets-Sheet 5

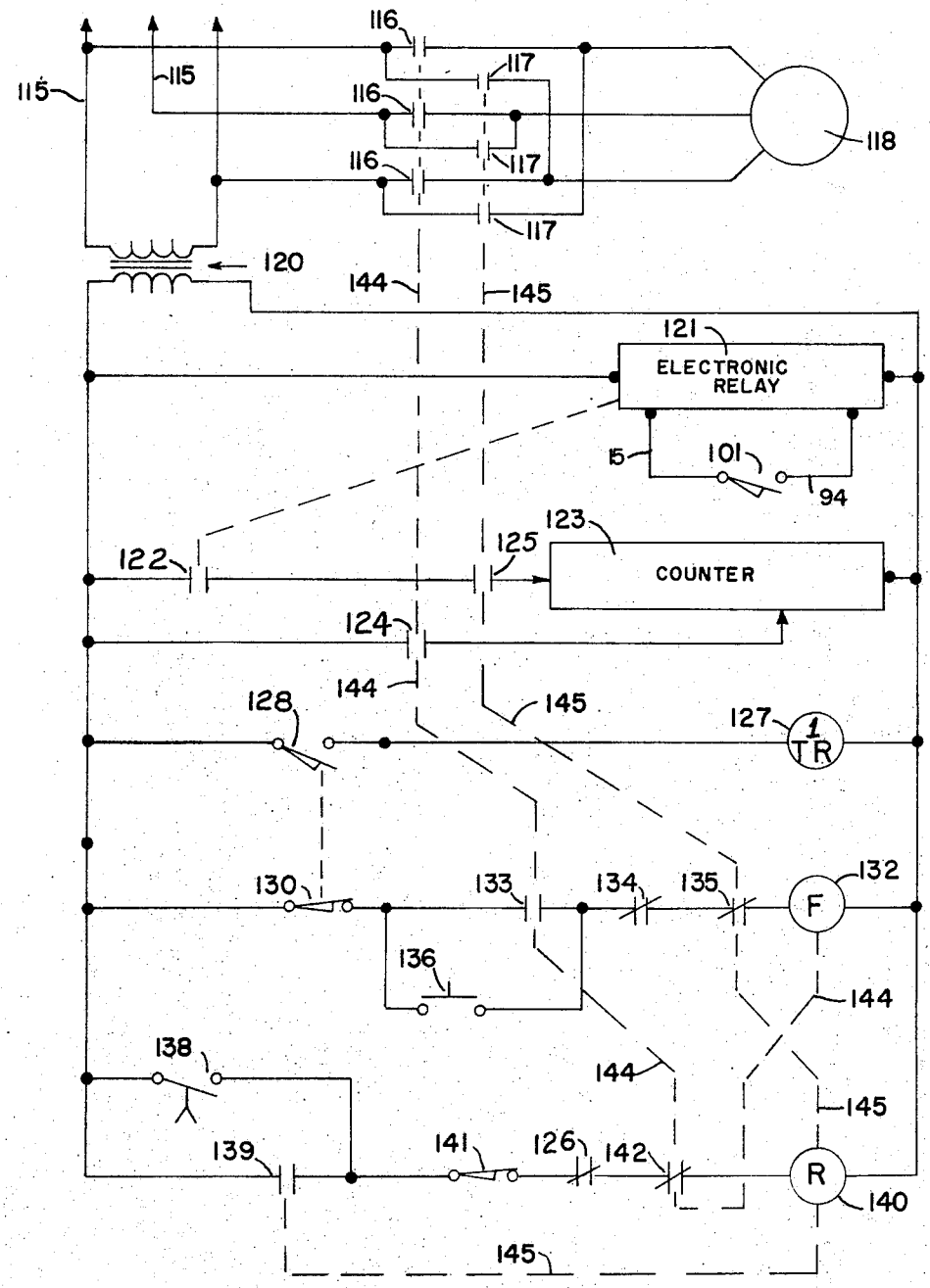


FIG. 10

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United States Patent Office 3,402,677 Patented Sept. 24, 1968



3,402,677

# SIGNAL PRODUCING MEANS FOR USE WITH A RAILWAY CAR HANDLING MECHANISM

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Filed Feb. 7, 1966, Ser. No. 525,500
15 Claims. (Cl. 104—176)

## ABSTRACT OF THE DISCLOSURE

In one embodiment, the railway car handling robot supports an actuating member including a pair of rollers engaging a cable which is suspended along the track serviced by the robot and connected to a counting mechanism. The actuating member includes a member engageable with the flange of a railway car wheel so as to momentarily bend the cable each time the robot passes a railway car wheel. After the counting mechanism has been actuated a predetermined number of times by the bending action of the cable, a signal is produced indicating to the operator that the robot has been moved to the desired position. In another embodiment, a circuit is substituted for the cable actuating means for the counter. In this embodiment, the engagement of a member with the flange of the railway car wheel opens and closes a set of contacts which are connected in a circuit to the counter. After the contacts have been opened and closed a predetermined number of times, a signal is produced indicating to the operator that the robot has been moved to the desired position.

The present invention relates in a general way to mechanism for moving or positioning one or more railway cars along a section of railway track by a cable operated device known as a robot, and more particularly the invention relates to means for producing a signal after the robot has been moved past a predetermined number of railway cars on the track section.

By way of background, one means for moving or positioning railway cars along a section of track extending to a shop, building, or other area where work is performed on or in connection with such cars, involves the use of a cable operated device known as a robot. The robot consists of a carriage or dolly mounted by rollers in a guideway for movement in either direction along a path parallel with and adjacent to the section of track. Such guideway is mounted in parallel relation between the rails of the track section, which track section is preferably rectilinear. Cables are connected to opposite ends of the robot; these cables extend to and are connected with suitable power means which serve to pull the robot in either direction along its guideway adjacent the track section. The robot includes a collapsible axle engaging member which adapts the robot to move one or more railway cars when the robot is being pulled in one direction. When the robot is pulled in the other direction, the axle engaging member thereof is either collapsed or merely deflects under the rail car axles upon engaging the same. Means for automatically collapsing and erecting a robot of this type are disclosed and claimed in copending Ames et al. application Ser. No. 469,696, filed July 6, 1965, and assigned to the assignee of the present application.

In practice, assuming a cut of cars, say twenty cars, for example, is to be moved in three car increments along the track section into the adjacent shop or building, the robot is pulled under the three railway cars whereupon the robot is stopped in a position ready for pushing engagement with one of the axles of the last railway car under which the robot is passed. It is desirable to provide some means whereby the robot can be stopped just after



it has been moved past the predetermined number of railway cars. The present invention provides such means in the form of new and improved construction which produces a signal after the robot has been moved past the predetermined number of cars, or more specifically a predetermined number of railway car wheels. In a preferred embodiment of the invention, this signal is an electrical signal which causes de-energizing of the robot motor.

A primary object of the present invention is to provide new and improved means for producing a signal after an associated railway car robot has been moved past a predetermined number of railway cars.

Another object of the present invention is the provision of signal producing means of the type described, which means include railway car sensing means carried by the robot.

Still another object of the present invention is the provision of signal producing means according to the preceding paragraph wherein the sensing means includes mechanical means for sensing the presence of a rail wheel flange on the track section.

Another object of the present invention is the provision of electrically operated signal producing means for a robot of the type described, such means being adapted to produce a signal after actuation of an associated switch a preselected number of times, which switch is carried by the robot and is actuated by mechanical sensing means also carried by the robot.

Even another object of the present invention is the provision of electrically operated signal producing means for use in association with a railway car moving robot of the type described, which signal producing means is actuated by mechanical means including cable bending means carried by the robot and in rolling engagement with a cable suspended along the track section with one end of such cable being connected with switch means associated with the signal producing means.

These and other objects and advantages of the invention will become apparent from the following specification disclosing a preferred embodiment of the invention illustrated in the accompanying drawings wherein:

FIG. 1 is a diagrammatic plan view of a typical robot installation including one embodiment of the present invention;

FIG. 2 is an enlarged top plan view of a robot with which the present invention is associated;

FIG. 3 is a side elevational view taken on the line **3—3** of FIG. 2;

FIG. 4 is an enlarged top plan view showing the major components of one embodiment of the present invention;

FIG. 5 is a view taken along the line **5—5** of FIG. 4;

FIG. 6 is an enlarged section taken along the line **6—6** of FIG. 4;

FIG 7 is a section taken along the line **7—7** of FIG. 8 showing another embodiment of the present invention;

FIG. 8 is a perspective view of such other embodiment;

FIG. 9 is a section taken along the line **9—9** of FIG. 8; and

FIG. 10 is a circuit diagram showing a preferred circuit for use with the FIGS. 7–9 embodiment of the present invention.

Referring now to FIGS. 1–3, an installation wherein the present invention may be used includes a straight section of railway track defined by rails **10** and **11**, which track section extends to a shop, building or area **12** to which it is desired to advance railway cars on the track section. A robot, generally designated **14**, is mounted for movement in either direction along a path parallel with and adjacent to the track section formed by the rails **10** and **11**. Actually, the robot **14** is mounted for move-

ment in a guideway defined by two pairs of channels **15** which extend in parallel relation with the rails **10** and **11** between the same.

The robot **14**, as best seen in FIG. 2, is of the dual type and includes a pair of identical robots **16** connected together in side-by-side relation by a pair of cross plates **17** and **18** braced by a longitudinal member **19**. Each robot **16** includes a base frame consisting of spaced beams **20** and **21** connected at their respective opposite ends to blocks **22** and **23**. Each of such blocks mounts a pair of rollers **25** which are received within the channels **15** defining the guideway for the robot.

An arm assembly **27** is pivotally mounted at one of its ends between the beams **20**, **21** for swinging movement in a vertical plane parallel with the direction of movement of the robot. The arm assembly **27** mounts a railway car axle engaging roller **28**. The length of the arm **27** is such that when the same is in the vertical or erected position illustrated in FIG. 3, the axis of rotation of the roller **28** is disposed slightly above the axis of rotation of the rail car axle to be engaged by the roller.

A suitable spring assembly **30** engages the lower end of arm assembly **27** and urges the same in a clockwise direction as viewed in FIG. 3. The arm assembly **27** is braced against clockwise swinging movement beyond its vertical or erected position by means of a brace arm **32** pivoted at one end thereof to the arm assembly **27** adjacent the end thereof mounting the roller **28**. The other end of brace **32** is arranged for abutting engagement with an inclined face **23***a* of the block **23**. It will be understood that when the robot **14** is moved from right to left as viewed in FIGS. 1–3, the rollers **28** will engage a rail car axle thereby to cause corresponding movement of the railway car. When the robot is moved in the opposite direction the arm assembly **27** will deflect or swing in a counterclockwise direction as the rollers **28** engage the railway car axles thereby to allow the rollers to deflect or roll under such axles without imparting movement to the associated railway car. For a more detailed explanation of the robots, reference may be had to the aforementioned Ames et al. application.

A cable **34** is connected to one end of the robot **14**, which cable passes around pulleys **35** and extends to a control station **36** where the cable is connected to suitable power means, such as a winch (not shown). Another cable **38** is connected to the other end of the robot **14**; this cable passes around pulleys **39** and is also connected with suitable power means, such as the same or another winch at the control station **36**. It will be understood that operation of such winch means serves to move the robot in either direction along the section of track defined by the rails **10** and **11**.

Assume that a number of railway cars are positioned on the track section to be advanced to the work area **12** in seriatim or in increments of a certain number of cars. For example, suppose three railway cars are to be moved into the area **12** by the robot **14**. Accordingly, the robot **14** will be moved in reverse from left to right until it has passed under the first three cars whereupon movement of the robot in the opposite direction, i.e., forward movement, will result in the same pushing the three cars to the left and into the area **12**. Of course, the remaining cars in the cut of cars will also be moved to the left.

It is desirable to provide means which will produce a signal just after the robot has passed beneath the predetermined number of railway car axles. Such signal may be used for de-energizing the robot control means as shown herein in a preferred embodiment of the invention.

However, it will be appreciated that the signal may be a visual or audible signal indicating to an operator of the robot that the same should be stopped. The present invention has to do with means for producing a signal just after the robot has passed a predetermined number of rail car wheels, which wheels of course bear a direct relation to the number of railway cars.

One embodiment of the present invention is best illustrated in FIGS. 4–6. This embodiment includes a cable **40** suspended in parallel adjacent relation with rail **11** of the track section. One end of the cable is fixedly secured to an angle **41** which is suitably anchored to a foundation **42**. The other end of the cable is connected to a rod **43**; this rod is mounted for axial reciprocable movement in aligned apertures in a pair of angles **44**, **45**. The angles **44**, **45** are mounted to the base **47** of a generally rectangular housing **48**; this base is fixedly mounted to foundations **49**, **50**.

Rod **43** includes a threaded section mounting a pair of adjustment nuts **52**, one of which nuts abuts a washer **53** which in turn abuts one end of a coil spring **54** encircling a portion of the rod **43**. The other end of the spring **54** engages a nut **55** which abuts the upwardly extending flange of the angle **44**. It will be understood that spring **54** acts to urge the rod **43** to the right as viewed in the figures thereby to maintain the cable **40** taut.

The rod **43** also mounts a nut **57** at one end of a sleeve **58**. The other end of the sleeve is engaged by a nut **59**, which nut is threadingly mounted on the rod **43** It will be understood that nut **57** may be adjustably positioned along the rod **43**.

A switch assembly **61** is mounted within housing **48**. This switch includes a generally vertically extending actuating arm **62** which mounts a roller **63**. The roller **63** is positioned to be engaged by the nut **57** on the rod **43** upon movement of the latter from right to left. Movement of the rod **43** and the nut **57** serves to deflect the actuating arm **62** to the broken line position illustrated in FIG. 5. Biasing means (not shown) within the switch **61** serve to return the arm **62** and roller **63** to the solid line position shown in FIGS. 4 and 5 upon return of the arm **43** and nut **57** to their positions shown in FIGS. 4 and 5, i.e., upon movement of the rod **43** and the nut **57** from left to right. Movement of the arm **62** from its solid line position to its broken line position and back to its solid line position serves to cycle or actuate the switch **61**, i.e., to close and open the contacts therein. As will be explained hereinbelow, cycling or actuating of the arm **62** a preselected number of times causes an electric signal to be produced, which signal may be used to control movement of the robot.

Referring now particularly to FIGS. 2, 4 and 6, it will be seen that a plate **65** is secured to the robot **14** adjacent plate **17** thereof; plate **65** extends outwardly of the robot transversely thereof and mounts an angle bracket **66** by means of a plurality of fasteners **67**. The depending flange of angle bracket **66** supports a pivot pin **68** at one end of the latter. Pin **68** pivotally mounts a pair of plates **70**, **71**, which plates support a pair of rollers **72**, **73** in respective rolling engagement with upper and lower portions of the cable **40**. A sleeve on the pin **68** serves to maintain plate **71** in spaced relation from the depending flange of the bracket **66** for unobstructed pivoting movement relative thereto.

Plate **70** mounts a pin **76**; this pin supports a roller **77**. A suitable spacer **78** on the pin **76** maintains the roller **77** in proper spaced relation from the plate **70**.

The cable **40** serves to maintain the plates **70**, **71** in the position illustrated in FIG. 5. When the plates **70**, **71** are in this position, the roller **77** is mounted in such a position that the same comes into engagement with the lower portion of the flange of a rail wheel on the rail **11** of the track section. Such a flange is represented by the numeral **80**. As the robot moves past a railway car wheel, the roller **77** causes the plates **70**, **71** to be pivoted about the pin **68** (in a counterclockwise direction as viewed in FIG. 5) by reason of the engagement of the roller **77** with the lowermost portion of the flange **80** of the rail car wheel. This pivoting movement of the plates **70**, **71** causes the rollers **72**, **73** to bend the cable **40** which in turn causes the rod **43** to be pulled from right to left. As the roller **77** passes beyond the lowermost portion of the

flange 80, the spring 54 serves to return the rod 43 to its position illustrated in FIGS. 4 and 5. This axial reciprocable movement of the rod 43 results in corresponding movement of the nut 57 thereby to actuate or cycle the switch 61. It will be apparent that the switch 61 will be cycled once each time the roller 77 passes a rail wheel on the rail 11 of the track section. Or in other words, the switch 61 is actuated each time the robot 14 passes a connected pair of railway car wheels (two wheels having a common axle) on the section of track. As it will be explained hereinbelow, after the switch 61 has been cycled a preselected number of times an associated, electrically operated, signal producing means produces a signal resulting in closing of a switch which is used to control movement of the robot. Before describing a circuit including signal producing means and the switch 61, another embodiment of the invention will be described. Such other embodiment is used with substantially the same circuit.

This other embodiment is illustrated in FIGS. 7, 8 and 9. The robot mounts a plate 83 which extends outwardly and transversely of the robot. This plate supports a bar 84, which bar mounts a bracket assembly 85. The bracket assembly includes an integral cylindrical portion 85*a* mounting a vertically extending rod 86. The rod 86 includes a bifurcated lower portion mounting a pin 87 on which one end of a collector arm 88 is pivoted. The other end of the arm 88 mounts a bracket 89 of inverted U-shape. This bracket supports a pin 90 which pivotally engages a collector shoe housing 91 formed of suitable dielectric material. The shoe 91 carries a contact 92 which is mounted for sliding electrical engagement with a conductor 94 mounted in parallel relation between the rail 11 and the adjacent channel 15 of the robot guideway. Conductor 94 is supported at intervals along the length thereof by supports 95. As noted in FIG. 7, the end of arm 88 adjacent the pivot pin 87 is in the form of a hook engaging one end of a spring 97. The other end of this spring is engaged with a hook integral with a collar member 98 mounted on the upper end of rod 86. Spring 97 serves to maintain the contact 92 in sliding electrical engagement with the conductor 94 during movement of the robot 14 in either direction along its path of travel.

Plate 17 of the robot also mounts a generally vertically disposed plate 100; this plate supports a switch assembly 101. Switch assembly 101 mounts a generally horizontally extending actuating shaft 102, one end of which shaft extends externally of the switch housing and is fixedly connected to one end of an actuating arm 104. Means (not shown) within the switch assembly 101 serve to maintain yieldably the shaft 102 and the arm 104 in the position illustrated in FIG. 8, but such means permit limited rotation of the arm 104 and shaft 102 in a clockwise direction as viewed in FIG. 8. Biasing means (not shown) within the switch assembly serve to return the arm 104 to its position illustrated in FIG. 8.

One contact within the switch 101 is connected with sliding contact 92 by means of an insulated connector or lead 105. The other contact in the switch 101 is grounded to the housing thereof. It will be understood that the housing of switch 101 is not insulated from plate 100, or any other of the various robot parts, all of which parts are of metallic construction.

Bar 84 also supports a vertically disposed plate 108. Plate 108 supports a horizontally disposed pin 109; this pin pivotally mounts an arm 110 intermediate the ends of the latter. A sleeve 111 maintains the arm 110 in spaced relation with the plate 108 for free pivoting movement relative thereto. As noted in FIG. 8, one end of arm 110 is in engagement with the actuating arm 104 of the switch assembly 101. The other end of the arm 110 mounts a pin 112, which pin supports a roller 114.

As mentioned above, arm 110 is pivotally mounted on the pin 109. The arm 110 is unbalanced and tends to rotate in a counterclockwise direction as viewed in FIG. 8. However, the engagement between the arm 110 and the actuating arm 104 of the switch normally prevents such counterclockwise rotation. When the arm 110 is held in this position by the actuating arm 104, roller 114 is positioned to come into engagement with the flange 80 of a rail wheel on the rail 11 of the track section. As the robot moves past such a railway car wheel, engagement of the flange thereof with the roller 114 causes the arm 110 to be cammed in a counterclockwise direction as viewed in FIG. 8, thereby to rotate the arm 104 for actuating the switch 101 controlled thereby. As the roller 114 rolls along the lowermost portion of the flange, i.e., deflects past the same upon movement of the robot, the switch 101 is cycled, i.e., the contacts therein are closed and then separated. As the roller 114 passes beyond the flange 80, the biasing means (not shown) within the switch assembly 101 serves to return the arm 110 and the arm 104 to the position illustrated in FIG. 8. In other words, the switch 101 is cycled or operated once each time the robot passes a connected pair of railway car wheels on the track section defined by the rails 10 and 11.

FIG. 10 illustrates a circuit incorporating the present invention. Actually, the FIG. 10 circuit is used with the embodiment of the invention shown in FIGS. 7–9. There are only minor differences between this circuit and the circuit used with the FIGS. 4–6 embodiment, which differences will be explained hereinbelow.

Referring now to FIG. 10, numerals 115 represent the input lines from a suitable source of alternating current. The lines 115 are connected through a set of forward contacts 116 and a set of reverse contacts 117 to the three phases of a reversible drive motor 118. It will be understood that the motor 118 operates the winch or winches connected to the cables 34, 38 which are secured to the robot 14. A transformer 120 reduces the voltage on the other side of the motor to approximately conventional line voltage, i.e., 117 volts. An electronic relay 121 with a self-contained transformer connected in parallel with the transformer 120 reduces the voltage further to approximately 10 volts. This relay includes a mechanically connected contactor 122. Thus, the electronic relay 121 serves to reduce the voltage in the exposed conductor 94 and channel 15 to a level which will not be a hazard to operating personnel. The switch 101, which is actuated by engagement of the roller 114 with the railway flange 80, is connected in a circuit on the low voltage side of the relay 121. One leg of this circuit is defined by the conductor 94 which extends along the track section and the other leg of the circuit is defined by one of the channels 15 forming a part of the guideway of the robot. Referring back to FIG. 8, one contact of the switch 101 is connected to conductor 94 by the contact 92 and electrical lead 105. The other contact of the switch 101 is grounded to the switch housing which is in electrical communication with the channel 15 via the robot itself.

Numeral 123 represents an electrically operated counting device which is connected in the circuit in a line including contactor 122 and also including normally open contacts 125. The counter includes a normally open reset contacts 124 and normally closed contacts 126. The contacts 126, which are shown remote from the counter 123 but which actually form a part thereof, are associated with a manually operated control knob and appropriate indicia (not shown) for setting a preselected number in the counter, say twelve for example. The counter 123, which is of known construction and of itself forms no part of the present invention, is of the type adapted to cause closing of the contacts 126 after the switch 101 has been cycled for a number of times equal to the number set by the manually operable control knob just mentioned.

A timing relay 127 is connected in a line with a forward limit switch 128. This limit switch is mounted along the robot guideway at the forward limit of travel of the

robot (see FIG. 1). Suitable means (not shown) are carried by the robot to engage and close the switch **128** as the robot reaches its forward limit of travel. The switch **128** is mechanically connected to another switch **130** so that closing of the former causes opening of the latter. The switch **130** is connected in a line with a forward contactor coil **132**. Also connected in this line are normally opened contacts **133**, normally closed contacts **134** controlled by the timing relay **127**, and normally closed reverse contacts **135**. A momentary start switch **136**, of the push button type for example, is connected in parallel with the normally open contacts **133**.

Numeral **138** represents normally open time delay contacts which are associated with the timing relay **127**. These contacts are connected in parallel with normally open contacts **139**, which contacts are connected in a line with a reverse contactor coil **140**. This line also includes the selector switch **126** and a normally closed reverse limit switch **141** which is mounted along the robot guideway at the reverse limit of travel of the robot **14** (see FIG. 1). Suitable means (not shown) carried by the robot serve to engage and open the switch **141** when the robot reaches its reverse limit of travel along the guideway therefor. Normally closed contacts **142** are also mounted in the line with the reverse contactor coil **140**.

Broken line **144** represents mechanical linkage which causes simultaneous actuation of the contacts **116**, **124**, **133** and **142** upon energizing of the forward contactor coil **132**. Broken line **145** represents mechanical linkage which causes simultaneous actuation of the contacts **117**, **125**, **135** and **139** upon energizing of the reverse contactor coil **140**.

The operation of the FIGS. 7–9 embodiment of the invention is as follows: Referring to FIG. 1, assume that a cut of railway cars, say twenty cars for example, is located on the railway track section to the right of area **12**. Assume that the robot motor **118** is de-energized and that the robot is positioned between the third and fourth cars (counting left to right from area **12**) in the cut of cars. In other words, it is desired to move the cut of cars in three car increments. Assuming further that each railway car has four pairs of rail wheels, the number twelve is set in the counter **123**.

A cycle of operation is commenced by momentarily closing start switch **136** which causes energizing of the forward contactor coil **132**. Energizing of this coil causes simultaneous closing of the contacts **116**, **124**, **133** and opening of contacts **142**. Closing of the contacts **124** actuates the counter **123** for being reset for the next cycle of operation. Closing of the contacts **116** causes motor **118** to be energized in the forward direction thereof thereby to bring about forward movement of the robot, i.e., from right to left as viewed in FIG. 1.

Such forward movement of the robot causes the robot rollers **28** to come into pushing engagement with the rearwardmost axle of the third railway car thereby causing movement of the entire cut of cars from right to left. The rail cars are then moved toward the area **12** until the robot **14** brings about closing of the forward limit switch **128**. At this stage of operation, the three cars will be positioned within the work area **12**. Closing of forward limit switch **128** causes simultaneous opening of switch **130** because of the mechanical connection between these two switches. Opening of the switch **130** causes de-energazing of the forward contactor coil **132**, thereby opening contacts **116**, **124**, **133** and closing contacts **142**. Opening of the contacts **116** causes de-energizing of the motor **118** thereby to allow the robot to come to rest.

Closing of the forward limit switch **128** also causes energizing of the timing relay **127**. Timing relay **127** brings about closing of the switch **138** after a predetermined interval of time. This interval of time is sufficient to allow the robot to come to a complete stop before energizing the motor **118** in its reverse direction. Closing of the switch **138** causes energizing of the reverse contactor coil **140**. Energizing of the coil brings about closing of contacts **117**, **125**, **139** and opening of the contacts **135**. Closing of the reverse contacts **117** energizes the robot control motor **118** for driving the robot in the opposite or reverse direction, i.e., from left to right as seen in FIG. 1.

As the robot moves in its reverse direction, the roller **114** will successively engage the flanges of the railway car wheels. The switch **101** will be cycled each time the roller **114** engages and deflects past a railway car flange. Each cycle of operation of the switch **101** caused cycling of the contactor **122** through the relay **121**, thereby advancing the timer **123**. After the counter has been energized or pulsed the preselected number of times, i.e., twelve, the counter will cause opening of the switch **126**. Opening of this switch will cause de-energizing of the reverse contactor coil **140** thereby causing simultaneous opening of the contacts **117**, **125**, **139** and closing of the contacts **135**. Opening of the contacts **117** results in de-energizing of the motor **118** thereby causing the robot to come to a stop after it has passed the three railway cars.

Another cycle of operation is commenced by again pushing the momentary start switch **136**. Should it now be desired to advance the cut of cars in only two car increments, the appropriate number, in this case eight, is set into the counter before the robot reaches the forward limit switch and commences reverse movement. During reverse movement of the robot, that is from left to right as seen in FIG. 1, the robot rollers **28** merely deflect beneath the axles of the railway cars.

When the FIGS. 4–6 embodiment of the invention is used, the FIG. 10 circuit need only be modified as follows: the switch **61** is substituted for the switch **101**. Since the conductor **94** is not used in this embodiment and since the channel **15** does not define a leg of the circuit in this embodiment, suitable electrical conductors are used to complete the circuit. Since no portions of the circuit need be exposed when using the FIGS. 4–6 embodiment, low voltage is not a necessity and therefore the transformer forming part of the electronic relay **121** may be dispensed with. Otherwise, the circuit and the operation thereof are the same as explained above in connection with the FIGS. 7–9 embodiment.

Although the counter **123** has been shown in the circuit for causing automatic operation of the robot control motor, the present invention is not to be limited for use in such a circuit. For example, the counter might be used in connection with visual or audible means for indicating to an operator of the motor **118** when the robot has been moved past the predetermined number of cars.

Both embodiments of the present invention possess many advantages which will be apparent to those skilled in the art. One particular advantage of the FIGS. 4–6 embodiment is that no electrical components need be mounted on the robot or along the section of track. The switch **61** and the actuating means therefor may be mounted at either end of the track section. In the event area **12** is a closed area, such as a shop or building, it is desirable to mount the switch **61** and the actuating means therefor at the end of the track section within such shop or building. Both embodiments of the invention make advantageous use of a roller which engages the flange of a rail car wheel. The vertical distance from the top of the rail **11** to the lowermost portion of the flange **80** remains substantially constant regardless of the diameter of the railway car wheel. In other words, the position of the roller **77** or **114** need not be adjusted to accommodate different types of railway cars.

While the invention has been shown but in one form, it will be obvious to those skilled in the art that it is not to be so limited. On the contrary, the invention is susceptible of various forms and modifications without departing from the spirit and scope of the appended claims. In the following claims, the term "signal producing means" is used in a broad sense and means any form or type of electrical or mechanical signal which is produced or generated

upon actuation of an associated cycling device, such as a switch, a preselected number of times.

I claim:

1. In combination with a railway car handling mechanism including a robot mounted for movement in either direction along a path parallel with and adjacent to a section of railway track, means for producing a signal after the robot has been moved past a predetermined number of railway cars on the track section, said means comprising, signal producing means and cyclic operating means associated therewith, which signal producing means is adapted to produce a signal upon cycling of said operating means a preselected number of times, mechanical sensing means carried by said robot and including a member adapted, upon movement of the robot along said track section, to engage and deflect past a formation constituting a part of a railway car on said track section, actuating means for said operating means, the former being adapted to cycle the latter in response to each deflection of said member.

2. The combination according to claim 1 wherein said formation is the flange of a railway car wheel and wherein said member is yieldably mounted to engage and follow the lower portion of such flange during movement of the robot therepast.

3. The combination according to claim 1 further defined by, said signal producing means being electrically operated, said cyclic operating means comprising switch means, and said actuating means comprising mechanical means.

4. In combination with a railway car handling mechanism including a robot mounted for movement in either direction along a path parallel with and adjacent to a section of railway track, means for producing a signal after the robot has been moved passed a predetermined number of railway cars on the track section, said means comprising, an electrical conductor supported in parallel adjacent relation with one of the rails of said track section, a circuit having one leg thereof defined by said conductor, a current collector carried by said robot, said current collector forming a part of said circuit and including a contact shoe in sliding electrical engagement with said conductor, a switch in said circuit for opening and closing the same, said switch being carried by said robot and being normally in one state, mechanical actuating means associated with said switch for actuating the same, said actuating means being carried by said robot and including a member adapted, upon movement of the robot along said track section, to engage and deflect past a formation constituting a part of a railway car on said track section, deflection of said member serving momentarily to actuate said switch to its other state, an electrically operated signal producing unit connected in said circuit and being adapted to produce a signal upon actuation of said switch a preselected number of times.

5. The combination according to claim 4 wherein said robot is mounted for movement in a guideway extending in parallel adjacent relation with said track section, said guideway being of metallic construction and defining one of the other legs of said circuit.

6. The combination according to claim 4 wherein said formation is the flange of a railway car wheel and wherein said member is yieldably mounted to engage and follow the lower portion of such flange during movement of the robot therepast.

7. In combination with a railway car handling mechanism including a robot mounted for movement in either directtion along a path parallel with and adjacent to a section of railway track, means for producing a signal after the robot has been moved past a predetermined number of railway cars, said means comprising, an electric conductor supported in parallel adjacent relation with one of the rails of said track section, a circuit having one leg thereof defined by said conductor, a current collector carried by said robot, said current collector forming a part of said circuit and including a contact shoe in sliding electrical engagement with said conductor, a switch in said circuit for opening and closing the same, said switch being normally biased open and being carried by said robot, mechanical actuating means associated with said switch for actuating the same, said actuating means being carried by said robot and including a member mounted for swinging movement in a vertical plane extending longitudinally of said track section, an element supported by said member for engaging and following the lower portion of the flange of a railway car wheel on said track section upon movement of the robot therepast, such movement of said element serving to cause swinging movement of said member, said actuating means further including linkage engaged with said member and said switch for momentarily closing the latter in response to a cycle of swinging movement of the former, an electrically operated signal producing unit connected in said circuit and being adapted to produce a signal upon actuation of said switch a preselected number of times.

8. The combination according to claim 7 wherein said robot is mounted for movement in a guideway extending in parallel adjacent relation with said track section, said guideway being of metallic construction and defining one of the other legs of said circuit.

9. In combination with a railway car handling mechanism including a robot mounted for movement in either direction along a path parallel with and adjacent to a section of railway track, means for producing a signal after the robot has been moved past a predetermined number of railway cars, said means comprising, a cable suspended at each end thereof in parallel adjacent relation with said section of railway track, a signal producing unit including switch means mounted adjacent one end of said cable, said unit being adapted to produce a signal upon actuation of said switch means a preselected number of times, said one end of said cable being connected with said switch means, which cable is supported and arranged to actuate said switch means, in response to the formation of a bend in said cable, cable bending means mounted on said robot and being in engagement with said cable, said cable bending means being adapted to remain in such engagement with the latter as said robot moves in either direction along said track section, said cable bending means having an element arranged to contact and deflect past a formation on a railway car on said track section during movement of the robot therealong, said cable bending means being adapted momentarily to bend said cable in response to each deflection of said element.

10. The invention according to claim 9 and further defined by said cable bending means including an assembly supporting said element and also supporting a pair of members in respective engagement with opposite portions of said cable, which assembly is pivotally mounted for bending said cable upon pivoting movement of the former, such pivoting movement being imparted by the action of said element in contacting and deflecting past said formation.

11. The combination according to claim 10 wherein said formation is the flange of a railway car wheel and wherein said element is mounted for engaging and following the contour of the lower portion of the flange as the robot moves therepast.

12. In combination with a railway car handling mechanism including a robot mounted for movement in either direction along a path parallel with and adjacent to a section of railway track, means for producing a signal after the robot has been moved past a predetermined number of railway cars on the track section, said means comprising, a cable suspended at its ends in parallel adjacent relation with said track section, a signal producing unit including an operating switch mounted adjacent one end of said cable, said unit being adapted to produce a signal upon actuation of said switch a preselected number of times, a movable actuator for said switch, the actuator

being biased against movement in one direction, said one end of said cable being connected with said actuator for moving the same in said one direction in response to corresponding movement of said one end of the cable thereby to actuate said switch, cable bending means on said robot in engagement with said cable, said cable bending means being adapted to remain in such engagement with the cable as said robot moves in either direction along said track section, said cable bending means having an element arranged to contact and deflect past a formation on a railway car on said track section during movement of the robot therealong, said cable bending means being adapted momentarily to bend said cable for pulling said one end thereof in said one direction in response to each deflection of said element.

13. The invention according to claim 12 wherein said cable bending means includes an assembly having a pair of rollers in respective under and over rolling engagement with said cable, which assembly is pivotally mounted about an axis parallel with the axes of said rollers for forming a bend in said cable upon pivoting movement of the assembly, said element being mounted on said assembly for pivoting the latter in response to the action of the former in contacting and deflecting past said formation.

14. The combination according to claim 13 wherein said formation is the flange of a railway car wheel or the track section and wherein said element is mounted for contacting and following the lower portion of such flange during movement of the robot therepast.

15. In combination with a railway car handling mechanism including a robot mounted for movement in either direction along a path parallel with and adjacent to a section of railway track, means for producing a signal after the robot has been moved past a predetermined number of railway cars on the track section, said means comprising, a cable suspended at its ends in parallel adjacent relation with said track section, a signal producing unit including an operating switch mounted adjacent one end of said cable, said unit being adapted to produce a signal upon actuation of said switch a preselected number of times, a movable actuator for said switch, the actuator being biased against movement in one direction, said one end of said cable being connected with said actuator for moving the same in said one direction in response to corresponding movement of said one end of the cable thereby to actuate said switch, the other end of the cable being fixedly mounted, cable bending means on said robot including a pivotally mounted bracket supporting a pair of rollers in respective over and under rolling engagement with said cable, which bracket is pivotally mounted about an axis parallel with the axes of said rollers, an element mounted from said bracket and being arranged to contact and deflect past the flange of a railway car wheel on said track section during movement of the robot therealong for pivoting said bracket, said rollers being effective, upon pivoting of said bracket, to form a bend in said cable and thereby pull said one end thereof in said one direction.

**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,042,236 | 10/1912 | Von Korotkiewitsch | 246—247 |
| 2,046,157 | 6/1936 | Gibbs | 246—247 |
| 3,141,420 | 7/1964 | Garbers | 104—176 |
| 3,194,176 | 7/1965 | Garbers | 104—176 |


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