Oct. 22, 1968 E. C. BRAUN 3,406,638

CODED SWITCH SYSTEM FOR TOWLINE CONVEYORS

Filed Oct. 12, 1965 3 Sheets-Sheet 1

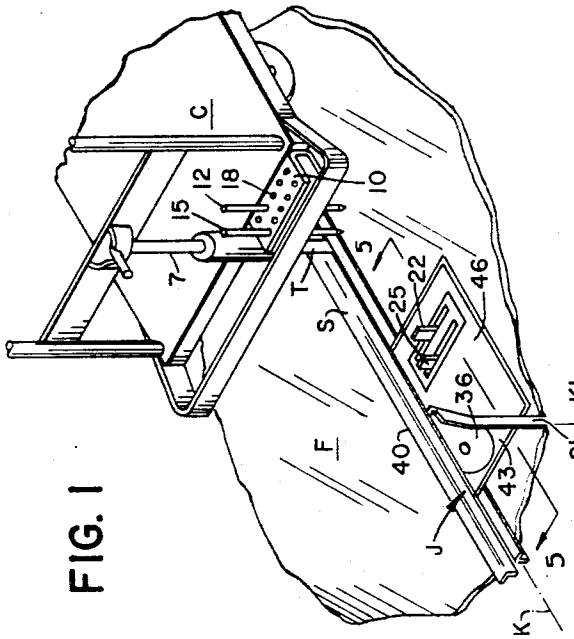


FIG. 1

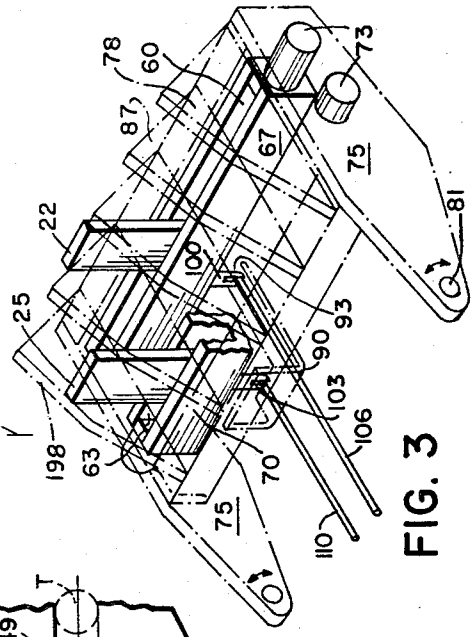


FIG. 3

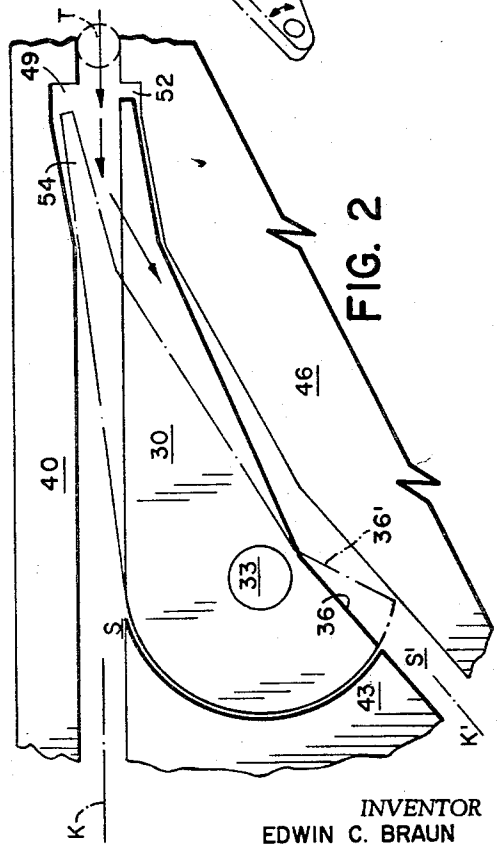


FIG. 2

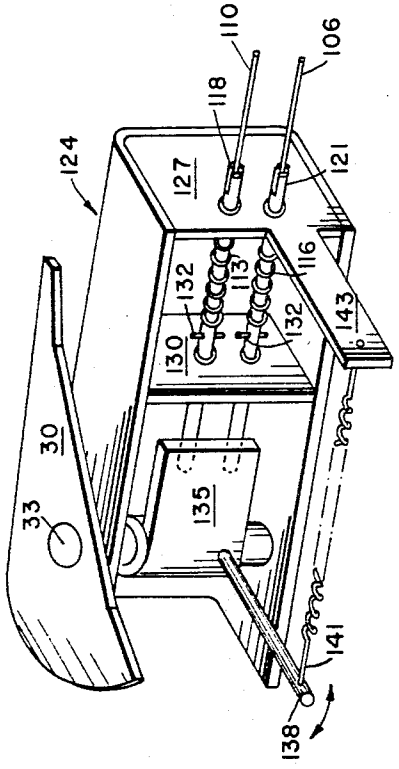


FIG. 4

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CODED SWITCH SYSTEM FOR TOWLINE CONVEYORS

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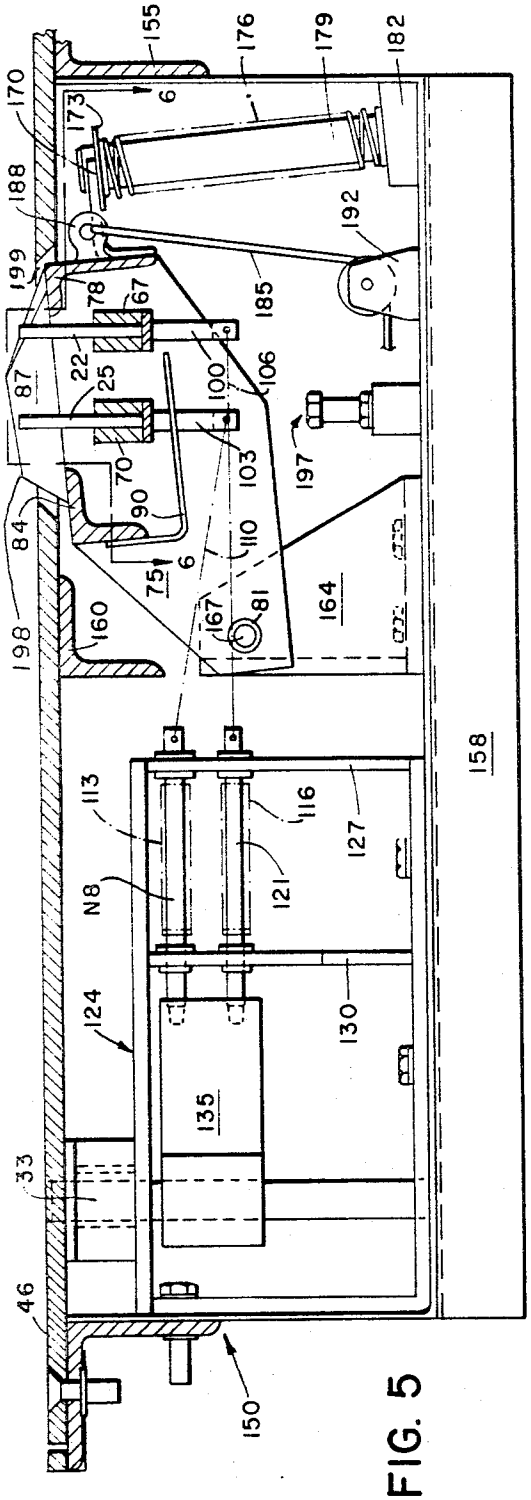


FIG. 5

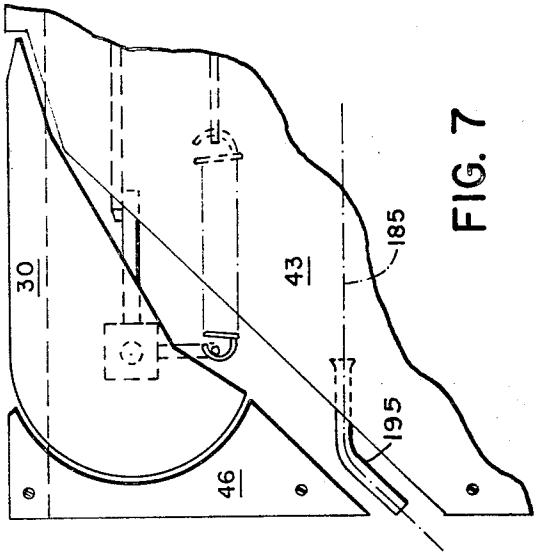


FIG. 7

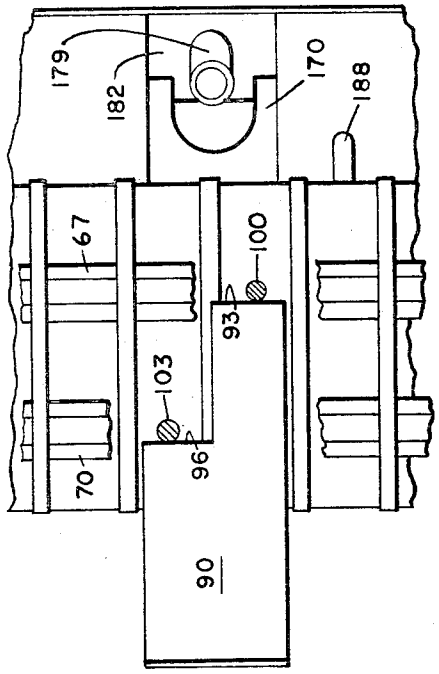


FIG. 6

CODED SWITCH SYSTEM FOR TOWLINE CONVEYORS

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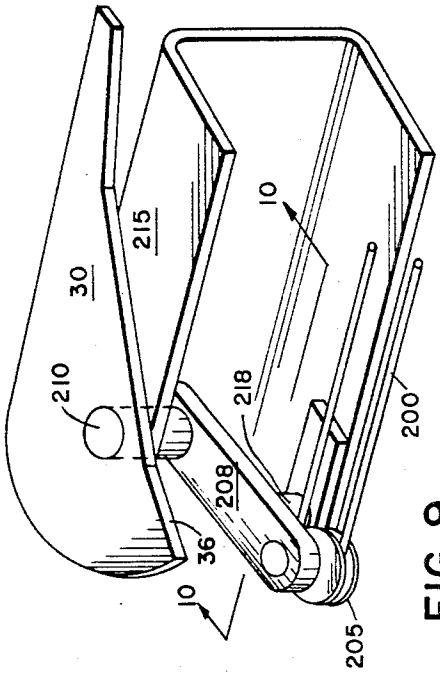


FIG. 9

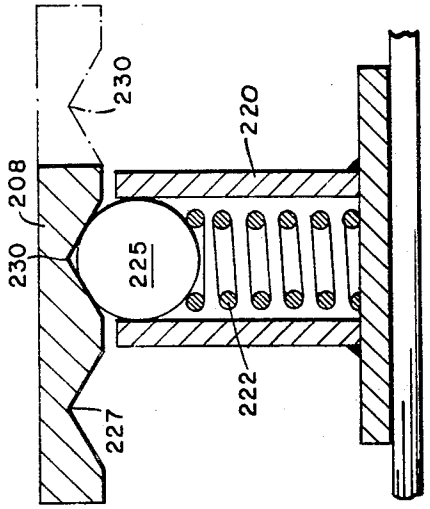


FIG. 10

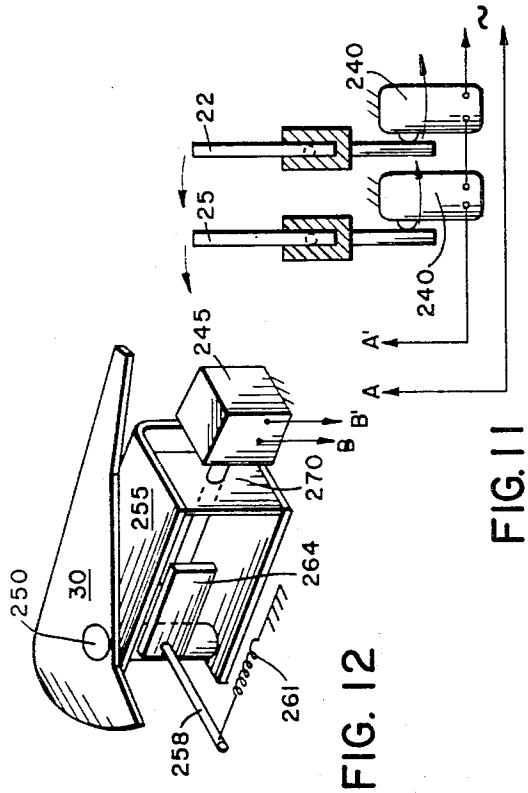


FIG. 12

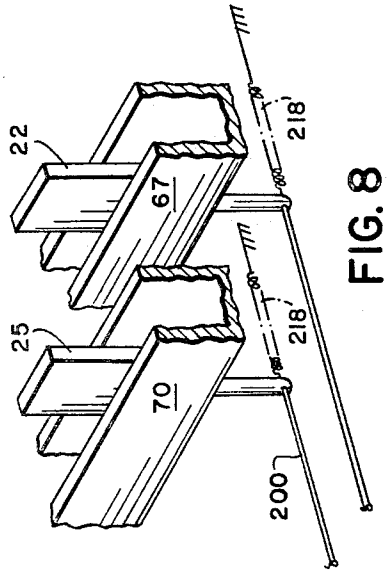


FIG. 8

FIG. 11

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CODED SWITCH SYSTEM FOR TOWLINE CONVEYORS

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Filed Oct. 12, 1965, Ser. No. 495,112
15 Claims. (Cl. 104—88)

ABSTRACT OF THE DISCLOSURE

This invention relates to towline systems of the kind generally shown in my previous application, S.N. 410,215, filed Nov. 10, 1964, now Patent No. 3,315,614, and S.N. 420,322, filed Dec. 22, 1964.

In general, such towline systems comprise carts which are moved across a floor for carrying cargo, the motive power being provided by towline cables or chains below the floor, wherein each cart has a towline pin protruding through a slot in the floor to engage the towline. Various systems comprise switch junctions so that selected carts can be switched from a main slot to a spur slot for cargo discharge or cart storage, etc.

In the present invention, a switch junction mechanism is disclosed capable of effecting predetermined switching from one slot to another, dependent upon control by code pin members carried by individual carts.

The particular feature of the present invention is the provision of a movable switch frog which is controlled by the actuation of selectively positionable movably mounted sensing members. Such members are rockably supported in a common mechanism which is installed in a floor on which carts roll and are engaged by pins carried by carts.

The members may be placed in preset coded positions to be engaged by correspondingly coded pins. In that manner the coding of pins coacting with coded members (referred to as "sensing tabs") can be utilized for a plurality of switch locations, each location having its respective coding of sensing tabs for controlling a switch frog at such location when the tabs are engaged by properly coded pins of a specific cart.

Thus, the support mechanism comprises a frame insertable in a floor adjacent a switch junction wherein such frame may take various forms but wherein any such frame is capable of holding a plurality of sensing tabs in selected positions for any desired predetermined coding.

It is, accordingly, an object of the invention to provide a system in which predetermined switching of carts at selected junctions can be effected in a simple and reliable manner.

It is another object of the invention to provide an economical and rugged construction for effecting a switching system and one which will be convenient in use.

It is a still further object of the invention to provide a system in which individual carts can carry a coded means coacting with a coded means at a selected switch junction wherein the cart and junction coding means are variable so that any cart of a series of carts can be switched selectively to any junction.

It is an even further object of the invention to provide a coding system for switching control so that a vast number of switch junctions can be provided in any one towline system operating over a large area such as a factory floor, warehouse, post office, or transportation depot, etc.

Briefly, the invention comprises a coding means carried by each cart wherein two pins are carried in variable predetermined positions and which are engageable with correspondingly positioned sensing tabs located adjacent a selected switch junction. The sensing tabs are likewise selectively variable as to their relative positions.

The arrangement is such that each of a pair of codedly positioned pins must strike respective sensing tabs in order to operate a elected switch. If only one pin strikes a tab, the switch will not be operated. The result is that a cart in which both pins have not been coded to correspond to the sensing tab positions will continue past the switch junction without being diverted. Any cart, however, wherein the pins have been coded to simultaneously strike or engage the coded tabs will cause movement of a switch frog to divert the cart towpin from the slot in which it is moving to a spur slot or a different towline loop of the system.

A detailed description of the invention now follows in conjunction with the appended drawing, in which:

FIG. 1 is a perspective view showing fundamental components of the combination of the invention;

FIG. 2 is a plan view showing details of a switch junction;

FIG. 3 is a perspective view showing the relative positions and supporting structure of a pair of sensing tabs;

FIG. 4 is a perspective view showing the relative position of the actuating elements for a switch frog;

FIG. 5 is a longitudinal cross section in elevation showing the general constructional details of a switch junction box taken generally on the section line **5—5** of FIG. 1;

FIG. 6 is a fragmentary plan view partially in section with portions broken away to show detail, taken generally on the section line **6—6** of FIG. 5;

FIG. 7 is a plan view of a fragment of the construction showing a corner of the switch junction;

FIG. 8 is a perspective showing the fundamental components of a modified version of the invention insofar as the sensing tabs are concerned;

FIG. 9 is a perspective showing a switch frog and actuating elements controlled by the tab arrangement of FIG. 8;

FIG. 10 is a section in elevation taken on section line **10—10** of FIG. 9;

FIG. 11 is an elevational view partially in section showing a modification wherein the sensing tabs operate electrical switches to control a switch frog; and

FIG. 12 is a perspective illustrating the fundamental components for electrical operation of a switch frog.

Referring now to FIGS. 1–4, the invention comprises a cart C of conventional construction movable on a floor F, being guided in a slot S through which the towpin T protrudes for engagement with a towline chain K, all in the usual and conventional manner. A switch junction J is indicated operative to switch towpins from slot K to a spur or side loop slot S'. It will be understood that the construction of the towlines below the floor, and their coaction with each other, are such that the cart towpins can be disengaged when a cart is switched or diverted from a towline such as K to a towline such as K', e.g., as shown in my co-pending application S.N. 420,322. In some instances, where carts are merely being stored in a slot S', there would be no need for a towline K', but where S' represents entrance to another loop of the system, then it is obvious that a towline K' would be used. The mode of disengagement and engagement of the towpin does not form part of this invention and can be accomplished by means heretofore known in the art or as disclosed in the art or as disclosed in the previously mentioned application.

The invention is characterized by the provision of an apertured bracket **10** for carrying a plurality of code pins such as **12** and **15**, which can be placed in a selectively coded manner in any pair of the bores **18** of bracket **10**. The bores **18** are provided in plurality in a pair of parallel

rows, but it will be appreciated that any pattern of bores is within the spirit of the invention. Thus, each cart would carry a bracket and one or more code pins to engage one or more sensing tabs such as **22** and **25**, which are located at the switch junction J. Although ordinarily the system is intended to utilize a pair of code pins in the present disclosure, it will be appreciated from what follows that systems using a single code pin or more than two code pins are quite possible.

Referring to FIG. 2, the switch frog **30** is noted carried by a pivot pin **33**, which frog diverts movement of towpins T from slot S to slot S', indicated by the phantom line position of the frog. Thus, with the switch frog in the solid line position the towpin proceeds in the slot S, whereas with the switch frog in the phantom line position the towpin is diverted into the slot S', following the arrows. It will be noted that the switch frog has a cam edge **36** projecting into slot S' when the frog is in the switching position and, accordingly, a diverted towpin can engage that edge to swing the frog back to the full line position whence slot S is once more open and slot S' closed. The floor pieces **40**, **43**, and **46** will be understood to be made of metal (also see FIG. 1) and suitably notched as at **49** and **52** to provide clearance for the upstream end **54** of the frog **30**.

Referring to FIG. 3, the sensing tabs **22** and **25** are carried in respective slots **60** and **63** of respective rotative elongated holders **67** and **70** having trunions such as **73** carried in side plates **75** fastened at their upstream ends by an angle iron **78** and being provided with bores **81** at their downstream end so that hte entire sub-assembly which comprises the sensing tabs and holders can rock on a horizontal axis as an integral frame **82** (FIGS. 3 and 5). The plates **75** are connected downstream of the sensing tabs by an angle iron **84** and, accordingly, it will be understood that a box-like bracket construction results which pivotally supports the assembly of holders **67** and **70** and respective sensing tabs **22** and **25**, the holders themselves being individually pivotal in side plates **75**. Parallel plates such as **87** are welded spacedly to the angle iron members **78** and **84** and are utilized as side guards for the sensing tabs and as floor members when depressed by wheels W (FIG. 1) and also to divide the holders into pockets into which tabs may be selectively placed for coding purposes. Thus, a tab may be annually slid into a slot between any two guards **87**, whereby coding of the tabs at any switch junction can be effected to align a pair of tabs for engagement with a pair of correspondingly coded pins such as **12** and **15** (FIG. 1). Guards **87** have been omitted in FIG. 1 for clarity but are depressible simultaneously upon engagement of cart wheels against sloping front edges **87***a*.

A feature of the invention resides in the ease with which the tabs may be removed from any coded positions for re-coding in other compartments of the arrangement at any switch junction, the tabs being held frictionally in respective slots.

It will be apparent from the above description that coded pins striking respective coded tabs will cause respective holders **63** and **67** to rock counterclockwise, as viewed on FIGS. 1 and 3, the ends of the pins simply sliding past the top edges of the tabs as the cart moves beyond the tabs.

The angle iron **84** carries a stop element **90** in the form of an angle having an edge **93** and another edge **96**, FIGS. 3, 5 and 6. The bracket **67** carries an actuator lever **100** and the holder **70** carries an actuator lever **103**. These levers terminate below the level of respective edges **93** and **96** and have fastened thereto actuator cables or chains such as cable **106** fastened to lever **100** and cable **110** fastened to lever **103**. The cables are maintained under tension and are disposed in a horizontal plane, compression springs being used for maintaining tension, as noted in FIG. 4. Thus, the spring **113** effects tension in cable **106** and the spring **116** effects tension in cable **110**.

The effect of the springs is to maintain the respective levers **100** and **103** in abutment with respective edges **93** and **96** of the stop member **90** so that the respective tabs **22** and **25** are normally disposed in substantially vertical planes. However, as described above, when the code pins strike the tabs, they effect rocking thereof by virtue of the pivotal holders **67** and **70**. Accordingly, cables **106** and **110** are pulled to the right as viewed on FIGS. 3 and 4. As seen on FIG. 4, the cables are attached to respective latch pins **118** and **121** which are carried in a housing **124** being reciprocally supported therein on plates **127** and **130**. The springs **113** and **116** are carried concentrically on respective latch pins and are stressed between pins such as **132** and plate **127** to maintain tension in cables **106** and **110**.

The pins **118** and **121** extend into engagement at their free extremities with a latch plate **135** which is firmly secured to pivot pin **33** (see FIG. 4) on which is mounted the frog plate **30**. Extending from the latch plate **135** is an arm **138** and a tension spring **141** is fastened between the arm and a tongue **143** extending from support plate **127**. Spring **141** maintains a bias on the frog to open switch position, shown in phantom lines in FIG. 2. Normally, latch pins **118** and **121** are engaged by plate **135** to hold the frog in closed switch position as shown in solid lines in FIG. 2. Should the latch pins be pulled to the right, plate **135** will swing under bias of spring **141** closing slot S by means of frog **30** and opening slot S'.

When tabs **22** and **25** are rocked by the code pins, they pull the latch pins via the respective cables **106** and **110** to release latch plate **135**. Obviously, both pins **12** and **15** must engage their respective tabs **25**, **22**, so that both latch pins are pulled out to release the latch plate and thus cause frog **30** to move to the phantom line postion of FIG. 2, thus diverting carts to slot S'.

It will be understood at this point that the system could be coded for use with a single latch pin and a single code pin acting against a single tab. However, the use of two code pins considerably increases the permutations with which the system can be used for controlling a plurality of switch junctions. Likewise, the use of more than two code pins would further increase the number of permutations. Modification of the latching arrangement and tab arrangement for more than two code pins would be a mere matter of duplication of the necessary components.

The free ends of rods **118** and **121** protrude only a small distance beyond the adjacent end of latch plate **135** and the dimensioning of the frog and the towline slots is such that the latch plate only swings a short distance. In actual practice, the swing distance may be of the order of one-half inch. Accordingly, the pins **118** and **121** do not escape past the edge of plate **135** but merely remain abutted thereagainst as indicated in phantom in FIG. 4. Were they to escape past the edge they would block latch plate **135** from effecting a reset movement to return position.

In reset, the towpin simply pushes the edge **36** to swing the frog **30** into the closed position of FIG. 2 from the dotted-line position. In so doing, the latch pins merely snap back to the position shown in FIG. 4 under bias of springs **113** and **116** whence latch plate **135** is once more held against movement until another pair of properly coded code pins strikes the sensing tabs.

Referring to FIGS. 5–7, the housing **124** is secured within a floor box **150** which may be of any suitable construction and sunk into a floor so that the plates **43**, **46** are flush at floor level. Various supporting elements, such as angle irons **155**, **158**, and **160** may be utilized for rigidifying the construction and the design of the floor box, all matters well within the skill of persons in the art. Accordingly, no detailed discussion of the box construction is required for the purposes of a clear understanding of the invention.

The tab carrying assembly, or tab carrier, comprised

of plates **75** and slotted rocker bars **70**, angles **78**, **84**, etc., may be pivoted between and to vertical pedestals **164** (FIG. 5) as by pins **161**, **166** extending into apertures **81** of plates **75**. The angle iron **78** has a yoke **170** secured thereto which engages against a washer **173** supported by a compression spring **176** concentric with a guide pin **179** securely fastened at its base **182** to a corner of the floor box. A cable **185** fastens to an eye **188** secured to angle iron **78**, and passes around pulley **192** (FIG. 5) extending through guide tube **195** (FIG. 7) suitably secured near the box floor. Pulling the cable will swing the bracket around pins **167** to lower the tabs below floor level, against bias of spring **176**, so that the tabs cannot be engaged by code pins of carts. This prevents overload of spur slots and pulling of the cable may be accomplished in a manner shown in the patent to Bradt et al. 3,103,895.

A threaded limit stop means **197** may be utilized abuttable with either or both of the carrier plates **75** for limiting maximum downward movement of the carrier. Thus, if the frame **82** is depressed either by cable **185**, or by cart wheels, the lower edge of one or both plates **75** strikes a limit stop **197** to limit downward swinging of the carrier so that frame **82** is supported with edges **198** of plates **87** flush with floor plate **46** to effectively bridge the large slot **199** (FIG. 5) through which the tabs protrude to provide a floor surface over which the cart wheels can travel as they depress the guards upon engaging the sloped front edges **87***a*.

Referring to FIGS. 8–10, the modification therein contemplates sensing tabs **22** and **25** as in the previously described modification, carried in the rocker bars **67** and **70** with levers **100** and **103**. In this instance, however, a single cable **200** (FIG. 9) extends from the sensing mechanism and passes around a roller sheave **205** carried on an arm **208** which in turn carries integrally frog **30** on a pin **210**. Pin **210** is supported for rotation in a support channel **215** which will be understood to be secured in a floor box the equivalent of the housing **124** of the previously described modification. The cable ends are tensioned as shown in FIG. 8 as by tension springs **218** secured to each side of the cable, such tension springs being fixed at their outer ends. It will be appreciated that if the tabs of FIG. 8 are actuated to rock counterclockwise, as by code pins, both sides of the cable will pull equally against sheave **205** causing arm **208** to rotate counterclockwise, whereby the frog **30** will rotate accordingly around the axis of pin **210** to the open switch position illustrated in FIG. 2. A detent arrangement is utilized to hold the frog in closed or open switch condition. Thus, a spring-holding collar **220** containing a compression spring **222** is carried below arm **208** and the spring presses a ball **225** into either of the two notches **227** or **230** on the under side of the arm. Accordingly, the frog will be held in switch open or switch closed condition. Upon reset, when the towpin strikes the edge **36** of the frog the arm will swing to snap the ball from one detent notch to another. In the position shown, the ball is in switch open position. When the arm swings to the dotted position shown in FIG. 10, the ball will go into notch **227** to hold the frog in frog open position. The notch and ball arrangement must, of course, provide sufficient detent effect so that the arm will be held against the pull of springs **218** when the frog is in either position. When the frog has been moved to switch closed position, the springs pull the tab holders to hold the tabs vertically as shown in FIG. 8.

In the form of the invention shown in FIGS. 11 and 12, tabs **22** and **25** are rockably mounted, all as hereinbefore described, and the lever pins **100** and **103** operate respective switches **240** which are connected in series and are normally open. These switches connect to a power line and it will be understood that when both tabs are rocked a series circuit is set up energizing a solenoid **245**. The arrows A and A' symbolize connections to the leads B and B' for circuitry. Frog **30** is rotatively supported in the usual manner as heretofore described on a pin **250** carried in a support bracket **255**. Pin **250** has an arm **258** spring tensioned as by a spring **261** to open switch condition which condition is maintained by a latch plate **264** secured to pin **250** when engaged by a latch pin **267** supported in plate **270**. Solenoid **245** may be fixedly carried on support member in any suitable manner, and when energized, it will be understood to have a plunger connected to pin **267** which retracts the pin against a spring within the plunger bore, thereby releasing the frog to switch open condition. The edge of the plate **264** holds the pin while the frog is open and upon resetting actuation by the towpin against edge **36**, the pin **267** is actuated by the solenoid spring back to latching position against plate **264**. The energization of the solenoid is, of course, only momentary, occurring when the code pins engage and move past the sensing tabs.

What is claimed is:

1. A towline cart switching system having a switch junction installed in a floor; a cart provided with a plurality of code pins and support means carried by said cart whereby said code pins may be disposed in a predetermined relation to each other, a switch means at said switch junction having codable sensing elements and a common support mechanism in said floor for movable support of said sensing elements, and means whereby said sensing elements may be coded by being selectively positioned in said mechanism in relation to each other so as to be movably engaged by respective code pins; actuatable means connected to said sensing elements in said switch means whereby simultaneous actuation of said sensing elements by code pins effects operation of said switch means to divert said cart at said switch junction.

2. A cart switching system having a switch juncture with diverging cart path means meeting thereat and comprising a movable switch element disposed to be moved in either of two positions, one such position for permitting carts to continue past said junction without being switched and the other such position to effect cart switching, means for biasing said switch element to one such position and latch means for holding said switch element in the other such position against the force of said bias means, a sensing means comprising sensing tab elements and a common mounting support frame means mounting said tab elements in predetermined positions with respect to each other operative for effecting selectively individual support for said tab elements for coding; means connecting said tab elements to said latch means whereby simultaneous movement of said tab elements from an initial predetermined position effects release of said latch means to permit said switch element to switch carts from one path to another.

3. A system as set forth in claim **2**, including a cart having codable pin elements and means for supporting said pin elements on said cart in position to engage respective sensing tab elements as said cart approaches said switch junction to effect release of said latch means.

4. In a system of the kind described, a cart sensing device for effecting the switch of carts at a switch junction, comprising a pair of elongated bar elements rockably supported in axial parallelism, a sensing tab for each of said bar elements and securing means for securing a respective sensing tab on its bar element at predetermined points along the length thereof and support means for locating said bar elements at a predetermined location relative to the switch junction.

5. In a system as set forth in claim **4**, a switch element and means comprising latch elements for holding said switch element in a predetermined position and means connecting said bar elements with respective latch elements whereby movement of said sensing tabs effects movement of said latch elements to release said switch element.

6. In a system as set forth in claim **4**, wherein said connecting means comprises cable means and resilient

means disposed to tension said cable means and to effect latching positions of said latch elements.

7. In a system as set forth in claim 5, said support means comprising a support device for said rockable bars and a motion limiting means carried by said support device comprising a member having a pair of stepped edges disposed below said bars, each of said bars having a lever secured thereto and abutable with a respective edge to limit rocking movement of respective bars for effecting an initial position of said tabs, said connecting means comprising a cable connected to each lever and extending to a respective latch element.

8. In a system as set forth in claim 5, said securing means comprising slots in said rocking bars, each of said rocking bars having at least one slot extending the length thereof and said sensing tabs comprising members insertable and removably securable in the slot of the respective rocking bar at selective positions.

9. In a system as set forth in claim 5, each of said rocking bars having a slot and said sensing tabs comprising members insertable and removably securable in the slot of the respective rocking bar, including a plurality of spaced vertical guard members and means for securing said guard members over said rocking bars in planes generally normal to the axes thereof and demarcating codable positions of said sensing tabs.

10. In a system as set forth in claim 5, and said support means for supporting said rocking bars comprising a support frame in which said bars are rockably supported, and means for rockably supporting said support frame, resilient means for holding said support frame in an initial position whereby said sensing elements may be engaged by moving actuator elements carried by a cart and means for retracting said frame against the resilient bias thereof, whereby said sensing tabs are moved therewith so as to prevent such engagement.

11. A towline cart switching system having a switch junction and a cart provided with a plurality of code pins and support means therefor whereby said code pins may be disposed in a predetermined relation to each other, a switch frog at said switch junction and sensing elements and support means for said elements at said switch junction whereby said elements may be disposed in relation to each other so as to be engaged by respective code pins; actuating means at said switch junction whereby actuation of said sensing elements effects operation of said switch frog to divert said cart at said switch junction, said switch frog being pivotally mounted and bias means to bias said switch frog to one position; latch means for holding said switch frog in another position against the force of said bias means, said latch means comprising a latch plate integral with said switch frog and further comprising a pair of pins having ends disposed to abut said latch plate at one side thereof to latch said switch frog against pivoting; said latch pins being movably mounted and spring means for said pins to maintain said pins in latching relation with said latch plate, and means connecting respective pins to said sensing elements whereby movement of said sensing elements withdraws said pins from latching relation with said latch plate thereby releasing said switch frog to assume a position effected by said bias means, and means for limiting movement of said switch frog so that said latch plate does not travel beyond the ends of said pins.

12. A towline cart switching system having a switch junction and a cart provided with a plurality of code pins and support means therefor whereby said code pins may be disposed in a predetermined relation to each other, a switch means at said switch junction comprising a movable switch frog and sensing elements having support means whereby said elements may be disposed to be engaged by respective code pins; connecting cable means whereby engagement of said sensing elements by said code pins effects operation of said switch frog to divert said cart at said switch junction, said cable means comprising a cable having ends attached to respective sensing elements, and said cable extending around a pulley connected to said switch frog and disposed so that bodily movement of said pulley effects movement of said switch frog, wherein movement of both of said sensing elements effects said bodily movement of said pulley to move said switch frog and wherein movement of but one of said sensing elements effects rotation of said pulley without bodily movement thereof to prevent movement of said switch frog.

13. In a system as set forth in claim 12, said pulley being carried by an arm and said arm being secured to said switch frog for movement thereof, and detent means to hold said arm in an initial position or a position to which it has been moved.

14. A towline cart switching system having a switch junction and a cart provided with a plurality of code pins and support means therefor whereby said code pins may be disposed in a predetermined relation to each other, a switch means at said switch junction having sensing elements and support means for said elements whereby said elements may be disposed in relation to each other so as to be engaged by respective code pins and having control means whereby actuation of said sensing elements effects operation of said switch means to divert said cart at said switch junction, said control means comprising a respective electrical switch for each of said sensing elements, said electrical switches being connected in series, said switch means comprising a movable switch frog and latch means for latching said frog in a predetermined position, means for biasing said frog to move to another position upon release of said latch means, and electromagnetic means controlled by said electrical switches for motivating said latch means to effect said release responsive to movement of said sensing elements and operation of respective electrical switches thereby.

15. A towline cart switching system having a switch junction and a cart provided with a plurality of code pins and support means therefor whereby said code pins may be disposed in a predetermined relation to each other, a switch means at said switch junction having sensing elements and support means for said elements whereby said elements may be disposed in relation to each other so as to be engaged by respective code pins and having actuating means whereby actuation of said sensing elements effects operation of said switch means to divert said cart at said switch junction, said support means comprising a depressible structure for carrying said sensing elements adjacent the surface of a floor on which said cart moves and having at least one member normally extending above floor level and engageable by said cart to depress said structure, and stop means for limiting the extent of depression so that said member is effectively leveled with said floor to provide support for said cart in moving therepast.

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