United States Patent [19]

Watts

[11] **3,897,735**

[45] **Aug. 5, 1975**

[54] **MEANS FOR STOPPING CARS IN A RAILROAD TRANSPORTATION SYSTEM EMPLOYING A ROTATING DRIVE SHAFT**

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[73] Assignee: **Aid Corporation,** Clayton, Ga.

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[21] Appl. No.: **454,447**

[52] **U.S. Cl.** **104/166;** 198/19

[51] **Int. Cl.** **B61b 13/12**

[58] **Field of Search** ..... 104/166, 165, 249, 252; 198/19, 127 R; 74/25, 190

[56] **References Cited**

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3,118,393	1/1964	Ohlin	104/166
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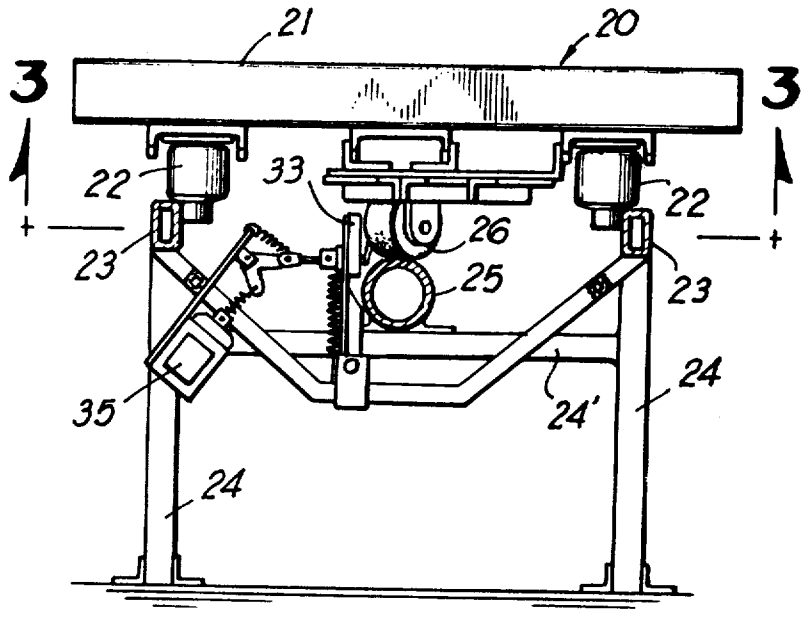
Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Randolph A. Reese
Attorney, Agent, or Firm—Newton, Hopkins & Ormsby

[57] **ABSTRACT**

A transportation system is disclosed comprising a railroad track, a rotatable drive shaft extending along the railroad track, and means for rotating the drive shaft. A car is movably supported upon the track. A drive wheel is rotatably mounted beneath the car for rotation about an axis oriented obliquely with respect to that portion of the track and drive shaft upon which the car is disposed. A brake wheel is also rotatably mounted beneath the car for rotation about an axis oriented generally along that portion of the track and drive shaft disposed beneath the car. Lever means are provided for alternately placing one of the wheels in engagement with the drive shaft. The system further includes lever actuation means mounted adjacent the track at a car stopping station.

A method is also disclosed for controlling the velocity of a car being driven upon tracks by frictional engagement of a car drive wheel rotating in oblique frictional engagement with a rotating drive shaft extending along the tracks. The method comprises the steps of disengaging the drive wheel from the rotating drive shaft and engaging a brake wheel rotatably mounted beneath the car for rotation about an axis oriented in general alignment with the rotating drive shaft whereby the car is braked. By reversing these steps the car may be accelerated.

21 Claims, 8 Drawing Figures



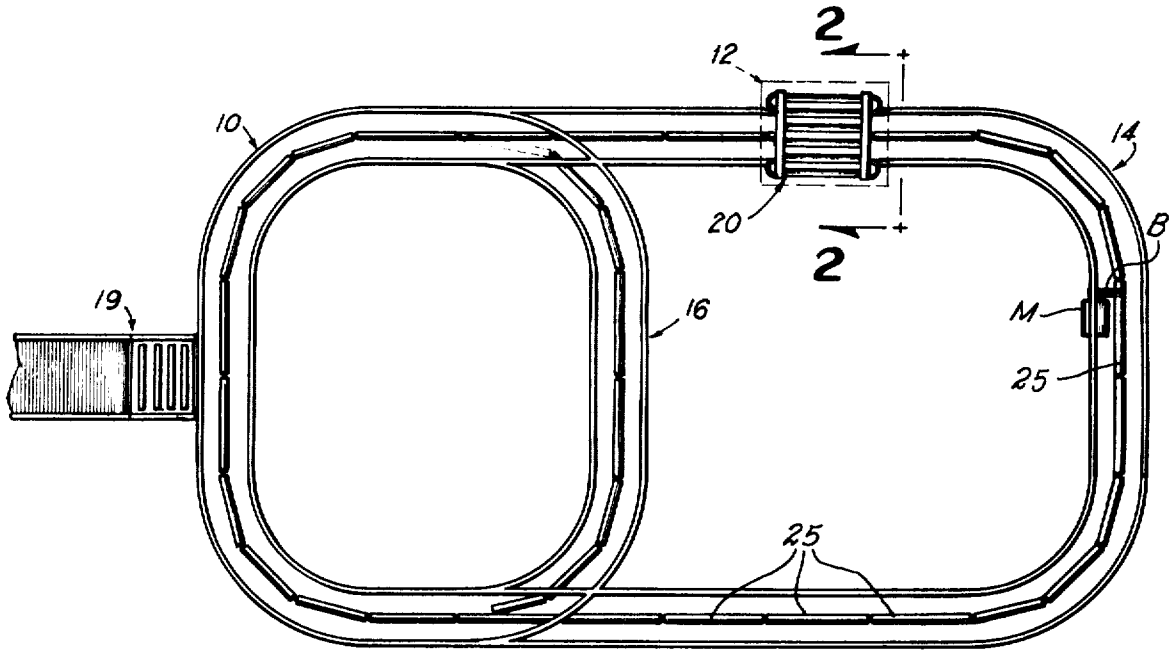


FIG 1

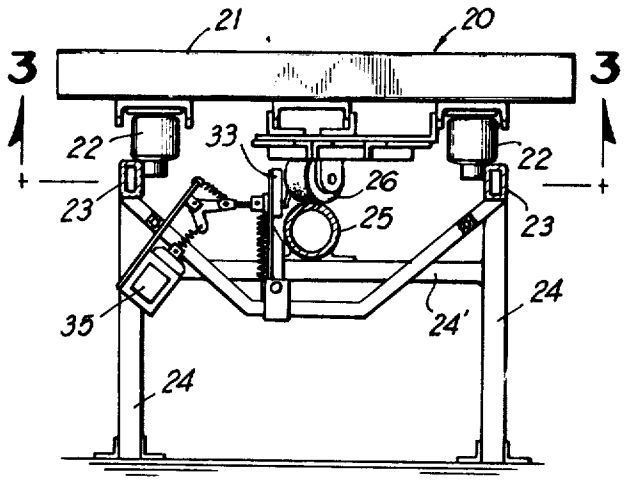


FIG 2

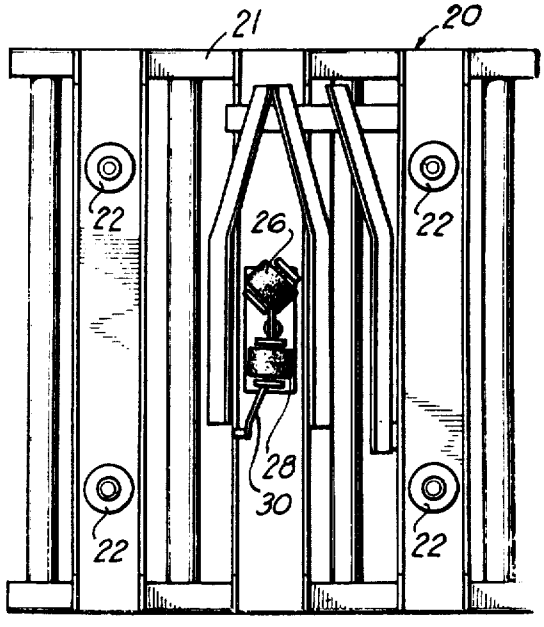


FIG 3

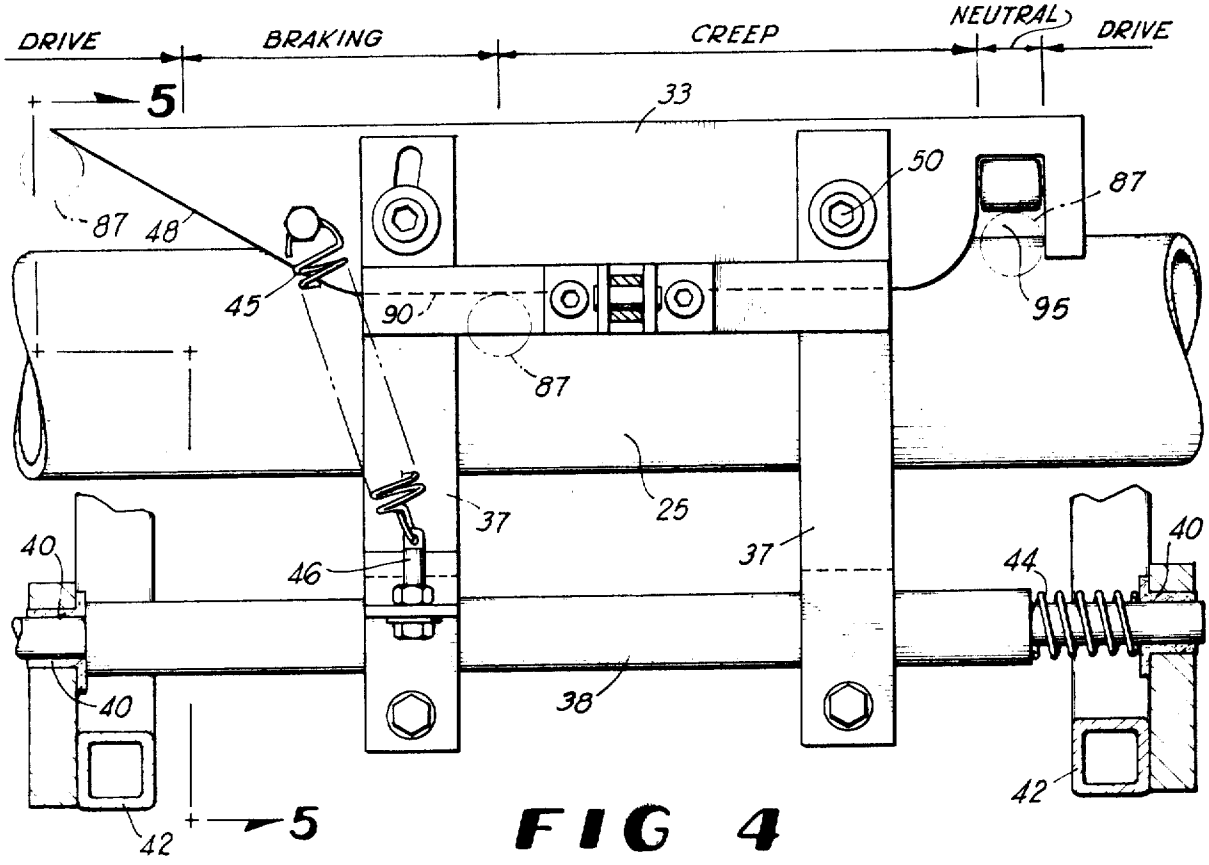

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FIG 4

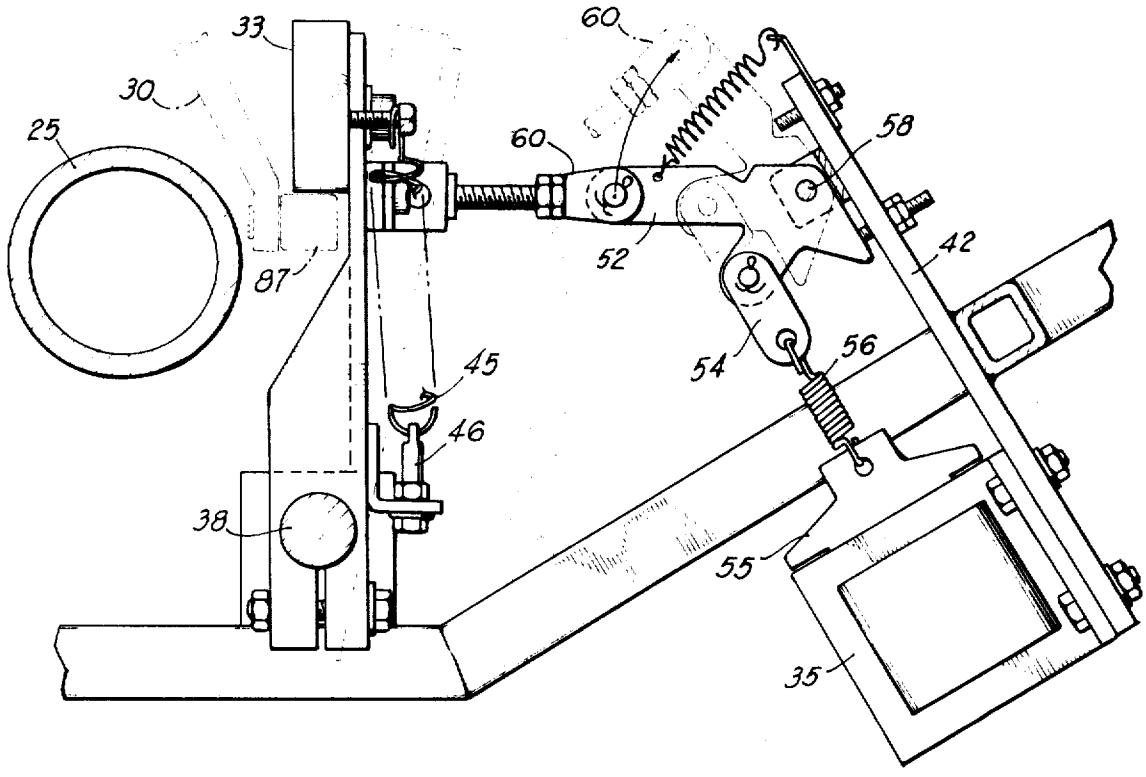

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FIG 5

FIG 6

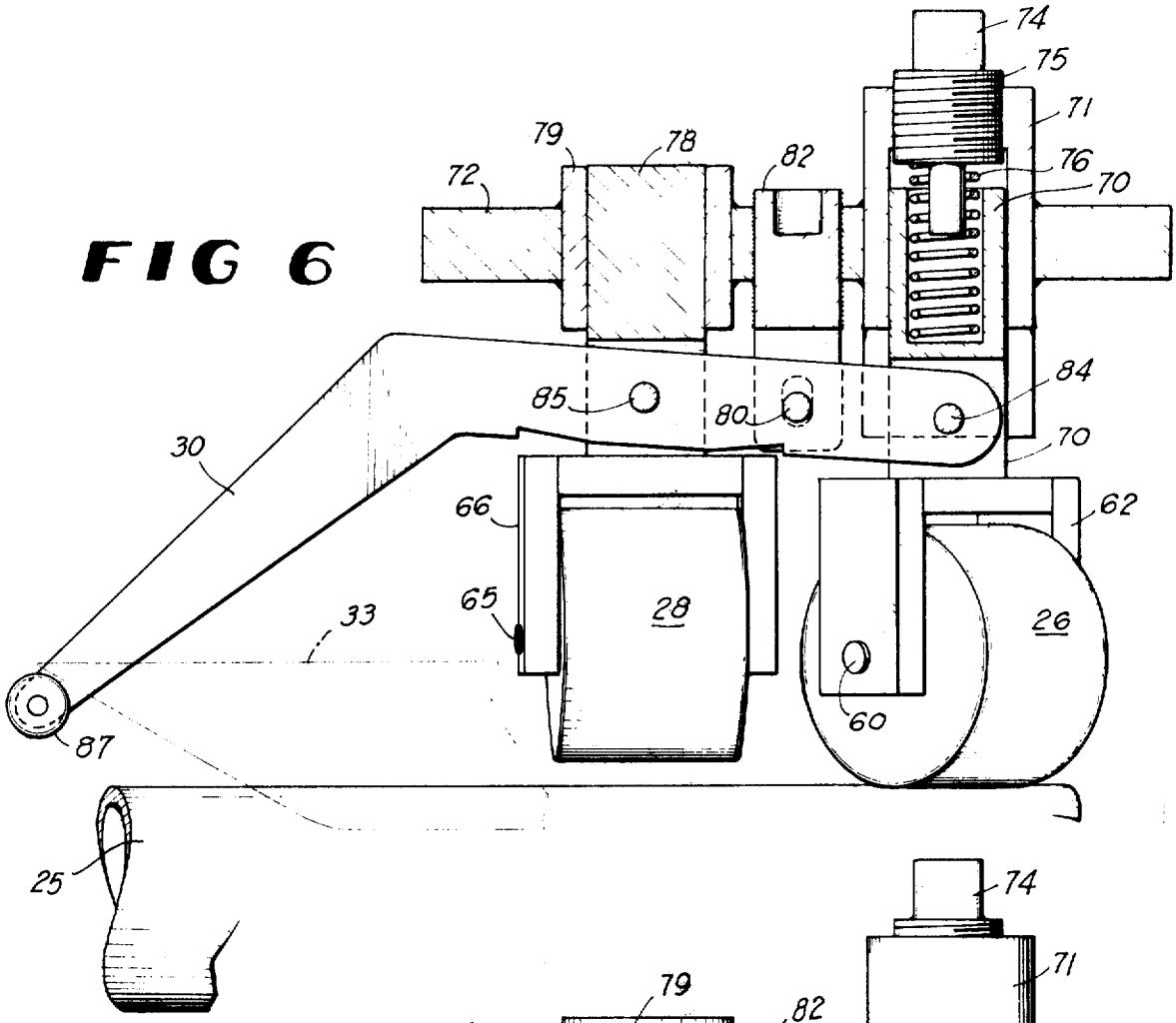
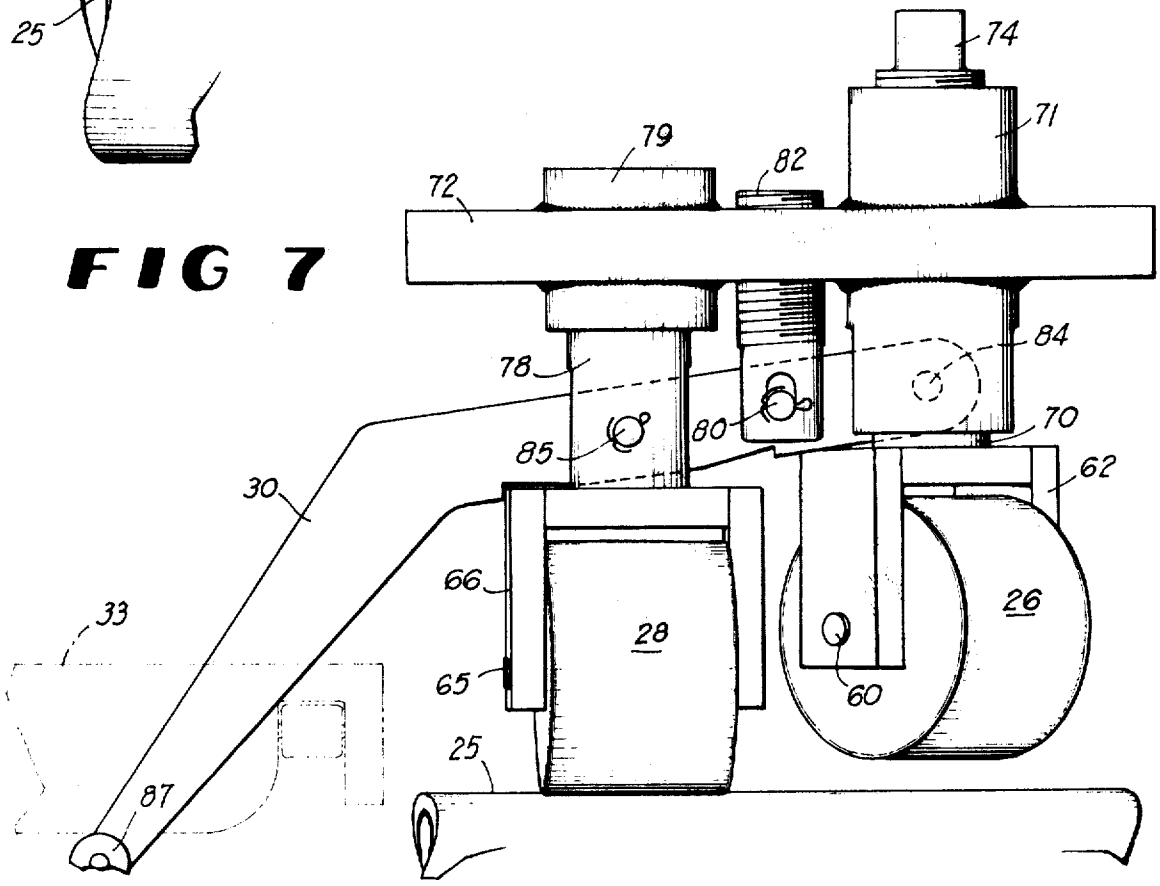

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FIG 7


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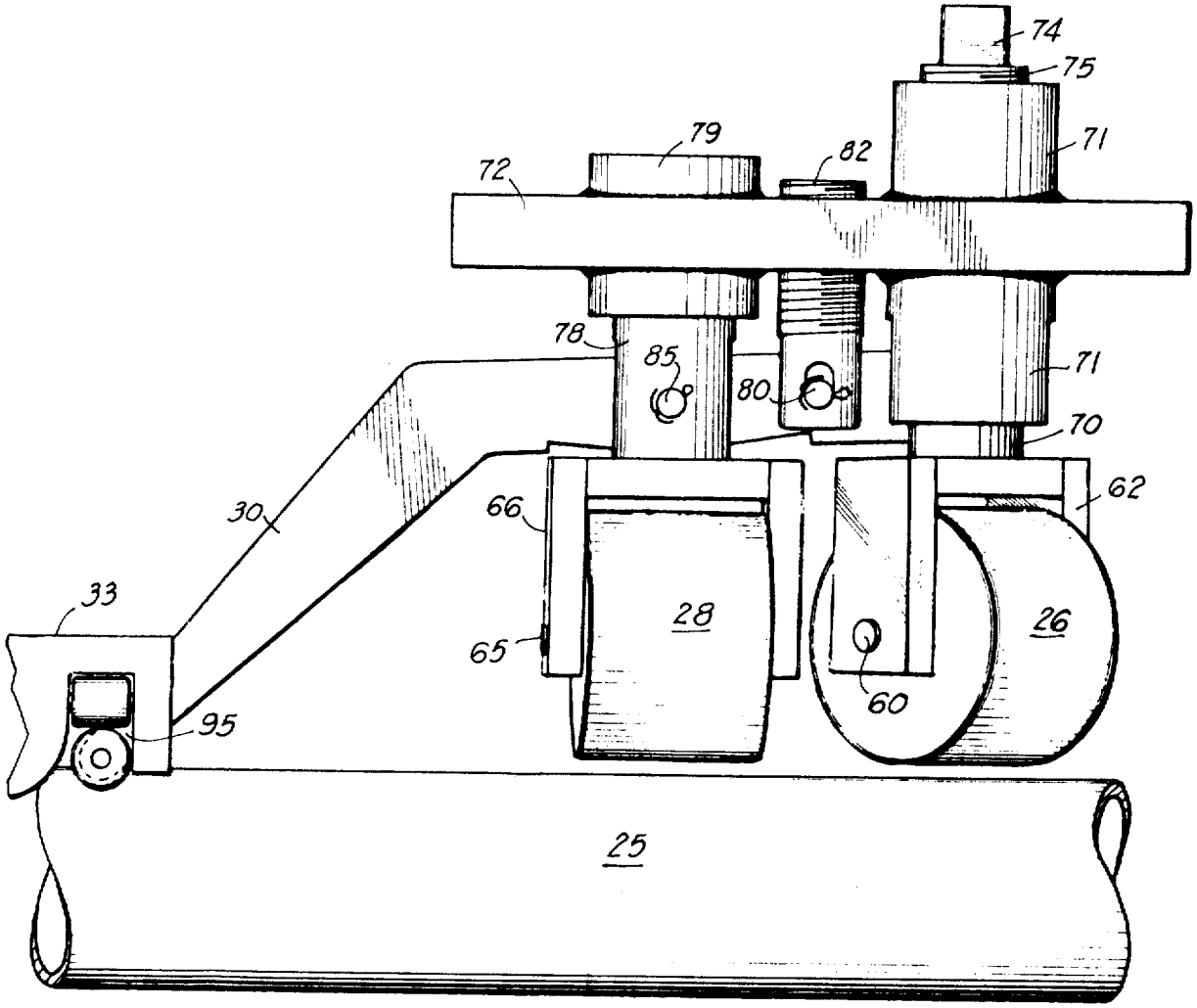


FIG 8

MEANS FOR STOPPING CARS IN A RAILROAD TRANSPORTATION SYSTEM EMPLOYING A ROTATING DRIVE SHAFT

BACKGROUND OF THE INVENTION

This invention relates generally to railroad transportation systems of a type which employ a rotating drive shaft, and particularly to means for controlling the velocity of cars in such systems by braking and stopping the cars at predesignated stopping stations.

Recently, railroad transportation systems have been devised for transporting small cars or dollies in freight-handling and distribution areas such as, for example, between loading docks and conveyor lines in manufacturing and processing plants. These systems employ elongated circuitous rotatable drive shafts or tubes disposed between parallel rails as a means for propelling cars thereover. One such system is disclosed in U.S. Pat. No. 3,118,393. Here, a freely rotatable drive wheel is supported beneath a vehicle in resilient frictional contact with the rotatable drive shaft. The drive wheel is oriented at an oblique angle with respect to the rotating drive shaft or tube whereby the drive shaft produces a pushing force on the drive wheel which force has a component in the direction of the driving shaft and thus provides a driving force for the car. Means are provided for pivoting the drive wheel and axis from rotation relative to the direction of car travel along the rotating shaft. In this manner the drive wheel may be moved from a driving position with its axis of rotation extending obliquely with respect to the rotating drive shaft to a direction of traverse over the rotating drive shaft in which position the axis of rotation co-extends along that of the rotating drive shaft. When the drive wheel is so moved to a position traverse the rotating drive shaft the drive wheel is caused to slide along the driving shaft thereby effecting a braking action upon the car. Once the speed of the car relative to the shaft is arrested the wheel may then freely rotate upon the drive shaft with the car maintaining a relatively stationary position with respect thereto.

The just-described system which employs a swivable drive wheel may successfully be used in transmitting a driving force to a car being propelled by a rotating drive shaft. This propulsion may be arrested by swiveling of the drive wheel to an orientation at right angles to the drive shaft. The direction of propulsion may also be reversed by the swiveling action. Notwithstanding these capabilities, these systems have not been without attendant problems. For example, in order to alter the transmission of driving force, and thus the velocity of the car, a signal must be transmitted to the car in order to effect swiveling action of the drive wheel. In addition, the system must include swivel implementation means for effecting the swiveling action against the resisting force of the drive shaft while the drive wheel is maintained in frictional engagement with the shaft. Furthermore, to consistently bring cars employing such systems to a halt at a precisely predesignated stopping station without some degree of car underrun or overrun has proven difficult to achieve with practicality and economy.

Accordingly, it is a general object of the present invention to provide improved apparatus and methods for controlling the velocity of cars adapted to be driven over rails by a rotatable drive shaft extending along the rails.

More specifically, it is an object of the invention to provide means for arresting the movement of cars driven over rails by means of drive wheels rotatably mounted to the cars at an oblique angle with respect to a rotating drive shaft extending along the rails, and which apparatus does not necessarily require a swiveling motion of the drive wheel.

Another object of the invention is to provide apparatus for controlling the velocity of cars adapted to be driven over rails by a rotatable drive shaft extending along the rails which apparatus may bring the cars to a halt at a predesignated stopping station with a high degree of positional accuracy.

Yet another object of the invention is to provide apparatus for controlling the velocity of cars adapted to be driven over rails by a drive shaft rotatably mounted along the rails which apparatus is of relatively simple and inexpensive construction and which does not require use of motive means mounted upon the car itself nor the use of a transmitting system in communication with such motive means.

SUMMARY OF THE INVENTION

In one form of the invention apparatus is provided for controlling the velocity of a car adapted to be moved in a predetermined direction of car travel over rails by a drive shaft rotatably mounted adjacent the rails. The apparatus comprises a drive wheel and means for mounting the drive wheel to the car for rotation about an axis oriented obliquely with respect to the predetermined direction. The apparatus further comprises a brake wheel and means for mounting the brake wheel to the car for rotation about an axis oriented in general alignment with the predetermined direction. Means are also provided for moving the drive and brake wheels relative to the car whereby the drive and brake wheels may be alternatively moved into and out of frictional engagement with the drive shaft to alternatively drive and brake the car.

In another form of the invention apparatus is provided for controlling the velocity of a car adapted to be driven in a predetermined direction of car travel over rails by engagement of a drive wheel with a rotatable drive shaft extending along rails, and with the drive wheel being coupled with an actuator and mounted to the car for rotation about an axis oriented obliquely with respect to the predetermined direction. The apparatus comprises, in combination, a camming block having an actuator camming surface communicating with an actuator stop surface, means for mounting the camming block adjacent the rotatable drive shaft with the camming block actuator camming surface extending generally parallel with the rotatable drive shaft, and means for moving the camming block between positions into and out of interception with the actuator mounted to the car.

In yet another form of the invention a method is provided for controlling a car being driven over tracks by frictional engagement of a car drive wheel rotating in oblique frictional engagement with a rotating drive shaft extending along the tracks. The method comprises the steps of disengaging the drive wheel from the rotating drive shaft and engaging a brake wheel rotatably mounted beneath the car for rotation about an axis oriented in general alignment with the rotating drive shaft.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view of a railroad transportation system employing a rotating drive shaft with which system means and methods embodying principles of the present invention may be used.

FIG. 2 is a front view in elevation of a car or dolly shown being driven over tracks of the transportation system shown in FIG. 1.

FIG. 3 is a bottom view of a car shown in FIG. 2.

FIG. 4 is a side view in elevation of a camming block shown mounted adjacent a rotatable drive shaft which block may be used in stopping cars in accordance with principles of the invention.

FIG. 5 is a front end-on view of the block shown in FIG. 4 together with block actuating means.

FIG. 6 is a side view, partially in cross section and partially in elevation, of a drive and brake wheel assembly embodying principles of the invention and which assembly is shown positioned in a drive mode upon a rotatable drive shaft.

FIG. 7 is a side view in elevation of the apparatus shown in FIG. 6 positioned in a braking or stop mode.

FIG. 8 is another side view in elevation of the apparatus shown in FIGS. 6 and 7 positioned in a neutral mode of operation.

DETAILED DESCRIPTION OF THE DRAWING

Referring in more detail to the drawing, there is shown in FIG. 1 a railroad transportation system comprising tracks 10 which bifurcate into branch tracks 14 and 16. A loading station 19 is shown disposed adjacent tracks 10 while a dolly or car 20 is shown positioned upon branch tracks 14 at a stopping station 12.

In FIGS. 2 and 3 car 20 is shown in greater detail as comprising a horizontal platform 21 beneath which are mounted four support wheels 22 for rotation about axes extending normally to the plane of the tracks defined by parallel rails 23. The rails are mounted atop track supports 24 which include a horizontal support member 24' upon which a drive shaft or tube 25 is rotatably mounted. As will be seen from FIG. 1, the drive shaft for the main section comprises a plurality of the shafts 25 which are aligned end-to-end and flexibly, drivably connected to form an endless chain. A suitable driving means such the motor M driving the belt B which is trained over one of the drive shafts is employed to rotate the drive shafts. A similar arrangement may be used to drive the separate length of drive shafts 25 in the branch section 16. A drive wheel 26 is rotatably mounted beneath platform 21 at an oblique angle, preferably 45°, with respect to drive shaft 25. A brake wheel 28 is also mounted beneath the platform for rotation about an axis at a slight inclination such as 3° with respect to the axis of drive shaft 25. A lever 30 is coupled with the drive and brake wheels which lever may be actuated by a camming block 33 mounted at car stopping station 12. The camming block may be repositioned by means of a solenoid 35 into and out of positions of interception with lever 30 mounted upon the dolly.

In FIGS. 4 and 5 block 33 is shown in detail as being mounted by means of vertical support plates 37 to a pivot rod 38 journalled within sleeve bearings 40 mounted to frame 42. Pivot rod 38 is biased by means of compression spring 44 forward or to the left as viewed in FIG. 4. A tension spring 45 is coupled between stud 46 mounted to the side of forward post 37 and the forward portion of block 33 adjacent camming surface 48. Tension spring 45 thus biases the forward portion of block 33 downwardly while permitting the forward portion of the block to be forcibly pivoted upwardly about pivot pin 50 mounted to the rear post 37.

To effect a stopping operation block 33 is positioned as shown with solid lines in FIG. 5 with a vertical orientation. This is accomplished by means of a solenoid 35 which is coupled with a bell crank 52 by means of a pivotal link 54 coupled with solenoid plunger 55 by means of spring 56. The bell crank is mounted by pivot pin 58 to frame 42. A turn buckle yoke 60 pivoted on bell crank 52 is secured to block 33. It thus is seen that upon actuation of the solenoid block 33 can be moved between the position shown in solid lines to effect a braking action upon a car or dolly to that position shown in dashed lines in FIG. 5 in which it is not operable upon the car. The relative position of the bell crank and turn buckle yoke for the inoperative position is also depicted in dashed lines.

Referring next to FIG. 6 the mounting means for drive wheel 26 and brake wheel 28 is shown in more detail. Drive wheel 26 is mounted by means of axle 60 within a fork 62 at an angle of 45° with respect to drive shaft 25 and the direction of car travel provided by means of support wheels 22. Brake wheel 28 is also mounted for rotation on an axle 65 within a fork 66 for rotation about an axis oriented at approximately 3° with respect to the axis of the drive shaft. Fork 62 is mounted to a cylinder 70 which is telescoped within an encompassing cylinder 71 rigidly mounted to undercarriage plate 72. A head grip 74 and threaded pressure adjust cylinder 75 assembly provides a stop for a compression spring 76 housed within the telescoped cylinders. This assembly provides a downward spring bias force upon fork 62 and drive wheel 26 thereby urging the drive wheel into frictional engagement with drive shaft 25. Fork 66 is also mounted to a cylinder 78 which is telescoped within an encompassing cylinder 79 rigidly mounted to plate 72.

Lever 30 is mounted to a fulcrum pin 80 which is secured to the mounting plate by means of a threaded cylinder 82. Drive wheel 26 is coupled to lever 30 by means of pivot pin 84 whereas brake wheel 28 is coupled to the lever by means of pivot pin 85. At the leading edge of lever 30 is rotatably mounted a cam following roller 87. It thus is seen that pivotal movement of lever 30 about pivot pin 80 alternately brings the drive wheel or brake wheel 28 into frictional engagement with drive shaft 25.

To effect a braking operation, solenoid 35 is actuated to position camming block 33 vertically as shown in FIG. 5. As the car to which the just-described drive and brake wheel assembly is secured is moved over the railroad tracks towards stopping station 12, the cam following roller 87 is brought into engagement with camming surface 48 as shown in FIGS. 4 and 6 with drive wheel 26 disposed in frictional engagement with drive shaft 25. Shock created by the abrupt engagement of roller 87 with surface 48 is absorbed by springs 44 and 45. As the car is advanced by the rotating drive shaft, the cam following roller 87 is forced downwardly along camming surface 48. This action causes lever 30 to pivot about pivot pin 80 thereby raising drive wheel 26 out of frictional engagement with drive shaft 25. Once the drive wheel is disengaged a neutral position is mo-

mentarily achieved as depicted in FIG. 8. Continuing advancement of the car due to its momentum causes cam following roller 87 to continue downwardly along the lower leading portion of camming surface 48 thereby bringing brake wheel 28 into frictional engagement with the rotating drive shaft 25.

When drive shaft engagement is established by the brake wheel, it is caused to slide along the surface thereof insomuchas its axis of rotation is in general alignment with that of the drive shaft. This sliding action effects a strong braking force upon car 20. As shown in the labels atop FIG. 4, the braking action continues while the cam following roller 87 continues along the bottom from the leading inclined camming surface 48 onto the bottom surface 90 of block 33. While continuing along the bottom surface of the camming block the car is brought almost, but not completely, to a halt relative to both the rails upon which it travels and drive shaft 25. Once this sliding motion of brake wheel 28 has terminated the car rolls freely in unison with the drive shaft with drive wheel 26 completely disengaged from the drive shaft as shown in FIG. 7.

Insomuchas there is a slight inclination of the axis about which the brake wheel rotates with respect to the drive shaft axis, car 20 is made to creep very slowly along the drive shaft and therefore cam following roller 87 to also move slowly along the bottom rear surface of block 33. This movement continues until roller 87 enters a detent or indentation 95 within the bottom surface 90 of block 33. This detent provides a stop which brings a car to a complete halt at the stopping station. The car will remain in this position until solenoid 35 is reactivated pulling camming block 33 laterally aside of the drive shaft to the position shown in dashed lines in FIG. 5. This action disengages the camming block from the roller enabling lever 30 to pivot under the force provided by spring 76 thereby re-engaging drive wheel 26 with drive shaft 25 and disengaging brake wheel 28 therefrom. The car will once again be propelled forward out of the stopping station.

It should, of course, be understood that the just-described embodiments merely illustrates principles of the invention in preferred forms. Many modifications may be made, of course, to the specifically described apparatus and method without departure from the spirit and scope of the invention as set forth in the following claims.

What is claimed is:

1. Apparatus for controlling the velocity of a car adapted to be driven in a predetermined direction of car travel over rails by a drive shaft rotatably mounted along the rails, said apparatus comprising a drive wheel; means for mounting said drive wheel to said car for rotation about an axis oriented obliquely with respect to said predetermined direction; a brake wheel; means for mounting said brake wheel to said car for rotation about an axis oriented in general alignment with said predetermined direction; and means for moving said drive and brake wheels relative to said car whereby said drive and brake wheels may be alternately moved into and out of frictional engagement with said drive shaft to alternatively drive and brake the car.

2. The apparatus of claim 1 wherein said moving means comprises a lever pivotally mountable to said car at a pivot point with said drive and brake wheels rotatably mounted to said lever about opposite sides of said pivot point.

3. The apparatus of claim 2 comprising lever actuating means mounted adjacent said rails at a car stop station for movement to and from a position to intercept and engage said lever as said car approaches said car stop station.

4. The apparatus of claim 3 wherein said lever actuating means comprising a camming block and means for moving said camming block laterally with respect to said rails at said car stop station.

5. The apparatus of claim 1 comprising spring means biasing said drive wheel towards said drive shaft.

6. Apparatus for controlling the velocity of a car adopted to be driven in a predetermined direction of car travel over rails by engagement of a drive wheel with a rotatable drive shaft extending along the rails, said drive wheel being coupled with an actuator and mounted to the car for rotation about an axis oriented obliquely with respect to said predetermined direction, said apparatus comprising, in combination, a camming block having an actuator camming surface communicating with an actuator stop surface; means for mounting said camming block adjacent said drive shaft with said camming block actuator camming surface extending along said drive shaft; and means for moving said camming block between positions into and out of interception with said actuator.

7. The apparatus of claim 6 wherein said camming block has an indentation forming said actuator stop surface.

8. The apparatus of claim 6 wherein said mounting means includes means for pivoting said camming block about an axis extending generally parallel to said rotatable drive shaft and rails.

9. The apparatus of claim 6 wherein said mounting means includes shock absorbent means permitting limited movement of said camming block against spring biasing means longitudinally along said drive shaft and rails.

10. The apparatus of claim 6 wherein said mounting means includes shock absorbent means permitting limited rotational movement of said camming block against spring biasing means about an axis extending transversely to said drive shaft and rails.

11. Apparatus for stopping a car in a railroad transportation system employing a rotatable drive shaft extending along car supporting rails, said apparatus comprising a drive wheel mounted beneath a car for rotation about an axis oriented obliquely with respect to car travel over said drive shaft and rails; a brake wheel mounted beneath said car for rotation about an axis oriented obliquely with respect to said car travel and with respect to said drive wheel axis; and means for relocating said drive wheel and brake wheel axes relative to said car without swiveling of said axes.

12. The apparatus of claim 11 comprising a lever pivotally mounted beneath said car to which said drive wheel and brake wheel are rotatably mounted.

13. The apparatus of claim 12 comprising a camming block mounted adjacent said drive shaft and rails at a car stopping station for movement between positions into and out of interception with said lever.

14. A transportation system comprising a railroad track; a rotatable drive shaft extending along said railroad track; means for rotating said drive shaft; a car movably supported upon said track; a drive wheel ro-

tatably mounted beneath said car for rotation about an axis oriented obliquely with respect to that portion of the track and drive shaft disposed beneath said car; a brake wheel rotatably mounted beneath said car for rotation about an axis oriented generally along that portion of the track and drive shaft disposed beneath said car; and means for alternately placing one of said wheels in engagement with that portion of said drive shaft disposed beneath said car.

15. The system of claim **14** wherein said wheels are rotatably mounted to a lever pivotally mounted beneath said car.

16. The system of claim **15** wherein said drive wheel is spring biased towards said drive shaft.

17. The system of claim **14** comprising lever actuation means movably mounted adjacent said track at a car stopping station.

18. The system of claim **17** wherein said lever actuation means comprises a lever camming block pivotally mounted adjacent said track.

19. A method of controlling the velocity of a car being driven over tracks by frictional engagement of a car drive wheel rotating in oblique frictional engagement with a rotating drive shaft extending along the tracks, said method comprising the steps of:

a. disengaging the drive wheel from the rotating drive shaft; and

b. engaging a brake wheel rotatably mounted beneath the car for rotation about an axis oriented in general alignment with the rotating drive shaft.

20. The method of claim **19** wherein upon initial engagement of the brake wheel with the rotating drive shaft the brake wheel is slid upon the drive shaft, and subsequently the brake wheel is rolled upon the drive shaft without appreciable sliding.

21. The method of claim **20** wherein the brake wheel is rolled upon the rotating drive shaft at a slight angle of brake wheel rotation with respect to drive shaft rotation whereby the car is made to creep along the tracks.

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