United States Patent [19]

Jones

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[54] **VEHICLE CONTROL DEVICE**

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[73] Assignee: **SI Handling Systems, Inc.**, Easton, Pa.

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[52] **U.S. Cl.** ..... **104/166**; 104/147 R; 104/252; 198/19

[51] **Int. Cl.**[2] **B61B 13/12**

[58] **Field of Search** ..... 104/147 R, 165, 166, 167, 104/168, 249, 252; 105/26 D; 74/194, 25, 190, 567, 569; 246/182 R, 206; 198/19

[56] **References Cited**

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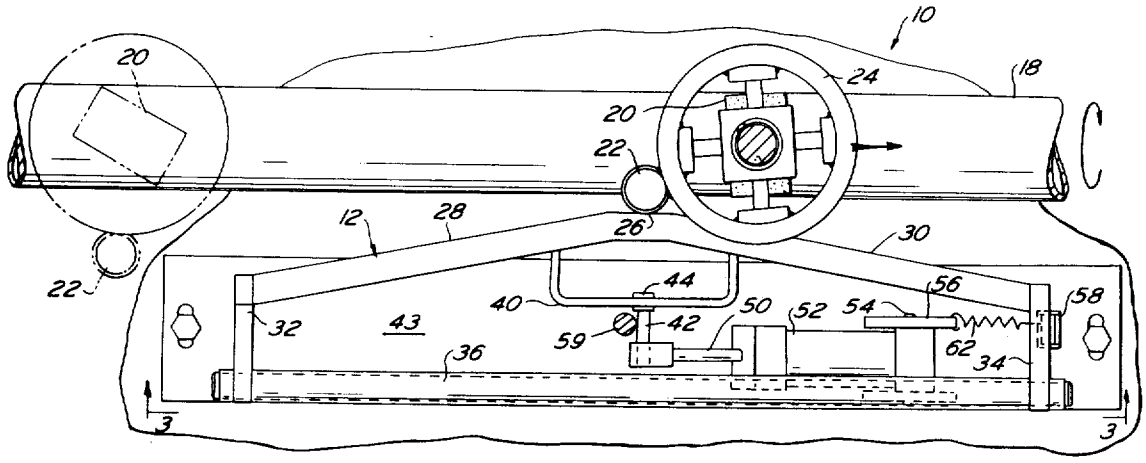
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Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Randolph A. Reese
Attorney, Agent, or Firm—Seidel, Gonda & Goldhammer

[57] **ABSTRACT**

A control device is provided for controlling the speed of a vehicle used in a conveyor system wherein the vehicle moves along the track. The control device has a generally straight section between a first angled section having a cam surface for deceleration and a second angled section having a cam surface for controlling acceleration. The control member is supported for movement between operative and inoperative positions and a motor is provided for moving the control member from an inoperative position to an operative position. The control member is held in an operative position by a movable latch.

13 Claims, 4 Drawing Figures



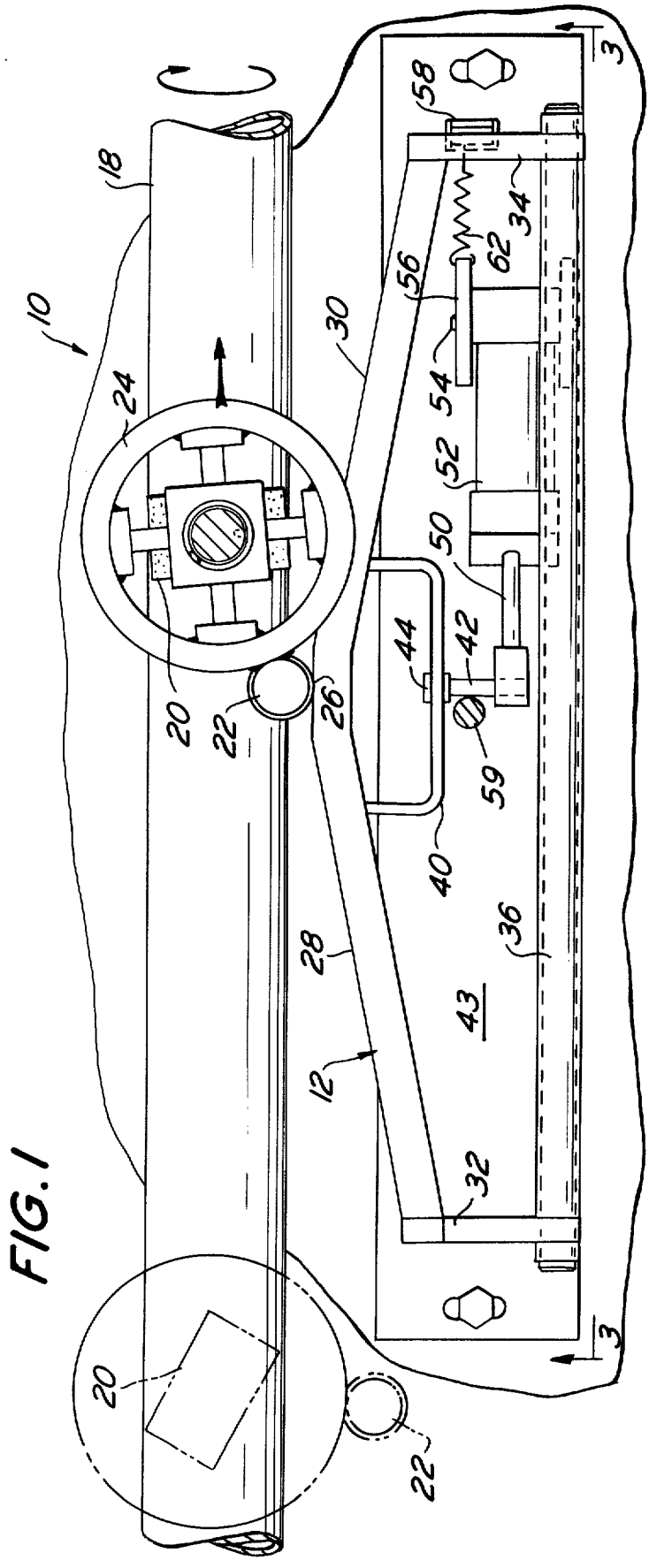

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FIG. 1

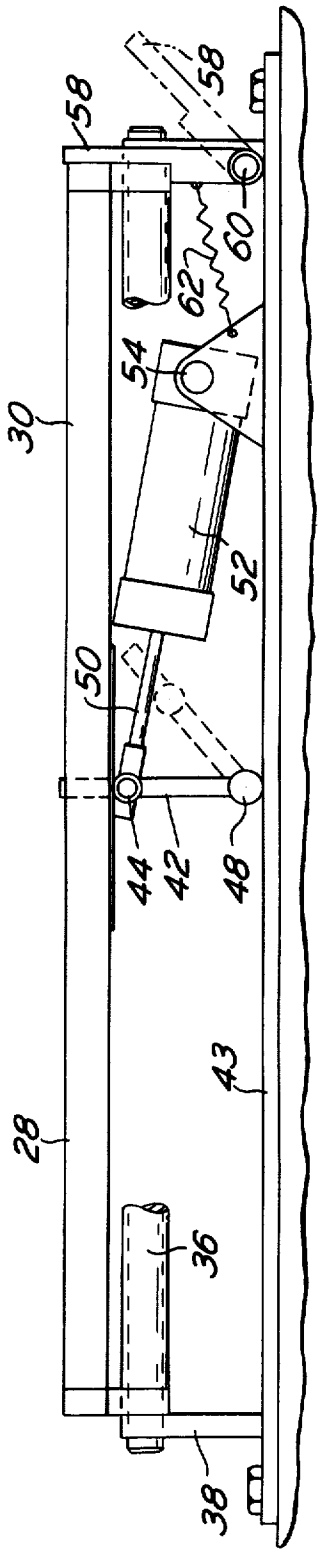
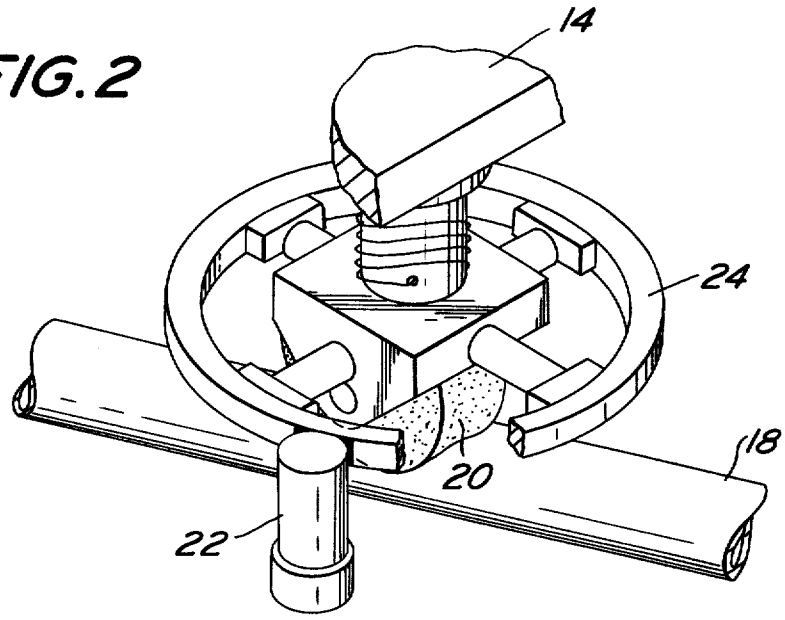

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FIG. 3

FIG. 2



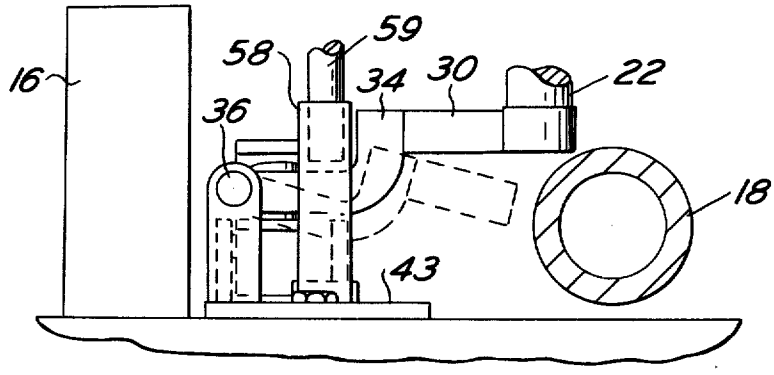


FIG. 4

VEHICLE CONTROL DEVICE

BACKGROUND OF INVENTION

Vehicles of the general type involved herein are known. For example, see U.S. Pat. No. 3,356,040. In that patent, a vehicle is guided for movement along the track and has a speed control wheel angularly adjustable with respect to a longitudinally extending drive shaft. The relative rotative position of said wheel with respect to said drive shaft controls the speed of movement of the vehicle along the tracks.

A control device for controlling acceleration and deceleration of vehicles of the general type disclosed in said patent are known. Such known devices include a cam surface which is angularly disposed with respect to the longitudinal axis of the drive shaft and another cam surface which is parallel to the drive shaft. The control device was supported by two or more vertically disposed arms forming a parallelogram in a manner whereby the device could be moved between operative and inoperative positions. A means was provided for moving the arms so that the section parallel to the drive shaft gradually pivots to form an angularly disposed cam surface in a progressive manner so as to control acceleration.

The prior art described above does a good job of stopping the vehicle in a predetermined manner. However, control of acceleration is difficult to adjust, subject to change, and almost impossible to control to the theoretical slope. The present invention seeks to overcome the difficulties described above.

DISCLOSURE OF THE INVENTION

The vehicle control device of the present invention includes a speed control member having a generally straight section between a first angled section having a cam surface for controlling deceleration and a second angled section having a cam surface for controlling acceleration. The straight section is adapted to maintain a cam follower in a position wherein the vehicle is stopped or permitted to move forward very slowly.

A means is provided for supporting the control member for movement between operative and inoperative positions. A motor means is provided for moving the control member from an inoperative position to an operative position. A movably mounted latch is provided for maintaining the control member in an inoperative position.

The vehicle control device of the present invention is adapted to be installed between one of the tracks which guide the vehicle and the main drive shaft. In a preferred embodiment of the invention, the latch is mounted in a position whereby it will be contacted by a fully accelerated vehicle and will move the latch to a position where it no longer maintains the control member in its operative position. As a result thereof, the control member moves to an inoperative position. All subsequent vehicles will not be stopped by the control device until the motor means is selectively operated to move the control member to its operative position. Thereafter, the next vehicle moving along the track will be decelerated and stopped.

It is an object of the present invention to provide a novel vehicle control device having converging cam surfaces for controlling deceleration and acceleration in a positive and uniform manner.

It is another object of the present invention to provide a vehicle control device which will selectively decelerate and accelerate vehicles moving along a track and adapted to cooperate with a cam follower on the vehicle.

It is another object of the present invention to provide a vehicle control device which is simple, easy to adjust, and reliable for controlling acceleration of a vehicle in accordance with a predetermined rate.

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. **1** is a partial plan view of a conveyor system incorporating the control device of the present invention.

FIG. **2** is a partial isometric view of a vehicle having a drive wheel and an associated cam follower for controlling the position of the wheel with respect to a drive shaft.

FIG. **3** is a side elevation view as seen along the line **3—3** of FIG. **1.**

FIG. **4** is an end view as seen from right to left in FIG. **1.**

Referring to the drawing in detail, wherein like numerals indicate like elements, there is shown a conveyor system designated generally as **10** and incorporating the vehicle control device designated generally as **12.**

A vehicle designated generally as **14** is provided with wheels in rolling contact with tracks **16.** A drive shaft **18** is provided between the tracks and parallel thereto. A drive wheel **20** is supported by the vehicle **14** and is in rolling contact with the drive shaft **18.** The velocity of the vehicle **14** depends upon the angular disposition of the drive wheel **20** with respect to the longitudinal axis of the drive shaft **18.** The drive shaft **18** rotates about its longitudinal axis and may be comprised of a plurality of axially interconnected sections.

An arm **24** is rotatably supported by vehicle **14** and is interconnected with the housing supporting the wheel **20.** The housing for wheel **20** and arm **24** are biased in any convenient manner such as by a torsion spring to a position wherein the drive wheel **20** rotates about an axis which is approximately 45° with respect to the longitudinal axis of drive shaft **18.** In this position, the vehicle **14** is moving at its maximum velocity. When the axis of rotation of the drive wheel **20** is parallel to the longitudinal axis of the drive shaft **18,** the velocity of the vehicle **14** is zero.

Arm **24** rotatably supports cam follower **22.** The normal position of follower **22,** when vehicle **14** is moving at uniform speed, is shown at the left hand end of FIG. **1.**

The control device **12** may be located in a variety of positions with respect to the tracks **16** and drive shaft **18.** In a preferred embodiment of the invention as shown, the control device **12** is between one of the tracks **16** and the drive shaft **18** at a location therealong where it is selectively desired to cause all or some of the vehicles **14** to stop. The purpose for stopping the vehicles **14** may include a variety of functions such as loading the vehicles, unloading the vehicles, performing a manipulative step with respect to materials or devices supported by the vehicles **14,** etc.

The control device **12** includes a rigid control member having a straight section **26** between a first angled

section 28 and a second angled section 30. The angled sections 28 and 30 are longer than the straight section 26 in the preferred embodiment and converge toward the straight section 26. The sections 26–30 lie in a generally horizontal plane. The surfaces of sections 26–30 juxtaposed to the drive shaft 18 are cam surfaces. Thus, the first angled section 28 has a cam surface for decelerating the vehicle 14 while the second angled section 30 has a cam surface for accelerating the vehicle 14.

The control member is connected to brackets 32 and 34 at its ends. The brackets 32 and 34 are pivotally supported by a pivot shaft 36 mounted on poles 38 supported by frame 43. The shaft 36 is below the plane containing sections 26–30. See FIG. 4. A U-shaped yoke 40 extends from the angled sections 28 and 30 toward the pivot shaft 36.

A stop bar 42 is provided on one side with a rotatable follower 44. The stop bar 42 is connected at its lower end for rotation about a horizontally disposed pin 48. The upper end of the stop bar 42 is pivotally connected to a clevis on one end of piston rod 50. The piston rod 50 is connected to a piston within the cylinder 52. Cylinder 52 is pivotally supported on a frame by brackets 56 for pivotal movement about the longitudinal axis of horizontally disposed pin 54. The cylinder 52 constitutes a motor means. Other equivalent devices which are selectively operable and can perform the function of a motor means may be utilized in place of the cylinder, such as a solenoid, electric motor, etc.

When the piston rod 50 is retracted, the bar 42 pivots to the phantom position shown in FIG. 3. The control member is preferably supported by a latch so that such pivotable movement of bar 42 has no effect on the control member remaining in its operative position as shown in solid lines in the drawing. The latch is preferably a pivotable latch 58 mounted for pivotable movement about pin 60 and aligned with stop bar 42. The longitudinal axis of pin 60 is horizontally disposed. The latch 58 has a shoulder which engages the bracket 34 and maintains the control member in its operative position. The latch 58 is biased to its supporting position by spring 62. The upper end of the latch 58 is in a position so that it will be contacted by a projection 59 on the vehicle 14. Contact between the vehicle projection 59 and latch 58 causes the latch 58 to be moved to the phantom position shown in FIG. 3 whereby the control member pivots downwardly to the phantom position shown in FIG. 4. The control member remains in the inoperative phantom position shown in FIG. 4 until the cylinder 52 is actuated.

Actuation of the cylinder 52 extends the piston rod 50. As the piston rod 50 extends, it pivots bar 42 from the phantom position shown in FIG. 3 to the solid line position shown in FIG. 3. Such pivotable movement of bar 42 causes the follower 44 to contact the yoke 40 and move the control member upwardly so that it pivots about the longitudinal axis of pivot shaft 36. Also stop bar 42 is moved to an operative position. Spring 62 will contract and pivot the latch 58 to a position wherein the shoulder on latch 58 again supports the bracket 34.

Contact between the follower 22 on the vehicle 14 with the first angled section 28 causes the vehicle 14 to decelerate. The vehicle 14 comes to a complete stop when the follower 22 is in the position juxtaposed to the straight section 26 as shown in FIG. 1 and projection 59 engages stop bar 42. As shown in FIG. 1, each of the angled sections 28 and 30 is at the same acute angle with respect to the longitudinal axis of the drive shaft 18. This is the preferred embodiment. If desired, the acute angle between the longitudinal axis of drive shaft 18 and the angled section 30 may be different from the corresponding angle between said drive shaft 18 and angle surface 28. If such angles are different, the rate of deceleration will be different from the rate of acceleration. Further, section 30 may be longer than section 28.

When it is desired to cause a stopped vehicle 14 to commence moving, piston rod 50 is retracted which in turn pivots stop bar 42 downwardly. Projection 59 is no longer restrained by stop bar 42. Straight section 26 had positioned follower 22 in a location so that the axis of wheel 20 was about 2° with respect to the axis of shaft 18. Hence, vehicle 14 moves forwardly very slowly along section 26. As follower 22 moves along angled section 30, vehicle 14 accelerates.

As the vehicle 14 accelerates to its maximum velocity, projection 59 moves the latch 58 to an inoperative position whereby the control member may fall due to gravity from its operative position to its inoperative position. The control member will remain in its inoperative position until the cylinder 52 is activated. Activation of cylinder 52 causes the control member to pivot to its operative position as described above. In this manner, it is possible to have certain ones of the vehicles 14 move past the station without being decelerated. Due to the fact that the acute angle between the longitudinal axis of drive shaft 18 and angled section 30 remains constant in all positions of the control member, acceleration is automatically controlled by the angle of the cam surface on section 30 with respect to drive shaft 18. Thus, each of the vehicles 14 will be accelerated in a uniform controlled manner.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

I claim:

1. A vehicle control device for use with vehicles adapted to move along a track comprising a speed control member having a generally straight section between a first angled section having a cam surface for controlling deceleration of a vehicle and a second angled surface having a cam surface for controlling the acceleration of a vehicle, each of said angled sections converging toward and terminating at said straight section, means supporting said control member for movement between operative and inoperative positions, motor means for selectively moving said control member from an inoperative position to an operative position, and a movable latch mounted to maintain the control member in its operative position, said latch being mounted for movement to an inoperative position wherein it no longer maintains the control member in an operative position.

2. A device in accordance with claim 1 including a yoke connected to said control member, said motor means being positioned to engage the yoke and move the control member from its inoperative position to its operative position.

3. A device in accordance with claim 1 including a stop member adapted to engage a vehicle when a cam

follower on the vehicle is in contact with said straight section, said stop member being mounted for movement between operative and inoperative positions, and said stop member being connected to said motor means whereby said motor means controls the position of said stop member.

4. A device in accordance with claim **3** wherein said stop member in its operative position has a portion which extends in a direction generally perpendicular to a vertical plane containing said straight surface.

5. A device in accordance with claim **1** wherein said latch is positioned adjacent the end of said second angled surface which is remote from said straight section, spring means biasing said latch to a position wherein it may maintain said control member in its operative position, said latch having a surface thereon adapted to be engaged by a vehicle which moves said latch to its inoperative position, and said control member being pivotable about an axis generally parallel to said straight section as said control member moves between its operative and inoperative positions.

6. A system comprising a vehicle, a track along which the vehicle is adapted to move, a drive shaft for causing the vehicle to move along said track, a control device disposed along said track for selectively controlling movement of vehicles as they move along said track, the improvement comprising said device being a speed control member having a first angled section having a cam surface for deceleration of a vehicle and a section angled surface having a cam surface for controlling acceleration of a vehicle, each of said angled sections converging toward said drive shaft, means supporting said control member for movement between operative and inoperative positions, motor means for selectively moving said control member from one of said positions to the other of said positions, a movable latch for maintaining the control member in its operative position, said latch being mounted for movement to an inoperative position where it no longer maintains the control member in its operative position, and said latch having a surface thereon adapted to be engaged by a vehicle to effect such movement of said latch.

7. A system in accordance with claim **6** wherein said latch is positioned adjacent the end of said second angled surface which is remote from said straight section.

8. A system in accordance with claim **6** wherein said motor means includes a cylinder mounted for pivotal movement about a first horizontal axis, said control member being pivotably supported by said supporting means for pivotable movement about a second horizontally disposed axis, said axes being mutually perpendicular.

9. A system in accordance with claim **6** wherein said control has a generally straight section generally parallel to said shaft and between said angled sections.

10. A system in accordance with claim **6** including a cam follower on said vehicle, said speed control member including a straight section between said first and second angled sections, a depending projection on said vehicle, said device including a stop member, said stop member being positioned for contact with said projection on said vehicle when said cam follower engages said straight section.

11. A system in accordance with claim **10** wherein said stop member is mounted for movement between operative and inoperative positions, said stop member having a portion extending toward said drive shaft when said stop member is in its operative position, said stop member being connected to said motor means whereby said motor means controls the position of said stop member.

12. A vehicle control device for use with vehicles adapted to move along the track comprising a speed control member between a drive shaft and a track, said speed control member having a cam surface for controlling acceleration of a vehicle, said cam surface extending at an angle away from said drive shaft toward said track, means supporting said control member for movement between an operative position and an inoperative position, a movable latch mounted adjacent one end of said cam surface for maintaining said control member in its operative position, means on said latch for contact with a vehicle after a vehicle has attained substantially maximum acceleration, said latch being movable by such contact to an inoperative position where it no longer maintains the control member in its operative position.

13. A vehicle control device in accordance with claim **12** including means biasing said latch to its operative position, and said control member being mounted for pivotable movement about an axis generally parallel to said drive shaft.

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