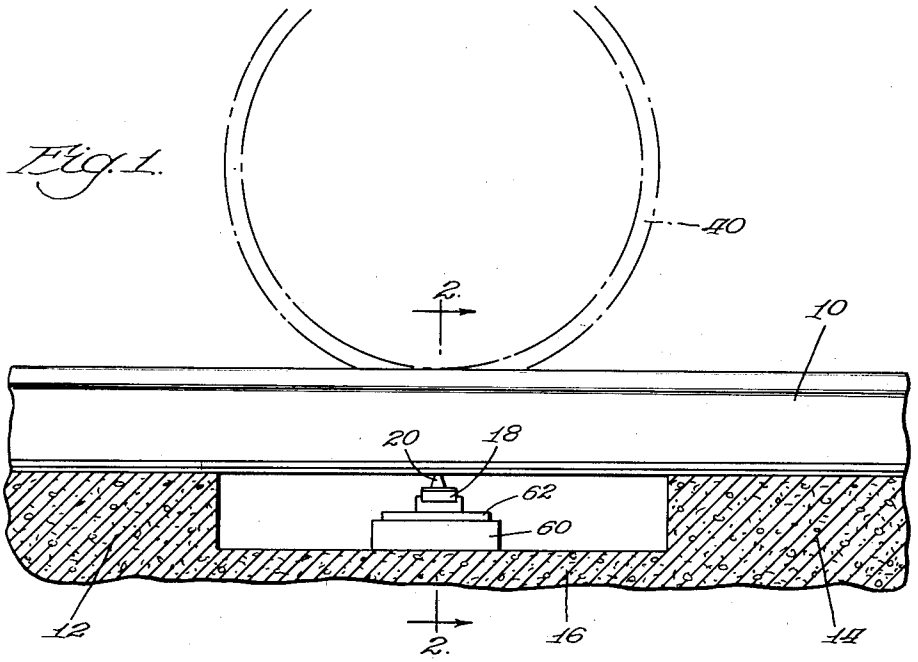
May 8, 1951 S. A. MEREDITH 2,551,754

AUTOMATIC RETARDER CONTROL

Filed Feb. 27, 1948

Fig. 1.



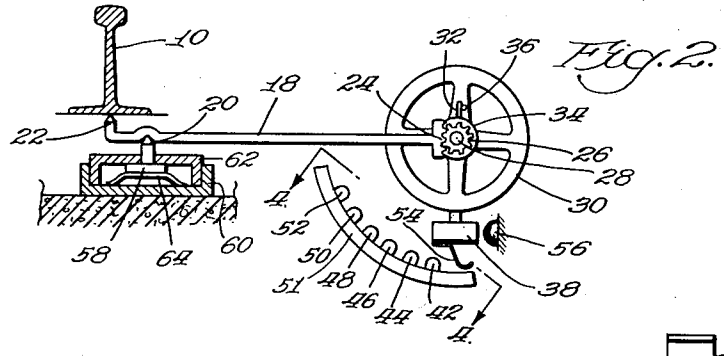


Fig. 2.

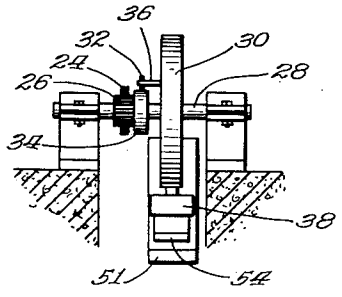


Fig. 3.

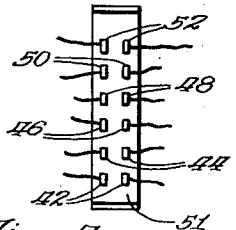


Fig. 4.

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AUTOMATIC RETARDER CONTROL

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Application February 27, 1948, Serial No. 11,481

5 Claims. (Cl. 200—85)

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My invention relates to the control of the speed of wheeled vehicles, and is particularly useful in connection with the automatic control of the speed of freight cars in a marshalling yard. It includes among its objects and advantages detector means for automatically controlling the operation of car retarding devices as an effectively accurate function of the kinetic energy of a car.

In the accompanying drawings:

Figure 1 is a side view partially in section, of a detector according to the invention;

Figure 2 is a view as in section on line 2—2 of Figure 1;

Figure 3 is an elevation of the parts shown in Figure 2, looked at from the right; and

Figure 4 is a detailed view of the series of detector contacts.

In the embodiment of the invention selected for illustration, the conventional rail 10 is supported by spaced rigid supports 12 and 14 which engage the rail throughout a length sufficient so that flexure of the unsupported rail portion between the supports 12 and 14 is substantially unaffected by loads carried by the rail at points beyond the supports 12 and 14. Between the supports I position deflection-responsive means which may advantageously be supported on a rigid base 16 integral with the supports 12 and 14. The deflection-responsive means illustrated includes displacement multiplying means and an inertia element arranged to move against increasing resistance, and a one-way connection to the inertia element so that the inertia element may coast further after the displacement initially actuating it has ceased. The multiplying lever 18 rests on a knife edge 20 and its short arm ends in an edge 22 bearing against the bottom of the rail 10. Its long arm terminates in a short gear sector 24 meshing with a small pinion 26 on the shaft 28. The inertia element 30 is freely rotatable on the shaft 28 and may be displaced from the position of Figures 2 and 3 by a pin 32 projecting radially from a collar 34, integral with the pinion 26, which pin bears against an axially projecting pin 36 projecting from the inertia wheel 30. The inertia wheel 30 is biased toward the position of Figures 2 and 3 by a weight 38.

It will be apparent that downward flexure of the rail 10 will move the knife edge downward and cause the pin 32 to press against the pin 36 and rotate the inertia wheel in a clockwise direction. The distance through which the pin 32 will positively push the pin 36 will be directly proportional to the downward movement of the knife

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edge 32, but the time during which such movement will occur will depend on the speed of the wheel 40, being completed in the time it takes the wheel to move to the middle of the unsupported rail 10. Thereafter the knife edge 22 will move up again to its original position between pin 36, and inertia wheel 30, in case the speed is sufficient, will continue to rotate for an additional increment of rotation which will be a function of the speed of the inertia element at the time the pin 32 stopped pushing.

Means are provided for the electrical detection of the extent of movement of the inertia element, which means may be connected to the conventional electric solenoids for conditioning a car retarder to slow down the car to a predetermined extent. I have illustrated six pairs of electrical contacts, 42, 44, 46, 48, 50 and 52, on a support 51. A light bridging contact 54 is mounted on the bottom of the weight 38. It will be apparent that actuation of the inertia element will swing the contact 54 up and that each successive contact will complete a corresponding circuit which may be employed in a conventional way to set a friction or other car retarder. As the automatic setting of such car retarders is conventional and well known in the art, this disclosure has not been encumbered with the details thereof.

I have indicated a rubber bumper 56 to cushion the counterclockwise return movement of the inertia element.

To prevent such a device from throwing its inertia element beyond its desired range of operation when a car of grossly excessive speed passes over the device, I provide relief means for the knife edge 20. The knife edge projects upwardly from a button 58 housed inside a sealed capsule comprising an upwardly facing cup 60 and a downwardly facing cup 62. A leaf spring 64 has its ends bearing on the bottom cup 60 and its middle portion pushing up on the button 58, with sufficient force to prevent any displacement of the knife edge 20 during passage of a car of sufficient weight and speed to throw the inertia element 30 to the limit of its desired movement. But operation at higher speeds, instead of imposing excessive forces on the pin 36, will momentarily depress the knife edge 20. Therefore, at speeds in excess of the maximum, the time during which the maximum permissible force is exerted on the pin 32 will decrease progressively with increased speeds. For instance, if the equipment is desired to handle cars moving at speeds up to some such speed as 12 miles per hour, a car going 20 miles per hour will depress the

knife edge 20 and not throw the inertia element as far as if it had a speed of only 12 miles an hour. And a car going 40 miles an hour will only throw the inertia element 30 about half as far as one going 20 miles an hour.

In ordinary operation, the parts are designed so that the heaviest car to be handled will not quite bring the contact 54 into operative engagement with the first contacts 42. Therefore, even if a maximum weight wheel 40 comes to rest in the position of Figure 1, the retarder will remain inactive. But at maximum speed, the same displacement may be completed in some such time interval as one-tenth of a second, and by the time the wheel 40 has gone on about five or six times the length of the unsupported span of rail 10, the inertia element will have coasted up to contacts 52 and the retarder will be set for maximum action when the wheel 40 arrives. A car weighing only half as much, and traveling at maximum speed, will complete its displacement in the same time interval as the heavy car, but the top speed of the inertia element will be only half as great and contacts 46 will be the highest contacts reached. The ratio between the rotary moment of inertia of the element 30, and that of the biasing weight 38 may be varied to secure any desired periodicity of swing.

Others may readily adapt the invention for use under various conditions of service by employing one or more of the novel features disclosed or equivalents thereof. With respect to the flexure of the beam 10, it will be apparent that a greater degree of uniformity of response as well as a greater degree of freedom in design with respect to the flexibility of the load-carrying span can be secured by inserting a short beam between two standard lengths of rail, which beam will preferably be a simple beam supported at its ends. With respect to the restoring force, it will be obvious that the restoring force of the weight 38 varies as the sine of the angular displacement from the vertical. It will be obvious that varying degrees of sensitivity throughout the operative range may be obtained by substituting a force directly proportional to the angular displacement, such as an ordinary spiral spring, or a constant force such as a flexible tension member encircling the wheel and lifting a constant weight. With respect to the response, the contacts illustrated provide for step by step action. Obviously various known Selsyn devices might be employed to secure greater refinement in this respect. For instance, a simple follow-up servomotor connection such that when the contact 54 first touches the contacts 42 the contacts 42 and the braking device are simultaneously moved so that the contacts 42 move up in front of the contact 54 to the limit of its motion, would eliminate any step by step irregularities in the setting of the braking instrumentality. Similarly, electronic means for detecting the extent of movement of the inertia member would eliminate even the slight friction of the contact 54, and render the functioning a little more precise.

As at present advised with respect to the apparent scope of my invention, I desire to claim the following subject matter:

1. In a device of the class described, in combination: yieldable weight-sensitive means in the nature of an unsupported rail section arranged to be displaced downwardly by flexure by the downward pressure of a wheel or the like rolling over the same; an inertia element biased toward a predetermined position with a force increasing as a non-linear function of displacement; a thrust connection operative in one sense only between said weight-sensitive means and said inertia element; said thrust connection including motion multiplying mechanism; and detector means in the nature of a series of electrical contacts for detecting the extent of movement of said inertia element; whereby conventional retarding means may be automatically controlled as a function of the energy of the load passing over; said thrust transmission including means adapted to yield at a predetermined maximum load without displacing said inertia element, to absorb displacements of excessive rapidity without imposing excessive load on said transmission, or excessive speed on said element.

2. In a device of the class described, in combination: yieldable weight-sensitive means in the nature of an unsupported rail section arranged to be displaced by the pressure of a wheel or the like rolling over the same; an inertia element biased toward a predetermined position with a force increasing as a function of displacement; a thrust connection operative in one sense only between said weight-sensitive means and said inertia element; said thrust connection including motion multiplying mechanism; and detector means in the nature of a series of electrical contacts for detecting the extent of movement of said inertia element; whereby conventional retarding means may be automatically controlled as a function of the energy of the load passing over; said thrust transmission including means adapted to yield at a predetermined load without displacing said inertia element, to absorb displacements of excessive rapidity without imposing excessive load on said transmission or excessive speed on said element.

3. In a device of the class described, in combination: yieldable weight-sensitive means in the nature of an unsupported rail section arranged to be displaced by the pressure of a wheel or the like rolling over the same; an inertia element biased toward a predetermined position with a force increasing as a function of displacement; a thrust connection operative in one direction only between said weight-sensitive means and said inertia element; and detector means in the nature of a series of electrical contacts for detecting the extent of movement of said inertia element; whereby conventional retarding means may be automatically controlled as a function of the energy of the load passing over; said thrust transmission including means for automatically limiting the maximum force applied to said inertia element, whereby displacement of said weight-sensitive means with excessive speed reduces the response of said inertia element.

4. Means for securing an integrated response depending on both the weight and velocity of a moving wheeled vehicle comprising, in combination: a weight-carrying member positioned to bear the weight of a wheel passing over it; a support for said member permitting deflection of said member proportional to the imposed weight; a response-indicating element; restoring means yieldingly urging said element toward a predetermined position; and a transmission from said member to said element; said transmission being operative in one direction only to displace said element positively away from said predetermined position, leaving said element free to coast beyond its positive displacement due to its own kinetic energy to the extent that its kinetic

energy at the end of positive displacement continues to overcome said restoring means.

5. Means for securing an integrated response depending on both the weight and velocity of a moving wheeled vehicle comprising, in combination: a weight-sensitive member arranged to be displaced to an extent dependent on the weight imposed on it; and speed-sensitive means connected to said weight-sensitive member for positive initial displacement thereby; said speed-sensitive means being left free to continue its displacement thereafter to an extent depending on the velocity of said positive initial displacement.

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