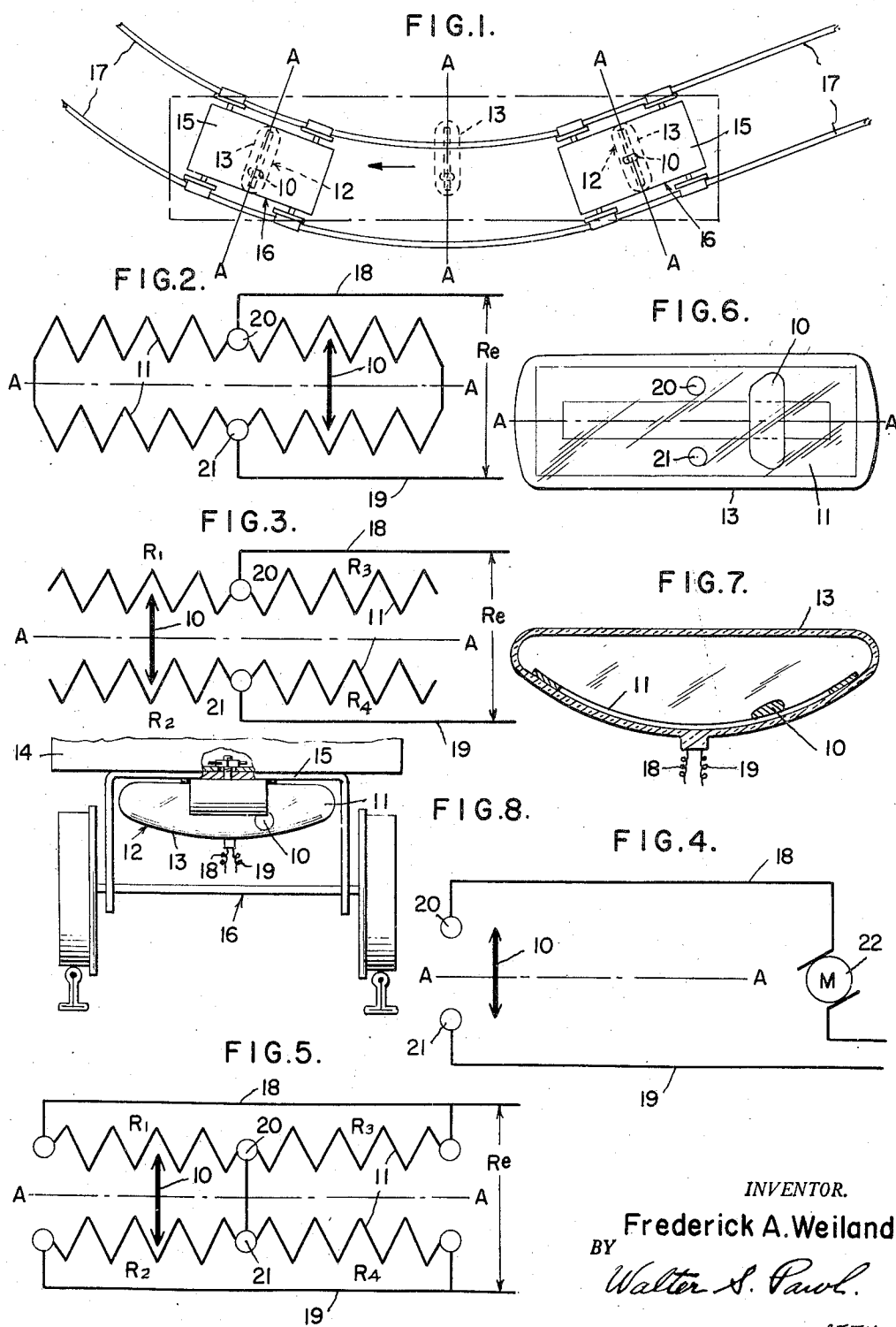


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F. A. WEILAND
ACCELERATION RESPONSIVE MOVABLE
CONTACT RESISTANCE CONTROL
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INVENTOR.

BY Frederick A. Weiland

Walter S. Paul.

ATTY.

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ACCELERATION RESPONSIVE MOVABLE CONTACT RESISTANCE CONTROL

Frederick A. Weiland, Silver Spring, Md.

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This invention relates generally to variable resistors responsive to accelerations in the direction of their axes. More specifically this invention is applied to the control of the motor speed of toy trains and the like so as to reduce it within a safe speed limit when going over dangerously curved sections of track.

The object of this invention is primarily to slow the speed of railroad vehicles upon entering a curve to within a safe limit.

Another object is to provide a novel automatic safety control for toy trains.

A further object generally is to make a simple variable resistance element responsive to its axial acceleration for mounting on moving objects and connected in suitable control circuits for automatic operation in accordance with such acceleration.

Other and more specific objects will become apparent in the following detailed description of some of the forms of the present invention, as illustrated in the accompanying drawing, wherein:

Fig. 1 illustrates one adaptation of a simple form of element applied to a toy train,

Fig. 2 is a schematic diagram one type of element having predetermined maximum resistance,

Fig. 3 is a similar diagram of another type of element having an infinite maximum resistance or a complete break for an acceleration beyond a predetermined limit,

Fig. 4 is a similar diagram of a simple make and break element normally closed or having substantially no resistance and being responsive to any small acceleration to break the connection completely or introduce an infinite resistance,

Fig. 5 is a similar diagram in which the resistance is reduced with an increase in acceleration,

Fig. 6 illustrates one form of construction in plan view of an element mounted in a transparent enclosure of insulated material,

Fig. 7 is a sectional view thereof, and

Fig. 8 is an end view of one of the trucks of the toy train shown in Fig. 1, showing a spring strap mounting for the resistance unit transversely under the truck platform.

As applied to toy trains, the novel unit 12 comprises a variable resistor arranged so that its effective electrical resistance is automatically varied by lateral displacement of a contactor 10 guided to move up a slightly upwardly curved resistance element 11 extending transversely of the truck platform. The resistance element may be mounted in the bottom of an enclosure 13 preferably made of transparent insulated material, such as glass, which enclosure may be suitably mounted in the toy car 14 transversely thereof at preferably its front end, as e. g. under the platform 15 of the front truck 16, so that its entry into a curved section of track 17 will cause the contactor 10 to increase the effective electrical resistance in the resistance unit 12. Pigtales 18 and 19 are passed through the bottom of enclosure and are fixed to the middle of the two sides of the resistor 11 as at 20 and 21

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respectively. The contactor may be a ball or roller of solid metal or a globule of mercury or other conductive liquid. If this unit is connected into the control circuit of the driving motor 22 for controlling its speed, an automatic speed control may be obtained for reducing the speed of the train when going around dangerously curved sections of track to prevent derailment. This not only introduces a new wrinkle in providing automatic speed controls for toy trains, but also provides an actual safety measure against accidental damage due to derailment of expensive toy cars such as locomotives, and possibly dropping them off on elevated rail platform to the floor, and breaking them up.

Another unit 12 may be similarly mounted at the other end of the toy car for similar control. Also every car in the train may be provided with such units connected in series or any other way to suitably reduce the speed in response to entry of any part of the train into a curved section of track.

As depicted schematically in Fig. 2, the unit consists of a resistor 11 comprising two fixed resistances connected in parallel between the two terminals 20 and 21, and an electrical contactor 10, arranged to shortcircuit both resistances in the absence of a displacing force. In response to such a force, the contactor 10 will shortcircuit a portion of the one or the other resistance, depending on the direction of the displacement from normal along the lateral axis A along which the contactor is guided to move. The greater the displacement of the contactor 10, the greater will be the effective resistance R_e between the terminals 20 and 21.

An alternative arrangement incorporating a circuit breaker is depicted schematically in Fig. 3. In this arrangement extreme displacement of the contactor 10 in either direction along A, beyond the free ends of the resistances R_1 and R_2 or R_3 and R_4 , will break the circuit between the terminals 20 and 21. Reduction in the magnitude of displacing force will permit the contactor 10 to close the circuit and the unit will otherwise function as described for the schematic depicted in Fig. 2.

A circuit-breaker without the variable resistor feature is depicted schematically in Fig. 4. In this arrangement any displacement of the contactor will break the circuit between the terminals 20 and 21. Removal of the displacing force will allow the contactor 10 to again connect the terminals 20 and 21, thus reclosing the circuit.

Another resistance arrangement is shown in Fig. 5. The resistances R_1 , R_2 , R_3 and R_4 are similarly extended from the terminals 20 and 21, but these terminals are connected together. The effective resistance R_e is taken off the outer ends of resistances R_1 and R_3 for one of the pigtales, and the outer ends of the resistances R_2 and R_4 for the other pigtail. In this unit the effective resistance is normally a predetermined maximum and is shorted out progressively upon displacement of the contactor 10 in either direction. This circuit may be connected in series with an electrically operated whistle on the train so as to cause the whistle to sound just as the locomotive entered a curve, if the unit is mounted transversely on the locomotive. If mounted axially thereon, it could be used to sound the whistle upon stopping or starting with suitable acceleration in either operation.

Many other uses will obviously suggest themselves to those skilled in the art, wherever it is desired to indicate or limit accelerations within safe limits or to operate warning signals in response to or upon reaching a predetermined acceleration, whether such acceleration be lateral, axial in the horizontal plane. The novel construction of a simple, sturdy automatically variable resistance unit in response to horizontal acceleration provides a very versatile and useful speed control and other safe acceleration limiting controls.

For example, it might be desirable to limit the deceleration of a passenger train when applying the brakes upon approaching a stop to prevent exceeding an amount that would cause extreme discomfort or be hazardous to the passengers. With the aid of units of the present type, control circuits could be designed in connection with the brake controls to provide smooth and safe decelerations, without disabling emergency stops requiring greater decelerations when necessary.

Besides control circuits, instruments for measuring accelerations could use these units to sense the amount of acceleration in any particular direction in the horizontal plane.

Many obvious modifications in the form and structure of the parts of this simple device may be made without departing from the spirit and scope of this invention, as defined in the appended claims.

What is claimed is:

1. The combination of a movable object having an electrical control circuit and one or more automatically variable resistors responsive to horizontal acceleration of said object, each of said resistors comprising a pair of parallel laterally spaced resistance elements in said circuit having their opposite ends curved upwardly, a pair of adjacent terminals extending downwardly therefrom, and an antifriction movable contactor normally resting over said terminals to form a bridge connection across said elements, said contactor being freely movable along said resistance elements to one side of said terminals in response to horizontal acceleration of said object in the opposite direction.

2. The combination as defined in claim 1, said resistance elements comprising a pair of strips of resistance material extending to each side of said terminals to form a slightly up-curved guideway for said contactor's movement to either side of said terminals so as to vary the resistance across said terminals in accordance with a variation in the horizontal acceleration of the resistor in the opposite direction in the vertical plane through its axis.

3. The combination as defined in claim 2, said strips being joined at their extremities to provide a maximum effective resistance across said terminals upon acceleration sufficient to move said contactor outwardly beyond said extremities.

4. The combination as defined in claim 2, said strips being joined together at their lowest point and the extremities of each of said strips at each end being connected to form the terminals of the effective resistance which is varied inversely as the said horizontal acceleration.

5. The combination as defined in claim 1, said control circuit being for reducing the speed of a toy train within a safe limit when rounding a dangerously curved section of track, including at least one of said automatically variable resistors mounted transversely on the forward end of said train.

6. The combination defined in claim 5, including a plurality of such resistors mounted transversely at suitable intervals on said train for connection in series in said control circuit to suitably reduce the speed in response to the increase of the effective resistance of any one or more of said resistors.

7. The combination defined in claim 4, wherein said control circuit controls a toy train whistle to operate the whistle when rounding a curve, and includes at least one resistor mounted transversely on said train.

8. The combination as defined in claim 1, a protective enclosure for each resistor, and mounting means therefor, said terminals having pigtails extending through said enclosure.

9. The combination as defined in claim 2, a protective enclosure for said resistance elements and contactor of each resistor, said terminals having pigtails extending outside of said corresponding enclosure for circuit connection.

10. The combination as defined in claim 2, said strips comprising coils of resistance wire.

11. The combination as defined in claim 9, said contactor being a metal ball.

12. The combination as defined in claim 9, said contactor being a metal roller.

13. The combination as defined in claim 9, said contactor being a globule of mercury.

14. The combination as defined in claim 8, said enclosure being a transparent envelope of insulated material, a spring strip clamp fitted to grip over the top of said unit and having a threaded stud on top for passing through a mounting surface and receiving a nut thereon.

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