Aug. 28, 1928.

1,682,052

A. RADCLIFFE

ESCALATOR

Filed Jan. 30, 1926

Fig. 1

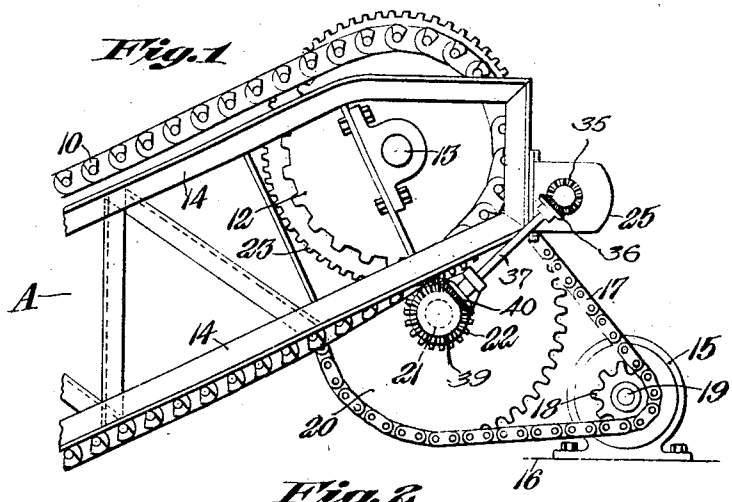


Fig. 2

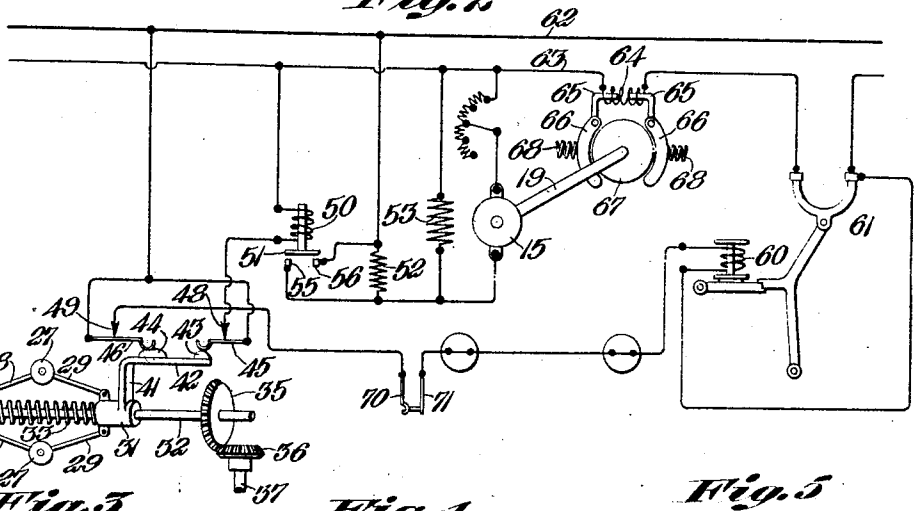


Fig. 3

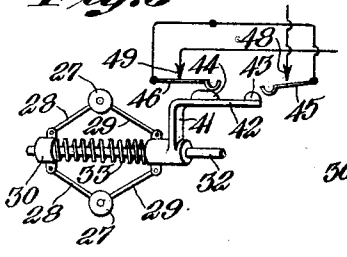


Fig. 4

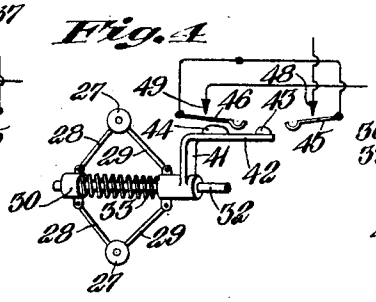
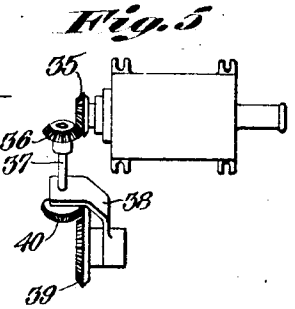


Fig. 5



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UNITED STATES PATENT OFFICE.

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ESCALATOR.

Application filed January 30, 1926. Serial No. 84,929.

This invention relates to escalators and particularly to those of the descending type, and has for its object to provide the same with mechanism for controlling the operation of the same and responsive to the speed of the escalator.

Provision is made for enabling the control mechanism to cause a slowing down of the escalator when the speed of the latter reaches a given or predetermined point, and to stop the escalator when the speed of the latter reaches a higher given or predetermined point.

The control mechanism may and preferably will be constructed and arranged to effect a slowing down of the speed, when the latter exceeds the normal speed at which it is desired the escalator should run by 20%, and to stop the escalator when the speed exceeds the normal by 40%, as, for instance, if the escalator should run away.

In the present instance, the invention is embodied in an escalator driven by an electric motor, and consists essentially of a governor responsive to the speed of the escalator and co-operating with a plurality of circuit controllers, one of which is operated by the governor to slow down the speed of the escalator when said speed exceeds the normal by 20%, and the other of which is operated by the governor to stop the escalator when the speed of the latter reaches the higher limit of 40% of the normal speed.

These and other features of this invention will be hereinafter described and pointed out in the claims at the end of this specification.

Fig. 1 represents a sufficient portion of a motor driven escalator embodying the invention to enable it to be understood;

Fig. 2, a diagrammatic view of the circuits provided with the governor-operated circuit controllers, showing the latter in the positions they occupy when the escalator is running at normal speed;

Fig. 3, a detail of the governor and the circuit controllers operated thereby, showing the relation of these parts when the speed reaches 20% increase;

Fig. 4, a view like Fig. 3, with the parts in the positions they occupy when the speed reaches the higher limit of 40%, and

Fig. 5, a detail of the housing for the governor and circuit controllers co-operating therewith and the gearing for driving the governor.

Referring to the drawing, A represents an escalator such as now in common use and only the upper portion of which is shown in Fig. 1. The escalator A is provided with an endless conveyer member, preferably a chain 10 passed about a sprocket wheel 12 on a shaft 13 supported by the framework 14, which shaft is driven by an electric motor 15 mounted upon a suitable support, represented by the line 16.

The electric motor 15 is operatively connected with the upper shaft 13 of the escalator as herein shown by a link chain 17 passed about a sprocket wheel 18 on the armature shaft 19 of the motor, and about a large sprocket wheel 20 on a countershaft 21, which is geared to a shaft 13 by a pinion 22 and gear 23.

The countershaft 21 is geared to a governor located in a box or housing 25 supported by the framework 14, and in the present instance one type of governor is shown in Fig. 2.

The governor may be of any suitable or known construction and is herein shown as provided with weights 27 connected by links 28, 29 to sleeves 30, 31, one of which as 30 is fixed and the other 31 is movable on a shaft 32 provided with a spring 33.

The governor shaft 32 outside the housing 25 is provided with a bevel gear 35 which meshes with a bevel gear 36 on a shaft 37 supported by a bracket 38 mounted on the countershaft 21, which is provided with a bevel gear 39 in mesh with a bevel gear 40 on the shaft 37.

In the present instance, the movable sleeve 31 of the governor is provided with an arm 41 having a portion or finger 42 substantially parallel to the shaft 32 and provided with two lugs or projections 43, 44, which are separated by a substantial space and one of which as 44 is materially longer than the other, for a purpose as will be described.

The lugs or projections 43, 44 co-operate with the movable members 45, 46 of two switches or circuit controllers, said members being represented in the diagrammatic figures as pivoted levers, which co-operate with the fixed members 48, 49 of the switches.

The lug 43 co-operates with the movable switch member 45 to close the circuit in which said switch is included so as to maintain it closed while the speed of travel of the conveyer member 10 is normal and also as long as it does not exceed the normal speed above

20%, whereupon it is moved by the governor in response to the increased speed, out of engagement with the movable member 45 and allows the latter to open the circuit in which it is included, as represented in Fig. 3.

When this occurs, the lug 44 is still in contact with the movable switch member 46 and maintains closed the circuit in which the member 46 is included, as represented in Fig. 3.

In the present instance, the switch 45, 48 is included in circuit with a solenoid 50 whose armature 51 constitutes the movable member of a switch, which controls a shunt circuit for a resistance 52, which is normally in series with the field 53 of the electric motor 15.

The shunt circuit includes fixed terminals 55, 56 with which the armature 51 co-operates, and when the escalator is running at normal speed and up to an increase of 20%, the solenoid 50 is energized and its armature 51 opens the shunt circuit for the resistance 52. When the speed of the escalator reaches the 20% increase, the governor permits the switch 45, 48 in the solenoid circuit to open, thereby de-energizing the solenoid 50, which allows the armature 51 to close the shunt circuit and cut out the resistance 52 from the field circuit of the motor, which increases the strength of the field and slows down the motor. As the motor slows down to normal speed, the governor operates in response thereto and moves the lug 43 from the position shown in Fig. 3 into that shown in Fig. 2.

If the speed of the escalator should increase to the limit of 40% above the normal, the governor moves the controlling member 41, 42 into the position shown in Fig. 4, with the lug 44 out of engagement with the switch arm 46, which latter opens the circuit in which it is included, which circuit as herein shown includes the holding coil 60 for the main circuit breaker or switch 61, which is included in circuit with the motor 15 and with the main lines 62, 63.

This circuit may be designated the motor circuit and includes a solenoid 64 whose cores 65 are connected with brake shoes 66 co-operating with a brake drum 67 on the armature shaft 19 of the motor.

The brake shoes 66 are disengaged from the drum 67 as long as the motor circuit is closed, but when opened, the brakes are applied to the drum by the springs 68.

It will be observed that the lug 44 on the controlling member 41, 42 is materially longer than the lug 43, so that when the lug 43 is disengaged from the switch member 45, the lug 44 will remain in engagement with the switch member 46 and the motor circuit will remain closed as long as the speed of the escalator is below the maximum limit set, which is herein specified as 40% increase above the normal.

It will further be observed that when the speed of the escalator reaches a point at which it would be dangerous, and particularly in the case of a descending escalator, which for any reason should run away, the motor circuit is opened and the brakes are applied to stop the escalator.

The motor circuit controlled by the governor-actuated controlling member may also include in it a circuit controller 70, 71 (see Fig. 2), which is capable of being opened by the escalator under an abnormal condition of use, as for instance in case the tension on the conveyer member or chain 10 should be reduced to a given point, either by the elongation or the rupture of the chain.

In the present instance, a single controlling member for the circuit controllers 45, 48, 46, 49 is shown, and while this construction may be preferred, it is not desired to limit the invention to the particular construction shown.

What I claim is:

1. An escalator having in combination an endless conveyer member, an electric motor for driving said conveyer member, a circuit for said motor, a governor operatively connected with said conveyer member and responsive to the speed thereof, a resistance normally in series with the field of said motor, electromagnetic means for shunting said resistance, a circuit independent of said motor circuit in which said electromagnetic means is located, a circuit controller for the circuit of said electromagnetic means, a second and independent circuit controller for the motor circuit, and a controlling member co-operating with said circuit controllers and operated by said governor to maintain both circuit controllers closed when the conveyer member is running at normal speed, to open the circuit controller for the electromagnetic means when the speed of the conveyer member exceeds the normal speed by a predetermined amount, to maintain the independent circuit controller for the motor circuit closed at the increased speed of the conveyer member, and to open the second independent circuit controller when the speed of the conveyer member is increased a further predetermined amount.

2. An escalator having in combination an endless conveyer member, an electric motor for driving said conveyer member, a circuit for said motor, a governor operatively connected with said conveyer member and responsive to the speed thereof, a plurality of independent circuits provided with circuit controllers, and a controlling member co-operating with said independent circuit controllers and operated by said governor to maintain both of said circuit controllers closed when the conveyer member is running at normal speed, to open the circuit governed by one of said circuit controllers when the speed of the conveyer member exceeds the normal speed a predetermined amount, to maintain

the circuit governed by the other circuit controller closed at said increased speed of the conveyer member, and to open the circuit of the second circuit controller when the speed of the conveyer member is increased a further predetermined amount.

3. An escalator having in combination an endless conveyer member, an electric motor for driving said conveyer member, a circuit for said motor, a governor operatively connected with said conveyer member and responsive to the speed thereof, a circuit controller governing the reduction in speed of the motor when the speed of the conveyer member exceeds the normal speed a predetermined amount, a second and independent circuit provided with a circuit controller for opening the motor circuit when the speed of the conveyer member exceeds the normal speed by a further predetermined amount, and means actuated by said governor for controlling the operations of said independent circuit controllers.

4. An escalator having in combination an endless conveyor member, an electric motor for driving said conveyer member, a circuit for said motor provided with a circuit controller, a circuit breaker governing said motor circuit, a holding coil for said circuit breaker, a circuit controller for said holding coil, an independent circuit provided with an electromagnet for operating the circuit controller in said motor circuit, a circuit controller in said independent circuit, a governor operatively connected with said conveyer member and responsive to the speed thereof, an arm movable by said governor and provided with lugs of unequal length co-operating with the circuit controllers in said independent circuit and in the circuit of said holding coil, the lug of greater length co-operating with the circuit controller for said holding coil.

In testimony whereof, I have signed my name to this specification.

ARTHUR RADCLIFFE.