Nov. 6, 1956 G. WALLMANNSBERGER 2,769,400

ELECTRICAL TRIP MEANS FOR STOPPING PASSENGER CABLE RAILWAYS

Original Filed Nov. 28, 1947 3 Sheets-Sheet 1

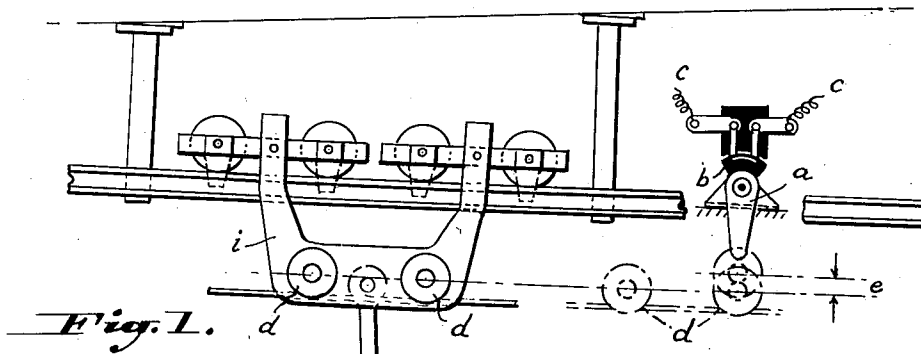


Fig. 1.

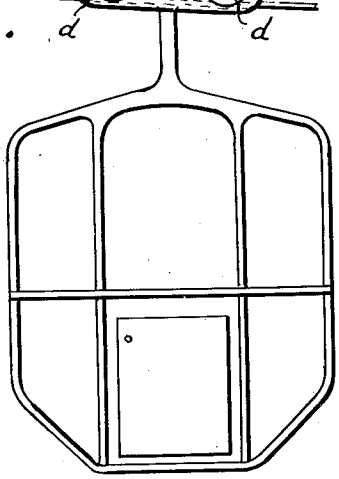
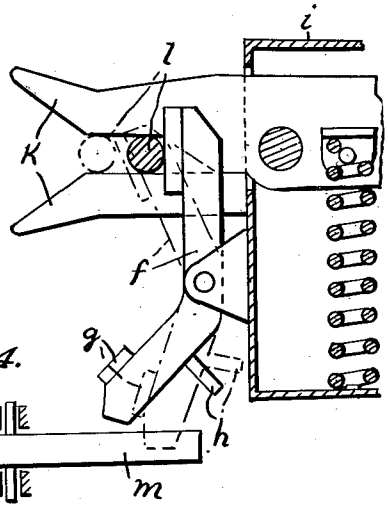


Fig. 3.



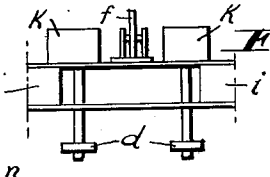
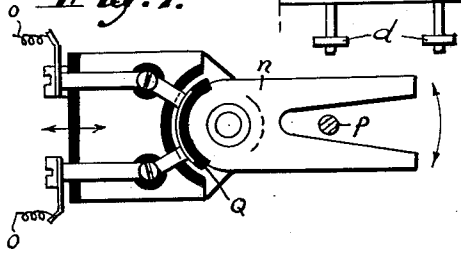


Fig. 4.

Fig. 7.



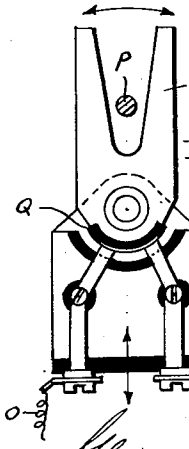
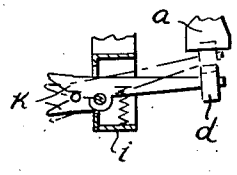


Fig. 8.

Fig. 2.



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Fig. 5.

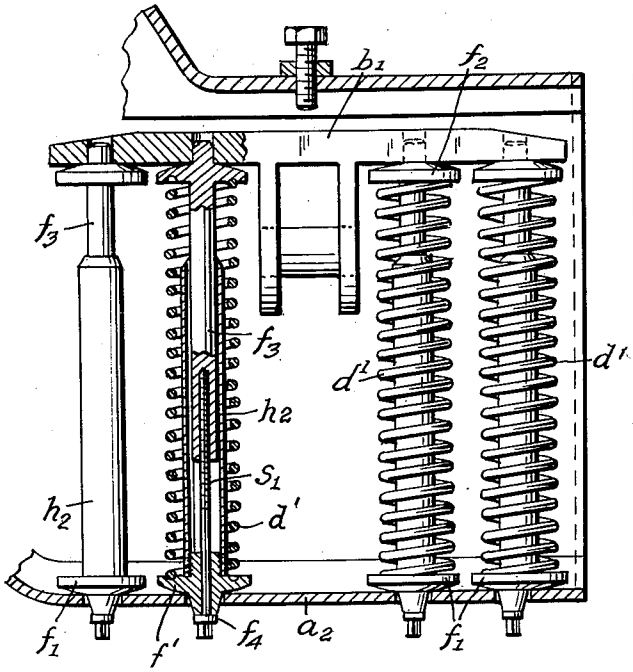
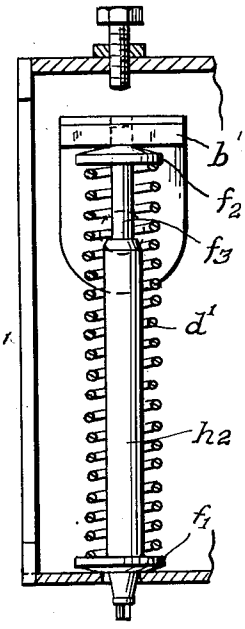


Fig. 6.



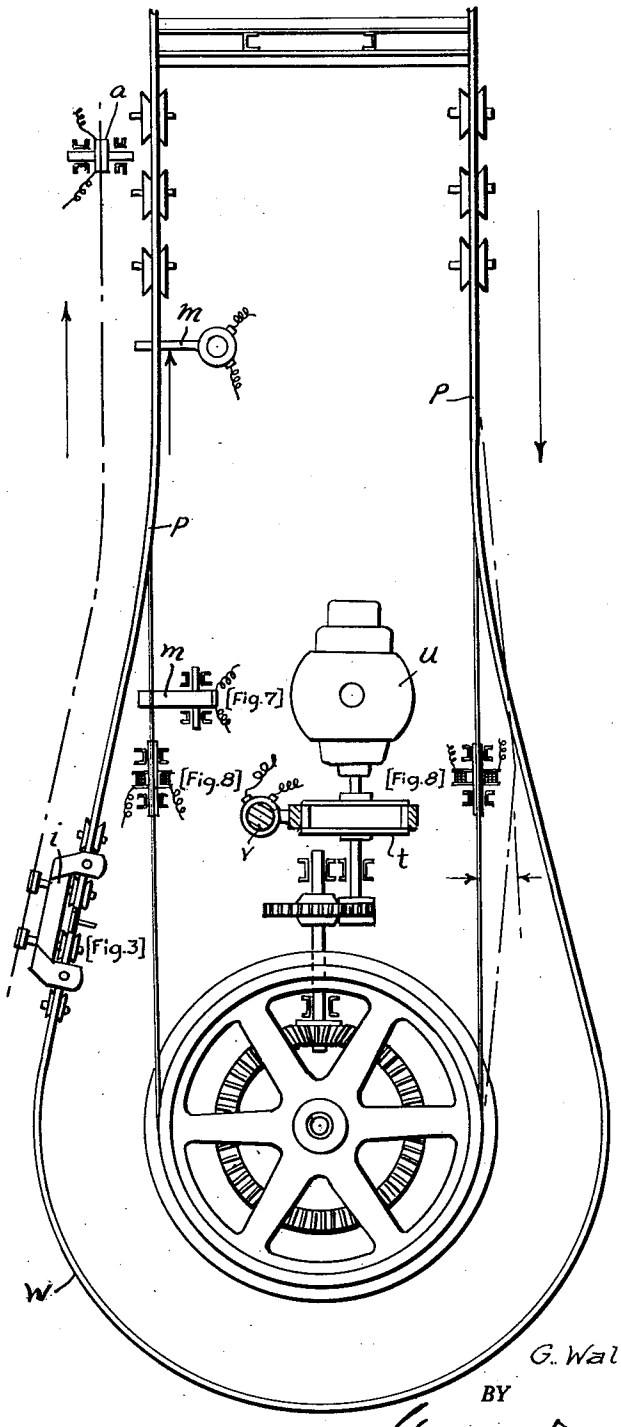
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Fig. 9.



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ELECTRICAL TRIP MEANS FOR STOPPING PASSENGER CABLE RAILWAYS

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Original application November 28, 1947, Serial No. 788,750, now Patent No. 2,608,161, dated August 26, 1952. Divided and this application August 25, 1952, Serial No. 306,267

6 Claims. (Cl. 104—202)

The present invention relates to a passenger cable railway system.

More particularly this invention relates to passenger cable railways of the type designed for endless rope operation.

Specifically this invention relates to improvements in electrical safety arrangements for such cable railway systems of the type embodying a towing cable and a towing cable gripping means on the cable car.

This application is a divisional of my prior filed U. S. patent application Serial No. 788,750, filed November 28, 1947, now patented under No. 2,608,161, dated August 26, 1952.

The present invention has for an object to maintain the requisite safety for passenger cable railways designed for endless rope operation and which include a carrying rope or cable supporting the car and a traction rope or cable. In such systems, the cable cars carry four or more persons and include means which automatically grip the endless traction cable when the car leaves the station and which means release the traction cable automatically when entering the next station.

While the cars are in the station, they move along a suspension rail and there while the car is stationary the passengers can enter and leave the cars while they are stationary with the traction cable still moving.

Each car embodies two clamping or gripping means which for the purposes of increased safety are capable of securely holding the car at even the steepest slope.

The gripping pressure exerted on the clamping means is effected by a battery of springs embodied with the clamping means that are mounted on the running gear of the car. This spring battery provides an unchangeable and steady gripping force.

In the operation of such endless cable railway systems, with particular reference to the clamping means, it of occasion happens that the clamping means do not adequately grip the traction cable when the car is to be coupled and after it has been pushed by hand or moved along an inclined rail in a station.

Additionally, it occasionally happens that the automatic uncoupling, namely the release of the clamping means from the traction cable, does not function properly when the car enters another station. Both of these operational disturbances are applicable to systems known as circulating cable railways.

This invention has for its primary object to completely eliminate these difficulties by utilization of electrical safety means that control and stop the railway.

In connection with these electrical safety means it is immaterial whether the same are in successive circuit or whether, of the multiple safety devices, one is embodied in the relay circuit controlling the main motor or whether one is embodied with another circuit controlling a brake for the motor.

According to the particular sequence of operation of the railway such as coupling and uncoupling, the control devices are such as to determine first of all whether the clamping means has properly gripped the towing cable in the coupling operation and in this connection to determine and control the positional arrangement of the traction cable at the point of coupling. Other safety devices check the proper uncoupling of the clamping means from the traction cable when the car is entering the station.

Thus this invention aims at providing a unique and novel electrical trip control system for passenger cable railways of the endless cable type which embodies a cable that supports the car, a traction or towing cable, drive means for this latter cable, a brake means associated with this drive means and electrical safety devices that operate in dependence upon the position of the clamping means before and after coupling and that further operate in dependence upon the position of the traction cable relative to the point of coupling and also uncoupling.

Thus this invention provides plural electrical control means inter-related with the clamping means embodied with the cable car and the position of the traction cable to control the movements of this latter cable in the best interests of safety.

The invention will be further described and more detailed and specific objects will be apparent from the following description taken in connection with the accompanying drawings, in which:

Figure 1 illustrates the cable car with its overhead support and an electrical safety device operable to check the adequacy of the clamping means after the car has been coupled to the traction cable,

Figure 2 is a diagrammatic fragmentary view looking to the left of a portion of Figure 1 showing two positions of the contact lever embodied with the running gear and associated with the clamping means,

Figure 3 illustrates diagrammatically the actuating components for an electrical device which determines whether the traction cable is properly gripped by the jaws of the clamping means embodied with the cable car,

Figure 4 is a view from above and on a reduced scale illustrating the positional arrangement of the control lever incorporated with the safety device of Figure 3,

Figure 5 is a side view partly in section of the pressure applying means embodied with each pair of gripping jaws on the running gear frame,

Figure 6 is an end elevation of the arrangement shown in Figure 5,

Figure 7 illustrates an electrical safety device for determining the proper position of the traction cable at the coupling-in point,

Figure 8 is a similar safety device shown in the position displaced 90° from that of Figure 7 and further operable to check the positional relationship of the traction cable, and

Figure 9 is a diagrammatic plan view of the cable system and the safety components incorporated in the station with particular reference to the safety devices embodied in Figures 1–4 and 7 and 8.

In Figure 1, there is illustrated a cable car including a running gear frame which embodies two pairs of clamping jaws. Projecting laterally from the frame *i* is a lever having a roller *d* thereon. This lever arm is carried by the movable jaw of the clamping means. This jaw is denoted at *k* in Figures 1–4 and in detail at *b'* in Figure 5. The calculated gripping pressure necessary to satisfy safety requirements and assure an adequate grip on the towing cable by the jaws of the gripping means includes the plural spring sets *d'*. These latter are set and adjusted so that they exert an upward pressure on the movable jaws to conform with the safety requirement. However, if one of the jaws has not gripped the cable, the roller *d* in its movement with the cable car will be at a higher

position by the distance *e*, Figure 1, than if it had gripped the cable. Thus as indicated, the line of movement of the thus elevated roller *d* is intersected by the lower end of the lever *a* so that the roller will strike this lever and the lever *a* will in turn control the circuit *c* back to either the motor *u* or the brake means *v*, *t* to stop the system and the car will not leave the station.

The mounting of the springs of the spring batteries, namely, putting in and removal of the springs, would be very difficult without resorting to the use of a mechanism facilitating the assembly and disassembly of the springs. In Figures 5 and 6, there are illustrated four springs *d'*. The ends of these springs are supported by lower spring heads f^1 and upper spring heads f^2. The cross beam *b'* is subjected to the pressure applied by all of the springs and this pressure is transmitted by way of the middle part of the cross beam to the clamping lever or upper jaw. The upper and lower spring heads f^2 and f^1 include pin portions that are cooperable with apertures in the cross beam *b'* and bottom flange a^2 respectively. The upper spring head f^2 is extended downwardly to form an upper bolt f^3, the lower portion of which is internally threaded. A sleeve h^2 extends upwardly from the lower spring head f^1 and this sleeve surrounds bolt f^3 so that during operation the springs are guided by the central disposition within the same of the sleeve h^2 and bolt f^3 respectively. In order to remove or insert the springs, one utilizes an auxiliary screw s^1 having an outer manipulating head f^4. This screw passes through spring head f^1 and when inserted and turned in the threaded aperture in bolt f^3 draws the two spring heads towards one another so that they and the associated spring can be removed or assembled. During the operation of the running gear, the auxiliary screws f^1 are removed so that the full strength of the springs can be utilized.

Thus, insofar as Figure 1 is concerned and as shown diagrammatically in Figure 9, when the running gear of a car including the clamping means, prior to leaving the station, is in such condition that the clamping jaws have not closed adequately or in other words, do not have the cable embodied therebetween, the roller *d* will strike pivoted switch lever *a* and the traction cable will stop so that the car will not leave the station.

In the interest of greater safety and combined with the aforementioned safety device, a cable position control means is incorporated in the system. On the frame of the running gear *i* and between the two clamping means denoted at *k*, Figures 3 and 4, is a two-armed lever *f*. This lever is provided with a weight *g* on one end and an abutment *h* protruding from the side of the lever opposite the weight *g*. Thus if the cable enters the bite of the jaws *k* properly, the lever *f* is moved back toward frame *i* from the top and this movement elevates the lower lever arm so that it will clear a swinging contact lever *m* that extends horizontally from a vertical pivot and projects into the path of movement of the car. If the cable has not passed back securely into the bite of the jaws *k* the lever *f* assumes the dotted line position in Figure 3 due to the weight *g* acting thereon and thus as the car moves, the lower arm of the lever *f* abuts switch lever *m* to move the same and thus interrupt the circuit of a relay operably coupled with the driving motor *u* for the traction cable so that the car is stopped and the jaws can be properly set relative to towing cable.

Figures 7 and 8 illustrate further electrical safety devices in the form of a double arm or forked levers which are actuated when the traction cable deviates from its proper position. These forked levers are components of electrical switch means in operative circuit relation with the drive means which includes the electric motor *u* and the magnetic brake means denoted generally at *t*. As shown in Figure 9, the cable car moves along the carrying track or cable *w* which at the coupling-in point is in parallel with and above the traction cable. However, just prior to that point the carrying cable merges to this overlying position. At the uncoupling point, the carrying cable and thus the car moves laterally away from the traction cable. The electrical switch means including the pivoted and axially adjustable forked levers of Figures 7 and 8 are provided to ensure the proper positional relationship of the traction cable relative to the coupling-in point and also to stop the railway if the cable clamping or gripping means have not become uncoupled. Thus on the left side of Figure 9 is shown an arrangement in which the forked levers of Figures 7 and 8 are adjacent one another and disposed transversely of one another, that is the axes of the forks are displaced 90° from one another, the axes of the forks are displaced 90° from one another, with the traction cable *p* passing between the forks. Both of these forked levers are located in advance of the coupling-in point. Thus any deviation of the traction cable relative to its proper position at the coupling-in point will move one or both of the forked levers to thereby, through suitable relay means in the circuit, stop the railway. The forked lever of Figure 7 checks the up and down deviation of the traction cable while the forked lever of Figure 8 checks the lateral deviation. A further forked lever of the type shown in Figure 8 is located after the uncoupling point so that if the traction cable is still clamped by the gripping or clamping means the lateral deviation of the still clamped cable with the car when it is moving along the deviating traction of the carrying cable will abut and actuate the forked lever to again interrupt the circuit to the driving means to stop the railway.

It is believed further clear and consistent with the foregoing that the actuation of the respective arm switch means each of which embodies a control lever, is indicated on a control panel which has a lamp in circuit with each switch lever so that regardless of which switch lever is actuated responsive to an irregularity in operation, the signal is given to indicate at what point in the system the irregularity has occurred.

What I claim is:

1. Electrical trip means for a passenger cable railway including at least two stations comprising a cable car, a carrying cable for supporting the same between the stations, an endless traction cable for moving the car between the stations, drive means for driving the traction cable including an electric motor, said car including a running gear frame, rollers on the frame engaging the carrying cable, clamping means carried by the car for clamping the traction cable including at least one pair of jaws including a fixed jaw and a movable jaw extending laterally of the frame and operable to grip the traction cable from above and below the same, means for applying clamping force to the jaws, an arm extending from the movable jaw in a direction transverse of the line of movement of the car, a roller on said arm, a coupling-in point at the station, a lever means in the line of movement of the roller and located beyond the coupling-in point, said lever being engageable by the roller when the traction cable has not been clamped by the jaws at the coupling-in point and electrical switch means including said lever means in operative circuit relationship with said drive means for stopping the railway when the traction cable has not been clamped and the roller has engaged and moved said lever means.

2. Electrical trip means for a passenger cable railway as claimed in claim 1 and at the coupling-in point a further electrical switch means in operative circuit relationship with said drive means, said further electric switch means including a contact lever, an angular lever pivotedly mounted intermediate its ends on said frame, one end of said angular lever facing the traction cable and being disposed adjacent the jaw means and engageable by the traction cable when the same has securely entered between and is clamped by the jaw means, the other end of said lever having a weight thereon normally holding the said other end in a posiiton to abut said contact lever whereby if the traction cable is not clamped

by the jaw means the said other end of the angular lever abuts the contact lever to interrupt the circuit to the drive means to stop the railway.

3. Electrical trip means for a passenger cable railway as claimed in claim 1 and in advance of the coupling-in point still further switch means in operative circuit relationship with said drive means and including a pair of pivoted forked switch levers mounted to extend transversely of one another and between the forks of which the traction cable passes in normal spaced relation, whereby upon any deviation of the line of movement of and thus the position of the traction cable relative to the coupling-in point at least one of the said forked switch levers are moved to interrupt the circuit to stop the railway.

4. Electrical trip means for a passanger cable railway as claimed in claim 1 and an uncoupling point at the station, a further pivotally mounted forked switch lever disposed after the uncoupling point and having its arms on opposite side of the said traction cable, said further forked switch lever being in operative circuit relationship with drive means, said car moving laterally of the traction cable after passing the uncoupling point whereby if the clamping means have not released the traction cable at the uncoupling point the lateral movement of the still clamped traction cable with the lateral movement of the car moves said last mentioned forked switch lever to interrupt the circuit to the drive means to stop the railway.

5. Electrical trip means for a passenger cable railway including at least two stations comprising a cable car, a carrying cable for supporting the same between the stations, an endless traction cable for moving the car between the stations, drive means for driving the traction cable including an electric motor, said car including a running gear frame, rollers on the frame engaging the carrying cable, clamping means carried by the car for clamping the traction cable including at least one pair of jaws including a fixed jaw and a movable jaw extending laterally of the frame and operable to grip the traction cable from above and below the same, means for applying clamping force to the jaws, an arm extending from the movable jaw in a direction transvesre of the line of movement of the car, a roller on said arm, a coupling-in point at the station, a lever means in the line of movement of the roller and located beyond the coupling-in point, said lever being engageable by the roller when the traction cable has not been clamped by the jaws at the coupling-in point, electrical switch means including said lever means in operative circuit relationship with said drive means for stopping the railway when the

traction cable has not been clamped and the roller has engaged and moved said lever means, at the coupling-in point a further electrical switch means in operative circuit relationship with said drive means, said further electric switch means including a contact lever, an angular lever pivotedly mounted intermediate its ends on said frame, one end of said angular lever facing the traction cable and being disposed adjacent the jaw means and engageable by the traction cable when the same has securely entered between and is clamped by the jaw means, the other end of said lever having a weight thereon normally holding the said other end in a position to abut said contact lever whereby if the traction cable is not clamped by the jaw means the said other end of the angular lever abuts the contact lever to interrupt the circuit to the drive means to also stop the railway, in advance of the coupling-in point still further switch means in operative circuit relationship with said drive means and including a pair of pivoted forked switch levers mounted to extend transversely of one another and between the forks of which the traction cable passes in normal spaced relation, whereby upon any deviation of the line of movement of and thus the position of the traction cable relative to the coupling-in point at least one of the said forked switch levers are moved to interrupt the circuit to also stop the railway, an uncoupling point at the station, a further pivotally mounted forked switch lever disposed after the uncoupling point and having its arms on opposite sides of the said traction cable, said further forked switch lever being in operative circuit relationship with the drive means, said car moving laterally of the traction cable after passing the uncoupling point whereby if the clamping means have not released the traction cable at the uncoupling point the lateral movement of the still clamped traction cable with the lateral movement of the car moves said last mentioned forked switch lever to interrupt the circuit to the drive means to also stop the railway.

6. Electrical trip means for a passenger cable railway as claimed in claim 5 and signal means in circuit relationship with the respective switch lever means including a lamp responsive to the actuation of each individual switch lever means.

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