United States Patent

[11] **3,585,941**

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[21] Appl. No. **864,820**
[22] Filed **Oct. 8, 1969**
[45] Patented **June 22, 1971**

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[32] Priority **Feb. 3, 1969**
[33] **Italy**
[31] **12374A/69**

[54] **CHECKING DEVICE FOR SINGLE AND DOUBLE CABLE CABLEWAYS WITH AUTOMATIC CLAMPING**
4 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **104/173,** 104/202, 73/133
[51] **Int. Cl.** **B61b 11/02,** B61b 7/20
[50] **Field of Search** 104/165, 173, 202, 204

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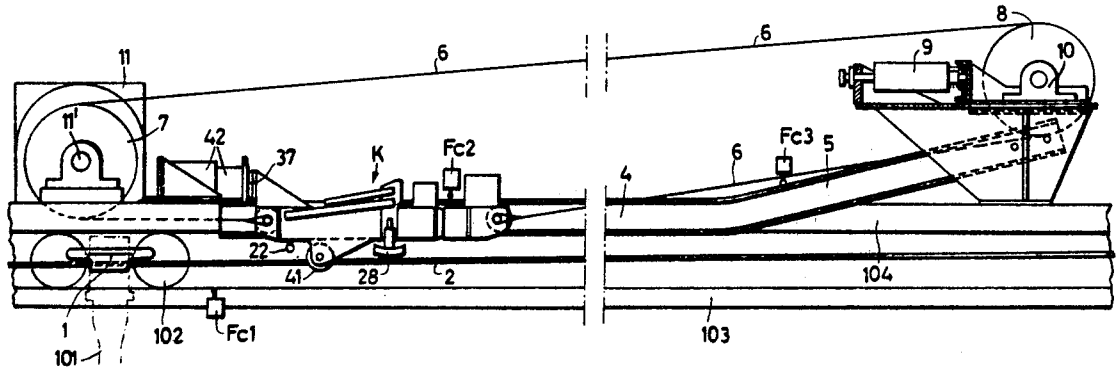
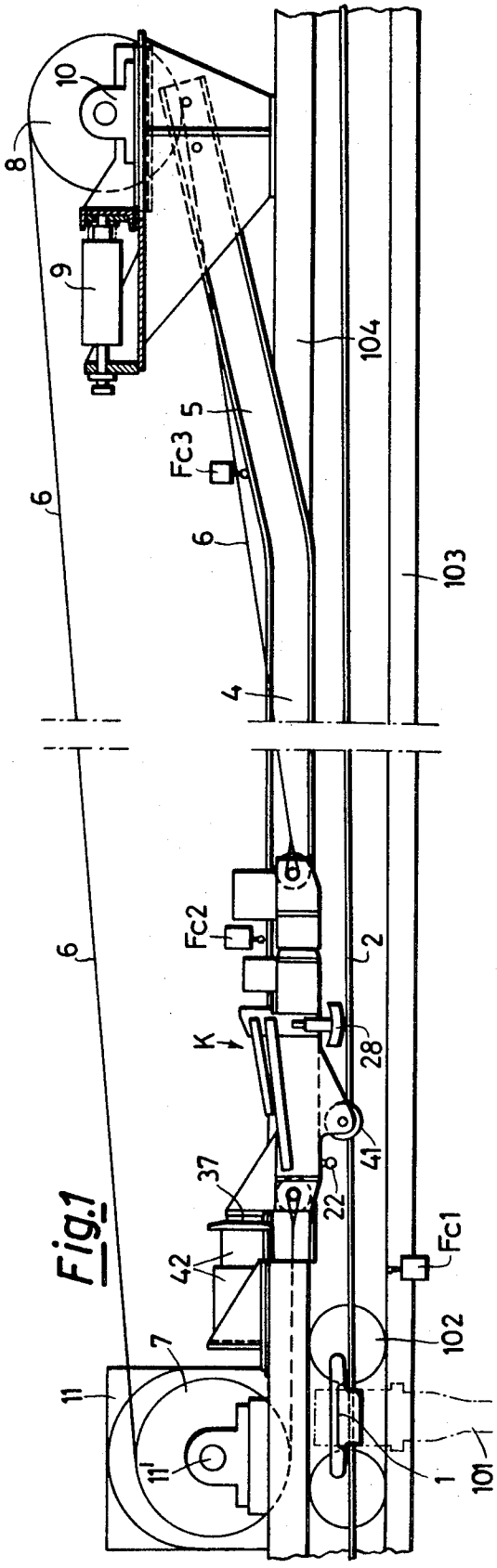
ABSTRACT: In cableways in which each car is frequently coupled and decoupled from the traction cable by means of an automatic locking clamp arranged on the principal trolley, a device, independent of the coupling device arranged on the car trolley, for checking the grip of the car coupling clamp on the traction cable.





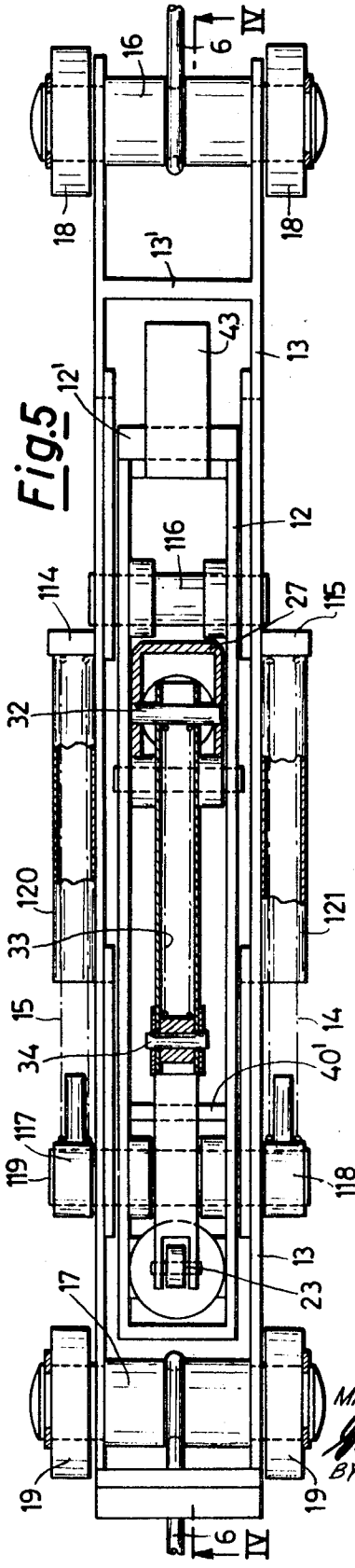


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Fig.2

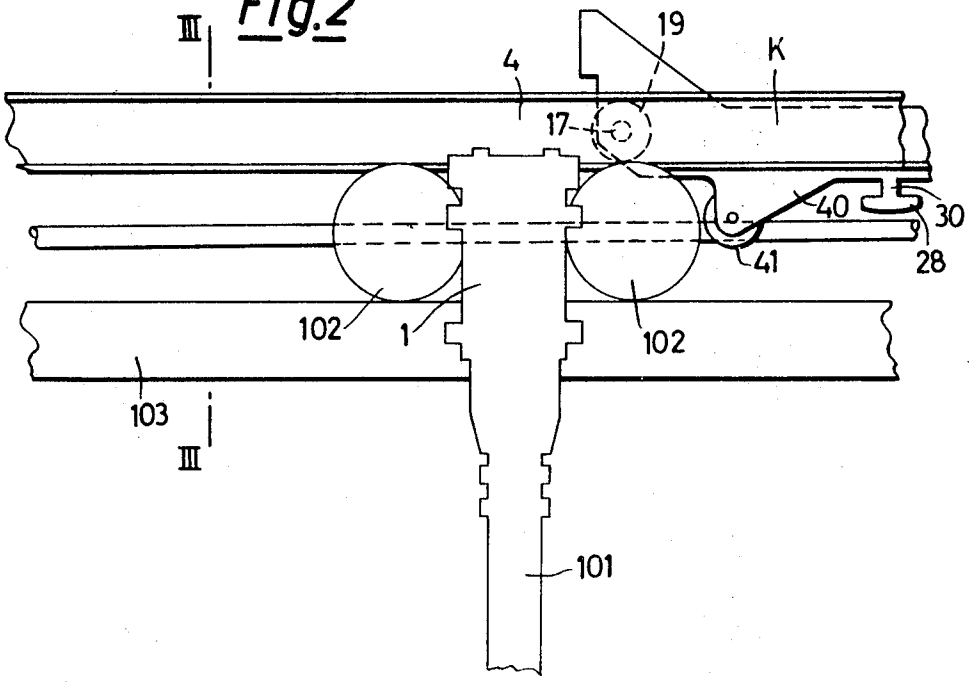
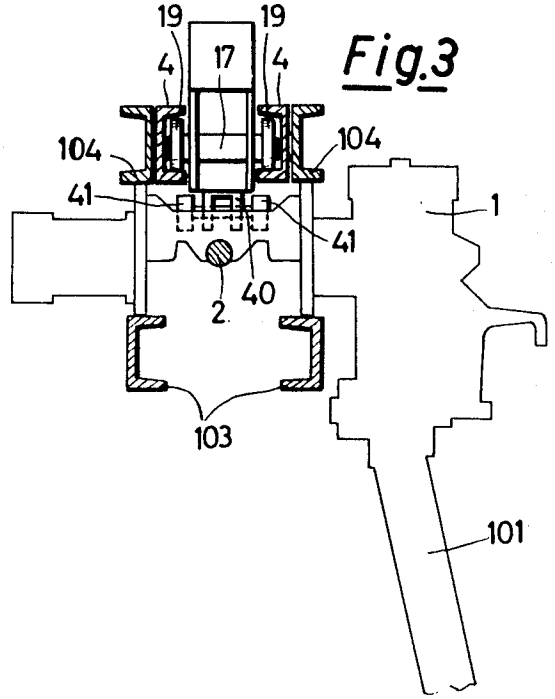


Fig.3



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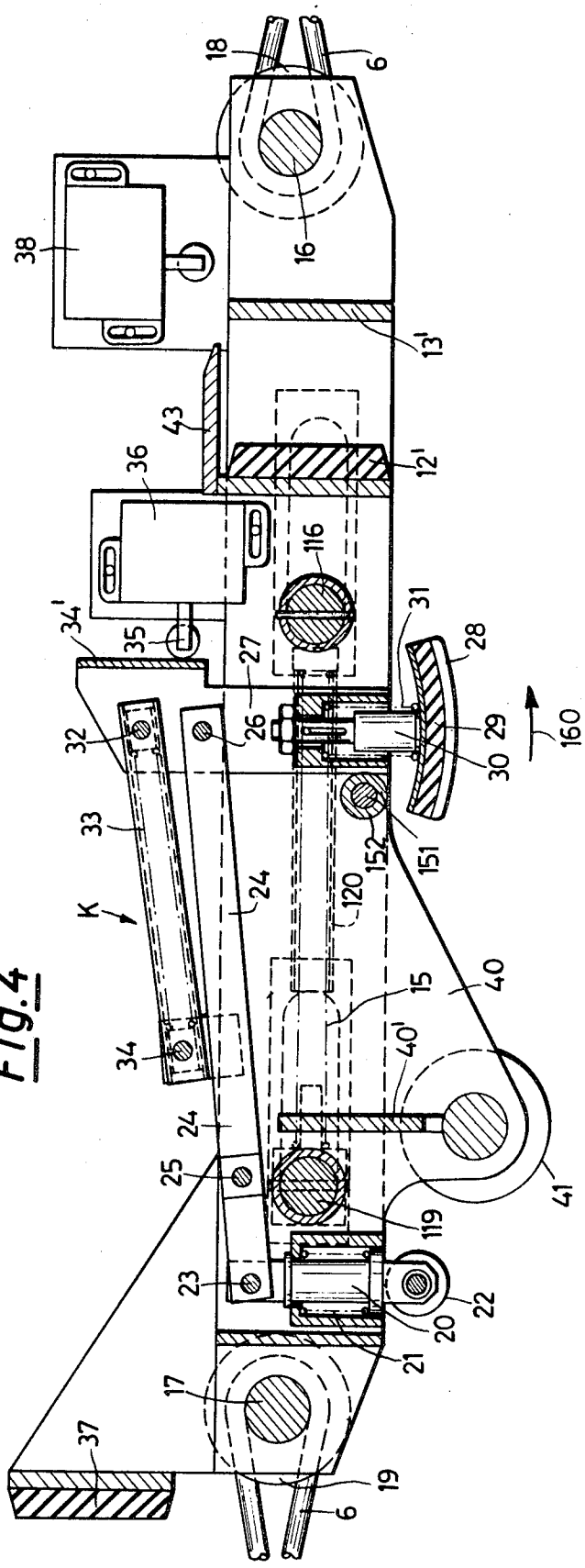

Fig. 4

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CHECKING DEVICE FOR SINGLE AND DOUBLE CABLE CABLEWAYS WITH AUTOMATIC CLAMPING

In cableways in which each car is frequently coupled and decoupled from the traction cable by means of an automatic locking clamp arranged on the principal trolley (which in the following will be indicated by the name of clamped trolley for brevity), it is necessary after each coupling to check if the grip of the clamp is entirely efficient and such as to guarantee the required safety during the outward or return journey of the car.

Conventional checking devices for this purpose have not given satisfactory results insofar as they are not capable of guaranteeing with certainty the safe locking of the clamp on the cable, either because of errors due to the components used or because of the shortness of checking time.

The object of this invention is a checking device which satisfies the most severe working requirements and which, being independent of the coupling device arranged on the car trolley, can also be applied to existing installations.

The device comprises a checking carriage which moves on wheels along a path of its own which is rigid with the guardrail of the path of the clamp trolley; a motor which causes said carriage to advance autonomously with a velocity slightly less than that of the clamp trolley in order to permit this latter to reach the carriage without appreciable impact and drag it beyond; a braking means acting with a preestablished torque value on the carriage; and finally a tracer carried by the carriage and maintained in contact with the traction cable which senses possible relative sliding between the cable and clamp trolley in the case of defective grip of the clamp, and in such a case to operate a signal device and switch for stopping the operation; the rail for the carriage being provided with a terminal ascending ramp for causing detachment of the carriage from the clamp trolley after checking and the cessation of braking torque in order to allow the carriage to return by inertia to its initial position.

The carriage is coupled to a cable loop which runs between two pulleys located at the ends of the path of travel of the carriage, one of said pulleys being driven by a reversible electric motor in order to furnish the motor torque necessary for the advancement of the carriage up the point where this latter is reached by the clamp trolley, and then to furnish by reverse motion the brake torque during dragging of the carriage by the clamp trolley. The said motor is controlled by remote switches actuated by suitable contacts arranged along the path of travel, a first contact being actuated by the clamp trolley in order to start the motor and make the carriage advance, a second contact being actuated by the carriage successive to the moment of impact between the clamp trolley and carriage, and a third contact being actuated at the end of travel of the carriage as it abandons the trolley, in order to cut off the current and allow the carriage to return to its initial position.

One embodiment of the invention is illustrated in the attached drawing in which:

FIG. 1 is a diagrammatic view of the device applied to a cableway;

FIG. 2 is a diagrammatic view of the carriage which is dragged by the clamp trolley;

FIG. 3 is a sectional view through the line III–III of FIG. 2;

FIG. 4 is a side view of the carriage;

FIG. 5 is a plan view of the carriage.

With reference to the drawings a clamp trolley I supports a cable car by means of an arm **101** and slides along the path of travel, constituted by a pair of lower rails **103** and a pair of upper guardrails **104** by way of wheels **102**. Said trolley is provided with automatic mechanisms for locking its clamp in order to render the trolley (and hence the car) rigid with the traction cable **2**. Said mechanisms which are well known in themselves are not shown and do not form part of the invention. The path of travel of a carriage K is indicated with the reference numeral **4**, said path **4** consisting of two opposing U-rails fixed to the guardrail **104** and having a length of about 4 meters and terminating in an ascending ramp **5**.

The carriage K is anchored by its end pivots **16** and **17** to the ends of a cable **6** which forming a closed loop runs between two pulleys **7** and **8**, pulley **3**being the driving pulley and pulley **8** the driven pulley, this latter provided with an expander **9** acting on the support **10**. The pulley **7** is keyed to the exit shaft II′ of a fixed motor with reduction gear II the motor of which is fed with 3-Phase current from the principal supply, said motor being connected to said supply by way of a reversing switch which allows two phases of feed current to be reversed with consequent reversion of the direction of rotation.

The carriage consists of two frames, an inner frame **12** and outer frame **13**, the former sliding with respect to the latter, these frames linked together by way of two lateral thrust springs **14—15** acting between the heads **114** and **115** of the pivot **116** of the internal trolley **12** and between the heads **117** and **118** of the pivot **119** of the external frame **13**. Said springs are contained in sheaths **120—121**. The outer frame **13** is provided with two pivots **16—17** which, in addition to serving as anchorage for the ends of the looped cable **6** support the two pairs of wheels **18—19** which rest on the path of travel **4**.

The internal frame **12** is provided with vertical appendices **40–40′** which support pivots on which two coaxial rollers of elastic material **41** are mounted against which the clamp trolley I rests when it reaches the carriage K (FIG. 2). The internal frame is also provided with a pivot **20** which moves vertically against a return spring **21**, said pivot supporting at its lower end a control roller **22** and at its upper end a pivot **23** on which is pivoted the end of a lever **24** pinned to the frame at **25**. At the end of said lever **24** an arm **27** is pivoted at **26** which supports a tracer **28** of arched shape mounted at its lower end, this tracer having a rubber base **29** for contact with the cable **2** and is rigidly secured to the pivot **30** which moves axially in the seat formed in the arm **27** against a return spring **31**. The upper end of the arm **27** is connected at **32** to one end of the compression spring **33** which is secured at its other end to the pivot **34** fixed to the lever **24**.

The arm **27** is maintained by the thrust of spring **33** against the fixed stop pivot **151** which has an elastic sheath **152**. Should the head of the arm **27** move angularly towards the left of the Figure, it actuates the pushbutton **35** of a signalling **36** and control device for stopping the operation of the cableway, by way of a plate **34**. An elastic stop **37** dampens the impact of the carriage against a limit buffer **42** when it returns to its initial position after the checking operation has been carried out. A device **38** supported on the frame **13** is furnished with a switch and pilot light which is extinguished by the action of the plate **43** when the minimum test force has been obtained. A stop of elastic material **12′** dampens the impact between the internal frame **12** and the cross piece **13** of the outer frame **13**.

The device operates in the following manner:

After the clamp trolley **1** has been automatically coupled to the traction cable **2**, said trolley actuates during its path of travel a first contact Fc**1** which starts the motor **11** and consequently causes the carriage K to move. Said contact is arranged in such a position that the clamp trolley can reach the carriage after the latter has traveled about 1 meter, at this point the difference in velocity between these two components being very small. A second contact Fc**2** is actuated immediately after the coupling together of the carriage and trolley and causes inversion of two feed current phases of the motor **11**. In this way the force exerted by the cable **6** in the opposite direction to the preceding is transmitted by the outer frame **13** to the inner frame **12** of the carriage, so providing the brake torque for checking, which remains constant over the whole of the length of the test section, equal to about 2 meters.

At the end of this section the carriage K rises up the ascending ramp **5** and on abandoning the clamp trolley actuates a third contact Fc *3* which, by operating a time switch, cuts off the current to the motor **11** with a small safety time lag, so that the carriage K can return by the action of its own inertia to its initial position with reduced speed. When the clamp trolley reaches the carriage K it touches the elastic rollers **41**, and

acts at the same time on the roller 22 and raises the pivot so causing lowering of the tracer 28 on to the traction cable. If the locking force of the clamp is greater than the said braking force there will be no sliding between the tracer and cable. If on the other hand the grip is not efficient there will be a sliding action between the trolley and the cable, because of which the tracer 30 will incline in the direction of the arrow 160 and the end of the arm 27 will release the pushbutton 35 of the signalling and control device 36, so causing stopping of the cableway.

For reasons of greater reliability and for the case in which the cableway because of unforeseen faults has to operate with its standby heat engine, provision is made for providing the braking test torque by means of a shoe brake and spring acting on the shaft of the motor 11, by way of a toothed coupling which in this case would be closed but which would normally be maintained open.

What we claim is:

1. A device for checking the grip of the car coupling clamp of the traction cable in single and double cableways with automatic clamping which comprises: a checking carriage which moves on wheels along a path of its own which is rigid with a guardrail of the path of the clamp trolley; a motor which causes said carriage to advance autonomously with a velocity slightly less than that of the clamp trolley in order to permit the latter to reach the carriage without appreciable impact and to drag it beyond; a braking means acting with a preestablished torque value on the carriage; and finally a tracer carried by the carriage and maintained in contact with the traction cable which senses possible relative sliding between the cable and clamp trolley in the case of defective grip of the clamp, and in such a case to operate a signal device and switch for stopping the operation of the cableway; the rail for the carriage being provided with a terminal ascending ramp for causing detachment of the carriage from the clamp trolley after checking and the cessation of braking torque in order to allow the carriage to return by inertia to its initial position.

2. A device as claimed in claim 1, in which the test carriage is inserted between the ends of a cable looped around two pulleys situated at the ends of the path of travel of the carriage; one of the said pulleys being driven by a reversible electric motor, in order that it can provide both the torque for driving the carriage and, on reversing, the braking torque acting on the carriage.

3. A device as claimed in claim 1, in which said electric motor is operated by way of remote switches arranged along the path of travel, a first contact being actuated by the clamp trolley for starting the motor for driving the carriage; a second contact being actuated by the carriage successive to the moment of impact between the clamp trolley and carriage; and a third contact being actuated at the end of the test path of the carriage, when this latter disengages itself from the clamp trolley, in order to remove current from the motor and allow the free return of the carriage to its final position.

4. A device as claimed in claim 1, in which the carriage comprises two frames one inner and one outer, the former sliding with respect to the latter, connected by means of springs which thrust in the longitudinal sense, the outer frame being anchored at its two ends to the ends of the cable loop, the inner frame being provided with two elastic rollers against which the clamp trolley rests and thrusts, and being further provided with a tracer member operated by a lever mechanism actuated by the clamp trolley for lowering on the traction cable; said tracer being interlocked with a device for signalling and interrupting the flow of electric current to the installation, and acting only in the case in which sliding occurs between the clamp trolley and traction cable under the action of the braking torque.