This invention relates to a safety device on passenger suspended ropeways with two pull ropes, consisting in that with utilization of the known compensation rope discs arranged at the driving station a permanent tension control of the pull ropes is carried through during the service, the service being interrupted, when inadmissibly high tensions or differences in length or sinking of the safety degree occurs in one pull rope or in both pull ropes.

The dependence on the secure working of the catching device built into the running gear in case of breakage of rope, and the impossibility to foresee what will take place if the catching device engages during the traveling at high speed, the pull rope being not damaged, are and remain sources of danger for suspended passenger ropeways operated with only one pull rope. To avoid these sources of danger, the ropeway must have two pull ropes.

This invention has for its object, to ensure on such ropeways a most extensive continuous and automatic controlling of the moved ropes, and thereby to avoid any dependence on the automatic catching device.

An embodiment of the invention is diagrammatically illustrated by way of example in the accompanying drawings in:

Fig. 1 in side elevation and in
Fig. 2 in top plan view of the safety device.
Fig. 3 is a similar view to Fig. 1 showing diagrammatically the construction of the switches.
Fig. 4 is a top plan view of Fig. 3.

The suspended cars travel on strong carrying cables not shown in the drawings, which are stretched in the air being anchored at one end and connected to a stretching device at the other end. These cables are stationary and rest on frames, the so-called aerial runway supports, which are erected at relatively great distances apart according to the nature of the ground.

The suspended cars are moved up and down or backwards and forwards on these cables by two pull ropes 51, 52. These ropes are connected to the suspended cars and pull them along when the pull ropes are moved.

The two pull ropes 51, 52 lead from the driving gear of the suspended car on the one way side over the driving element (see Fig. 1) to the running gear of the suspended car on the other way side.

The guide rope connecting the cars at their lower end is guided over a rope stretching pulley in known manner. A separate connecting rope is provided for each pull rope. The action of the pull rope on the running gear on the one hand and on the other hand the action of the connecting rope are movable and provided by means of a two-armed lever, in order that in the event of breakage of a pull rope no eccentric action movement is formed for the unbroken pull rope or the running gear.

The guiding of the pull ropes 51 and 52 in the driving station is as follows:

Pull rope 51 coming from the car is guided over the compensator disc 7 to the upper groove of the driving pulley 53, thence to the compensator disc 52 and over this disc to the track or to the other car.

Pull rope 52 comes from the car over the compensator disc 52 to the lower groove of the driving disc 53, thence to the compensator disc 52 and from the same to the track or to the other car.

The compensating disc discs 51 to 52 are in a known manner mounted on carriages shiftable in horizontal, inclined or vertical direction.

The compensating discs are further positively connected in pairs by compensating ropes, i.e., in the form of construction shown, the compensating discs 51 and 52 by the compensating rope 51 and the compensating disc 52 and the compensating rope 52. The compensating ropes 51, 52 are conducted over pulleys 51, 52 for changing the direction of ropes.

The compensating disc 51 to 52 act like automatic weighing devices of the tensions in the pull ropes on the two track sides. Each difference of tension in the pull ropes is indicated by these discs. When tension differences occur, the compensation discs try to compensate, by forward or backward shifting, the disc on which the pull rope having the greater tension acts, unwinding rope, i.e., moving forward, whereas the disc under less high tension hauls rope, i.e., moves backward.

The discs act therefore in opposition to the tension differences.

This operation of the compensation discs known per se is utilized, according to the invention, to control a device, which stops the service of the ropeway at inadmissibly high pull rope tension, at length differences or at lowering of the safety degree in one or both pull ropes.

With this object in view one or several switches 51 to 54 are arranged at the extreme positions of the carriage-guide for the several compensation discs 51 to 54. The stroke of the compensation discs is limited to a certain measure, permitting of normal tension differences. If then the pull rope is stressed to an impermissible extent, for example by the pull rope encountering any obstacle on the way (getting hooked on the...
construction) or as the second pull rope stretches inadmissibly, the pair of compensation discs answering thereto will move into its extreme position and positively operate one of the extreme switches, whereby the motor is cut out and the ropeway stopped.

Referring to Figs. 3 and 4, all the switches $r^1$ to $r^3$ are of the same construction. On the shifting bearing block of each of the compensation rope discs $a'$ to $a^2$, projections $t$ are provided which project downwardly in order to act against the oscillatable contact. If one of the compensation discs passes into its extreme position, that is when the rope is overstressed, the projection $t$ comes into contact with the oscillatable contact and presses same to one side so that the circuit is broken.

The extreme switches $r^1$ to $r^3$ are preferably arranged so that they come into engagement before the compensation discs have arrived in their extreme positions, so that up to the stopping of the ropeway the tension differences cannot exert any effect upon the running gear of the car.

As stated above the problem is, to stop the service of the ropeway when too high tensions occur or the safety degree sinks in the one or other pull rope. The case can be further imagined, that both pull ropes get hooked on any stationary point on the ropeway, so that the tension in both ropes remains equal, but becomes too high, wherefrom results the danger of breakage of a rope. In this case the compensation disc can no longer operate. According to the invention the overstressing of the pull rope is utilized also in this case to automatically stop the service.

The compensation discs will, as already mentioned, not move in this case, but the tension in the compensation ropes $u'_{a^1}$, $u^2_{a^2}$ respectively will increase with the tensions in the pull ropes. The pressure exerted by the guide pulleys for changing direction of rope $u'_{a^1}$, $u^2_{a^2}$ respectively, around which the compensation ropes are guided, against their abutment becomes greater proportional to their increasing tensions. These pulleys for changing direction of rope are therefore mounted on springs, or the like, acting in the direction of the rope pull. If the tension in the compensation ropes becomes inadmissibly high, the springs of the abutment are for instance compressed so that a contact is closed, which cuts out the motor and stops the ropeway. The switch for the reversing pulleys $u'_{a^1}$ and $u^2_{a^2}$ are similarly arranged to those of the compensation rope discs $a'_{a^1}$.

This permanent automatic tension control makes it almost impossible that a rope breaks suddenly, and it ensures further the desired independence of the automatic catching device. The catching device comes into engagement in the system according to the invention only, when the ropeway has been stopped.

I claim:

1. A safety device for passenger suspended ropeways with two ropes, comprising in combination with the driving station, equalization rope discs arranged in said driving station for permanently automatically controlling the tension of the pull ropes during service, and means for stopping the service when inadmissibly high tensions or differences of length or sinking of the safety degree occur in one pull rope or in both pull ropes.

2. A safety device as specified in claim 1 comprising in combination with shiftable compensation discs, switches at the points of extreme position of the compensation discs adapted to be operated by said discs when shifted into the extreme position so that the motor is cut out and the ropeway stopped.

3. A safety device as specified in claim 1, comprising in combination with shiftable compensation discs, a switch at the point of extreme position of each compensation disc adapted to be operated by the corresponding disc when shifted into the extreme position so that the motor is cut out and the ropeway stopped.

4. A safety device as specified in claim 1, comprising in combination with shiftably mounted, compensation discs connected in pairs, two compensation ropes, one for each pair of compensation discs, resiliently mounted pulleys for changing direction of rope, one for each pair of compensation discs, at a certain distance behind each pair of discs for conducting the corresponding compensation rope and adapted to be shifted in the direction of the rope pull by the tensions in the compensation rope so that the service is stopped when in both pull ropes inadmissible rope tensions occur.

5. A safety device as specified in claim 1, comprising in combination with shiftably mounted, compensation discs connected in pairs, two compensation ropes, one for each pair of compensation discs, pulleys for changing direction of rope, one for each pair of compensation discs, at a certain distance behind each pair of discs for conducting the corresponding compensation rope, a resilient bearing for each pulley, contacts, one behind each resilient bearing adapted to be closed by said bearings when inadmissibly high tension occurs in both compensation ropes so that the motor is cut out and the ropeway service stopped.

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