

The invention relates to a cable haulage system according to the preamble to Patent Claim 1.

A cable haulage system of this type is known from US-A-2 591 680. The cable clamp which is mounted on a pulley cradle frame is normally maintained closed by a payload container which is supported in the pulley cradle frame. Accordingly, the cable clamp is maintained coupled to the haulage cable which extends beneath the load so long as the weight of the payload container and its contents can be accommodated by the pulley cradle frame. Provided at the stations are connecting links which, by raising of the payload container in relation to the pulley cradle frame, also allow opening of the clamping jaws under the action of pre-tensioned springs. Raising of the payload container is accomplished via pulleys fixed to the payload container and which encounter the connecting links. A cable haulage system of this type is convenient in the case of material transporting systems of limited travelling speed.

Particularly in the area of sports cable-ways, the performance of cable haulage systems has in recent decades increased in accordance with the development of the breadth of skiing as a sport and also the development of mountain tourism. Also the continuous cable railways have followed this trend by an increase in carrying capacity and travelling speed in that the conventional systems, i.e. single-cable railways and twin-cable railways have been strengthened by being designed to meet more exacting demands. However, it has been found that on the basis of conventional systems, there are limits to how much performance can be increased while complying with the demands which prevail in terms of safety and it is preferable to sacrifice the comfort of the users.

Therefore, the problem on which the present invention is based is that of providing a cable haulage system which at the same time guarantees an increase in

safety and comfort by improving the stability and smoothness of running.

The problem according to the invention is resolved by the features set out in the characterising part of Claim 1.

In addition to the gain in stability achieved by supporting the pulley cradles on both carrying cables, also the weight engaging the pulley cradles between the carrying cables has the effect of stabilising the haulage cable. The fact that the clamps are able to move vertically makes it possible to alter the height of the haulage cable in relation to that of the carrying cables which is particularly important in the stations when the pulley cradles have to be separated from or again connected to the haulage cable. By reason of the movable disposition of the clamps in relation to the pulley cradles, therefore, it requires no deflection of the vehicles and all that has to be moved is the mass of the clamps which is minimal in relation thereto.

It is advantageous if the haulage cable extends above the pulley cradles 8 and if the cable clamps engage around the haulage cable from below. This makes it possible to guide, i.e. deflect or drive the haulage cable on top of the pulley cradles or vehicles in the stations so saving space in the station building.

Preferably, the pulley cradles according to the invention are provided with supports for the haulage cable and they are expediently disposed in front of and behind the cable clamps. Thus, the cable clamps are spared the task of accommodating the weight of the haulage cable suspended between the spans and of transmitting it to the pulley cradles.

Preferably, the supports for the haulage cable are so disposed on the pulley cradle that the corresponding supporting forces are transmitted directly to the carrying cables via the pulleys without imposing any stress on other parts.

The invention is described in greater detail hereinafter within the framework of an example of embodiment relating to a three-cable continuous cable-way and with reference to the accompanying drawings in which:

Fig. 1 is a diagrammatic view of the cable arrangement and a vehicle;

Fig. 2 is an elevation of the pulley cradle of a vehicle according to Claim 1;

Fig. 3 shows a plan view of the pulley cradle in Fig. 2;

Figs. 4 and 5 are cross-sections through the pulley cradle in the respectively open and closed conditions of the cable clamps and

Fig. 6 shows in a simplified view, a cross-section taken on the line VI-VI in Fig. 3.

As can be seen from Fig. 1, the cable-way which is by way of example constructed as a cabin cable-way has a plurality of carrying cables and at least one haulage cable which is constantly circulating during operation. To be precise, Fig. 1 shows an embodiment with two carrying cables and one haulage cable, the carrying cables being designated 1 while the haulage cable is designated 2. In this situation, the haulage cable 2 is disposed centrally between the two carrying cables 1 which are stretched at the same height so that they extend horizontally and with a space between them. In the spans,

the haulage cable 2 extends over a plurality of pulleys 4 from V-shaped intermediate supports generally designated 3 and which are rigidly clamped on the haulage cables 1 from below, connecting these rigidly to each other.

Reference numeral 5 generally denotes a vehicle of the cable haulage system, of which the cabin 6 is supported by a pulley cradle 8 through suspension means 7. The construction of the pulley cradle 8 which is likewise in accordance with the invention is shown in greater detail in Figs. 2 to 6 and is described in greater detail hereinafter.

A cross-sectionally box-shaped longitudinal girder 9 has, close to both its ends and rigidly mounted on connecting members 10, two journals 11 the axes of which all lie in one common horizontal plane. The journals 11 of both girder ends each engage a resilient element 12 or 12', which elements are disposed in a bifurcated arm 13. Each of the two arms 13 is rigidly connected to a U-shaped cross-member 14 but the elastic elements 12 and 12' nevertheless allow limited movement of the transverse members 14 in all directions in relation to the longitudinal member 9 and in particular a completely independent pivoting of the transverse members about the longitudinal axis of the longitudinal member 9. Thus, the parts 9 to 14 together form a frame 15 of the pulley cradle 8 which is adapted to be twisted about an axis extending in a longitudinal direction.

As can be seen from Fig. 3, on each of the transverse members 14, via spindles 16, in each case two rockers 17 or 18 are pivotally mounted and of these each has two rotatably mounted pulleys 19. The pairs of pulleys on each of the rockers 17 or 18 of a cross-member 14 are disposed at the same distance from one another as the carrying cables 1 or carrying rails 1' which

correspond thereto and which are disposed in the stations (Fig. 4).

The rockers 18 of the pairs of pulleys which are in the lead in the direction of travel are, in contrast to the rockers 17, provided with friction shoes 20 against which it is possible to apply, as indicated in Fig. 4, friction wheels 21 which are driven in the stations, in order in known manner to move or to accelerate or to decelerate the vehicles 5 which are decoupled from the haulage cable. A further pulley 22 is seated in each of the bifurcated arms 13 on the interior of the two elastic elements designated 12'. The two pulleys 22 constitute auxiliary wheels of the vehicle 5 or pulley cradle 8 for negotiating curves particularly in the uphill or downhill stations of the system where they cooperate with a deflector rail 23 (Fig. 4) which replaces the carrying rails 1' on the bends.

As Figs. 2 and 3 show, the pulley cradle 8 has two cable clamps 24 disposed between the arms 13 in a longitudinal direction. Each of the cable clamps 24 comprises a clamp housing 25 in which two clamp parts 27 and 28 are pivotally mounted via a spindle 26 passing through the clamp housing 25. Each of the clamp parts 27 and 28 comprises a clamping jaw 27a and 28a, and an actuating roller 27c and 28c mounted at the free end of this latter. The clamping levers 27 and 28 are constructed as curved members, the clamping jaw 28a and the clamping lever 28b being disposed between the arms of the clamping lever 27b. Between the pairs of arms of the two clamping levers, there is finally a plate spring assembly 29 which is articulately braced on the lever 27b through a journal 27d and on the lever 28b through a journal 28d. As is evident from the position of the journal 28b in Figs. 4 (clamp open) and 5 (clamp closed), this part of a knee lever joint shows that during the

opening or closing movement of the clamping jaws 27a, 28a travels over a dead centre position against the effect of the plate spring assembly 29 which applies the clamping force. In the open position of the clamping parts 27 and 28, these bear on not shown abutments on the housing 25.

According to the invention, the cable clamps 24 are not rigidly but are movably connected to the frame 15, the mobility being independent of the opening or closing movement of the clamping jaws. To this end, the clamping housings 25 are each articulately connected to a link 30 (Fig. 2) via pairs of connecting members 25a provided on the remote sides, the link member for its part engaging by means of two spaced apart rods 30a into two resilient bushes 31. The resilient bushes 31 are inserted into transverse members 14 at the same height on both sides of the vertical central plane through the vehicle. Nevertheless, the two cable clamps 24 are independently of each other adapted for limited axial and vertical movement via the links 30 which are deflectable in relation to the cross-members 14, the clamping jaws 27a, 28a engaging around the haulage cable 2 from below and opening and closing cross-wise to their vertical mobility. It must be added that between the link members 30 and the clamping houses 25 or their pairs of connecting members 25a, there are incorporated further resilient elements, not shown, which in the normal working position of the link members 30, maintain the axis 26 of the clamping jaws 27a, 28a parallel with the longitudinal axis through the vehicle and thus with the haulage cable 2, so that this latter can be axially aligned during the closure process.

As is clearly evident from Figs. 4 and 5, the clamp housing 28 of each cable clamp 24 comprises an adjusting roller 25b by which it is possible to influence the position of the roller. In the stations, actuating rails (not shown) are provided in order to open (or close)

the clamping jaws 27a, 28a via the actuating rollers 27c and 28c. In the direction of travel, there are downstream of the actuating rails provided for opening or upstream of those for closing, connecting links 36 in each of the stations and which in the open condition of the clamping jaws 27a, 28a can, by means of the adjusting roller 25b, be lowered out of or raised into the range of height of the haulage cable 2.

The lowest position of the haulage cable 2 in relation to the pulley cradle 8 is defined by supports 32 which are rigidly mounted on the cross-members 14 and which, via the pulleys 19, transmit as far as possible directly to the carrying cables 1 the resulting haulage cable forces which are downwardly directed.

Rigidly mounted on the longitudinal member 9, substantially in the longitudinal centre thereof, there is a laterally outwardly projecting extension arm 33 which, as can be seen in Figs. 4 and 5, is of yoke-like construction. The extension arm 33 is at a distance from and engages over the adjacent carrying cable 1 and at its downwardly directed free end 33a, it carries, extending parallel with the journal 11, a bearing arbor 34 which defines a pivot axis 34a of the suspension means 7. As Fig. 5 shows, there is at the upper end of the suspension gear 7 a bearing lug 7a through which passes the bearing pin 34. Due to the yoke-like construction of the extension arm 33, it is possible for the forces resulting from the load to be passed at the height of the carrying cables 1 directly into the pulley carrier 8, just as the haulage cable 2 engages the pulley carrier also at this height. For the sake of completeness, it should be mentioned that the suspension means 7 can be so connected to the extension arm 33 additionally via a damping element which is not shown that pendular movements of the cabin 6 about the pivot axis 34a are damped.

In an entry and exit zone of the stations, the haulage cable 2 which runs in or out via depressing or raising pulleys extends parallel with the rails 1', and on the entry side, in a first portion, the vehicles are uncoupled or the clamping jaws 27a, 28a are opened while in a subsequent second portion the movement of the clamps 24 by means of the connecting links engaging the rollers 25b, is accomplished into the lowered position shown in Fig. 4. In the lowered position, the clamping jaws 27a, 28a can without any risk of collision pass by a cable guide pulley 36 for the haulage cable 2, which is shown in Fig. 4 and on which it is possible for the cable to be deflected obliquely upwardly over the plane of rotation of the pulley carriers.

Between the entry zone and exit zone of a station, the clamps are maintained in an inoperative position by the resilient bushes 31 which act on the connecting links 30, until they are again lifted to the height of the haulage cable 2 by a connecting link in the corresponding portion of the run-out zone.

On the other hand, in a case of the cable haulage system according to the invention, the two carrying cables may also be replaced by pairs of carrying cables, in order to increase stability and/or carrying capacity.

P a t e n t   C l a i m s

1. A cable haulage system with vehicles of which the pulley cradles (8) are supported on two horizontally spaced apart carrying cables (1) and can be coupled to the circulating haulage cable (2) via cable clamps (24), the haulage cable extending between the carrying cables, and in which means of opening and closing the cable clamps are provided in the stations, characterised in that the cable clamps (24) are movably connected to the pulley cradles (8) independently of the height of their clamped condition and have height adjusting means (25b) with which positioning means (36) provided in the stations are associated.
2. A cable haulage system according to Claim 1, characterised in that the haulage cable (2) runs on the top of the pulley cradles (8) and in that the cable clamps (24) engage around the underneath of the haulage cable.
3. A cable haulage system according to Claim 1, characterised in that the pulley cradles (8) comprise in addition to first pulleys (19) for support on both carrying cables (1) further pulleys (22) disposed substantially centrally between the carrying cables (1) and provided for support on a curvilinearly extending switching rail (23) provided in the stations.
4. A cable haulage system according to Claim 3, characterised in that the pulley cradles (8) have a frame (15) adapted to twist about its longitudinal axis.



5. A cable haulage system according to Claim 4, characterised in that the frame (15) comprises, connected to each other by a longitudinal member (9), two U-shaped tre system according to Claim 5 or 7, characterised in that the cable clamps (24) are constructed as toggle clamps and in that each has a housing (25) provided with an adjusting roller (25b), clamping jaws (27a, 28a) each being connected to a respective actuating roller (27c, 28c), the links (30) engaging the housings.



10. A cable haulage system according to Claim 1, characterised in that provided in the stations are positioning means which cooperate with the cable clamps (24).
11. A cable haulage system according to Claim 9 and 10, characterised in that the positioning means cooperate with the adjusting rollers (25b) of the cable clamps.

Three sheets of drawings



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