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Applicants: Von Roll
Transportsysteme AG
Industriestrasse 2
CH-3601 Thun (CH)

Inventor: Fritz Feuz
Rütlistrasse 5
CH-3600 Thun (CH)

Representatives:
Patent Attorneys
Schaad, Balass & Partner
Dufourstrasse 101
Postfach
CH-8034 Zurich (CH)

A cable transporter system.

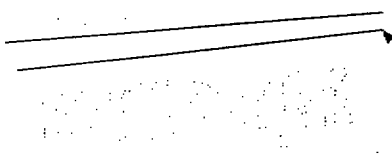
The cable transporter system which comprises in the stations respectively a crossover portion (8) between an alighting path (7) and a boarding path (9) has on the still straight starting portion (17) of each crossover path, driven wheels (20) and (21) and on the straight end portion (18) driven wheels (22) and (23). With regard to wheels disposed on the alighting path (7), the wheels (20) and (21) are driven at rotary speed which increase in stages so that vehicles (2) moving from this alighting path onto the crossover path are accelerated by wheels engaging friction shoes on these latter. A chain conveyor (13) extends between the wheels (21) and (22) of the crossover path (8) and transports the vehicles at increased speed and correspondingly increased distance from one another over the curves (8a) and (8b). The wheels (22) and (23) which are driven by the wheels of the boarding path (9) at rotary speeds which increase by grades, decelerate the vehicle once again before it reaches the boarding path. On the alighting and boarding paths, the vehicles can nevertheless be moved at minimal speed and at minimal distances from one another without colliding on the curve of the crossover path, the number of vehicles disposed thereon being kept to the minimum.

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

Cable transporter systems of the aforementioned type are known as heavy duty continuous rope-ways. In addition to the comparatively high rope speed, this performance is based on a large number of vehicles which are constantly circulating.

The time lapse between successive vehicles - also referred to as the cycle time - is in transporter systems of this type constant over the entire track and also remains unaltered even when passing through the stations. On the other hand, the travelling speed of the vehicles on the boarding path and on the alighting path is of necessity substantially less compared with the situation in which the vehicle is coupled to the cable. It follows therefrom that for the same time lapse two directly successive vehicles are all the closer to each other the lower the travelling speed which has to be maintained on these paths. There are however limits to this approximation of the vehicles in fact caused by the basic dimensions of the vehicle cabins, and the smallest radius of arc of the crossover path between the boarding and alighting paths. These dimensions which are as a rule determined define the minimum geometrical distance between successive vehicles and thus they also determine the time lapse of the installation at a given travelling speed.

In order to permit of further increases in performance, attempts have been made in some of the suspended cable railways currently in use to avoid a critical approximation of the vehicles on the crossover path by a high speed during boarding and alighting. High speeds in these areas are however at least inconvenient for the users and may even be likely to cause an accident under certain circumstances.



The object on which the invention is based is that of providing a cable transporter system in which, while at the same time improving the economy, the pattern of the crossover path has no effect on the minimum geometrical distance between cabins so that the travelling speed during boarding and alighting can be kept low and agreeable to the users.

The problem on which the invention is based can be resolved by the features according to the characterising part of Claim 1.

As a result of disposing the accelerating means at the commencement of the crossover path and prior to the arc or curvature thereof it is possible for consecutive vehicles to be spaced apart from one another at least sufficiently that the vehicle cabins are also spaced apart sufficiently on the curve.

An unexpected advantage of the solution according to the invention lies in the fact that for given structural conditions of the plant there is a smaller number of vehicles in circulation which have to observe a given cycle time (time lapse). By reason of the greater average travelling speed, the crossover path is negotiated in a shorter time. Since the crossover path constitutes the dead zone of the system, the reduction in the number of vehicles produces an improved economy. On the other hand, the structural expense involved in the solution according to the invention is minimal.

Since the solution according to the invention admits of low running speeds on the boarding and alighting paths, it is possible for these paths to be made short without any disadvantage for the users. As a rule, this fact also permits of shorter station buildings which has

favourable effects not only in terms of the structural costs but also for the general design.

A further advantage of the invention arises from the - gained by the higher travelling speed - greater geometrical distance between the vehicles on the crossover path in that a switch disposed in this path can also be actuated during normal operation for switching a vehicle in or out. This may be important when transporting disabled users or for transporting materials.

The solution according to the invention can also be applied in a crossover path which combines two sections of a system with each other.

Preferably, the acceleration means and the deceleration means are constituted by wheels which are driven at corresponding rotary speeds and which cooperate with friction shoes which are mounted on the vehicles. In order to allow driving of the wheels at different speeds, these latter are advantageously connected to one another by endless transmission elements, e.g. V-belts which are guided over V-belt pulleys of differing diameters. The drive for the wheels is advantageously derived from the drive of the cable pulley.

The means on the crossover path, which deliver at a constant speed, are expediently constructed as per se known chain conveyors which take over the vehicles from the accelerating means at the correspondingly increased speed, move them through the arc of the crossover path and finally transfer them to the deceleration means.

The cable transporter system according to the invention is explained in greater detail hereinafter with reference to an example of embodiment and with reference to the accompanying drawings in which:

Fig. 1 is a diagrammatic plan view of a station of a single-cable continuous rope-way and

Fig. 2 is a plan view of a detail from Fig. 1.

Reference numeral 1 in Figs. 1 and 2 denotes a track which in the station forms a U-shaped path for vehicles 2. Passing over the cable pulley 3 is a supporting and traction cable designated 4. The track 1 takes over the vehicles 2 by means of undercarriages 2a (Fig. 2) as they run into the station, as soon as they have been uncoupled from the cable 4.

Arrows 5 indicate the direction of travel of the vehicles 2. The track 1 extends in the direction of travel starting from a deceleration path 6, through an alighting path 7, a crossover path 8, an alighting path 9 and an acceleration path 10. Along the deceleration path 6 and the alighting path 7 on the one hand and the boarding path 9 and the acceleration path 10 on the other, extend wheel sets 11, 12 which are disposed above the track 1.

These wheel sets 11 and 12 can for example be so constructed and driven as is described and illustrated in Swiss Patent Application 02 468/86-8.

While the wheels of both wheel sets 11, 12 which are disposed in the region of the alighting path 7 or boarding path 9, are driven at what are inter se the same rotary speed, those wheels which are provided in the regions of the deceleration path 6 or acceleration path 10 rotate at different speeds from one another. These rotary speeds decrease in the direction of travel on the deceleration path 6 and increase in the direction of travel on the acceleration path 10. The wheels of the wheel sets act as friction wheels on friction shoes 2b

(Fig. 2) of the vehicles 2 or undercarriages 2a. Accordingly, the wheels of the corresponding paths decelerate or accelerate the vehicles after the takeover from the cable 4 or prior to delivery thereto; the wheels of the deceleration path act as braking means, while those of the acceleration path serve as driving means.

Reference numeral 13 generally denotes a per se known chain conveyor which is disposed on the crossover path 8 below the track 1 and it comprises a driving wheel 14. The chain conveyor 13 is provided with entraining means 15 which engage, in each case supporting a cabin 2b, suspension gear 2c on the vehicles 2, moving these latter at a given travelling speed.

According to the invention, then, the predetermined travelling speed in the region of the chain conveyor 13 is not equal to the travelling speed of the vehicles 2 on the alighting path 7 or boarding path 9 but it is considerably greater than this latter. For the higher speed, accelerating means 16 are responsible which act on a straight initial portion 17 of the crossover path 8 before the curvatures which are constructed as a quarter-circle arc 8a and 8b. On a straight end portion 18 of this path 8 there are on the other hand effective decelerating means 19 which decelerate the cabins from the given speed of the chain conveyor 13 to the travelling speed of the boarding path 9.

The accelerating means 16 and the decelerating means 19 are in the example shown constructed as wheels 20 and 21 or 22 and 23 which in each case form an extension of the wheel sets 11, 12. The wheels 20, 21 and 22, 23 are driven by the adjacent wheels of the wheel sets 11 and 12 through (not shown) V-belts and belt pulleys. By reason of the grading of the diameters of the belt pulleys of the associated wheels, these latter are driven at

higher gradings of rotary speeds, the wheel 21 having a higher rotary speed than the wheel 20 while the wheel 23 has a lower rotary speed than the wheel 22.

Fig. 1 further shows that both the drive of the wheel sets 11 and 12 and also of the chain conveyor 13 is derived from the cable pulley 3. To this end, the cable pulley 3 is coupled to a branching transmission 24 which is connected in a driving fashion to the transmissions 27 and 28 via shafts 25 and 26. The transmission 27 which is constructed likewise as a branching transmission drives the wheel sets 11 and 12 through shafts 29, 30.

Finally, the transmission 28 is connected via a shaft 31 to the driving wheel 14 of the chain conveyor 13 which is constructed for example as a sprocket.

The mode of action of the cable transporter system according to the invention is indicated in Fig. 1 by the position of the cabins 2. The vehicles 2 which are present at the station at the specific point in time are designated A, B, C etc. to differentiate between their positions at any given time.

The vehicles 2 are designated A, B and C on the alighting path 7. In this case, the vehicle A has entered the path 7 at what is assumed to be an elapsed time or time lapse. On the deceleration path 6, this vehicle had been braked from the cable speed of for example 4 m/sec to a travelling speed which permits of an effortless alighting of passengers, e.g. 0.2 m/sec. As a result of the reduction in travelling speed for a constant time lapse the vehicles A, B and C would be sufficiently close to one another that the distance between them would be a little greater than the cabin length.

Whereas the vehicle C is disposed briefly before the portion 17 occupied by the accelerating means 16, the vehicle D has already negotiated this portion and has arrived in the active zone of the chain conveyor 13. Under the action of the accelerating means 16, the vehicle D has assumed a higher travelling speed, e.g. 0.6 m/sec, which corresponds to the speed of revolution of the chain conveyor. Accordingly, the vehicle D is at an increased distance from the vehicle C. The chain conveyor 13 transports the vehicle D onwards at a higher travelling speed.

It is evident that when negotiating the curves 8a and 8b of the crossover path 8, the vehicle D can be hindered neither by the vehicle C nor by the vehicle E.

During the lapse in time which has just passed, the vehicle E was transported from the position assumed by the vehicle D and into the position shown at a constant speed by means of the chain conveyor 13.

During the same time interval, the vehicle F has passed through the portion 18 and has been decelerated thereby to the boarding speed. At this speed which is shown as being the same as that on the path 7, also the vehicle G moves on the boarding path 9. The vehicle H finally has left the boarding path 9 and is now accelerated on the path 10.

It should be noted that the travelling speed of the vehicles on the paths 7 and 9 does not have to be identical. Instead, the invention makes it possible to envisage different travelling speeds for these paths if this is expedient.

It must be added that the wheels 20, 21, 22 and 23 which act as friction wheels are preferably constructed as

pneumatically tyred wheels as may be the case for example for the wheels of the wheel sets 11 and 12.

It may be desirable to adapt the speed of the vehicles upon passage through the station to a given uniform rhythm (time lapse between two successive vehicles). In such a case, it is possible to dispose in parallel with the chain conveyor 13 a rhythmic conveyor on the crossover path 8, as described in Swiss Patent Application No. 05 105/86 (date of application: 18.12.86).

Patent Claims

1. A cable transporter system, particularly an aerial cableway of high conveyance capacity with, running around between two stations, at least one cable (4) with vehicles (2) adapted to be coupled to this cable, a track for the vehicles when they are uncoupled from the cable and in at least one station, and comprising in the direction of travel a deceleration path (6), an alighting path (7), a crossover path (8), a boarding path (9) and an acceleration path (10), braking means in order to reduce the travelling speed of the vehicles on the deceleration path and drive means in order to increase the travelling speed of the vehicles on the acceleration path, as well as conveyor means in order to maintain the vehicles in motion on the alighting path, the transfer path and the boarding path, characterised in that the conveyor means in the transfer path (8) comprise not only means (13) which promote a constant speed but also acceleration means (16) which operate upstream thereof in the direction of travel and deceleration means (19) which operate downstream thereof in the direction of travel.
2. A cable transporter system according to Claim 1, characterised in that the acceleration means (16) are disposed upstream of a curve (8a) while the deceleration means (19) are disposed downstream of a curve (8b) of the transfer path (8).
3. A cable transporter system according to Claim 1 or 2, characterised in that the acceleration means (16) and the deceleration means (19) each comprise at least one driven wheel (20 or 22) which cooperates with a friction shoe (2b) which is rigidly connected to the vehicles (2).



4. A cable transporter system according to Claim 3, characterised in that the drive for the wheels (20, 22) is derived from the cable pulley (3) at the station.
5. A cable transporter system according to Claim 3 or 4, characterised in that the acceleration means (16) and the deceleration means (19) each comprise a plurality of driven wheels (20, 21 and 22, 23).
6. A cable transporter system according to one of Claims 2 to 5, characterised in that the conveyor means of the boarding path (9) and of the alighting path (7) which are equipped with wheel sets (11, 12) are connected in a driving fashion to wheels of the acceleration path (17) or deceleration path (18) and to means (13) which operate at a constant speed.

