

The invention relates to a track arrangement for the vehicles of a haulage system according to the preamble to claim 1.

In the case of cable railway systems which are constructed as circulated gondola type railways, it is known practice for the number of vehicles in circulation to be adapted to the transport demands at any given time, in order to save on driving energy and to reduce the wear and tear on the system. For this purpose, vehicles which are not required at the time are parked on sidings which are associated with at least one of the stations of the system, being connected to the station track via switching points. The sidings mostly extend within the station building or a storage area, to protect the vehicles from the effects of the weather. With regard to the track arrangement, means are known in which one end of the siding forming a plurality of cohesive loops is connected to the alighting side while the other end is connected to the boarding side of the station track. In this case, the vehicles are pushed about on the siding by hand.

In the meantime, an arrangement of the type indicated in the preamble to claim 1 has become known. Viewed in longitudinal profile, the siding comprises a plurality of consecutive rising and falling portions. Associated with each of the rising portions is a chain conveyor which picks up the vehicles at the end of the falling portion and transports them to the start of the next

falling portion. The angle of inclination of the falling portion is so chosen that the vehicles are able to negotiate it under their own weight. However, practice has shown that the inevitable differences in rolling friction of the individual vehicles, to which also weather influences may contribute, result in different running properties. The consequences are problems in operation which have to be remedied by the operating staff, and in some cases there may even be damage to gondolas which collide or become jammed together. A basic disadvantage of this arrangement also lies in the fact that the structural costs are increased considerably. When dimensioning the clear height of the structural member intended to accommodate the arrangement, it is necessary to add to the height of the vehicle the additional height of the siding between the lowest and highest points of the longitudinal profile. This extra height has a tremendous influence on the cubature, since such an arrangement demands a considerable area of ground even with optimum design.

The object of the invention is to provide an arrangement which overcomes the aforesaid disadvantages.

This problem is resolved by the features set out in the characterising part of claim 1.

The horizontal run of the track line makes it possible to limit the clear height of the structural body to the height needed to accommodate the vehicles. In addition, the solution according to the invention makes it possible to provide on the track line not only clearly defined holding stations for vehicles and in

which the latter are automatically stored, but the vehicles remaining on the track line are automatically referred to other holding stations when one or more of them is or are withdrawn from the track line. Consequently, the vehicles present on the track line will always seek out and occupy this holding stations which are mostly closely adjacent to the outlet side. As a rule, since the track line comprises straight and curved portions, it is possible by matching the intervals between the abutments which define the holding stations to store the vehicles at the minimum distances from one another while at the same time deriving maximum benefit from the length of the track line.

Another transport arrangement of the type mentioned in the preamble to claim 1 is known from FR-A-2 593 759. With this apparatus, two-armed driving members on the conveyor are connected to it in such a way that they can pivot between an entraining position and a locking position being held in the entraining position by a spring. Vehicles the speed of which is greater than that of the conveyor are able to overtake the driving members by pivoting out of the entraining position. Each vehicle comprises an individually and selectively operable locking element which in its operative position produces a pivoting of the driving member into the locking position when the vehicle is moving forwards in relation to the conveyor. In the locking position, the second arm of the driving member engages into the path of such a vehicle and prevents its further forwards movement in relation to the conveyor. Here, no fixed abutments or vehicle sensors are associated with the track line and therefore clearly defined holding stations are not provided.

By way of example, an embodiment of the invention is described in greater detail hereinafter with reference to the accompanying drawings, in which:

Fig.1 shows the track arrangement in plan view in connection with a station of the circulating cable railway system which is construction as a gondola railway;

Fig.2 shows in elevation a portion of the track line in the arrangement shown in Fig. 1;

Fig.3 shows the detail from Fig. 2 but in a different working condition, and

Fig.4 is a cross-section through the track line.

Reference numeral 2 in Fig. 1 denotes a track line comprising a plurality of loops 25 formed from straight portions 22 and bends 24 which connect them. The track line 2 has an intake side 26 and an outlet side 28, both sides ending adjacent a station track of the gondola railway which is generally designated 10. In between an alighting section 12 of the station track 10 and the intake side 26 of the track line there are a connecting track 30 and a set of points 32. A further connecting track 40 with a set of points 42 is provided between the outlet side 28 of the track line 2 and a boarding section 14 which is connected to the alighting section 12 by a curved portion 16. Extending along and over the entire length of the track line 2 is a conveyor 4 constructed as a chain conveyor and only shown diagrammatically in Fig. 1 and which runs on a closed path which is connected to drive means, not

shown, for example the cable drive of the gondola railway. The chain conveyor 4 will be dealt with in greater detail hereinafter.

Distributed along the extent of the track line 2 are holding stations 6, the design of which is shown in Figs. 2 to 4. In order thereby to derive maximum benefit from the length of the track line 2, the intervals between holding stations 6 are shorter on the straight portions 22 than on the bends 24, where the vehicles have to be spaced apart by a greater distance due to their width. Indicated purely diagrammatically in Fig. 1 are such holding stations and also a plurality of vehicles 8 which are at rest at holding stations 6a to 6e on the track line 2.

As can be seen from Fig. 4, the track line 2 comprises, mounted on a T-shaped carrier 50 and formed by a round bar, a rail 52 which supports the running gear 20 of the vehicles 8 through wheels 18. Provided on the T-shaped carrier 50, at intervals corresponding to the spacing between the holding stations 6, are abutments 54 which co-operate with whichever is the leading wheel 18 of a set of running gear 20. The abutments 54 are constructed as depressions on an arm 56 of a two-armed lever 60 (hereinafter referred to as the abutment lever) which is pivotally mounted on the carrier 50 at 58. Furthermore, there is associated with each of the holding stations 6 on the track line 2 a vehicle sensor 62 which against the direction of travel is remote from the abutment of the corresponding holding station 6 by substantially the distance between centres of the wheels 18. The vehicle sensor 62 is constituted by a single-armed lever having an angled-over end part 63

and which is pivotally mounted on the carrier 50 at 64. A link member 66 connects the vehicle sensor 62 of one holding station 6 to an actuating member generally designated 68 of the adjacent holding station in the direction opposite to the direction of travel. The actuating member 68 comprises, pivotally mounted on the carrier 50 at 70, a two-armed lever 72 one arm of which is engaged by the link member 66 while its other arm carries a wheel 74 which engages a concavely formed guide surface 76 on the arm 56 of the abutment lever 60. The link member 66 carries between a position ring 78 and a second arm 80 of the abutment lever 60 a thrust spring 82 which maintains the abutment 54 normally in an inoperative position as shown in Fig. 2. Similarly, the thrust spring 82 maintains the vehicle sensor 62 in a position in which it projects into the profile of the wheels 18 and which the corresponding holding station 6 indicates to be unoccupied.

When a vehicle 8, indicated by its running gear 20, is present at a holding station 6, as shown in Fig. 3, its rear wheel 18 maintains the vehicle sensor 62 of this holding station in the position shown in Fig. 3. Equally, at the preceding holding station 6, via the link member 66, the lever 72 with wheel 74 is against the action of the tensioned thrust spring 82, maintained in an upright position, pivoted in an anti-clockwise direction, in which the abutment lever 60 is pivoted in a clockwise direction, while the abutment 54 locks the front wheel 18 of the vehicle 8 which is within this holding station 6.

Fig. 4 shows the chain conveyor 4 which, as already mentioned hereinabove, extends along the track line 2. The chain conveyor 4 comprises, disposed in a guide 90, a link chain 92 which carries on its upper side 94 entraining dogs 96 which are spaced apart at regular intervals. When the vehicles 8 are operating on the track line 2, the said projecting driving members 96 engage pawls 98 mounted on respective extension arms 100 of the running gear 20 to pivot about a horizontal axis 102. In principle, the gap between the projecting entraining members is freely selectable but it is expedient to keep this greater than the minimum acceptable distance between adjacent holding stations or abutments on the bends 24.

It can be seen from Figs. 2, 3 and 4 that each holding station is equipped with a circuit-breaker 84 mounted on a respective arm 56 on the abutment lever 60. In the inoperative position of the abutment 54 which is shown in Figs. 2 and 4, the circuit-breaker 84 is in a lowered position (shown by solid lines in Fig. 4). Accordingly, the pawl 98 of a vehicle 8, resting on the top 94 of the link chain 92, moves over the circuit-breaker 84 and remains in undisturbed engagement with the projecting entraining members 96. However, if the abutment 54 is raised into its operative position (Fig. 3), then the circuit-breaker is moved into the position shown by dash-dotted lines in Fig. 4. The pawl 98 of a vehicle 8 which is propelled by the chain conveyor 4 runs onto a ramp 86 provided on the circuit-breaker 84 and is then pivoted out of engagement with the entraining member 96. Accordingly, there is no longer any conveying effect on the vehicle 8 and it comes to a standstill at the corresponding abutment 54.

By virtue of the fact that the abutment 54 is constructed as a depression, the wheel 84 running onto it is caught and the abutment 54 likewise prevents a reverse movement of the vehicle 8. This also affords a guarantee that the vehicle sensor 62 associated with this holding station 6 assumes and retains the position shown in Fig. 3 which represents the presence of a vehicle 8. Compared with the position shown in Fig. 2, the vehicle sensor 62 was pivoted in a clockwise direction by the incoming wheel, and the angled-over end part 63 thereof then rests on the wheel. When a holding station 6 is left by a vehicle 8 after it has been released by the corresponding abutment 54, the vehicle sensor 62 is indeed released by the rear wheel 18 but the thrust spring 82 ensures that the vehicle sensor returns to the position shown in Fig. 2 and the actuating member 68 of the preceding holding station 6 allows the associated abutment 54 to return to the inoperative position. Therefore, the thrust spring 82 acts as a restoring member for the vehicle sensor and the abutment.

By way of explanation of the manner in which the track arrangement operates, it should be assumed that a vehicle 8 has to be shunted out of the circulating system. From the alignment section 12, therefore, this vehicle 8 is moved via the points 32 and the adjacent connecting track 30 to the intake side 26 of the track line 2 by hand. Thus, the vehicle 8 arrives within range of the chain conveyor 4 and, by means of its pawl 98, it is entrained by one of the projecting entraining dogs 96 thereof and is passed along the track line 2 without hindrance from the abutments 54 at the available holding stations 6. Since according to Fig. 1

the holding station 6e is occupied and its vehicle sensor 62 has via the link member 66 lifted the abutment 54 on the holding station 6f into the position shown in Fig. 3, the vehicle 8 arriving at this holding station is brought to a standstill as described hereinabove.

The process described is repeated automatically at further unoccupied holding stations when further vehicles 8 have to be shunted out of the circulating system and into the track arrangement, so coming into the range of action of the chain conveyor 4.

If vehicles which are being stored on the track line 2 have to be transferred to the circulating railway system, then means not shown but capable of being actuated for example by hand can render inoperative the abutment 54 which is associated with the holding station 6a. Such means can be provided instead of the vehicle sensor which is not required here. If, then, the vehicle 8 present at this holding station 6a is to be moved to the connecting track 40, then its vehicle sensor 62 will assume the position shown in Fig. 2. The abutment 54 of the immediately preceding holding station 6b thus becomes ineffective and releases the wheel 18 of the corresponding vehicle 8. At the same time, by pivoting of the circuit breaker 84 in an anti-clockwise direction together with the abutment lever 60, the pawl 98 can come to rest on the top 94 of the link chain 92 where it can be picked up by an entraining dog 96. While the corresponding vehicle 8 is consequently being transported to the holding station 6a and is brought to a standstill there in the manner described, the vehicle sensor 62 of the holding

station 6b can pivot into the position shown in Fig. 2 and so indicates the unoccupied state of that station to the preceding holding station 6c. Correspondingly, the abutment lever 60 at the holding station 6c likewise pivots and a vehicle 8 which is present there is released and is able to move closer to the outlet side by one holding station. The process described is repeated obviously at the appropriate intervals of time at all the other holding stations which are occupied by vehicles 8.

Instead of moving the vehicles by hand from the alighting section 12 to the intake side 26 or from the outlet side 28 to the alighting section 14, this task could also be taken over by conveying means under motorised operation. These conveying means, for example pneumatically tyred wheels, can be driven at the same speed as those which move the vehicles on the alighting and boarding sections 12, 14. Also the points 32 and 42 can be provided with a motorised drive and actuated automatically.

It is furthermore possible for the hand-over of vehicles from the track line 2 to the circulating system to be not only automated but to take place according to a predetermined sequence. For example, this sequence may be adapted to the original cadence of travel of the vehicles which are in circulation. Thus, vehicles which follow one another can be handed over at intervals of time which correspond to the original timing of the vehicles on the circulating system. In this respect, shunting of further vehicles into the circulating system may for example be so attuned to the encircling vehicles that the original rate of passage

is exactly halved. So that further vehicles enter the system at an exactly attuned point in time, it is possible in the case of a conveyor comprising entraining means for a starting position of these entraining means to be predetermined and then sought. Seeking or tracing the predetermined starting position of the entraining means can be carried out either at every stoppage of the conveyor or prior to whichever is the first release of a vehicle from the last holding station of the track line. If the conveyor drive is derived from the drive of the cable haulage system, then the coupling which is in any case required for stopping the conveyor can be used for tracing the predetermined starting position of the entraining means. It only remains to add that the conveyor is expediently stopped whenever the number of vehicles in circulation is in any case being maintained constant for the time being.

Expediently, a track arrangement according to the invention should be provided at both stations of a circulating system or at the end stations of a cable haulage system which comprises a plurality of sections. The track arrangement according to the invention can however also be installed as a storage section between circulating sections which form the sections of one common system. It is even conceivable for the intake side and the outlet side to be constructed so that they can be optionally connected to both circulating systems to make it possible for vehicles to be shunted both out of as well as into both circulating systems.



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Patent claims

1. A track arrangement for the vehicles of a haulage system, particularly a circulating cable railway system with, supporting the vehicles (8) by their running gear (20) and having an intake side (26) and an outlet side (28), a track line (2) and associated with the track line a conveyor (4) which has drivers (96) intended to entrain in each case one vehicle in the direction of travel, characterised in that extending along the completely horizontally extending track line of the conveyors and over the entire length there are distributed abutments (54) each of which is provided for one vehicle and in that the abutments are adapted for movement between an effective position defining holding stations (6) and an ineffective position, each of the abutments having an actuating member (68) and in that for each holding station there is a vehicle sensor (62) and a circuit-breaker (84), the vehicle sensor of one holding station being, with reference to a holding station preceding it in the direction of travel, connected both to the actuating member and also with its circuit breaker and in that the circuit breaker is constructed to act on the entraining connection between one driver (96) of the conveyor and a vehicle.

2. A track arrangement according to claim 1, characterised in that each vehicle sensor (62) consists of, pivotally mounted on the track line (2), a lever (64) which is connected via a link member (66) to the actuating member (68) of the abutment (54) of the holding station (6) precedent in the direction of



travel, and in that the vehicle sensor, the abutment and the circuit breaker (84) are subject to the action of a restoring member (82).

3. A track arrangement according to claim 1, characterised in that each abutment (54) is so constructed that it holds a vehicle (8) in the range of action of the associated vehicle sensor (62) and in that the abutment and the circuit breaker (84) are subject to the action of a restoring member (82).

4. A track arrangement according to claim 3, characterised in that the abutment (54) is constructed as a depression on a lever (60) pivotally mounted on the track line.

5. A track arrangement according to claim 1 or 2, characterised in that the vehicle sensor (62) is, under the action of a spring (82), held in a position which projects into the profile of the wheels (18) of the vehicles (8).

6. A track arrangement according to claim 2 or 5, characterised in that the actuating member (68) has, connected to the link member (66), a lever (72) which via a wheel (74) engages a guide surface (76) on the lever (60) which comprises the abutment (54).

7. A track arrangement according to claim 4, characterised in that the vehicles (8) have entraining detents (98) while the circuit breakers (84) in their operative position maintain the detents disengaged from the drivers (96).



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8. A track arrangement according to claim 7, characterised in that the circuit breaker (84) is rigidly connected to the abutment (54) of the associated holding station (6).

9. Use of the track arrangement according to one of the preceding claims as a holding section between adjacent sections of a circulating cable railway system comprising a plurality of sections.

Three sheets of drawings