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DRIVEN TROLLEY FOR SUSPENSION FROM AND TRAVEL ON A RAIL

The invention concerns a driven trolley for suspension from and travel on a rail. The invention particularly but not exclusively relates to a line trolley for use with a drag line device.

Similar line trolleys are described for example in German Patent DE 26 28 112 C2 of the Applicant. In this case, these are passive line trolleys, i.e. line trolleys without their own drive. In addition, there are driven line trolleys in particular for use with heavy loads, for example with a linear motor drive or with a gearbox motor drive using a direct current motor which drives the main supporting wheels by means of toothed belts or a separate driving wheel by means of a friction wheel drive.

Such known drives for line trolleys have the drawback that a gearbox has to be used in order to reduce the high speed of the direct current motor to the speed required to drive the supporting wheels. Mostly a bevel gear gearbox is used for this. However, each gearbox means additional production effort and cost and takes up a considerable amount of space. This is disadvantageous in particular because in the case of line trolleys space is often at a premium and a low unit height is imperative. The known drive methods are particularly disadvantageous when it is necessary to drive a plurality of supporting wheels, for example on both sides of the supporting rail, since complicated idler gears and ratios are required in the drive line for this purpose. Due to the slip occasionally occurring during operation of the line trolley, the known driven line trolleys must also have slip clutches for all the driven supporting wheels in order to prevent damage to the drive.

Therefore, the object of the present invention is to provide a driven trolley so that the supporting wheels can be driven at low cost while requiring little space.

According to the present invention a driven trolley for suspension from and travel on a rail, said trolley comprising a pair of co-axial supporting wheels carried on shafts, one of said supporting wheels being disposed for location on each side of said



rail, a driving motor having a driving shaft parallel to said supporting wheel shafts, and the ends of the motor driving shaft being connected by first and second belt drive means to said supporting wheel shafts.

The invention can be performed in various ways but one embodiment will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a side view of the trolley according to the invention suspended on a supporting rail, and

Figure 2 is a front view of the trolley shown in Figure 1.

The trolley 1 illustrated in Figs. 1 and 2 is suspended by means of four supporting wheels, three of which are designated 4, 4' and 5, on a rail 2 with a double-T cross-section, which is shown best in Fig. 2. The supporting wheels 4, 4' and 5 run on the inner transverse surfaces of the lower (inverted) T. In each case, two supporting wheels, namely the supporting wheels 4 and 4' and the supporting wheels 5' are arranged co-axial with one another and in each case run on one side of the rail 2. The shafts 7 and 7' and 8 of the two pairs of supporting wheels are parallel to one another. Each supporting wheel is connected by means of a hub 17 to the trolley 1. The shafts 7, 7' and 8 of the supporting wheels 4, 4' and 5 run through bearing hubs 17, and on the outside protrude therefrom. Driving wheels 18, 19 and 20 are secured on the outer ends of the shafts 7, 7' and 8 so that rotation of these driving wheels 18, 19 and 20 causes leads to rotation of the associated supporting wheels 4, 4' and 5.

While supporting wheels 4, 4' and 5 have shafts running horizontally, additional guiding wheels 21, 22 and 23 associated with each supporting wheel 4, 4' and 5 are provided with vertical shafts, the axes of the guiding wheels 21, 22 and 23 intersecting with those of the supporting wheels 4, 4' and 5. The horizontally arranged guiding wheels 21, 22 and 23 serve for lateral guidance of the trolley 1 and to this end bear on the ends of the transverse members of the inverted T of the double-T shaped rail 2.

On its underside the trolley 1 has a line carrying device 16 which takes the form of an essentially semi-circular double-sided support on which to lay lines, hoses, cables and the like. On its front and rear side, viewed in the path of the rail 2, the trolley 1 in each case has a buffer 24 and 25 which acts as a damper when two trolleys 1 run into one another or one trolley 1 runs into the wall.

The trolley 1 is driven by a three-phase motor 3 which is disposed with its driving shaft 6 parallel to the shafts 7, 7' and 8 of the supporting wheels 4, 4' and 5. The driving motor 3 is located under the arrangement of supporting and guiding wheels and over the supporting device 16 for the lines roughly level with the buffers 24 and 25. This is a synchronous three-phase motor, i.e. a motor which runs at nominal speed and without load practically without current and whose speed can be regulated precisely by the control frequency. The driving motor 3 has a driving shaft 6 which projects on both sides and on each side carries a driving wheel 26 and 27 respectively. The breadth of the driving wheels 26 and 27 is essentially identical with the breadth of the driving wheels 18, 19 and 20 which are located on the shafts 7, 7' and 8 of the supporting wheels 4, 4' and 5. The driving wheel 26 is disposed in a plane with the driving wheels 18 and 20 of the supporting wheels running on one side of the rail 2; the other driving wheel 27 is disposed in a plane with the driving wheels 19 which are associated with the supporting wheels 4' running on the other side of the rail 2. As a result, in each case three wheel shafts, namely the shaft 6, 7 and 8 and the shafts 12, 7' and the shaft not shown running co-axially to the shaft 8 form a triangle lying in one plane. A V-belt or toothed belt 9 or 10 runs over the wheels associated with each shaft triangle. As can be seen from Fig. 1, the driving wheel 26 on the end 11 of the driving shaft 6 of the motor 3 drives the V-belt 9 which runs over the two driving wheels 18 and 20. Since the supporting wheels 4 and 5 are axially secured to the driving wheels 18 and 20, rotation of the driving shaft 6 of the motor 3 causing to rotation of the supporting wheels 4 and 5 and hence to movement of the trolley 1 on rail 2. The same driving process takes place in mirror-image form on the other side of the rail 2.

The driving motor 3 is mounted on an adjustable arm 13 and can be adjusted and fixed relative to a shaft 31 running parallel to the driving shaft 6 with the aid of an adjusting device 30. Thus, the belts 9 and 10 are tensioned when the arm 13 is pivoted downwards and relaxed when it is pivoted upwards.

The driving motor 3 is connected to a frequency changer whose electrical construction is essentially known. Thus, the speed of the motor 3 can be controlled by means of the output frequency of the frequency changer. The frequency changer is connected so that in the event of a rise in current due to a reduction in the speed of the trolley 1 and hence the speed of the motor 3 the control frequency is adapted to the new speed.

The trolley 1 is operated with a drag line device as follows:

After suspension from the rail 2 and loading of the carrier device 16 with lines, cables and hoses (not shown) and connection of the motor 3, the device is ready for operation. As a rule a plurality of line trolley 1 are arranged on a rail 2 behind one another. Here, this can be an assembly line rail in a motor vehicle production plant or a rail arrangement for the travelling carriage of a crane. When the end user attached to the rail, i.e. the travelling carriage for example, is to be moved, the driving motors 3 of each trolley 1, are activated. For this, preferably the frequency is slowly ramped up and the speed continuously increased. A plurality of trolley 1 are activated with different frequencies by a common circuit, the trolleys 1 standing next to the travelling carriage being activated with the highest frequency and the trolley 1 furthest back with the lowest frequency. This corresponds to the different optimum speeds of the line trolleys when the travelling carriage is moving.

Should slip occur in operation, the current consumed by the driving motor 3 increases, which leads to adjustment of the drive frequency. If, for example, one trolley runs into another, the resulting increase in current leads to a reduction in the control frequency. Since a frequency-controlled three-phase motor can turn at any slow speed in practice, creeping or inching and slow starting are also possible.



1. A driven trolley for suspension from and travel on a rail, said trolley comprising a pair of co-axial supporting wheels carried on shafts, one of said supporting wheels being disposed for location on each side of said rail, a driving motor having a driving shaft parallel to said supporting wheel shafts, and the ends of the motor driving shaft being connected by first and second belt drive means to said supporting wheel shafts.
2. A trolley as claimed in claim 1, in which a second set of co-axially disposed supporting wheels is provided on both sides of the rail.
3. A trolley as claimed in claim 2, in which the second set of supporting wheels is connected by means of the first and second belt drive with one or the other end of the driving shaft and thus driven.
4. A trolley as claimed in any one of the preceding claims, in which the driving motor is disposed on an arm which can be adjusted and fixed and the adjustment of which changes the tension of the or each belt of the belt drives means.
5. A trolley as claimed in any one of the preceding claims, in which the driving motor is a three-phase motor which is actuated by a frequency changer and thus variable in its speed by changing the control frequency.
6. A trolley as claimed in claim 5, in which in the event of a rise in current as a result of a reduction in the speed of the trolley the frequency changer adapts the frequency to the new speed accordingly.
7. A trolley as claimed in any one of the preceding claims, which includes a line carrying device and is provided with a rail with a double-T shaped cross-section for use with a drag line device.
8. A trolley substantially as described herein with reference to and as shown in the accompanying drawing.