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Giraud

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[54] **TRANSPORTATION INSTALLATION WITH A PLURALITY OF STATIONS**

[72] Inventor: **Francois L. Giraud,** Plaisir, France

[73] Assignee: **LTV Aerospace Corporation,** Dallas, Tex.

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[58] **Field of Search** ....104/23 FS, 88, 89, 93, 96, 104/105, 112, 118, 121, 130, 131, 147, 261; 105/141, 146, 147; 198/185; 214/38 CB, 42 R

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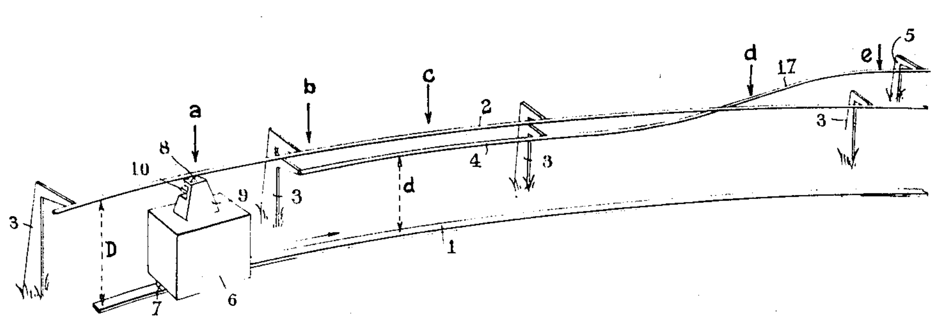
Primary Examiner—Gerald M. Forlenza
Assistant Examiner—D. W. Keen
Attorney—Walter J. Jagmin et al.

[57] **ABSTRACT**

A transportation installation having a lower substantially horizontal conveyor and a guide rail extending parallel to and spaced above the conveyor and a car transportable by the conveyor having a shoe frictionally engageable with the conveyor at its bottom, a guide wheel vertically movably mounted on its upper top end and means for moving the guide wheel upwardly into engagement with the guiderail during movement of the car by the conveyor. The installation includes at least one station to which the car may be switched from the conveyor, each of the stations including a carrier rail having an upstream portion parallel to and spaced below the guide rail, an intermediate portion which is spaced laterally and upwardly from the guide rail, a downstream portion which is parallel to and spaced below the guide rail, and connector portions extending convergently laterally outwardly and upwardly from the upstream and downstream portions to the upstream and downstream ends of the intermediate portions.

20 Claims, 4 Drawing Figures



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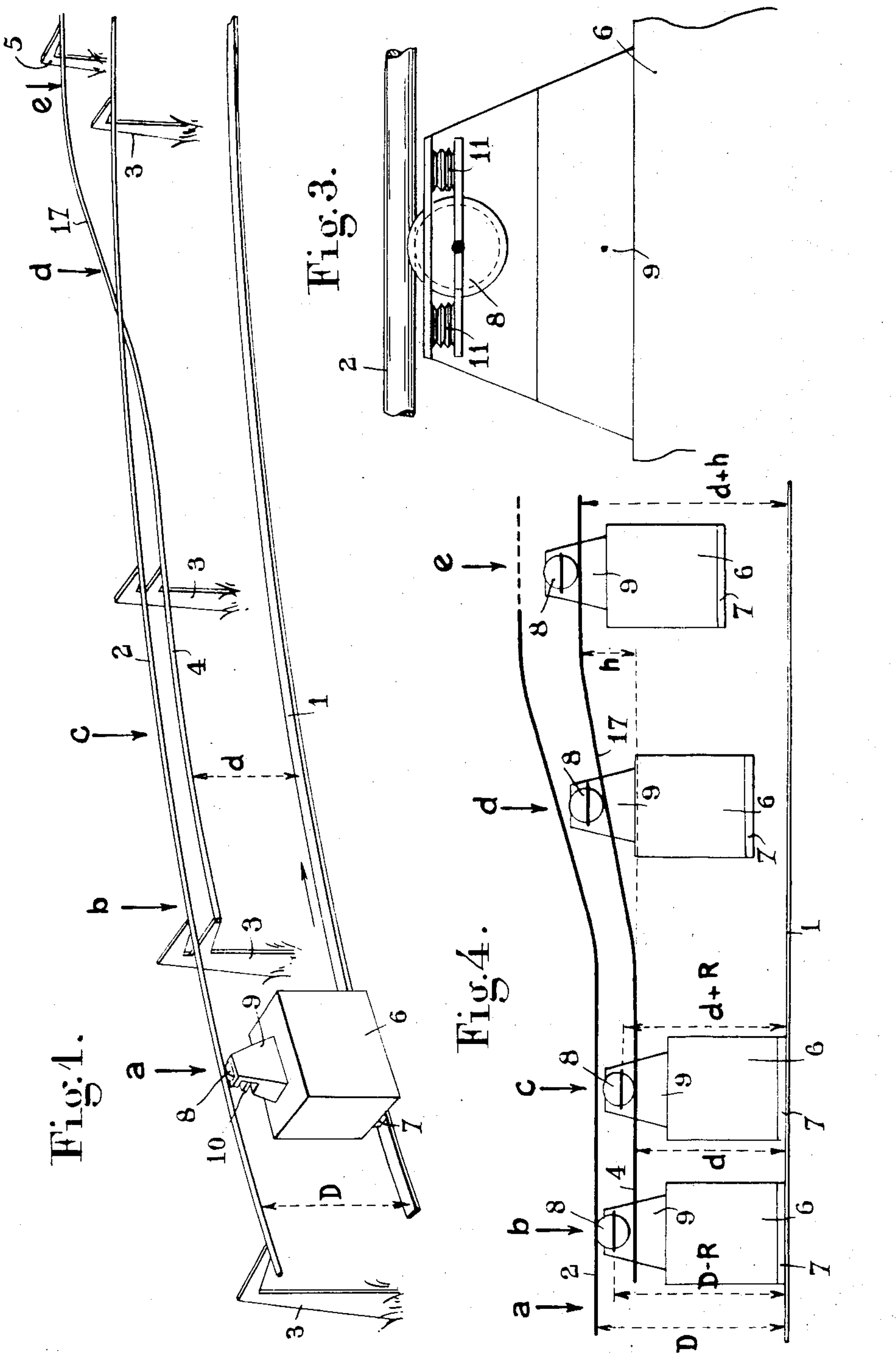
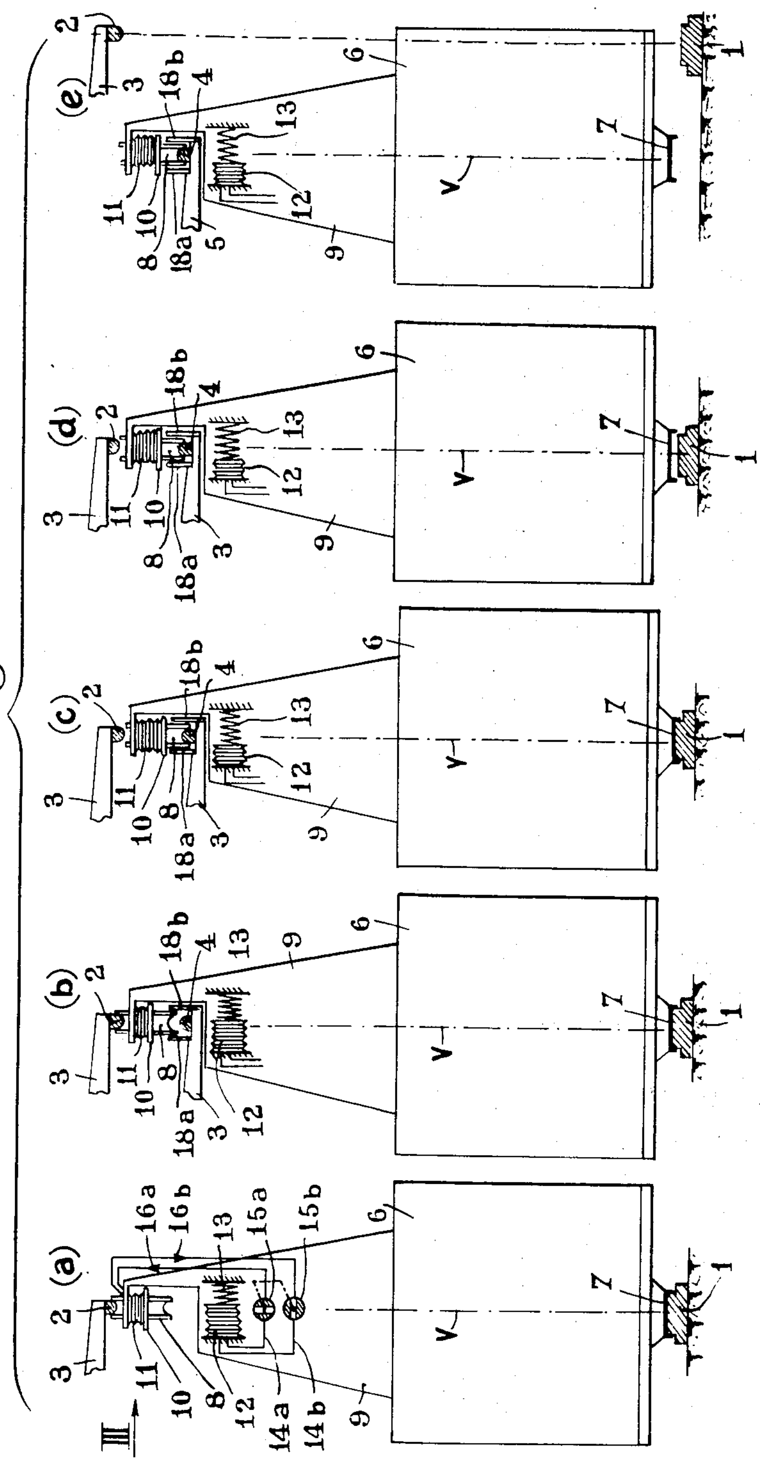


FRANCOIS L. GIRAUD
INVENTOR
BY Walter J Jog
ATTORNEY

Fig. 2.



FRANCOIS L. GIRAUD
INVENTOR
BY [signature]
ATTORNEY

TRANSPORTATION INSTALLATION WITH A PLURALITY OF STATIONS

The present invention relates to a transportation installation, particularly for passengers.

There are numerous applications for transportation installations, particularly for passengers, which make it possible to serve a relatively large number of stations, situated at average distances from one another; as non-limiting examples of these applications, there are urban and suburban transportation systems, the service of various pavilions at an exposition or of the various locations of a technical or administrative center, etc.

All these applications necessitate transportation installations having a high traffic capacity, high frequency of service of each of the stations, as well as the possibility of selective service of each station of the installation from any other station. The latter condition is particularly difficult to meet because at any given moment and in a given station in the installation, the number of passengers wishing to go to another station in the installation is relatively small, in direct proportion to the number of stations in the installation and provided that the traffic is distributed in a substantially uniform manner among them. This problem can be solved by equipping the passenger transportation installation with a large number of vehicles, each of small capacity and capable of being moved from any station in the installation toward another freely chosen station. But, although the use of small-capacity vehicles, i.e., designed, for example, for two or four passengers only, offers the great advantage of a substantial reduction in the time necessary to unload and reload each vehicle in each station, this is incompatible with the obtention of high traffic capacity except insofar as the vehicles, independently of one another (i.e., not "coupled"), follow one another on the main track of the said installation at very short intervals, corresponding, for example, to a period of several seconds. The embodiment of a transportation installation of the type mentioned, having high traffic capacity, therefore raises the problem which is technically very difficult to solve, of the temporary and selective stopping at selected stations of the installation of some of the many vehicles following one another at very short intervals on the main track of the said installation. If each station of the installation is served, for example, by a special side or secondary track connected to the main track, the said problem is one of selective shunting or switching toward some of the side tracks of the installation of certain of the many vehicles following one another at very short intervals on the main track; in other words, it is a matter of a problem of selective switching at a very fast rate. A technical solution of this problem cannot be conceived of unless the instantaneous positions of the various vehicles on the main track of the installation are defined with very great precision, i.e., in particular, with an error much smaller than the interval provided between the various, successive vehicles, which also implies an equally high precision as to the instantaneous speed of the various vehicles. Moreover, the use of vehicles of small capacity, hence of relatively small size, does not make it easy to equip them with a self-contained source of energy which would very substantially increase their bulk, weight and cost.

The transportation installation according to the present invention makes it possible to solve all the

problems and meet all the conditions indicated above under the best conditions of technical simplicity and profitability. It is characterized in that it comprises a main track which is formed essentially by a conveyor, placed on the ground, and by a guide rail supported at a generally constant distance D above the said conveyor, side or secondary tracks, each of which serves a station and is formed essentially by a carrier rail passing below the guide rail of the main track, in an incoming switching zone, and an outgoing switching zone, where the carrier rail is supported at a distance d, less than the distance D, above the conveyor, while in the sections of each secondary or side track, the carrier rail is supported at a distance greater than the distance d above the ground, as well as passive vehicles which can rest by means of at least one lower shoe on the conveyor of the main track, and which are each equipped at the top with at least one wheel of radius R which is less than $(D-d)/2$, and of means for varying in a switching zone the distance from the axle of this wheel to the shoe of the vehicle, between the two values $(D-R)$ and $(d+r)$.

Since the main track of the transportation installation according to the present invention is constituted essentially by a conveyor of known type, of a belt, cable, chain or other suitable type, the speed of which can easily be kept constant and largely independent of the load on the said conveyor, the instantaneous positions and speeds of the vehicles which it entrains are always defined with sufficiently high precision to eliminate any error in the selective switching of the vehicles from the said conveyor to the secondary or side tracks serving the various stations of the installation, even in the event the said vehicles follow one another on the conveyor at small enough intervals to obtain a high traffic capacity. The transportation installation according to the present invention can therefore be equipped with a relatively high number of vehicles of small capacity, hence of small size, whose stopping times at the stations can consequently be very brief. The use of a conveyor to constitute the main track of the transportation installation according to the present invention offers the additional advantage of permitting the accommodation of exclusively passive vehicles without any self-contained source of energy capable of increasing the size, weight and cost of each vehicle.

In a preferred form of embodiment of the transportation installation according to the invention, the means with which each vehicle is equipped to vary the distance from the axle of the upper wheel to the lower shoe, comprise a set of communicating, elastic bellows by means of which the said axle is suspended from a pylon solid with the upper part of the vehicle, as well as means for varying the expansion of the said elastic bellows, in particular their degree of filling by a fluid under pressure. Each vehicle preferably comprises at least one variable chamber in controllable communication with the set of suspension bellows, and subjected to an action of a compression by an elastic means, as well as means for temporarily opening in a switching zone, the communication between the said variable capacity chamber and the said set of suspension bellows; the variable chamber is constituted by an auxiliary bellows mounted on a fixed part of the vehicle and subjected to the action of a compression spring; finally, the variable chamber can be connected to the set of suspension bellows by two pipes, in which are inserted, respectively, two control valves and two check valves with mutually opposing directions of flow, and means are provided to open, in a switching zone, one of the two control valves, and close the other.

The use of passive vehicles in the transportation installation according to the present invention, raises however the problem of controlling them on the secondary track serving each station, with a view in particular to stopping them at the corresponding station, then starting them up again and accelerating them toward the outgoing switching zone where they must reach the speed of the conveyor in order to be switched toward the latter; this problem is solved in a particularly advantageous fashion in a preferred form of embodiment of the transportation installation according to the invention, in which each vehicle is equipped with a device for braking its wheel, in particular on the carrier rail of a secondary track, in order to stop the vehicle at the corresponding station; in this case, preferably, the brake device of each vehicle, of hydraulic or pneumatic type, is fed from the set of suspension bellows, where, during the braking on the carrier rail of a side track, a maximum pressure prevails that is substantially proportional to the loaded weight of the vehicle. Thanks to the latter arrangement, the action of the brakes of each vehicle engaged on a side track is always proportional to the pressure prevailing in the set of suspension bellows; in other words, the braking power on the vehicle wheel is always proportional to the weight of the loaded vehicle, so that decelerations of the said vehicle on the side track can be rendered largely independent of its working load. In a variant, at least one of the side tracks can comprise, before the corresponding station, means to brake the wheel of the vehicle to be stopped at the said station, these means including for example, a rising ramp and/or a track brake. Moreover, each of the side tracks must comprise, beyond the corresponding station, means for accelerating the vehicle stopped at the said station, up to the speed of the conveyor. The latter means can be, for example, a descending ramp, formed by the carrier rail of the side track considered.

Furthermore, the carrier rail of each side track can have, before the outlet of its incoming shunting zone, a rising ramp which causes the vehicle to rise above the conveyor of the main track; naturally, this rising ramp can be proportioned to produce at least partial braking of the vehicle which is necessary in order to stop it at the station served by the considered side track. Likewise, the carrier rail of each secondary track has to form, somewhat beyond the entrance to its switching zone, a descending ramp to bring back down to the level of the conveyor of the main track each vehicle emerging from the station served by the side track considered; naturally, this descending ramp can likewise be proportioned so as to accelerate the vehicle to the speed of the conveyor.

A form of embodiment of a passenger transportation installation according to the present invention has been described below and illustrated schematically in the attached drawing.

FIG. 1 represents schematically, in perspective, the incoming switching zone of the secondary or side track serving one station of the transportation installation.

FIG. 2 represents, in a plane perpendicular to the tracks in FIG. 1, the various phases in the switching of a vehicle from the conveyor constituting the main track toward the said side track.

FIG. 3 is a partial view in the direction of arrow III in FIG. 2*a*.

FIG. 4 is a schematic view illustrating the working of the incoming switching zone represented in FIG. 1.

The passenger transportation installation according to the present invention comprises a main track, which is formed essentially by a conveyor **1**, (FIG. 1), placed on the ground, and by a guide rail **2**, supported, for example, by pylons **3**, suitably spaced at a distance D, which generally is constant, above the conveyor **1**. The conveyor **1** is preferably of a known type, such as a belt, cable or chain type, or some other suitable type. Along the main track of this transportation installation and somewhat removed from this main track, stations (not shown) are disposed, each of which is served from the said main track by a secondary track diverging from the main track into a first switching zone known as the "incoming" switching zone, then passes to the corresponding station, and finally converges with the main track in a second, so-called "outgoing" zone. FIG. 1 which represents an incoming switching or shunting zone, shows that each switching track is formed essentially by a carrier rail **4** which, in each of the two secondary zones, is supported, for example, by the same pylons as the guide rail **2** of the main track, or by special pylons at a distance d, less than the distance D, above conveyor **1**, i.e., below the said guide rail **2**; in the sections of each side track other than its two switching zones, hence in particular in the passage through the corresponding station, the carrier rail **4** is supported, for example, by pylons **5** at a distance greater than d above the ground. The transportation installation according to the present invention also comprises passive vehicles **6**, i.e., vehicles without a self-contained source of energy, which are adapted to cooperate sometimes with the main track and sometimes with the side track serving one of the stations of the installation; since each of the passive vehicles **6** is made in a small capacity, (for example for two or four passengers only), it can be of a relatively small size, light weight and low cost, which is particularly advantageous to the embodiment of transportation installations with high traffic capacity comprising a large number of small vehicles of this type. In the said form of embodiment of the invention, each vehicle **6** is equipped at the bottom with a shoe **7** by means of which it can rest in particular on conveyor **1** of the main track, and is equipped at the top with a wheel **8** whose radius R is less than $(D-d)/2$; according to the present invention, means are provided to vary, particularly in a switching zone, the distance from the axle of wheel **8** of each vehicle to its shoe **7**, between the values $(D-R)$ and $(d+R)$. In the case of the said form of embodiment of the invention, the means for varying the distance from the axle of wheel **8** of each vehicle to the shoe **7** are embodied as follows: as seen in FIGS. **2** and **3**, the axle of wheel **8** is mounted on a support **10**, for example in the form a plate, which is itself suspended from the upper end of pylon or bracket **9** by a set of communicating bellows **11**, filled with a fluid under pressure; in this form of embodiment, this set of communicating bellows comprises a single pair of bellows aligned in the direction of movement of the vehicle, and a choke can be provided, in known fashion, in the communication between these two bellows (this communication, as well as the corresponding choke, have not been shown, in order not to complicate the figure); coil or leaf springs, also not shown, can optionally be provided between the support **10** and the upper end of bracket **9**, so as to compress the set of bellows **11**. Furthermore, a variable chamber, constituted essentially by an auxiliary bellows **12** (FIG. **2**) is mounted on a fixed part of the vehicle, for example, on bracket **9**, so as to be subjected to the action of a compression spring **13**; the variable chamber **12** is connected to the set of bellows **11** by two pipes **14*a*** and **14*b***, in each of which is inserted a control valve **15*a*** or **15*b*** and a check valve **16*a*** or **16*b***; the two check valves **16*a*** and **16*b*** are mounted in such a way as to have mutually opposing directions of passage, as indicated by the arrowhead symbols which represent these check valves diagrammatically in FIG. **2*a***; furthermore, the two control valves **15*a*** and **15*b*** are coupled to one another by known means which therefore need not be described and which have simply been symbolized by a dotted connecting line, so that one of the two control valves **15*a*** and **15*b*** is always in open position, and the other is closed, as represented in FIG. **2*a***. Naturally the coupling of the two control valves **15*a*** and **15*b***, each of which is a two-way valve, can be embodied by combining them into a single control valve with at least three passages. The set of suspension bellows **11**, as well as auxiliary bellows **12**, contains a total volume of fluid under pressure that is less than the sum of maximum volumes. Finally, means are provided to open, in a shunting zone, preferably automatically, one of the two control valves **15*a*** and **15*b***, consequently, to close the other.

Each of the passive vehicles **6** of the said transportation installation is equipped with a device (not shown) to brake its wheel **8**; it can be a matter of a braking device of known type, hydraulic or pneumatic, which therefore need not be described in detail; preferably, this braking device, with which each vehicle is equipped, is fed from the set of suspension bellows **11**, through a suitable duct (not shown), either directly, in the event the braking device can be fed by the same fluid under pressure as the set of suspension bellows, or through a suitable converter device, optionally of known type, in the event the brake fluid is different from the fluid filling the set of suspension bellows. Moreover, carrier rail **4** of each secondary track can form a rising ramp (**17** in FIG. **4**) somewhat before the outlet from its incoming shunting zone, so that beyond the outlet of the incoming switching zone, carrier rail **4** of the side track is supported (by pylons similar to **5** in FIG. **1**), at a distance above the ground greater than d, which the said carrier rail retains up to a point close to the outlet from the station served by the said side track; below this station, the carrier rail of the side track forms a descending ramp which returns the said carrier rail to the entrance of the outgoing shunting zone, at a distance above the ground, and hence above conveyor **1**, which is exactly equal to *d*.

The passenger transportation installation according to the present invention, as just described, works as follows:

Between two successive stations of the installation, the passive vehicles rest, at regular intervals, each with the under face of its lower shoe **7** on the top face of conveyor **1** of the main track which entrains them at uniform speed; and since control valve **15*a*** of the two valves **15*a***, **15*b***, is closed, which would optionally permit auxiliary bellows **12** to empty into the set of suspension bellows **11**, through check valve **16*a***, while control valve **15*b*** is open, which permitted the set of suspension bellows **11** to empty into auxiliary bellows **12**, the latter is at maximum extension; while the set of bellows **11** is compressed by the aforementioned elastic parts (not shown), so that support **10**, on which the axle of wheel **8** is mounted applies the top of the rim of this wheel **8** against the running surface facing downward of guide rail **2**. This situation is illustrated in FIG. **2**a, which corresponds to the passage of vehicle **6** at point a in FIG. **2**. Naturally, the braking device for wheel **8** of vehicle **6** is then released, so that the wheel can rotate in contact with guide rail **2**. When a vehicle **6**, entrained by conveyor **1**, reaches the upper end b of the incoming shunting zone of a side track serving a station of the installation, a comparator (not shown), fixed for example to the lower shoe **7** of vehicle **6**, or to its pylon or bracket **9**, compares the coded indication of the corresponding station, which is born by a suitable part (not shown), fixed close to one edge of conveyor **1**, or close to one of the rails **2** and **4**, for example on one of the pylons **3**, with a coded indication of the destination of vehicle **6**, which was, for example, selected by the passenger or passengers, using known means which need not be described. If the indication of the destination selected by the passengers, on the one hand, and the code of the station, on the other coincide, the said comparator produces a signal, an electric one, for example, which is transmitted to a device, an electromagnetic one for example, controlling valves **15*a*** and **15*b***, coupled to one another, so as to open the first and close the second; consequently, auxiliary bellows **12** is emptied, partially and gradually into the set of suspension bellows **11**, under the influence of compression spring **13**; the result is a gradual expansion of the set of suspension bellows **11**, and consequently a gradual descent of support **10** on which the axle of wheel **8** is mounted, the whole being proportioned in such a way that when bellows **11** and **12** have exchanged their respective states of maximum and minimum fullness, the bottom of the rim of wheel **8**, guided by lateral parts **18*a*** and **18*b*** (FIG. **2**, *b – c*) comes in contact with the upper running surface of carrier rail **4** of the side track considered (the case illustrated in FIG. **2*c***, which corresponds to the passing of the vehicle at point c in FIG. **1**), the said wheel **8**, naturally, ceasing to cooperate with guide rail **2** of the main track, although vehicle **6** does not cease to rest with shoe **7** on conveyor **1** of the main track. Since wheel **8** of vehicle **6** now begins to climb ramp **17** formed by carrier rail **4**, the lower shoe **7** of the said vehicle is gradually raised above conveyor **1** of the main track, as can be seen in FIG. **2*d*** and **4**; between points *d* and *e* in FIG. **1**, corresponding respectively to parts d and e in FIG. **2**, the carrier rail **4** of the side track considered diverges from the vertical plane v passing through the centers of the guide rail **2** and the conveyor **1**; furthermore, as seen in FIG. **4**, at the exit from rising ramp **17**, carrier rail **4** of the side track is supported, for example, by pylon (not shown in FIG. **4**) at a distance $d + h$ above the ground, such that the lower shoe 7 of vehicle 6 passes largely above all the irregularities of the ground; the slope of rising ramp 17 formed by carrier rail 4 is preferably selected so that each vehicle 6, at the top of ramp 17 will have a speed substantially less than its speed of entrainment by conveyor 1, and still just enough to bring the vehicle into the station (not shown) served by the said side track; in this station, automatic means, of which there are numerous known forms of embodiment, hence it is unnecessary either to describe or represent them, cause the application of the braking device of wheel 8 on vehicle 6, and stop the latter in the station, with a view to its unloading and perhaps reloading. In the form of embodiment considered, in which the braking device for the vehicle is fed from the set of suspension bellows 11, in which at this time a maximum pressure, substantially proportional to the loaded weight of the vehicle, prevails, the application of this braking device is suitable retarded, with respect to the moment when the set of suspension bellows 11 reaches its state of maximum fullness, for example, by the insertion of known retarding devices or chokes in the duct (not shown) connecting the said set of suspension bellows 11 to the braking device. Means which are likewise automatic and, optionally, known, can likewise be provided in each station which, after release of the brake on the stopped and reloaded vehicle, push the said vehicle to the top of the descending ramp provided near the exit from the said station; this descending ramp is preferably proportioned so that the passive vehicle 6, after having run freely with its wheel 8 on the carrier rail 4 beyond the said station, reaches the entry of the outgoing switching zone of the corresponding secondary or side track with a speed that is preferably very close to that of conveyor 1 of the main track, and at a height above the ground selected so that the lower shoe of vehicle 6 will rest on the upper face of the said conveyor 1 without having upper wheel 8 cease to work with the carrier rail (as in FIG. 2*c*). The automatic means already mentioned and not shown, then cause the reversal of the positions of the two control valves 15*a* and 15*b*, so that the elastic parts acting on the set of suspension bellows 11 will cause the partial and gradual emptying of the latter into the fixed supplementary bellows 12 through check valve 16*b* and control valve 15*b*, now open; the compression of the set of suspension bellows 11 causes, with the aid of support 10 of the axle of wheel 8, the rise of the latter, back into the position in which it works with the running surface of the guide rail 2 of the main track (as in FIG. 2*a*). Naturally, the switching of the passive vehicle 6 from the side track under consideration toward the main track takes place in very gentle fashion, without jolting or acceleration which can be unpleasant to the passengers because the vehicle is propelled at a speed very close to that of the conveyor of the main track, when its lower shoe 7 comes to rest on the upper face of the said conveyor. Likewise, in the course of the braking phase of the vehicle, for stopping it in a station, the same advantages are obtained, not only thanks to the use of a very gradual braking device, but thanks also to the fact that the latter is fed from the set of suspension bellows in which the pressure prevailing therein is then substantially proportional to the loaded weight of the vehicle, so as to obtain a braking power exactly matched to this loaded weight. When the passive vehicle is running on the carrier rail of a side track, its two suspension bellows 11 aligned in the direction of movement of the vehicle, and communicating by means of a choke, compensate for the effects of pitching due to irregularities that may be present in the side track and the carrier rail. In each outgoing switching zone, lateral guide parts facing downward, the function of which is similar to that of lateral guide parts 18*a* and 18*b* in FIG. 2*b*, can be provided somewhat before the exit from this switching zone, on the guide rail or the main track.

The form of embodiment of the transportation installation according to he present invention just described, can be varied in many ways, some of which are obvious to the man of the art, and all of which come within the scope of the invention. A few of these variants will be indicated below. The running tracks serving the various stations of the installation can form closed loops, each passing through the corresponding station, and tangent to the main track in a single zone, the upstream part of which (in the direction of movement of the conveyor of the said main line) serves as an incoming switching zone, and the lower part, as an outgoing switching zone. At least one of the guide rails of the main track and the carrier rail of each side track can be aligned with another parallel rail; the two parallel rails can be supported in the same vertical plane, one of them being eliminated in each switching zone; likewise, there can be two continuous parallel rails, supported in the same horizontal plane, i.e., substantially parallel to the ground, in which case each passive vehicle must have at least two vertical wheels to cooperate, respectively, with the two parallel rails. However, even in the case of single rails, each passive vehicle 6 can be equipped with a plurality of vertical wheels, aligned in the direction of movement of the vehicle, and mounted, for example, on a support in the form of a single plate suspended from the upper end of the upper bracket of the vehicle by a single set of suspension bellows. The set formed by two suspension bellows aligned in the direction of movement of the vehicle described above, can be complemented by two additional suspension bellows aligned perpendicularly to the direction of movement of the vehicle, and serving, in particular, to compensate for the rolling effects to which the said vehicle can be subjected when it is running on the carrier rail of a side track; these two supplementary suspension bellows must then communicate with one another, and optionally with the two principal suspension bellows, preferably through chokes. The means for varying the distance from the axle of each wheel of the passive vehicles of the installation, to their shoe, can differ widely from those described above; in particular, the wheel of the vehicle can be suspended from the upper and lower branches of a fork formed by the free upper end of the bracket solid with the top of the vehicle, with the aid, respectively, of two sets of bellows with controllable communication, containing a total volume of fluid under pressure that is less than the sum of their maximum volumes, means being provided to temporarily open the communication between the two sets of bellows in a switching zone so as to cause the partial emptying of the fuller set of bellows into the emptier set of bellows and consequently, the exchange of the respective upper and lower working positions of the wheel of the vehicle with the guide rail of the main track and the carrier rail of a side track, according to the patent application filed by Francois Giraud, and entitled, "Transportation installation, particularly for passengers" and filed the same date as this application. In the latter case, each of the two sets of bellows can be embodied in one of the ways described for the single set of bellows **11** (FIG. **2**). The exchange between the two working positions of the wheel of each vehicle can, of course, also be obtained by purely mechanical or electromechanical means, optionally known ones. The means with which each vehicle of the installation according to the present invention is equipped for establishing and controlling communication between the various bellows when said vehicle is in a switching zone, can themselves be embodied in diverse ways which can differ from the one described above; the same is true of the automatic means, mentioned above, for operating the valves controlling the said communications. Moreover, the rising and descending ramps provided respectively somewhat before the exit from each incoming switching or shunting zone and somewhat beyond the entrance to each outgoing switching zone, can be proportioned merely as a function of the need to vary, in the said switching zones, the position of the lower shoe of each vehicle with respect to the conveyor of the main track. In the latter case, the stopping of each vehicle at a station can be insured practically exclusively by braking its wheel or wheels; it is also possible, however, to equip the carrier rail of each side track with a track brake, above the corresponding station, which can optionally allow the elimination of the braking device on each vehicle. Likewise, each vehicle stopped at a station can be accelerated between the exit from this station and the corresponding outgoing switching zone, so as to reach therein a speed practically equal to that of the conveyor, by means different from an ascending ramp and optionally combined with the side track, in particular with its carrying rail. One of these means, described in the patent application cited above, includes a departure conveyor belt, moving at the speed of the conveyor, from the station under consideration to the corresponding outgoing switching zone, and each vehicle comprises, at the level of its lower shoe, controlled-friction clutching means allowing a gradual variation of the relative speed of the vehicle with respect to the said conveyor belt between a maximum value for which the vehicle is stopped in the corresponding station and a zero value for which the vehicle is entrained by the conveyor belt at the speed of the conveyor toward the outgoing switching zone. In a preferred form of embodiment, the controlled-friction clutching means consist essentially of an endless belt guided to pass between the lower shoe of the vehicle and the departure conveyor belt or the conveyor on which the said vehicle rests, as well as a device for gradually braking the movement communicated to the said endless belt by the departure conveyor belt.

While only one embodiment of the invention, together with modifications thereof, has been described in detail herein and shown in the accompanying drawing, it will be evident that various further modifications are possible in the arrangement and construction of its components without departing from the scope of the invention.

What is claimed is:

1. Transportation installation, particularly for passengers, characterized in that it comprises a main track, which is formed essentially by a conveyor placed on the ground, and by a guide rail supported at a distance D, which is generally constant, above the said conveyor, secondary or side tracks, each one of which serves a station and is formed essentially by a carrier rail, passing below the guide rail of the main track, in an incoming switching or shunting zone and an outgoing shunting zone, where the carrier rail is supported at a distance d, less than D, above the conveyor, while the other sections of each side track, the carrier rail is supported at a distance greater than d above the ground, as well as passive vehicles which can rest by means of at least one lower shoe on the conveyor of the main track, and each of which is equipped, at the top, with at least one wheel of radius R less than $(D-d)/2$, and with means for varying, in a shunting zone, the distance from the axle of this wheel of the vehicle to the shoe, between the two values $(D-R)$ and $(d+R)$.

2. Transportation installation according to claim **1**, characterized in that the conveyor of the main track is of a known type, using belt, cable or chain, or of a suitable different type.

3. Transportation installation according to claim **1**, characterized in that the means with which each vehicle is equipped for varying the distance from the axle of its upper wheel to its lower shoe, include at least one set of communicating, elastic bellows, by means of which the said axle is suspended from a bracket, solid with the upper part of the vehicle, as well as means for varying the expansion of the said elastic bellows, in particular their degree of filling by a fluid under pressure.

4. Installation according to claim **3**, characterized in that each vehicle comprises at least one variable chamber in controllable communication with the set of suspension bellows, and subjected to an action of compression by an elastic means, as well as means for temporarily opening, in a shunting zone, the communication between the said variable chamber and the said set of suspension bellows.

5. Installation according to claim **4**, characterized in that the variable chamber is constituted essentially by an auxiliary bellows, mounted on a fixed part of the vehicle, and subjected to the action of a compression spring.

6. Installation according to claim **4**, characterized in that the variable chamber is connected to the set of suspension bellows by two pipes in which there are inserted, respectively, two control valves and two check valves having mutually opposing direction of flow, and in that means are provided to open one of the two control valves, and close the other, in a shunting zone.

7. Installation according to claim **1**, characterized in that the carrier rail of each side track forms a rising ramp somewhat before the outlet of the incoming shunting zone, and a descending ramp somewhat beyond the entrance to the outgoing shunting zone.

8. Installation according to claim **1**, characterized in that the carrier rail of the side track is equipped, at the entrance to the incoming shunting zone, with lateral guide parts, facing upward, while the guide rail of the main track is equipped, somewhat beyond the outlet of the outgoing shunting zone, with lateral guide parts facing downward.

9. Installation according to claim 1, characterized in that each vehicle is equipped with a device for braking its wheel, in particular on the carrier rail of a side track, in order to stop the vehicle at the corresponding station.

10. Installation according to claims 3 and 9, characterized in that the braking device of each vehicle, of the hydraulic or pneumatic type, is fed from the set of suspension bellows where, during the braking on the carrying rail of a side track, a maximum pressure prevails, substantially proportional to the loaded weight of the vehicle.

11. Installation according to to one of claims 1 and 7, characterized in that at least one of the side tracks comprises, before the corresponding station, means to brake the wheel of the vehicle to be stopped at the said station, these means comprising, for example, a rising ramp and/or a track brake.

12. Installation according to one of claims 1 and 7, characterized in that each of the side tracks comprises, beyond the corresponding station, means, for example, a descending ramp, to accelerate the vehicle, stopped at the said station, up to the speed of the conveyor.

13. Installation according to claim 12, characterized in that the means with which each of the side tracks is equipped in order to accelerate a vehicle up to the speed of the conveyor, comprise a departure conveyor belt, moving at the speed of the conveyor, from the corresponding station to the outgoing shunting zone, and that each vehicle comprises, at the level of the lower shoe, controlled-friction clutch means, for gradually varying the relative speed of the vehicle with respect to the said conveyor belt, between a maximum value, at which the vehicle is stopped in the corresponding station, and a zero value at which the vehicle is entrained by the conveyor belt at the speed of the conveyor, toward the outgoing shunting zone.

14. Installation according to claim 13, characterized in that the controlled-friction clutch consists, essentially of an endless belt, guided to pass between the lower shoe of the vehicle and the departure conveyor belt, or the conveyor in which the said vehicle is resting, as well as a device for gradually braking the movement communicated to the said endless belt, by the departure conveyor belt.

15. A transportation installation including: a lower substantially horizontal conveyor; a guide rail extending parallel to and spaced above the conveyor; and at least one station comprising a carrier rail having an upstream portion parallel to and spaced below the guide rail, an intermediate portion spaced laterally and upwardly from the guide rail, a downstream portion extending parallel to and spaced below the guide rail, and connector portions extending convergently upwardly and outwardly from the upstream and downstream portions of the carrier rail to the upstream and downstream ends of the intermediate portion; and a car transportable by said conveyor, said car having support means at its bottom engageable with said conveyor, a guide wheel vertically movably mounted at the upper end of the car, and means for moving the guide wheel upwardly into engagement with the guide rail during movement of the car by the conveyor and downwardly into position engaging said carrier rail for raising the car out of engagement with the conveyor and for movement on the carrier rail.

16. The transportation installation of claim 15, wherein said means for movably mounting said guide wheel on said car includes a bellows means, and said third means includes a source of fluid under pressure, conduit means connecting said source of fluid under pressure with said bellows, and valve means connected to said conduit means for selectively permitting flow of fluid under pressure to said bellows from said source of fluid and from said bellows to said source.

17. The installation of claim 16, wherein said source of fluid under pressure comprises means providing a variable capacity chamber and means yieldably biasing said chamber toward a contracted position.

18. A car for use in a transportation installation having a lower substantially horizontal conveyor, a guide rail extending parallel to and spaced above the conveyor and a carrier rail spaced below said guide rail, said car including: a support means at its bottom engageable with a lower horizontal conveyor of a transportation installation, a guide wheel vertically movably mounted on the upper end of the car, and means for moving the guide wheel upwardly to a position wherein it is engageable with the guide rail during movement of the car by the lower horizontal conveyor and downwardly into position engageable with said carrier rail for raising the car out of engagement with the carrier and for movement on the carrier rail.

19. The car of claim 18, wherein said means for movably mounting said guide wheel on said car includes a bellows means, and said third means includes a source of fluid under pressure, conduit means connecting said source of fluid under pressure with said bellows means, and valve means connected to said conduit means for selectively permitting flow of fluid under pressure to said bellows from said source of fluid and from said bellows to said source.

20. The installation of claim 19, wherein said source of fluid under pressure comprises means providing a variable capacity chamber and means yieldably biasing said chamber towards a contracted position.

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