RAIL-MOUNTED CONVEYOR SYSTEM AND METHOD OF OPERATING IT

Technical Field

The invention relates to a rail-mounted conveyor system according to the preamble of claim 1, as well as a method to operate the same according to claim 18.

State of the Art

Rail-mounted conveyor systems of the above-mentioned type are known, for instance from the EP 0 513 460 B1. In this rail-mounted system the conveyor carriage has connection means in the form of coupling means, which are arranged on the upper side of the conveyor carriage and act together with the bottom portion of a transport box to be conveyed. These coupling means consist of profiled lateral components running parallelly with the rails, wherein the transport box is movable in the travel direction, or they can swing in and out in transverse direction against the bottom portion of a transport box. The drawback is that in a vertical track arrangement, no stations can be arranged on top of each other. A station can be arranged only at the end of a horizontally running track, since at the station a ramp for receiving the box has always to be

provided underneath the box. Even then the transport box can be released only when the conveyor carriage has left the station moving upwards. This way the desired versatility in using the conveyor carriage for several transport boxes is strictly limited.

The US Patent 4 015 537 describes a further rail-mounted conveyor system, wherein a vertically positioned container is pivotally mounted on the container carriage. In this conveyor system no means are provided for the separation of the transport box from the conveyor carriage at a station. Therefore each transport box requires its own conveyor carriage, which makes the conveyor system very expensive.

Description of the Invention

It is the object of the invention to create a rail-mounted conveyor system of the kind mentioned in the introduction, which makes possible the arrangement of stations at any point in the vertical track runs of a track system and which always insures the release of a transport box from the conveyor carriage.

According to the invention this object is attained by:

- the conveyor system according to claim 1; and
- the method of operating it according to claim 18.

Due to the fact that the transport box can be arranged either in a receiving container rigidly mounted on a conveyor carriage or on a receiving platform pivotally mounted on a conveyor carriage, whereby the inlet opening of the receiving container, as well as the receiving platform can be synchronized with a loading and/or unloading ramp of a station, such a station can be provided at any point of a vertical track run, since now it is no longer necessary for a receiving ramp to project through the stations into the conveying profile of a conveyor system, in order to be able to receive a transport box. Further no special discharge switches and discharge tracks are required. The construction of the conveyor carriage according to the invention is particularly suited for vertical track runs. In certain embodiments the conveyor carriage is also suited for other track runs.

Advantageous embodiments of the conveyor system are described in claims 2 to 17 and of the method for its operation in the claims 19 to 21.

In simple track runs it can be sufficient to arrange the transport box in the receiving container, without securing it. In more complicated conveying tasks, such as in overhead transport, it is absolutely necessary to provide the receiving container according to claim 2 with locking means for securing the transport box in the receiving container. Thereby the securing means according to claim 3 can be a mechanical snap-action member, which in simpler cases can be released by hand, but preferably by a motor, for instance electromagnetically. A further particularly preferred embodiment of the securing means is described in claim 4, with a permanent-magnet holder , which can be deactivated by electrically, thereby releasing the transport box.

In the most simple case, the transport box can rest against the lateral walls of the receiving container. The loading and unloading of the receiving container is facilitated by the design according to claim 5, and thereby the transport device can be inactive and can consist of a roller conveyor according to claim 6, so that the transport box is automatically released from the receiving container when the securing means are released. More advantageous is an embodiment according to claim 7, whereby the transport

device actively performs the loading and unloading of the transport box at one station.

When the conveyor carriage has a receiving platform, for simple conveying tasks the latter can be a simple plate. Thereby the receiving platform can be loaded, respectively unloaded, in that the transport box is moved transversely to its longitudinal direction, but preferably in its longitudinal direction, in order to avoid a tilting of the transport box. For the guidance of the transport box on the receiving platform and for partial securing, the conveyor system is preferably designed according to claim 8. However its design according to claim 9 is more advantageous for preventing the transport box to slip down during transport. Numerous examples are offered for the design of the safety device, whereby a design analogous to claims 3 and 4 is possible. Such safety devices can be released manually, but are preferably motor-driven. A safety device particularly advantageous for a receiving platform is described in claim 10.

The receiving platform can be manually loaded with a transport box, and/or unloaded, however more suitable is the embodiment according to claim 11,

particularly when the conveyor system is intended to be automatically operated.

It serves the purpose to provide means for eliminating the pivotability of the receiving platform at a station, in order to insure a safe loading and unloading of the receiving platform at the station. For this purpose members of the receiving platform can be equipped with stationary feeding and discharge guides at a station. Claim 12 describes a particularly simple solution.

For the construction of the station for loading and unloading of a container carriage with a transport box a great variety of solutions is available, whereby the respective ramps can be simple slides on which the transport boxes are moved by hand, in order to load or unload a conveyor carriage.. However more advantageous is a design of the station according to claim 13, with a transport device for loading, respectively unloading the conveyor carriage. Thereby the transport device can be inactive, for instance consisting of a simple roller bottom or an endless transport belt. However it is more advantageous when the transport device for loading, respectively unloading is equipped with a corresponding

driving device.

A station construction according to claim 14 is advantageous for unloading the conveyor carriage. The loading of the conveyor carriage can be improved by a station construction according to claim 15. When at one loading station more than one transport box are at the same time in a waiting position, a construction of the conveyor system according to claim 16 proves to be advantageous. The arresting element or elements can be operated from the conveyor carriage, whereby there for instance a telescopic pusher is provided which cooperates with a corresponding actuation member for the arresting element. But it is also possible that a corresponding driving device , for instance an electromagnet, be arranged directly at the station. The actuation can be done manually via corresponding switch or automatically at the arrival of a conveyor carriage via a corresponding control unit of the conveyor system.

Claim 17 describes a particularly advantageous transport device, which makes possible to insure an overlapping transport between the conveyor carriage and the station ramp for loading and unloading of a conveyor carriage.

For the control of the conveyor system and the loading, respectively unloading, there are a great variety of possibilities exist, from the simple manual operation to a semi-automatic, up to a fully automatic operation, via corresponding control systems. Such control systems are known in principle, so that they need not be closer described. Thereby the control of the conveyor system can be simplified through a method of operation according to claim 18. For preventing the conveyor carriages from roll derailment a further development of the method according to claims 19 and/or 20 is advantageous. Claim 21 describes an advantageous control of the conveyor system.

Brief Description of the Drawing

Embodiment examples of the invention are subsequently closer described with the aid of a schematic drawing, which shows:

Figure 1 a loading and an unloading station on two vertical track runs of a conveyor system, in a plan view;

Figure 2 an unloading station in a diagrammatic representation;

Figure 3 a transport device at a station for unloading, respectively loading of a conveyor carriage with a transport box, in a view transversely to the loading, respectively unloading direction.

Figure 4 the transport device system of Figure 3 in a plan view and partially sectioned;

Figure 5 a further transport device at a station, in a plan view;

Figure 6 the transport device of Figure 5 with a view on the entrainment pin in cutout;

Figure 7 a conveyor carriage with a receiving container and a transport box with securing means for the same, in a side view and transversely to the travel direction;

Figure 8 the securing means of Figure 7 in detail at a larger scale;

Figure 9 a second safety device, in a cutout and at a

larger scale;

Figure 10 a third safety device, in a cutout and at a larger scale;

Figure 11 a loading station with a conveyor carriage, in a side view and transversely to the travel direction;

Figure 12 an unloading station with a conveyor carriage in a side view and transversely to the travel direction;

Figure 13 a further conveyor system in a cutout with a conveyor carriage with a receiving platform for a transport box at a station, in a transverse view with respect to the travel direction and to the rail plane;

Figure 14 the conveyor system of Figure 13 in the view XV-XV of Figure 13;

Figure 15 the conveyor system of Figure 13 in section XV-XV;

Figure 16 a loading station and an unloading station arranged underneath it, in a transverse view with respect to the travel direction and the rail plane;

Figure 17 Loading and unloading stations arranged next to each other in a view transversely to the travel direction and the rail plane;

Figure 18 a diagram of a conveyor system with a closed-circuit rail system and guide rail segments; and

Figure 19 the diagram of the conveyor system according to Figure 18, but with a communication rail.

Ways to Implement the Invention

Figure 1 shows a conveyor system with two vertical rail tracks 2, 4 arranged in a shaft 6 and a connected loading station 8 for the rail track 2 and an unloading station 10 for the rail track 4. A rail 12 of such a conveyor system has a base part 14 and lateral parts 16, whereby the latter contain mutually facing flange parts 18, which surround in a C-like fashion the running or driving

wheels 20 of a conveyor carriage 22. The rails comprise live rails which are not closer described and optionally a guide rail and toothed racks, and the conveyor carriage 22 has a driving toothed wheel. Further the conveyor carriage is equipped with a motor, so that it can move on its own. Such a conveyor carriage and the pertaining rails are designed for instance according to the US Patent 3 636 883. The conveyor carriage 22 further comprises a rigidly mounted receiving container 24 for a transport box 26, which is introduced into the receiving container 24 of a conveyor carriage stopped at a loading station 8 via a loading ramp 28. At an unloading station 10 the transport box 26 can be discharged at an unloading ramp 30. Thereby the arrangement is made so that the loading station 8 and the unloading station 10 border on the conveying profile of the conveyor system and do not hinder the free circulation of the conveyor carriage with the receiving container.

Figure 2 shows in a diagrammatic representation an unloading station 10 containing a transport device 32, which has an entrainment pin 36 arranged on an actuatable revolving member 34, which by means of the revolving member 34 and the guide rollers 38 travels through an active zone in the lower stand of the revolving member and through a

return area in the upper stretch. The transport device 32 located at the transition area projects from the unloading ramp 30 into the conveying area of the conveyor carriage 22, namely so that the entrainment pin 36 can seize a catch 40 of the transport box 26 which is arranged in the receiving container 24 of a conveyor carriage 22 and stop it in front of the unloading station. Then by means of the revolving member 34, the entrainment pin 36 pulls the transport box 26 from the receiving container 24 of the conveyor carriage 22 onto the unloading ramp 30. The latter comprises a roller conveyor formed by rollers 42 and lateral guides 44. When the revolving member 34 of the transport device 32 is driven in the opposite direction of rotation, the entrainment pin 34 can serve for the transfer of a transport box 26 into the receiving container 24 of a conveyor carriage 22 stopped at the station.

Figures 3 and 4 show a further transport device 46 for the transfer of a conveyor carriage [sic- should be transport box] between a receiving container 24 of a conveyor carriage and a ramp 48 of a station. For this purpose the transport device 46 comprises a swinging arm 50 fastened to a shaft 52 and corotationally connected with a toothed wheel 54 which mashes with a toothed rack 56,

stationarily connected with the ramp 48. A motor 58 serves for driving the shaft 52 via a gear 60, so that the toothed wheel 54 is driven and moves forward via the toothed rack 56. Thereby the shaft 52 is also moved at the same time and the swinging arm 50 is swung from the position shown in Figure 3 on the right to the position shown in Figure 3 to the left in dash-dot lines. The entire mechanism is guided to slide back and forth on a guide rod 62. When the swinging arm 50 is swung, an entrainment pin 64 comes into engagement with a catch 66 on the transport box 26, and at a further motion of the swinging arm 50, pulls the transport box 26 from the receiving container 24 onto the ramp 48 of the unloading station. A reverse motion of the transport device 46 can serve for loading a receiving container 24 with the transport box 26.

Figures 5 and 6 show a third transport device 68, which at a loading and/or unloading station serves for the transfer of a transport box 26 from the receiving container 24 of a conveyor carriage 22 at the ramp 70 of the station, respectively vice versa. The transport device 68 comprises a lift-thrust rod 72, which by means of a drive 74 can be moved back and forth in the loading, respectively unloading direction 76. At the free end the lift-thrust rod 72

comprises an entrainment pin 78 which can swing back and forth between an entrainment position shown in Figure 6 for a catch 80 of the transport box 26 and a free position shown in dash-dot lines in Figure 6. The loading and unloading of a transport box 26 takes place in manner analogous to the above-described examples.

Figures 7 and 8 show a safety device 82 which insures a firm hold of the transport box 26 in the receiving container 24 of the conveyor carriage 22. For this purpose the safety device comprises a catch spring 84 made of spring steel fastened on the receiving container 24 and a cam-shaped head portion 86, which when the transport box 26 is inserted reaches over a rim 88 of the same. The spring force of the catch spring 84 is calculated so that the catch spring 84 will lock or release the transport box 26 as intended, while at the same time a release of the transport box 26 from the receiving container 24 is avoided during the conveying process under normal loads.

Figure 9 shows a further safety device 90 with a rocker 94 supported on the receiving container 24 so that it can swing about an axle 92. On one side the rocker 94 has a locking nose 96 which interacts with a recess 98 in

the transport box 26. An abutting surface 100 insures the automatic locking of the locking nose 96 at the recess 98, when the transport box 26 is inserted in the receiving container 24. A pressure spring 102 serves for prestressing the rocker 94, and therewith the locking nose 96 into the locking position shown in Figure 9. For the release of the safety device 90 serves an actuation device 104, for instance a piston/cylinder unit or a lifting magnet, whereby a plunger 106 moves the rocker 94 against the prestressing force of the pressure spring 102 into the open position, as indicated by the arrow 107 in Figure 9.

Figure 10 shows yet another safety device 108, which has two angled arms 112 swingable about an axis 110, The angled arms are arranged so that the arms 114 point towards each other and are connected via a swivel joint 116 with a plunger 118 of an actuation device 120. The free arms 122 of the angled arms 112 have locking noses 124 pointing outwardly away from each other with abutting surfaces 126, which engage from behind in corresponding restraining elements 128, arranged on a transport box. A pressure spring 130 stresses the arms 122 outward, and therewith the locking nose 124. By means of the actuation device 120, by pulling the plunger 118 the engagement can be released, as

shown in dash-dot lines in Figure 10.

Figures 11 and 12 show a conveyor carriage 22 with a modified receiving container 132 at a loading station 134 and an unloading station 136. The receiving container 132 comprises at its contact side a transport device 140 for the transport box 26. The transport device 140 has a receiving platform 142 for the transport box 26, whereby this receiving platform 142 is designed as a rocker 144, which is arranged swingably about an swivel axle 146 floatingly supported in the receiving container 132. Between the rocker 144 and the contact side 138 of the receiving container 132 a turntable 148 is arranged, which has a wedge 150 imparting the corresponding inclination to the rocker 144. The turntable 148 is rotated by means of a drive 152, whereby limit switches 154, 156 determine the end positions of the turntable 148. Free-running or optionally driven rollers 158 are arranged on the rocker 144.

In Figure 11 the rocker 144 is arranged so that it is inclined towards the rear end of the receiving container and serves for receiving a transport box 26 coming from a loading ramp 160. The loading ramp can be a chute or a

roller train with rollers 161. At the inner end of the rocker a catch 162 is provided, which can optionally serve for securing the transport box 26 in the receiving container 132. For this purpose the catch 162 is designed as a permanent magnet and can be electrically deactivated. At the upper end of the receiving container a limit switch 164 is arranged, which signals the orderly arrival of a transport box in the receiving container 132. A further safety device 166 is arranged in the proximity of the opening 168 of the receiving container 132 and has a safety catch 170 which prevents the transport box 26 from sliding out of the receiving container 132 in the lower position shown in Figure 11. In the position shown in Figure 11 the conveyor carriage 22 and therewith the receiving container 132 is at the loading ramp 160 of the loading station 134, whereby the loading ramp is inclined towards the receiving container 132 and the transport boxes 26 are already stationed for transfer at the stop members 172, 174, which prevents the transport boxes 26 from sliding unintentionally into the receiving container 132 or from falling off the loading ramp 160 in the absence of the conveyor carriage 22. The stop members can be actuated mechanically by hand or by the approach of a conveyor carriage, as further described in Fig. 16, or electrically,

e.g. by means of an electromagnet, in a manner which is not closer described.

In Figure 12 the conveyor carriage 22 with its receiving container 132 is shown at an unloading station 136, which comprises a downwardly sloped unloading ramp 176, in order to receive a transport box coming from the receiving container 132. A retractable stop member 178 prevents an uncontrolled run of the transport boxes unto the unloading ramp 176, which similar to the loading ramp is provided with rollers 161. At the unloading station 136 the rocker 144 of the transport device 140 in the receiving container 132 is inclined towards the unloading ramp 176, so that a transport box 26 can freely roll down towards the unloading ramp 176.

Figures 13 to 15 show a further system with a rail track 180 which runs from a vertical segment through a curved portion into a horizontal segment. The rail track 180 comprises again the initially described rail 12 with a base part 14, the lateral parts 16 and the flange parts 18, which reach over the wheels 20 of the conveyor carriage 182. Live rails 184 serve for the supply of driving electrical power to the conveyor carriage 182 and as

control rails for the connection and control of the system components. On the base part 14 of the rail 12 also a rack 186 is arranged, which cooperates with a drive pinion of the conveyor carriage 182. The conveyor carriage 182 further comprises a bow-like member 190 which reaches up to the lateral parts 16 of the rail 12 and there it has support rollers 192 which run on the outer side of the lateral parts 16. The bow-like member 190 further comprises a swivel axle 194 to which a support arm 196 is fastened, at whose free end a receiving platform 198 is arranged for receiving a transport box 26. On the side facing away from the support arm 196, the receiving platform 198 is equipped with a guide bolt 200 which is axially parallel to the swivel axle 194 and which at a loading and/or unloading station 202 cooperates with a stationary guide slot 204, in order to stabilize the receiving platform 198 in its position at the station 202. The guide slot 204 is provided at its access side with a funnel-shaped enlargement 206.

The receiving platform 198 comprises lateral guides 208, which are oriented in the loading, respectively unloading position , which in the present example corresponds to the longitudinal direction of the transport

box 26. Seen in the loading, respectively unloading direction, the receiving platform has at both ends safety pins 210, which project into the sliding path of the transport boxes arranged on the receiving platform. The extended, respectively blocking position of the safety pins 210 corresponds to their basic position. These safety pins can be withdrawn in a manner which is not closer described, by hand and/or actuation devices into the free position, wherein they do not hinder the transfer of the transport box from the receiving platform at a ramp 212 of the station 202. Further on the receiving ramp a transport device 214 is arranged, which has two endless conveyor belts 216, which in a manner not closer described can be driven by means of an actuator back and forth in transfer direction, in order to deliver a transport box 26 from the receiving platform 198 at the ramp 212 of the station 202 or to receive it therefrom. The ramp 212 of the station 202 is also equipped with a transport device 218 which comprises rollers 220, which can be either freely rotatable for moving the container by hand, or driven in order to receive the transport box 26 automatically from the receiving platform 198 or to deliver it to the same.

Figure 16 shows a conveyor system of the kind

illustrated in Figures 13 to 15, whereby a rail track 180 runs in a shaft 222 which in the area of the loading station 224 and of an unloading station 226 arranged therebelow is provided with a wall opening 228 which can be closed by a fire door 230. The loading station 224 is equipped with a loading ramp 232 sloping downwards towards the conveyor carriage 182 and which has rollers 234. At the transfer point, the loading ramp 232 has a stop member 236 which projects into the moving path of the transport box 26 and can be retracted by means of a sliding plate 238 which can be actuated by a corresponding plunger 240 at the receiving platform 198 of the conveyor carriage 182. For this purpose the receiving platform 198 comprises an actuator 242 in the form of an electromagnet, in order to push the plunger 240 against the sliding plate 238, as shown in Figure 16. The sliding plate 238 comprises a first setting cam 244 for the stop member 236, as well as a further setting cam 246 for a further stop member 248, which is arranged on the rear of the waiting transport box and cooperates with a following transport box, in order to retain the latter when the first transport box is transferred at a receiving platform 198 of a conveyor carriage 182 stopped at the station. For this purpose the sliding plate 238 with the setting cams 244, 246 is built

so that the setting cams operate alternately. By means of a prestressed spring 250 the sliding plate 238 is prestressed in the basic position, wherein the frontal stop member 236 is in locked position.

The unloading station 226 arranged underneath the loading station 224 is provided with an unloading ramp 252, which receives a transport box delivered from the receiving platform 198, so that the former is conveyed against an end stop 254.

Figure 17 shows a further conveyor system wherein the loading station 224a and the unloading station 226a are designed analogously to the loading station 224 and the unloading station 226 of Fig. 16, however these stations are not arranged one on top of the other but next to one another, and correspondingly serve two rail tracks running next to each other, analogously to the embodiment example in Fig. 1. The conveyor carriage 182a is basically analogous to the conveyor carriage 182, however the receiving platform 198a is built so that loading and unloading direction, and therewith also the longitudinal direction of the conveyor carriage 26 [sic, should be transport box 26, translator's note] run parallelly to the

swivel axis 194a of the conveyor carriage 182a.

In the construction of the conveyor system according to Figure 16 the receiving platform 198 is suited only for loading stations 224, as well as unloading stations 226, which are arranged on vertical rail tracks. In the construction of the conveyor system according to Figure 17 the receiving platform 198a, the loading station 244a and the unloading station 226a can be used on any, also horizontally arranged rail tracks. On an optionally horizontal rail track the stations 224a and 225a are not serviced parallelly, as shown in Figure 17 or 1, but in succession, as indicated for the vertical rail track in Figure 16.

Figure 18 shows the diagram of a conveyor system for vertical transport in a building over four floors S1, S2, S3, S4. An upward rail track 260 and a downward rail track 262 are connected at the upper and lower ends to a loop by respective reverse shunts 264, 266. In addition in their middle area the rail tracks are connected via a transverse shunt 268. Along the upward rail track 260 loading stations B01, B02, B03, B04 are arranged and along the downward rail track 262 unloading stations E05, E06, E07,

E08 are arranged. Within the conveyor system circulate conveyor carriages F01, F02, F03, etc., which preferably are at equal distances from each other, which correspond approximately to the height of one floor. This means that in the present example six conveyor carriages are provided, whereby however only three are shown in the drawing for the sake of simplicity. The system components such as stations, rails, control rail segments 270 and shunts are separately connected via corresponding lines with a control unit containing a computer R. Various not closer described reading devices are arranged at the stations and along the tracks, which serve for reading of an identification code F01, F02, F03, etc. of the conveyor carriages and of a target code 01, 02, 03, 04, 05, 06 on the transport boxes to be moved. The conveyor carriages search independently for their target based on the target code and thereby control individual system components. Thereby the control unit R serves for the coordination and monitoring of the conveyor system.

Figure 19 shows the conveyor system of Figure 18, whereby however the control rail segments 270 are replaced by a continuous communication rail 272. By means of the communication rail the individual system components are

connected with the control unit R, which controls the individual system components and directs the conveyor carriage to the target based on the target code set at the sender station. The control is thereby preferably performed according to the principles disclosed in CH-A-677 469. The control of the conveyor system is performed according to the CH-A-677 469 in such a manner that in the control unit R for the pertaining track network a preprogrammed program table is installed, with at least all decision and control commands for all conveying tasks and all system components actively participating therein and that along the track network at least in the decision points position codes 274 are arranged, which are read by the conveyor carriages. Each conveyor carriage communicates by means of the communication rail 272 which extends continuously along the track network with the control unit R. The latter controls at each decision point the conveyor carriage and/or a pertaining component with the aid of the respectively communicated position code in connection with the identification code and the target code, by means of the same control rail, until the conveyor carriage reaches the receiving station.

Further the control of the conveyor system takes place advantageously in the case of Figures 18 and 19 in such a manner that the conveyor carriages F01, F02, F03 pass through the conveyor system approximately at equal distances. If one conveyor carriage stops at a station, for instance the conveyor carriage F01 at the loading station B03 in order to receive a loaded receiving container, then the remaining circulating conveyor carriages also stop immediately or at least the speed at which they are driven is reduced, in order not to crash into the stopped conveyor carriage.

List of Reference Numerals

B	loading station
E	unloading station
F	conveyor carriage
R	control unit
S	floor
2	rail track
4	rail track
6	shaft
8	loading station
10	unloading station
12	rail
14	base part
16	lateral part
18	flange part
20	wheel
22	conveyor carriage
24	receiving container
26	transport box
28	loading ramp
30	unloading ramp
32	transport device
34	revolving member
36	entrainment pin
38	guide roller
40	catch
42	roller
44	guide
46	transport device
48	ramp
50	swinging arm
52	shaft
54	pinion
56	toothed rack
58	motor
60	gear
62	guide rod
64	entrainment pin
66	catch
68	transport device
70	ramp
72	lift-thrust rod
74	drive
76	loading, respectively unloading station

78	entrainment pin
80	catch
82	safety device
84	catch spring
86	cam-shaped head portion
90	safety device
92	axle
94	rocker
96	locking nose
98	recess
100	abutting surface
102	pressure spring
104	actuation device
106	plunger
107	arrow
108	safety device
110	axis
112	angled arm
114	arm
116	swivel joint
118	plunger
120	actuation device
122	arm
124	locking nose
126	abutting surface
128	restraining element
130	pressure spring
132	receiving container
134	loading station
136	unloading station
138	contact side
140	transport device
142	receiving container [sic, should be receiving platform, translator's note]
144	rocker
146	swivel axle
148	turntable
150	wedge
152	actuator
154	limit switch
156	limit switch
158	roller
160	loading ramp
161	roller
162	catch
164	limit switch
166	safety device

168	opening
170	safety catch
172	stop member
174	stop member
176	unloading ramp
178	stop member
180	rail track
182	conveyor carriage
182a	conveyor carriage
184	live rail
186	toothed rack
188	driving pinion
190	bow-like member
192	support roller
194	swivel axis
194a	swivel axis
196	support arm
198	receiving platform
198a	receiving platform
200	guide bolt
202	station
204	guide slot
206	enlargement
208	lateral guide
210	safety pin
212	ramp
214	transport device
216	conveyor belt
218	transport device
220	roller
222	shaft
224	loading station
226	unloading station
226a	unloading station
228	wall opening
230	fire door
232	loading ramp
234	roller
236	stop member
238	slide plate
240	plunger
242	actuator
244	adjusting cam
246	adjusting cam
248	stopping member
250	prestressed spring
252	unloading ramp

254	end stop
260	upward rail track
262	downward rail track
264	upper reverse shunt
266	lower reverse shunt
268	transverse shunt
270	control rail segment
272	communication rail
274	position code

Patent Claims:

1. Rail-mounted conveyor system with self-propelled conveyor carriages (22, 182, 182a) running on rails (12), which have connection means for temporarily receiving and holding of transport boxes (26) intended for the conveyance of goods, as well as loading and/or unloading stations (8, 134, 202, 224, 224a; 10, 136, 226, 226a) for loading and/or unloading of the conveyor carriages (22, 182, 182a), characterized in that the connection means have:

- a receiving container (24, 132, 142) provided with a receiving opening for a transport box (26) and rigidly connected with the conveyor carriage (22); or

- a receiving platform (198, 198a) for a transport box (26) swingable about a swivel axis (194, 194a) running perpendicularly to the rail plane, which is swingably connected with the conveyor carriage (182, 182a) via the support arm (196),

whereby the receiving opening of the receiving container (24, 132, 142) or the receiving platform (198, 198a) can be

synchronized with the loading and/or unloading ramp (28, 30, 48, 70, 160, 176, 212, 232, 252) of a station.

2. Conveyor system according to claim 1, characterized in that the receiving container (24, 132, 142) has at least one releasable safety device (82, 90, 108, 162, 166) for securing the transport box (26) in the receiving container.

3. Conveyor system according to claim 2, characterized in that the safety device (82, 90, 108) has at least one mechanical catch element (86, 96, 124) which can be released, preferably motor-operated, for instance electromagnetically.

4. Conveyor system according to claim 2, characterized in that the safety device (162) has at least one permanently magnetic holding magnet cooperating with the transport box (26) and which can be electrically deactivated.

5. Conveyor system according to one of claims 1 to 4, characterized in that the receiving container (132) is provided on its contact side (138) for the transport box (26) with an optionally actuatable transport device (140).

6. Conveyor system according to claim 5, characterized in that the transport device (140) has an inclined receiving platform (142), whereby the inclination is preferably adjustable from sloping downwards to the opening of the receiving container (132) to sloping downwards to the inside of the receiving container.

7. Conveyor system according to claim 6, characterized in that the receiving platform (142) is built as a rocker (144), whose inclination can be adjusted by means of an actuator (148, 152), preferably by a revolving wedge-shaped turntable (148).

8. Conveyor system according to claim 1, characterized in that the receiving platform (198, 198a) has lateral guides (208) on both sides of the transport box (26) in the loading, respectively unloading direction, preferably in the longitudinal direction of the transport box.

9. Conveyor system according to claim 8, characterized in that the receiving platform (198, 198a) has at least one releasable safety device (210) for securing the transport box (26) on the receiving platform.

10. Conveyor device according to claim 9, characterized in that the safety device has two safety pins (210) which are arranged at both ends of the receiving platform (198, 198a) seen in the loading, respectively unloading direction and which in their basic position project into the sliding path of the transport box (26) and which can be retracted, preferably by a motorized actuator, into the release position.

11. Conveyor system according to one of claims 7 to 10, characterized in that the receiving platform (198, 198a) has a transport device (214) actuatable in the loading and/or unloading direction, preferably a revolving member (216) for the loading, respectively unloading of the receiving platform.

12. Conveyor system according to one of claims 1, as well as 8 to 11, characterized in that on its side facing away from the support arm (196) the receiving platform (198, 198a) has a guide bolt (200) which is axially parallel to the swivel axis (194, 194a) and which at each station engages in a guide slot (204) having a funnel-shaped enlargement (206) on the access side.

13. Conveyor system according to one of claims 1 to 12, characterized in that at the station a transport device (32, 46, 68) is provided for loading, respectively unloading the conveyor carriage (22).

14. Conveyor system according to one of claims 1 to 13, characterized in that at a station (136, 226, 226a) an unloading ramp (176, 252, 252a) for at least one transport box (26) is arranged, starting from the conveyor carriage (22) and sloping downwards.

15. Conveyor system according to one of claims 1 to 14, characterized in that at a station (134, 224, 224a) a loading ramp (160, 232) for at least one transport box (26) is arranged, sloping downwards to the conveyor carriage (22, 182, 182a) for loading, which at the transfer point comprises a stop member (172, 236) which can be retracted from the sliding path of the transport box and which preferably can be actuated from a conveyor carriage (182, 182a) present at the station.

16. Conveyor system according to claim 15, characterized in that the stop member (236) cooperates with a control slide plate (238) slidably supported in the loading ramp

(232) and preferably actuatable from the conveyor carriage (182), which plate in turn interacts with a further stop member (248) on the rear side of a conveyor carriage to be loaded, so that when the front stop member (236) is activated, the rear stop member (248) is released, and vice versa.

17. Conveyor system according to one of the claims 13 to 16, characterized in that the transport device (32, 46, 68) of the station (10) has an entrainment pin (36, 64, 78) arranged laterally of the moving area of the transport box (26), for instance on a revolving member (34), a swinging arm (50) or a lifting rod (72), which projects against the transport box, so that in one moving direction the entrainment pin unloads the transport box (26) from the conveyor carriage (22) and in the opposite moving direction is loads the conveyor carriage (22) with the transport box (26).

18. Method for operating the conveyor system according to one of claims 1 to 17, characterized in that the rails (260, 262) are arranged in a closed circuit (260, 262, 264, 268) and the conveyor carriages (F) are set to circulate at equal distances.

19. Method according to claim 18 or 19, characterized in that when a conveyor carriage (F) is stopped at a station (B, F), the remaining circulating conveyor carriages are stopped or at least slowed down.

20. Method according to claim 18 or 19, characterized in that in the circuit parts thereof (260, 262) are connected via a transverse shunt 268.

21. Method according to one of claims 18 to 20, characterized in that all system components are connected via a communication bar (272) with a common control unit (R).

This Sheet Has Been Replaced