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(54) Device supporting the driving and guiding wheels of a wagon transporting bulk material

(57) Device for actuating and guiding wagons (10; 110) for transporting bulk material on rails (1), comprising support means (20;120) able to be fastened to the wagon (10;110) and provided with at least one hinging axis (21)

suitable for coupling with a corresponding hinging arm (41) of a respective flange (40) carrying the driving wheels (51) of the wagon (10;110) and able to be oriented with respect to the rails (1).

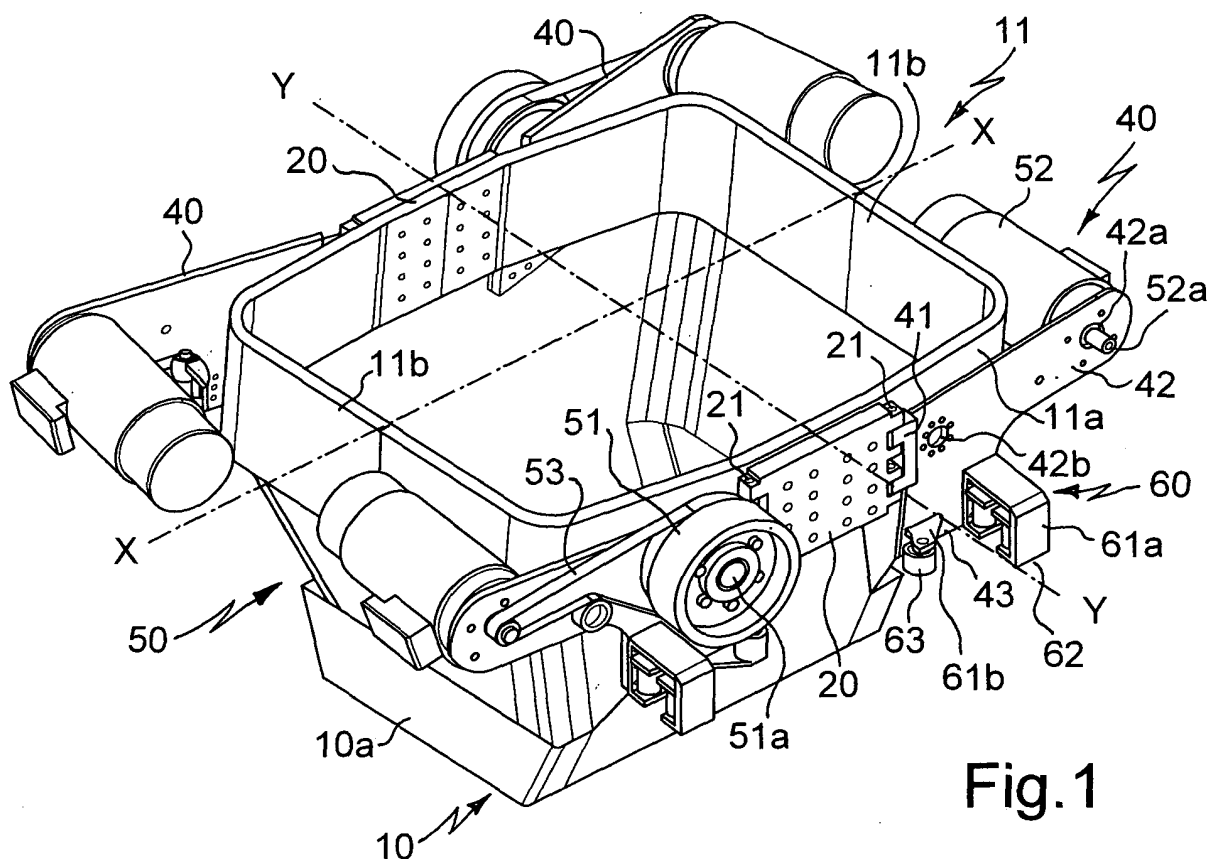


Fig.1

Description

[0001] The present invention relates to a device for actuating and guiding wagons for transporting bulk material on rails.

[0002] It is known in the technical sector relating to the movement of bulk materials that there exists the need to transport said materials from one station to another within complex plants by means of wagons movable on rails.

[0003] An example of this need consists, for example, in the movement of concrete in the fluid/viscous state in concrete mixing and casting plants; transportation equipment is also known, having a design based on the provision of pairs of rails extending parallel to each other and laterally with respect to the wagon which travels on them so that it is possible to perform filling of the wagon from a position situated above the loading compartment, without access to the entry opening of the loading compartment being even only partly obstructed by a rail.

[0004] An example of this known art is described, for example, in EP 0,824,424 which illustrates a wagon with fixed driving wheels able to solve the problem of derailment on bends and at the same time limit production costs owing to the simplicity of the structure of the means for propelling and guiding the wagon.

[0005] Although performing its function, this device nevertheless has drawbacks which limit the application thereof: the fact of having envisaged both fixed driving wheels and fixed guiding wheels gives rise to the drawback that, during movement around a bend, the trajectory followed by the wheels does not correspond to the trajectory of the rails, thus producing a relative friction between wheels and rails which is the cause of loss of power and wearing of the wheels.

[0006] This phenomenon is further accentuated with a reduction in the radius of curvature, essentially resulting in the obligation to adopt slow travel speeds which are incompatible with the ever increasing need to reduce the cycle times.

[0007] The technical problem which is posed, therefore, is to provide a moving and guiding device for wagons in plants for transporting bulk materials, able to cooperate with a pair of rails so as to allow loading of the wagon from above without interference, an increased speed of travel along the rails, without relative friction, in particular around bends, including bends with a small radius of curvature.

[0008] Within the scope of this problem it is also required that this device should have small dimensions, be easy and inexpensive to produce and assemble and be able to be installed easily also on already existing wagons by means of normal connection means and without the need for special adaptation.

[0009] These results are obtained according to the present invention by a device for actuating and guiding wagons for transporting bulk material on rails, which comprises support means able to be fastened to the wagon and having at least one hinging axis suitable for coupling

with a corresponding hinging arm of a respective flange carrying the driving wheels of the wagon and able to be oriented with respect to the rails.

[0010] Further details may be obtained from the following description of a non-limiting example of embodiment of the subject of the present invention provided with reference to the accompanying drawings in which:

- Figure 1 shows a perspective view of the device according to the invention applied to a wagon with a container having a bottom unloading mouth;
- Figure 2 shows a side view of the device according to Figure 1;
- Figure 3 shows a plan view of the device according to Fig. 1;
- Figure 4 shows a perspective view, from above, of the device during travel around a bend;
- Figure 5 shows a perspective view, from below, of the device according to Fig. 4;
- Figure 6 shows a front view of a second embodiment of the device according to the invention for wagons comprising swivel-type unloading containers; and
- Figure 7 shows a side view of the device according to Fig. 6;
- Figure 8 shows a side view of a variation of embodiment of the device according to the invention.

[0011] As shown in Fig. 1 and assuming solely for the sake of convenience of description three conventional axes of orientation, i.e. longitudinal axis X-X, transverse axis Y-Y and vertical axis Z-Z, the device according to the present invention for moving and guiding a wagon 10 comprises a pair of plates 20 respectively fastened to the longitudinal side 11a of the upper perimetral structure 11 of the wagon 10; each plate 20 extends in the longitudinal direction and has a hinging axis 21 along the opposite vertical edges 20a, so as to enable coupling with corresponding hinging arms 41 of a respective flange 40 for supporting actuating means 50 and guide wheels 60 of the wagon 10.

[0012] In more detail and according to preferred embodiments, said flanges 40 are in the form of an overturned "L", with the long arm 42 extending parallel to the longitudinal direction and short arm 43 extending in the vertical direction.

[0013] The longitudinal arm 42 has, formed therein, seats 42a and 42b designed to carry the rotating spindle 51a of a driving wheel 51 and the shaft 52a of an actuating motor 52 connected together by means of a drive belt 53, preferably driven on a tensioning roller 53a.

[0014] According to the invention it is envisaged that the motor is preferably oriented with its shaft substantially parallel to the transverse axis Y-Y. The short arm 43 of the flange 40 has, mounted thereon, brackets 61a for supporting a pair of rollers 62 for longitudinal guiding and 61b for supporting an auxiliary transverse guide roller 63, all of which are able to engage with respective surfaces 1a, 1b of the rails 1 supporting the wagon.

[0015] With this configuration each driving wheel is actuated independently of all the other wheels and each set of rollers is also in turn independent of the other rollers and consequently may be oriented rotationally by means of the respective support flange 40 which rotates about the fixed flange 20 by means of the hinge 21/41.

[0016] The operating principle of the device is as follows:

- after positioning the rails 1 along the track envisaged inside the plant (not shown) the wagon 10 is mounted so that
- the driving wheels 51 rest on the horizontal upper surface 1c of the respective rail;
- the transverse guide rollers 62 of each pair are arranged on opposite sides of the web of the rail 1 and rest on the respective inner/outer surfaces;
- the auxiliary longitudinal guide roller 63 comes into contact with the inner surface 1b of the rail;
- as shown in Figs. 3 and 4 the rotation of the flanges 40 about the respective hinges 21/41 allows the driving wheels 51 and the guide rollers 62,63 to vary their orientation, following the rail 1 around bends whatever the radius of curvature of the rail.

[0017] It is therefore evident how with the device according to the invention it is possible to produce wagons able to travel along support and guide rails also with very small radii of curvature without the danger of derailment, without the loss of power and without causing wear of the parts making contact, in view of the substantial lack of relative friction due to the fact that the possibility of orientation of the flanges 40 ensures substantially the same trajectory of the rails and the trajectory followed by the wheels in contact with them.

[0018] This possibility of reducing the radii of curvature is particularly useful in view of the fact that transportation of the material is normally performed inside warehouses where it is required to negotiate obstacles such as pillars and the like.

[0019] In the examples of embodiment described above the device is applied to a wagon 10 with a fixed container 10a having an unloading mouth 12 arranged underneath and able to be operated so as to open/close by means of associated actuating means 12a.

[0020] Figures 6 and 7 show instead the actuating and guiding device according to the present invention applied to wagons 110 with container 110a, of the drum type, able to be unloaded by means of swivelling thereof; in greater detail the device comprises in this case a pair of flanges 113 joined to the respective transverse sides 11b of the structure 11 and provided with seats 113a for receiving respective pivots 112b which are joined to the container 110a and about which the latter is able to rotate so as to bring the mouth (not shown) from the upper loading position into the bottom unloading position by means of gravity.

[0021] The rotation is controlled by suitable actuating

means 112a such as motors or the like.

[0022] Figure 8 shows a further embodiment of the device according to the invention in which it is envisaged that the support plate 120 is provided with a suitable seat 120a for coupling with a corresponding pivot 111c joined to the longitudinal side 11a of the support structure 11.

[0023] In this configuration the plate 120 is able to rotate about said horizontal axis 111c so as to keep the wheels 51 of the respective side resting on the rails also in the event of significant differences in level of the two rails; with this configuration it is therefore ensured that all four driving wheels rest on the respective rail independently of the possible differences in height between the two rails.

Claims

1. Device for actuating and guiding wagons (10,110) for transporting bulk material on rails (1), **characterized in that** it comprises support means (20,120) able to be fastened to the wagon (10,110) and having at least one hinging axis (21) suitable for coupling with a corresponding hinging arm (41) of a respective flange (40) carrying the driving wheels (51) of the wagon (10,110) and able to be oriented with respect to the rails (1).
2. Device according to Claim 1, **characterized in that** said support means consist of a plate (20,120) joined to the longitudinal side (11a) of a perimetral structure (11,111) supporting the wagon (10,110).
3. Device according to Claim 2, **characterized in that** said perimetral structure (11) is joined to the container (10a) of the wagon (10).
4. Device according to Claim 2, **characterized in that** said support structure (111) has flanges (113) joined to the respective transverse sides (11b) of the structure and provided with a respective seat (113a) for receiving a corresponding longitudinal pivot (112b) joined to the container (110a) of the wagon (110) and able to allow the rotation thereof about a longitudinal axis.
5. Device according to Claim 2, **characterized in that** each plate (20,120) extends in the longitudinal direction and has a hinging element (21) along the opposite vertical edges (20a).
6. Device according to Claim 2, **characterized in that** each plate (120) is joined to the associated side (11a) of the support structure (11,111) by means (120a, 11c) able to allow rotation of the plate (120) with respect to the said structure (11,111).
7. Device according to Claim 1, **characterized in that**

said flanges (40) are in the form of an overturned "L".

8. Device according to Claim 7, **characterized in that** said "L" has a long arm (42) extending parallel to the longitudinal direction (X-X) and short arm (43) extending in the vertical direction (Z-Z). 5
9. Device according to Claim 8, **characterized in that** the longitudinal arm (42) has, formed therein, at least one seat (42b) able to carry the rotating spindle (51a) of the driving wheel (51). 10
10. Device according to Claim 1, **characterized in that** said flange (40) carries the means (52) for actuating the driving wheel (51). 15
11. Device according to Claim 10, **characterized in that** said actuating means consist of at least one motor (52) with a shaft (52a) substantially parallel to the transverse axis (Y-Y). 20
12. Device according to Claim 10, **characterized in that** the longitudinal arm (42) of the flange (40) has, formed therein, at least one seat (42a) able to carry said shaft (52a) of the actuating motor (52). 25
13. Device according to Claim 11, **characterized in that** each driving wheel (51) is connected to the respective shaft (52a) of the actuating motor (52) by means of a drive belt (53). 30
14. Device according to Claim 13, **characterized in that** said drive belt (53) is driven on a tensioning roller (53a). 35
15. Device according to Claim 1, **characterized in that** said flange (40) carries the means (62,63) for guiding the wagon (10). 40
16. Device according to Claim 15, **characterized in that** the flange (40) has, mounted thereon, brackets (61) for supporting a pair of rollers (62) for guiding in the transverse direction (Y-Y). 45
17. Device according to Claim 15, **characterized in that** the flange (40) has, mounted thereon, brackets (61) for supporting an auxiliary roller (63) for guiding in the transverse direction (Y-Y). 50
18. Device according to Claim 16 or 17, **characterized in that** said guide rollers (62,63) are able to enter into engagement with respective surfaces (1a,1b) of the web of the rails (1) supporting the wagon. 55
19. Wagon (10,110) for transporting bulk material on rails (1), **characterized in that** it comprises support means (20,120) able to be fastened to the wagon (10,110) and having at least one hinging axis (21) suitable for coupling with a corresponding hinging arm (41) of a respective flange (40) carrying the driving wheels (51) for moving the wagon (10) and able to be oriented with respect to the rails (1).
20. Wagon according to Claim 19, **characterized in that** it has a support structure (11,111).
21. Wagon according to Claim 20, **characterized in that** said support structure (11,111) is arranged partially above the plane of the rails (1) along which the driving means (51) operate.
22. Wagon according to Claim 20, **characterized in that** the volume of the support structure (11,111) in the transverse direction (Y-Y) is contained within the centre distance of the rails (1) in the transverse direction.
23. Wagon according to Claim 20, **characterized in that** the sides (11a) of the carrying structure (11) are substantially parallel to the rails (1).
24. Wagon according to Claim 19, **characterized in that** said support means of the device consist of a plate (20,120) joined to the longitudinal side (11a) of the structure (11,111) of the wagon (10,110).
25. Wagon according to Claim 24, **characterized in that** each plate (20,120) extends in the longitudinal direction and has a hinging element (21) along the opposite vertical edges (20a).
26. Wagon according to Claim 24, **characterized in that** said flange (40) has, formed therein, at least one seat (42b) able to carry the rotating spindle (51a) of the driving wheel (51).
27. Wagon according to Claim 24, **characterized in that** said flange (40) carries the means (52) for actuating the driving wheel (51).
28. Wagon according to Claim 27, **characterized in that** said actuating means consist of a motor (52) with shaft (52a) substantially parallel to the transverse axis (Y-Y).
29. Device according to Claim 27, **characterized in that** the longitudinal arm (42) of the flange (40) has, formed therein, at least one seat (42a) able to carry said shaft (52a) of the actuating motor (52).
30. Device according to Claim 28, **characterized in that** each driving wheel (51) is connected to the respective shaft (52a) of the actuating motor (52) by means of a drive belt (53).
31. Device according to Claim 19, **characterized in that**

said flange carries the means (62,63) for guiding the wagon (10,110).

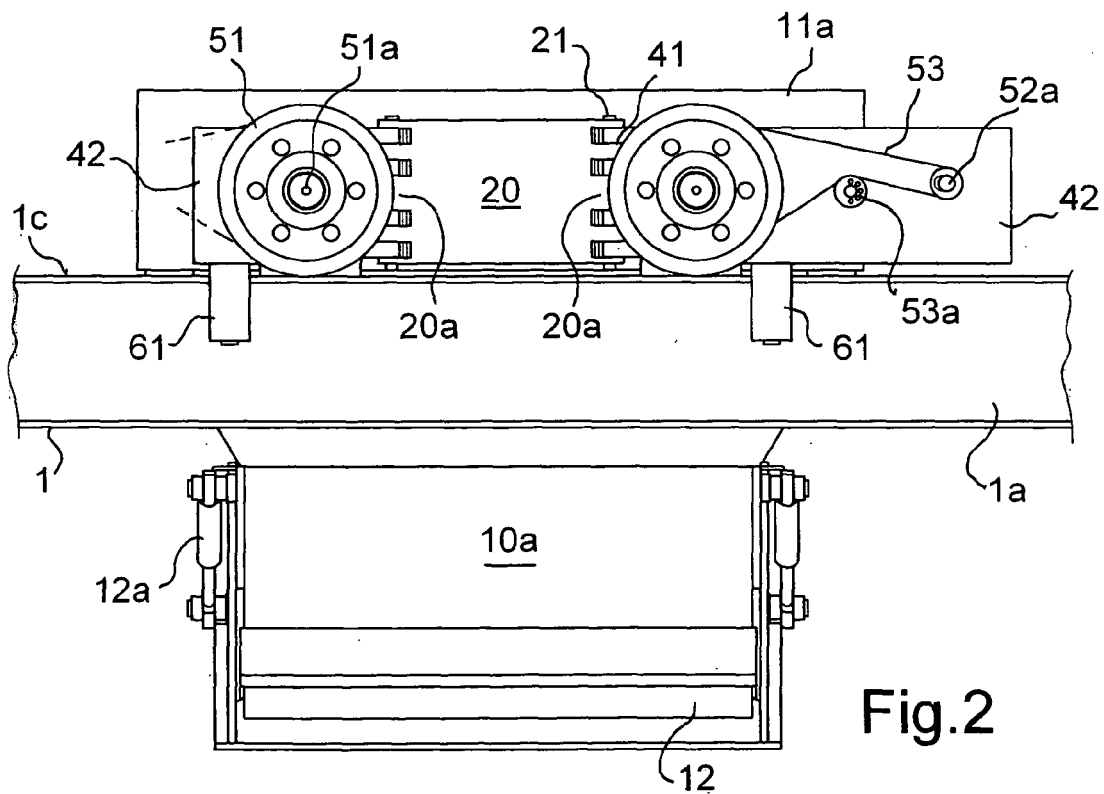
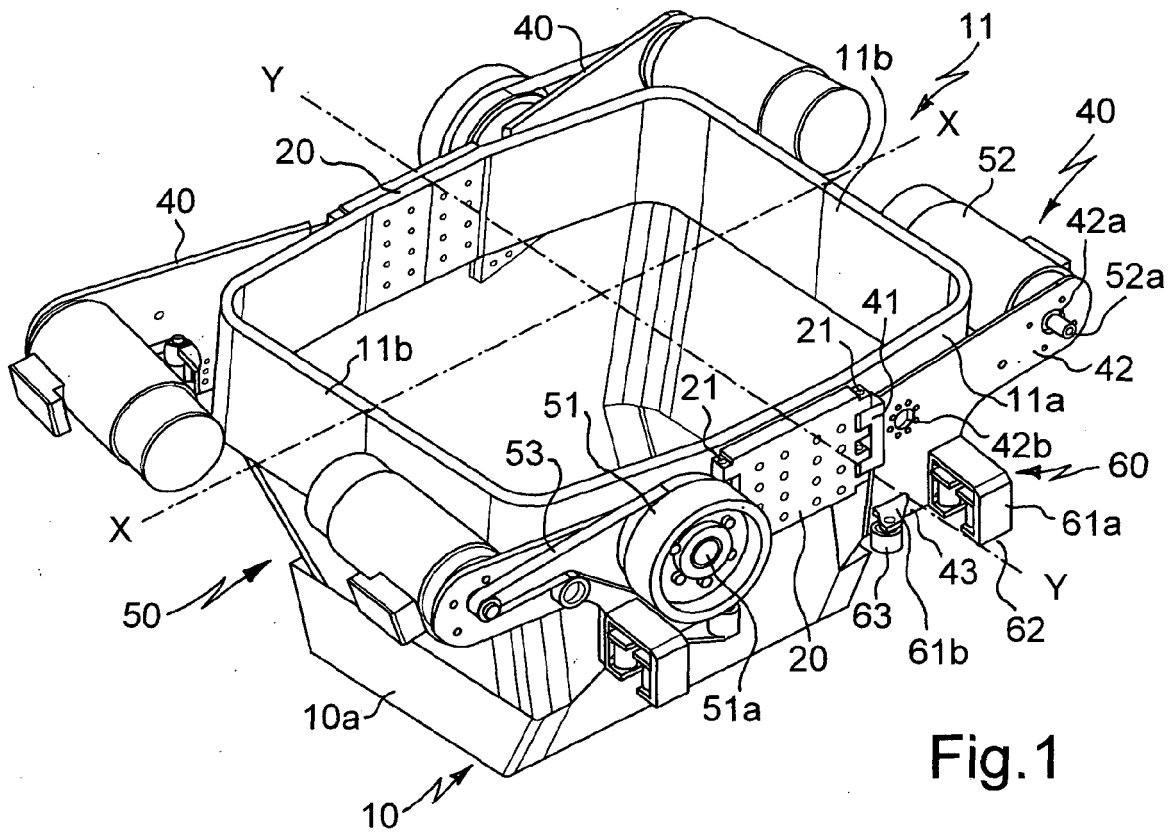
32. Device according to Claim 31, **characterized in that** the flange (40) has, mounted thereon, brackets (61a) for supporting a pair of rollers (62) for guiding in the transverse direction (Y-Y). 5
33. Device according to Claim 31, **characterized in that** the flange (40) has, mounted thereon, brackets (61b) for supporting an auxiliary roller (63) for guiding in the transverse direction (Y-Y). 10
34. Device according to Claim 32 or 33, **characterized in that** said guide rollers (62,63) are able to enter into engagement with respective surfaces (1a,1b) of the web of the rails (1) supporting the wagon. 15
35. Wagon according to Claim 19, **characterized in that** it has an unloading mouth (12) arranged underneath the rails (1) in the vertical direction (Z-Z). 20
36. Wagon according to Claim 35, **characterized in that** said support structure (11) is joined to the wagon. 25
37. Wagon according to Claim 19, **characterized in that** it has an unloading mouth coinciding with the loading mouth.
38. Wagon according to Claim 37, **characterized in that** said carrying structure (111) has flanges (113) joined to the respective transverse sides (11b) of the structure (111) and provided with respective seats (113a) for receiving respective pivots (112b) joined to the container (110a) of the wagon and able to allow rotation thereof about a longitudinal axis. 30 35

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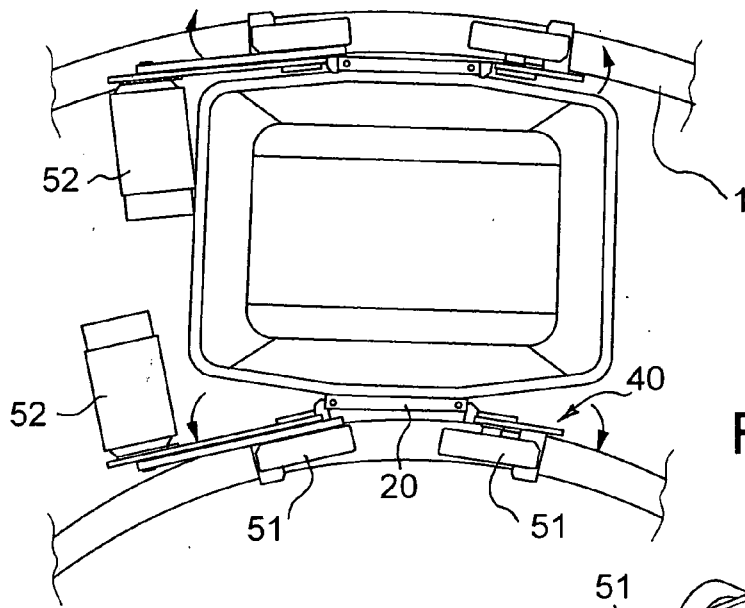


Fig.3

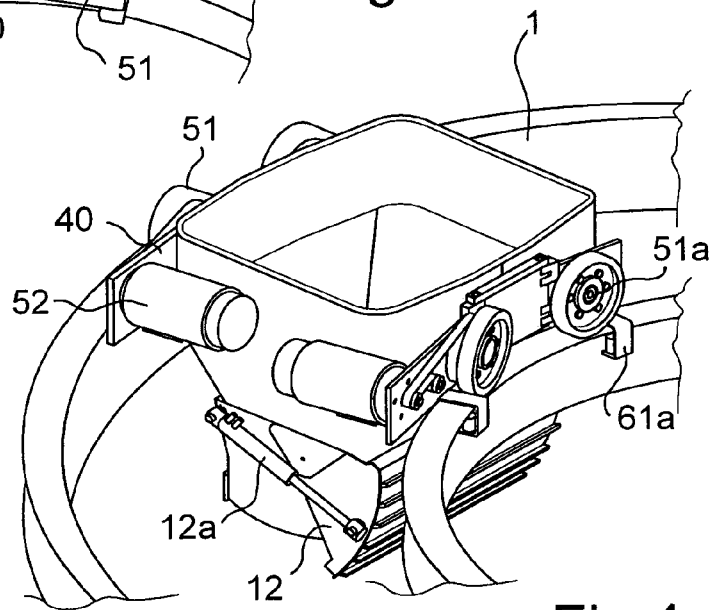


Fig.4

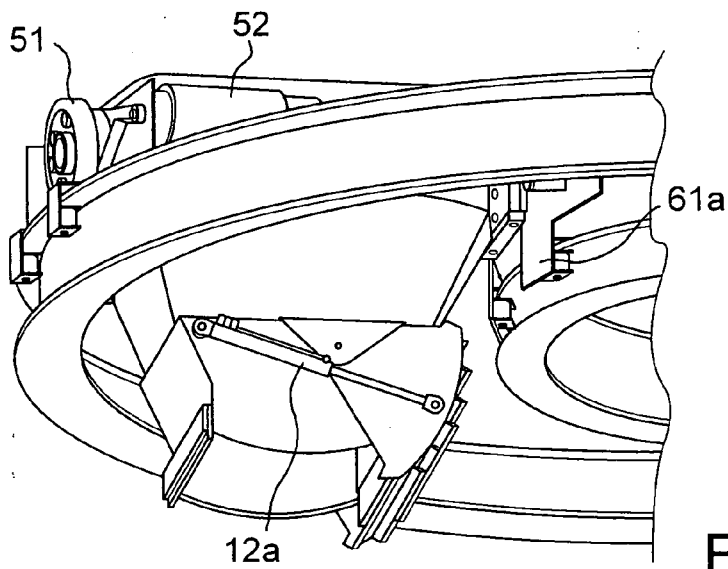


Fig.5

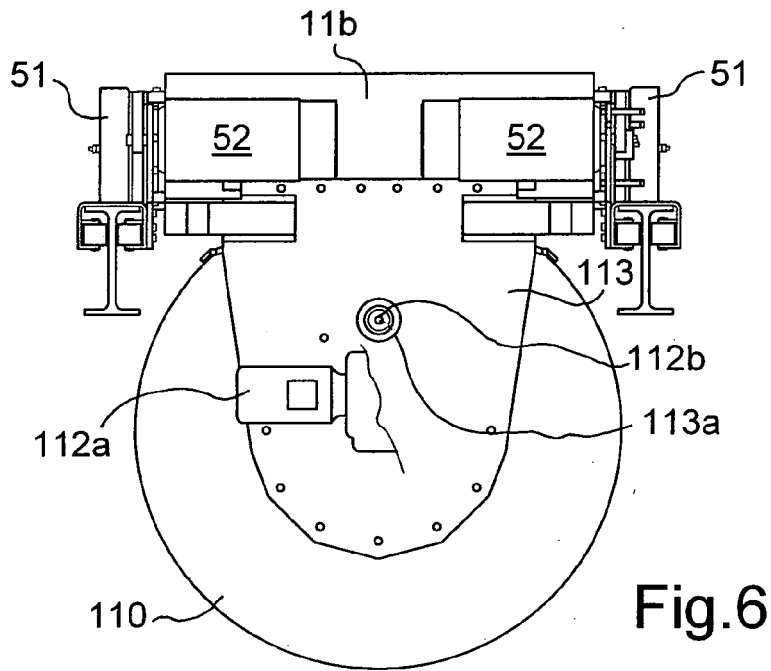


Fig.6

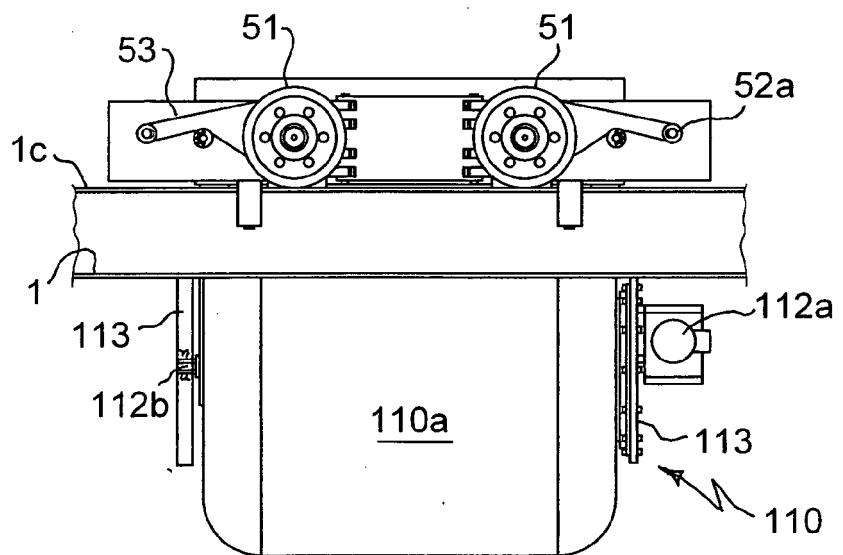


Fig.7

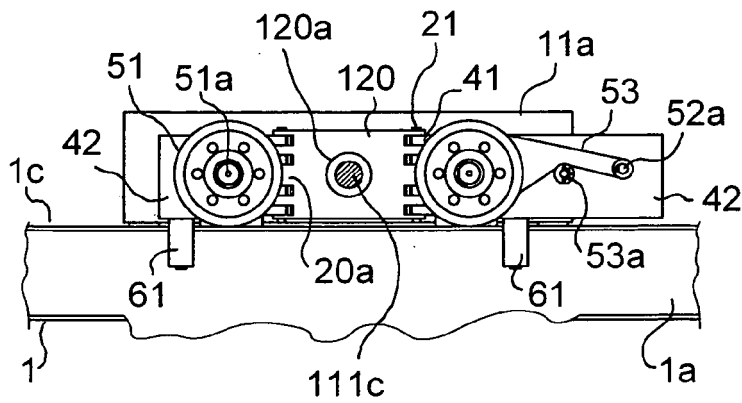


Fig.8