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(54) **Drive mechanism for drive chains of mechanical stairways and moving walkways**

(57) The invention relates to a drive mechanism for drive chains of mechanical stairways and moving walkways, comprising at least one pair of gear wheels (1) assembled on one and the same drive shaft (2), which wheels engage two parallel drive chains (4) in coinciding straight trajectory runs in both chains.

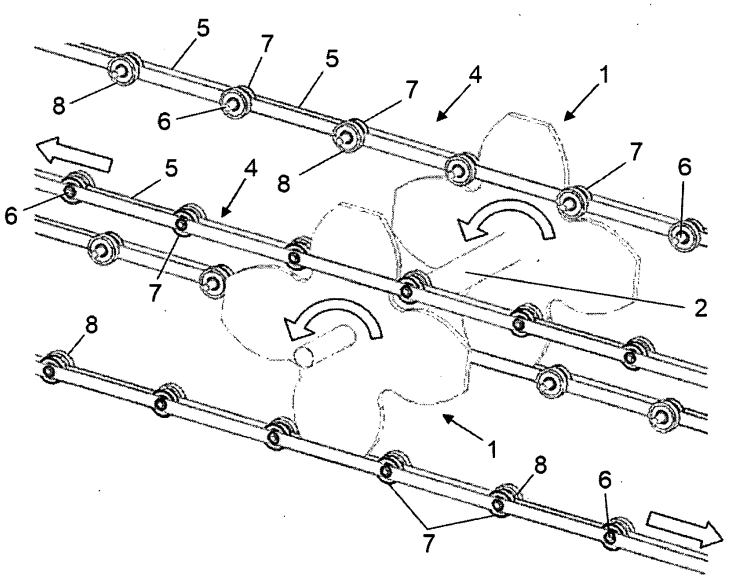

Fig. 2

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Description

Field of the Invention

[0001] The present invention relates to a drive mechanism for drive chains of mechanical stairways and moving walkways formed by gear wheels engaging two parallel drive chains linked to the steps or treadboards of the stairways or walkways.

Background of the Invention

[0002] Mechanical stairways and moving walkways usually move step or treadboard bands through chains attached to the steps or treadboards. These chains are usually driven through a gear wheel placed at the upper end which is driven by a geared motor. In this case, the chain wraps around the gear wheel. Due to the construction of the chain, a polygonal effect is usually created in which the speed of the chain does not maintain a constant value.

[0003] Other constructions provide linear speed to the chain through systems in which the chain is driven in a straight part, usually through an intermediate belt or chain, which moves the chain forming the step or treadboard band.

[0004] In this sense, US patent 7168547 for example describes a system in which the chain is formed by a series of links having a gear-like toothing formed therein engaging a toothed belt. Patent GB 1371519 describes a system similar to the previously mentioned one in which the drive member that was previously a belt is now a transmission chain.

[0005] Both described systems are based on a flexible transmission member (belt or chain) requiring maintenance and possibly having a limited service life, leading to its replacement during the service life of the stairway or walkway. The system described in the present invention engages a wheel directly on the articulations of the step or treadboard drive chain, whereby this flexible transmission member is avoided. The other construction additionally requires the use of links with gear-like teeth formed therein, the present invention uses a conventional chain, without needing to form any toothing on the link meshes.

Description of the Invention

[0006] The object of the present invention is to overcome the described problems by means of a mechanism with a simple construction which can be used both in the horizontal head area, before the turning, and in the inclined area, making this second option a modular drive system for cases in which it is nessecary.

[0007] The mechanism of the invention is formed by gear wheels engaging two parallel drive chains, which chains include free rotating rollers at the articulation points between links.

[0008] According to the invention, the mechanism comprises at least one pair of gear wheels, one wheel for each drive chain. The wheels comprise at least three teeth each and engage the two parallel drive chains in coinciding straight trajectory runs thereof. The wheels can be driven by independent drive mechanisms or by a single drive mechanism if both wheels are assembled on one and the same shaft.

[0009] The pair or pairs of gear wheels will drive the two parallel drive chains of the stairway or walkway which will in turn provide movement to the step or treadboard band.

[0010] The rollers of the coinciding straight runs of the two chains will simultaneously engage the two gear wheels, transferring linear movement to the system. The rollers can be made of metal, plastic, polyurethane, etc.

[0011] The mechanism of the invention allows driving the chains in both directions by rotating the gear wheels clockwise or counter-clockwise, thereby allowing the forward of the treadboard or step band in the two movement directions, thus forming a reversible system.

[0012] Each link of the chain can include just one roller at each end, coinciding with the articulation points with the adjacent links, or a roller at each end and at least one intermediate roller between articulations.

[0013] The chain can further include an outer roller with respect to the links in each articulation arranged coaxially with the articulation shafts between consecutive links. These outer rollers can serve as a support means on guides in the areas where the system requires it. These outer rollers can also serve as engaging rollers for the gear wheels.

[0014] The mechanism can be formed by two or more pairs of gear wheels. Each of these pairs will be assembled on an independent drive shaft, the gear wheels of each pair in all cases engaging the chains in coinciding straight trajectory runs thereof in both chains.

[0015] According to a possible embodiment, at least the two gear wheels of the pair of wheels closest to the upper pair of the stairway can engage the forward and backward runs of the drive chains of both sides, whereas the gear wheels of the remaining pairs of gear wheels of the mechanism will only engage the forward run of the chains.

[0016] The mechanism of the invention can also have means for driving the handrail.

[0017] These means can consist of pulleys integral with the gear wheels, with a diameter equal to the pitch diameter of said gear wheels.

[0018] It should finally be pointed out that in the mechanism of the invention the stairway will have guides in the turning areas of the chains, at least one of these guides being able to be provided with a tensing device for tensing the chains.

Brief Description of the Drawings

[0019] The attached drawings show a drive mecha-

nism for drive chains of mechanical stairways and moving walkways formed according to the invention and provided by way of non-limiting example. In the drawings:

Figure 1 shows a perspective view of a pair of gear wheels assembled on a common shaft which is part of the mechanism of the invention.

Figure 2 shows a perspective view of the set of gear wheels of Figure 1 assembled in two parallel drive chains.

Figure 3 shows a side elevational view of the mechanism of the invention positioned for driving at the head of the drive chains.

Figure 4 is a view similar to Figure 3, showing the positioning of the mechanism for driving in an inclined run of the drive chains.

Figure 5 is a perspective view similar to Figure 1, including a drive mechanism for the pair of gear wheels assembled on one and the same shaft.

Figure 6 is a view similar to Figure 2, with two drive mechanisms for the common shaft of a pair of gear wheels.

Figure 7 shows a first embodiment of the drive chains.

Figure 8 shows a perspective view of a possible type of engagement of the gear wheels with the chain of Figure 7.

Figure 9 shows a perspective view of a second embodiment of the drive chains.

Figure 10 shows a perspective view of the engagement between the gear wheels and the drive chain of Figure 9.

Figure 11 shows a side elevational view with the condition of tangency between the teeth of the gear wheels and the rollers of the drive chains.

Figure 12 shows a drive mechanism including two pairs of gear wheels.

Figure 13 is a view similar to Figure 5, showing an embodiment variant.

Figures 14 and 15 show the turning system of the drive chains.

Detailed Description of an Embodiment

[0020] The constitution of the mechanism of the invention as well as the features and advantages thereof will be described below in further detail with the following description of the embodiment shown in the drawings described above.

[0021] Figure 1 shows a pair of gear wheels 1 which are assembled on one and the same shaft 2. In the depicted embodiment each gear wheel 1 includes four teeth 3, being able to have three or more teeth.

[0022] As shown in Figure 2, the two gear wheels 1 assembled on one and the same shaft 2 engage as many other parallel drive chains 4 in coinciding straight trajectory runs of said chains in both chains 4.

[0023] The chains 4 are formed by links 5 which are articulated through shafts 6, inner free rotating rollers 7 being assembled in coincidence with them. Outer rollers 8 which can serve as support means or engagement points with the wheels 1, as will be explained below, can further be assembled in the shafts 6.

[0024] In the embodiment depicted in Figure 2, the rollers 7 of the upper part or outgoing branch of the two chains 4 simultaneously engage the two gear wheels 1.

[0025] The gear wheels 1 can rotate in the direction indicated by the arrows or in the opposite direction, such that the shifting of the step or treadboard band can take place in the two movement directions, thus forming a reversible system.

[0026] The pair of gear wheels 1 assembled on one and the same shaft 2 can be arranged in straight runs of the chains 4 running in the horizontal position, as shown in Figure 3, or in inclined runs, as shown in Figure 4. In the first case the drive of the drive chains 4 can be at the head, before the turning of the chains.

[0027] The shaft 2 on which each pair of gear wheels 1 is assembled can have a single drive mechanism 9 connected thereto formed for example by a motor or geared motor or by two drive mechanisms 9 and 10, as shown in Figure 6, which in any case will be attached to the necessary couplings, depending on the location of the system, always within the structure of the rolling stairway or walkway.

[0028] Figure 7 shows the constitution of the chain in greater detail in which there are assembled on the articulation shaft 6 between consecutive links 5 an inner free rotating roller 7 with which the teeth 3 of the gear wheels 1 engage and an outer roller 8 which will serve as a support, in the area where the system requires it, on known guides 11 of the system.

[0029] The steps or treadboards will be located in the portion of the shafts 6 projecting towards the inner side of the stairway or walkway.

[0030] The outer rollers 8 can also serve as engagement points of the teeth 3 of the gear wheels 1 as shown in Figure 8.

[0031] The gear wheels can thereby engage the inner rollers 7 or the outer rollers 8 of the chains.

Figure 9 shows an embodiment variant of the chains in which each link 5 includes an intermediate inner roller 12 located between the end rollers 7 assembled on the articulation shafts 6 between consecutive links. This intermediate roller 12 will also be a free rotating roller assembled on the corresponding shaft 13.

Figure 10 shows how the teeth 3 of the gear wheels 1 engage the intermediate roller 12 and the adjacent end rollers 7.

Figure 11 shows the engagement between the teeth 3 of the gear wheels 1 and the rollers 7 or 12, Figures 9 and 10, of the chains.

[0032] The shaft 6 of the rollers 7 and also the shaft

13 of the rollers 12 further describe a trajectory 14 in the engagement area that remains tangent to the pitch circle 16 of the wheel 1 at point 15. The speed of the chains 4 is thereby maintained constant.

[0033] As seen in Figure 11, the teeth 3 of the gear wheels have a profile formed by two symmetrical convex curved side runs 10 conjugated with the geometry of the rollers 7 or 12 and linked to the passage of the chain 4. The teeth thus have a wrap-around profile to produce the engagement with the rollers 7, 8 or 12 of the chains.

[0034] As shown in Figures 1 and 2, the mechanism could include two or more pairs of gear wheels 1-1', each pair assembled on an independent common shaft 2-2' of the other pairs, each of these shafts being linked to one or more drive mechanisms. The wheels 1 of the drive closest to the upper head preferably engage both sides of the stairway both in the forward path 18 and in the return path 19 of the drive chains. This double engagement has the purpose of reducing loads on the rollers in the upper turning because the rollers are subjected to the greatest loads in this turning. With this embodiment, the remaining wheels 1' of the drive located downstream from the wheels 1 would only engage in the forward path 18.

[0035] The mechanism of the invention can also include the drive of the handrail integrated in the shaft of one of the pairs of gear wheels, as shown in Figure 13. The gear wheels 1 have respective pulleys 20 fixed thereto having a diameter equal to the pitch diameter 16 of said gear wheels 1, Figure 11, thus achieving a speed of the step band equal to the speed of the handrail.

[0036] With the mechanism of the invention the traction of the chains 4 is always in straight trajectory runs thereof, so the turning in the head areas will be carried out by means of guides 21, as depicted in Figure 14. The guide 21 of at least one of the heads can include a tensing device 22 for tensing the chain 4 as shown in Figure 15.

Claims

1. A drive mechanism for drive chains of mechanical stairways and moving walkways by means of gear wheels (1) engaging two parallel drive chains (4), which include free rotating rollers at the articulation points between links, **characterized in that** it comprises at least one pair of gear wheels (1), which wheels comprise at least three teeth (3) each and engage two parallel drive chains (4) in coinciding straight trajectory runs in both chains.

2. The mechanism according to claim 1, **characterized in that** the links (5) of the chains (4) comprise a roller (7) at each end coaxial with the articulation shaft (6) between consecutive links.

3. The mechanism according to claim 1, **characterized in that** each link (5) of the chains includes a roller (7) at each end coinciding with each articulation point with adjacent links, and at least one intermediate roller (12) between the articulation points.

4. The mechanism according to claims 1 to 3, **characterized in that** it comprises at least two pairs of gear wheels (1-1'), each of which pairs is assembled on an independent drive shaft (2-2') and engages the two chains (4) in coinciding straight trajectory runs of said chains.

5. The mechanism according to claim 4, **characterized in that** the two gear wheels (1) of the pair of wheels closest to the upper head of the stairway engage the forward run (18) and return run (19) of the drive chains (4) of both sides, whereas the gear wheels (1') of the remaining pairs of gear wheels only engage the forward run (18) of the chains.

6. The mechanism according to any of claims 1, 4 or 5, **characterized in that** the gear wheels (1-1') have fixed thereto pulleys (20) having a diameter equal to the pitch diameter (16) of said gear wheels for applying traction on the handrail.

7. The mechanism according to the preceding claims, **characterized in that** it has guides (21) for the chains (4) in the turning areas.

8. The mechanism according to claim 7, **characterized in that** at least one of the aforementioned guides includes a tensing device (22) for tensing the chains (4).

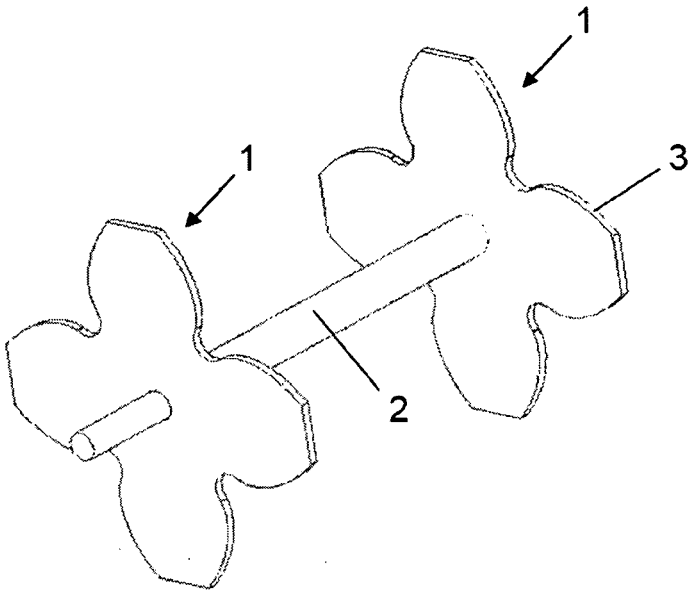


Fig. 1

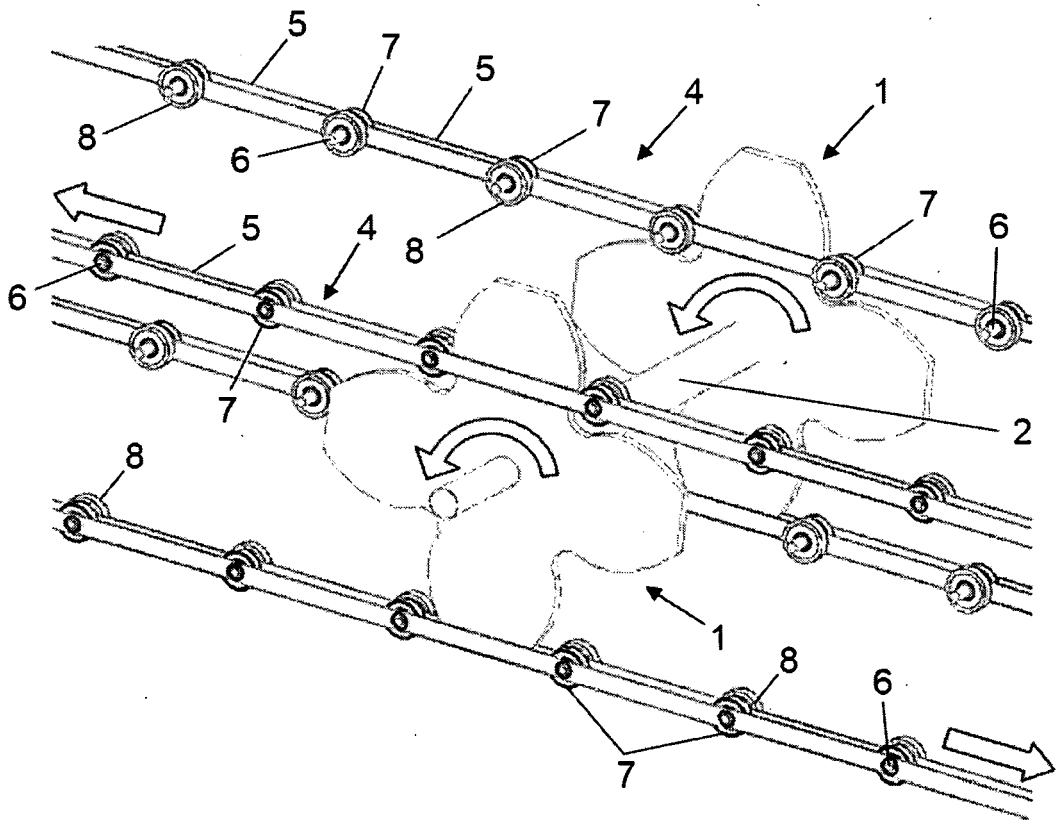


Fig. 2

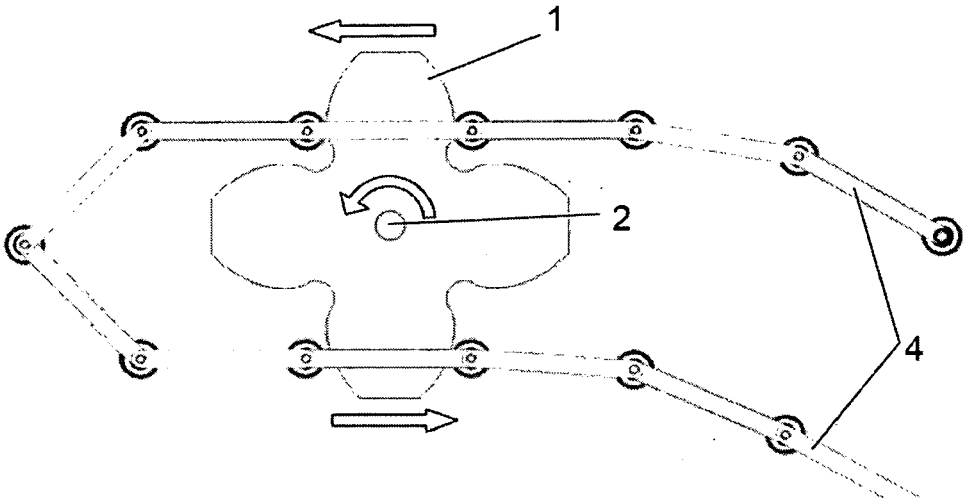


Fig. 3

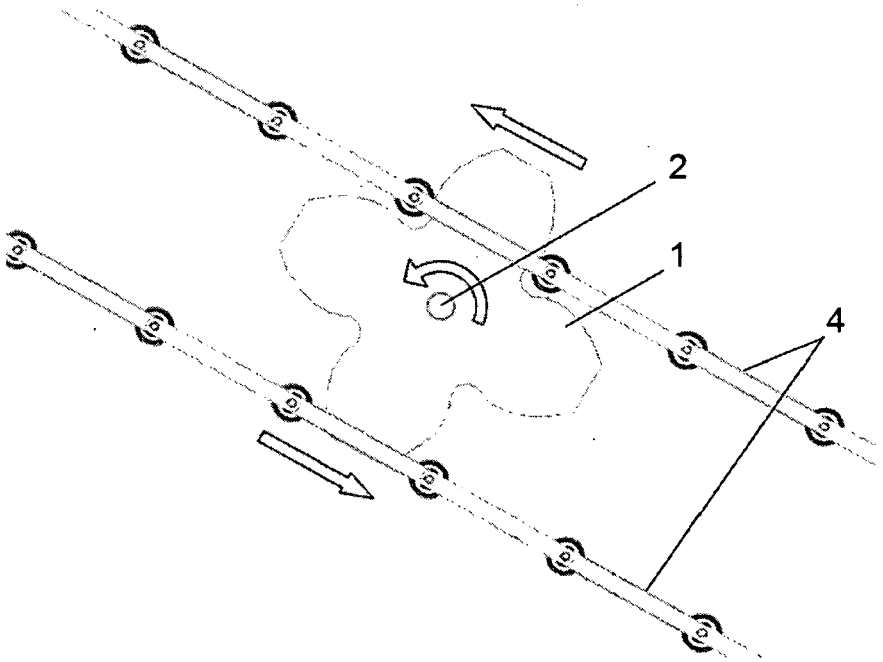


Fig. 4

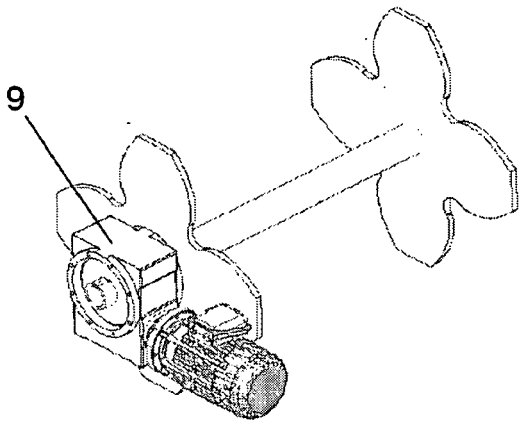


Fig. 5

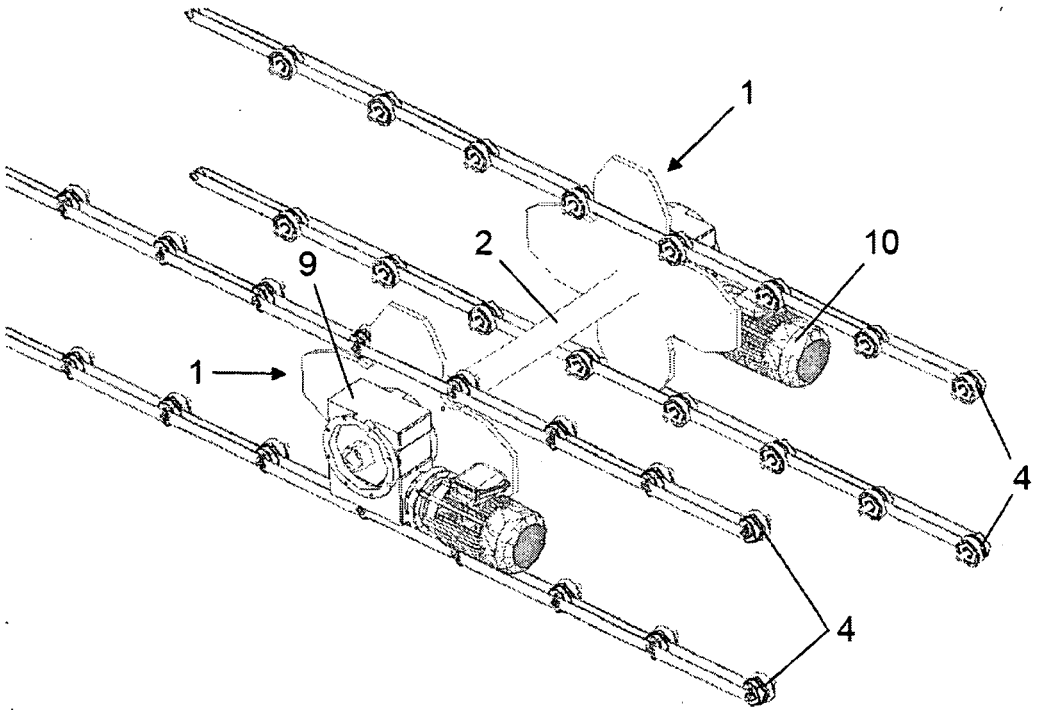


Fig. 6

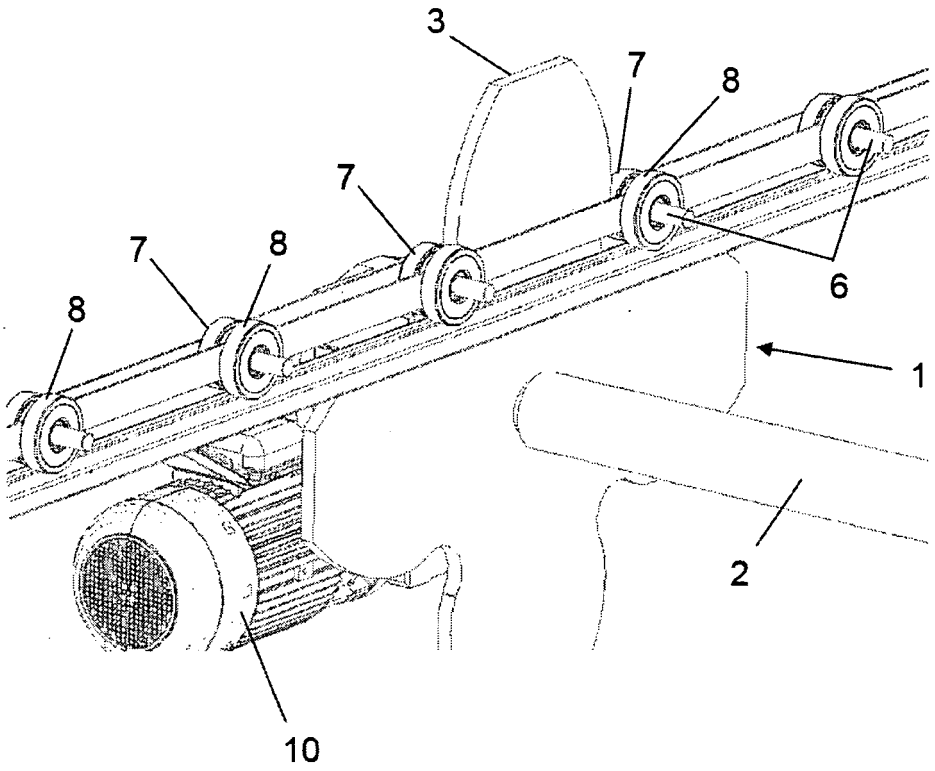
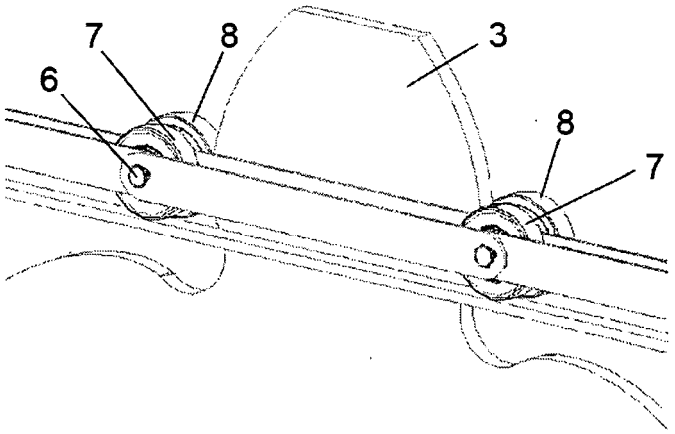


Fig. 7



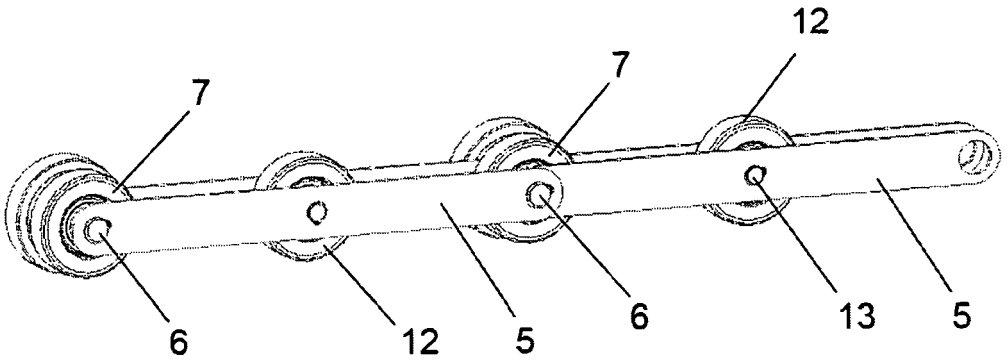


Fig. 9

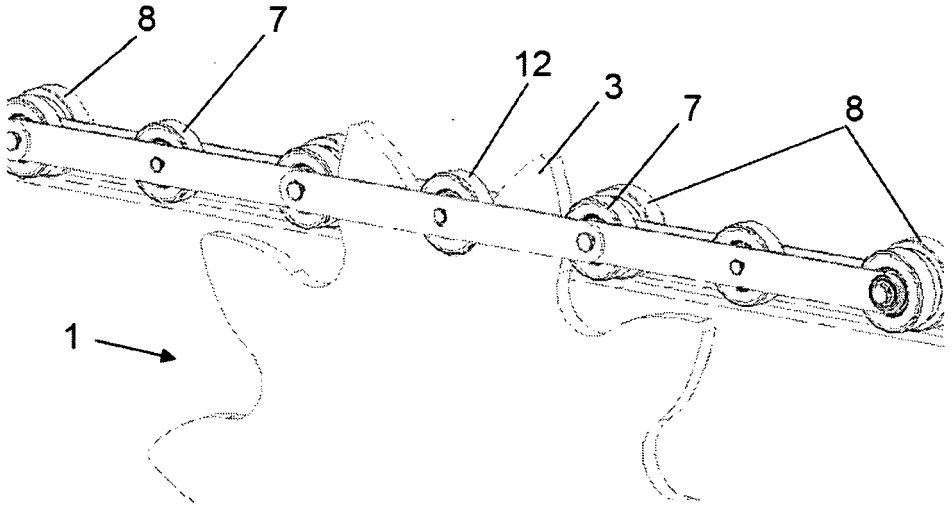


Fig. 10

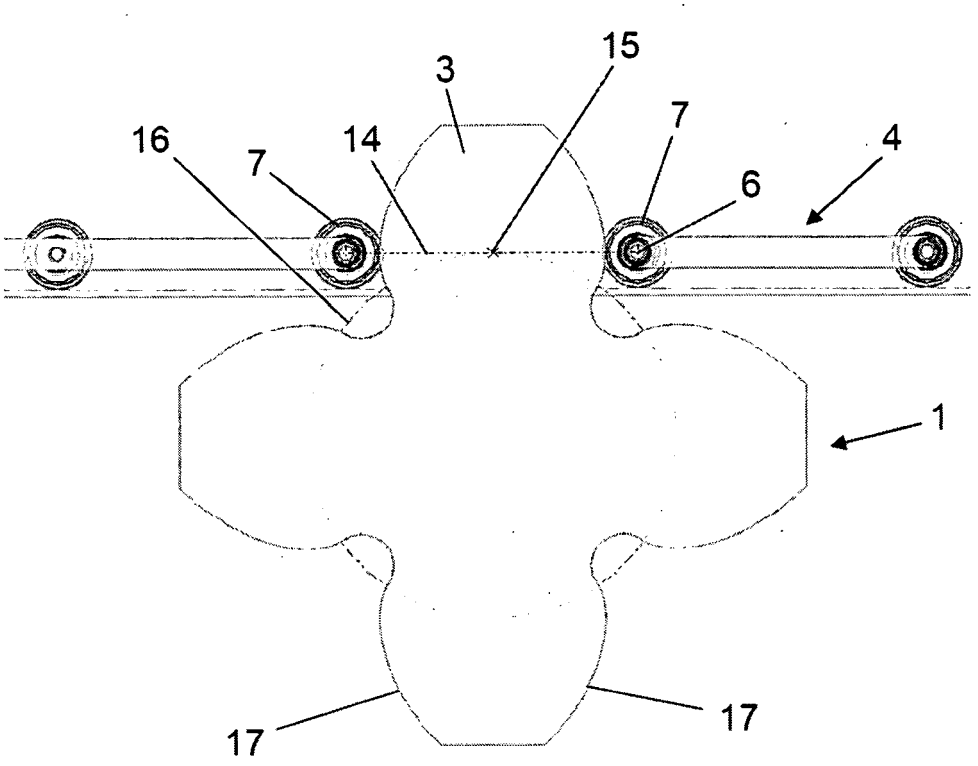


Fig. 11

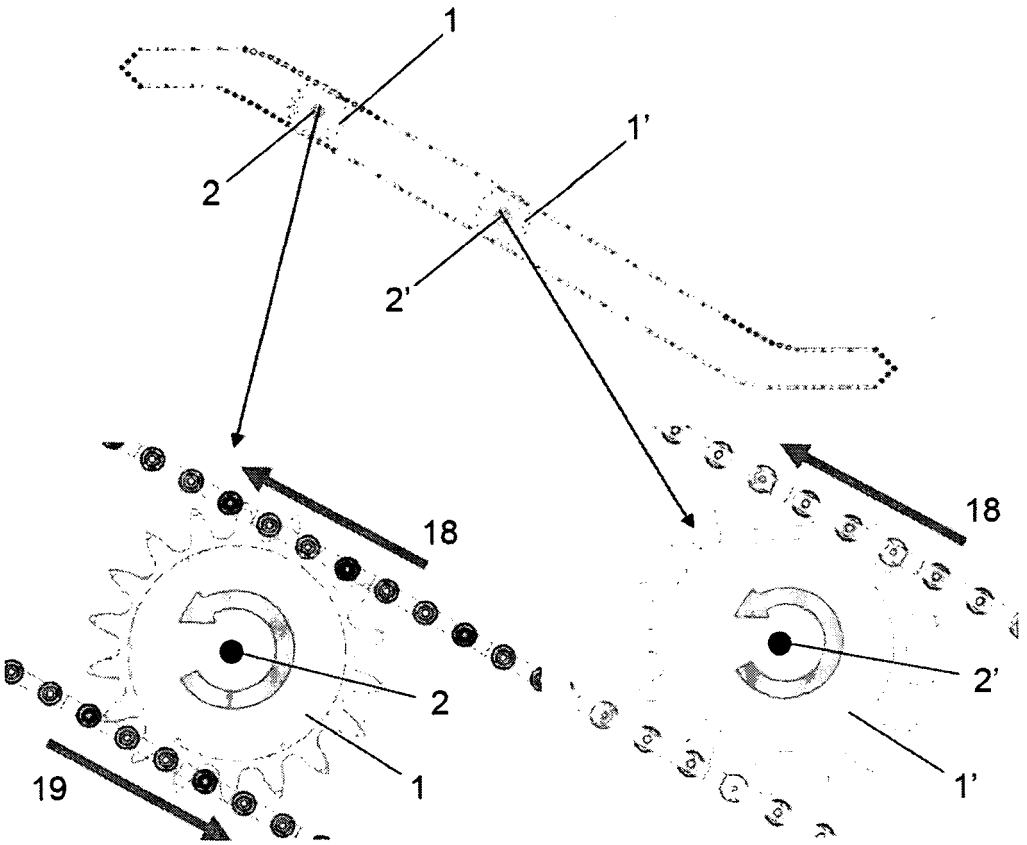


Fig. 12

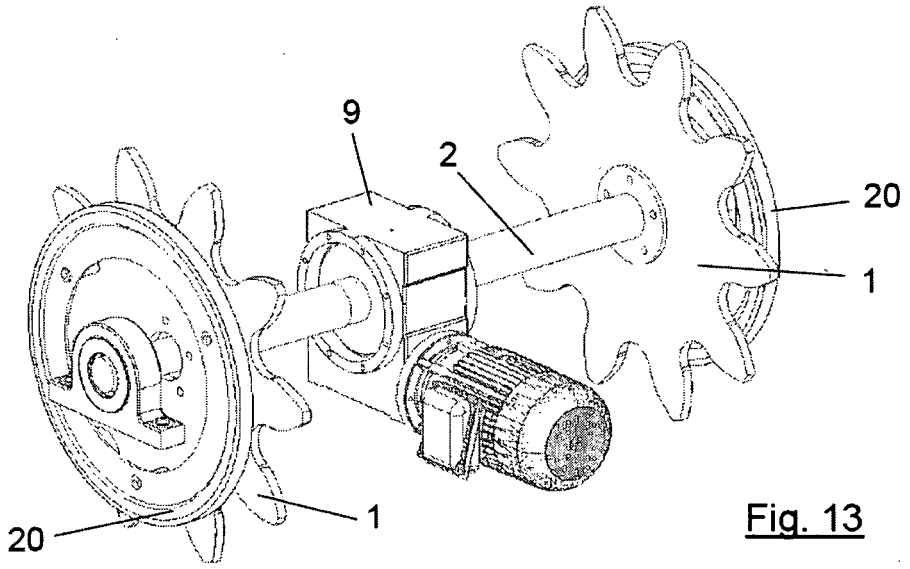


Fig. 13

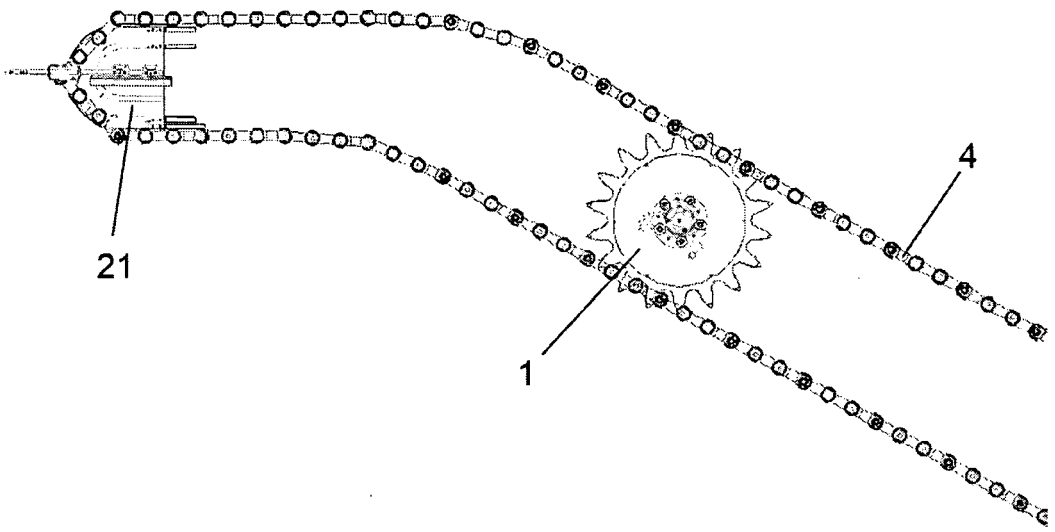


Fig. 14

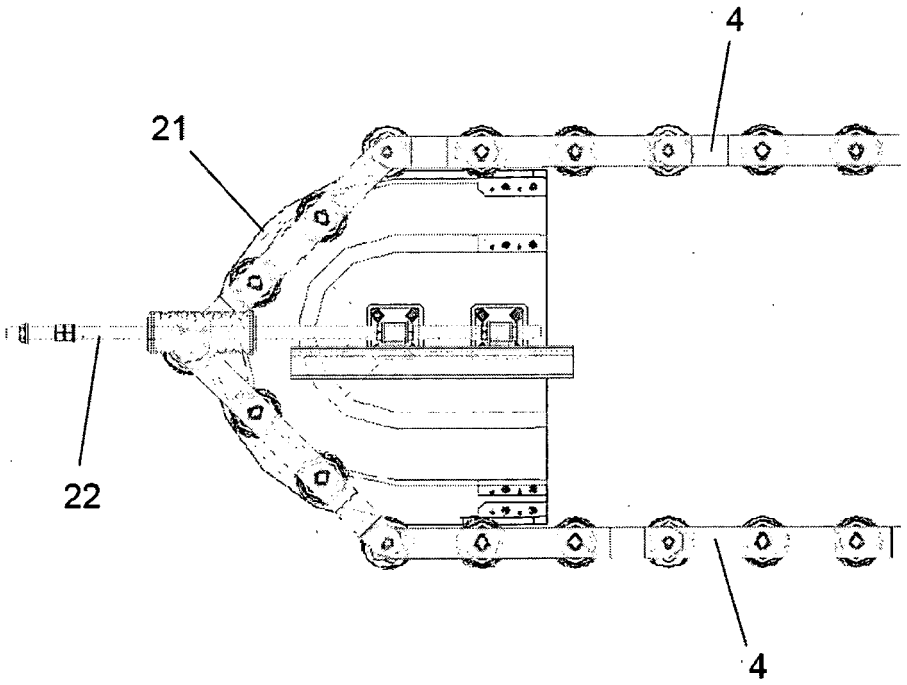


Fig. 15

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 September 2011	Bleys, Philip

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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