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(71) Applicant: **La Falco S.R.L.**  
**42028 Poviglio (RE) (IT)**

(72) Inventor: **Giuberti, Enzo**  
**42028, Poviglio (RE) (IT)**

(74) Representative: **Guareschi, Antonella**  
**c/o Ing. Dallaglio S.r.l.**  
**Viale Mentana 92/C**  
**43100 Parma (IT)**

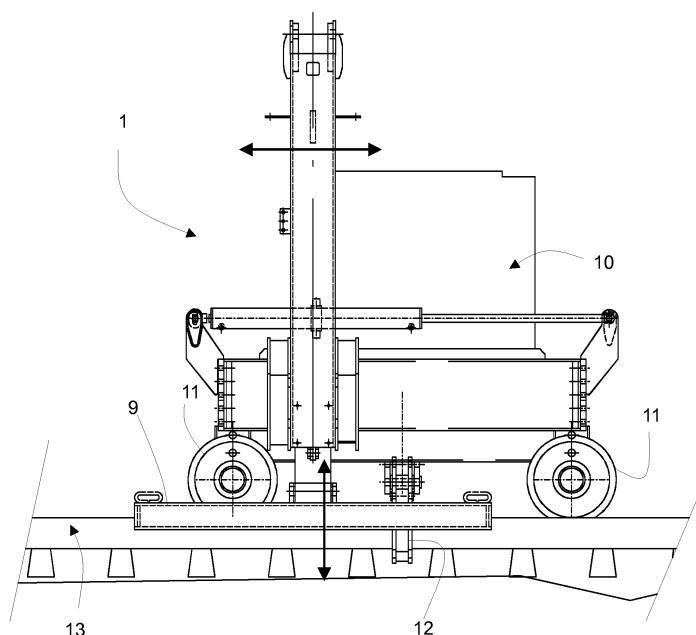
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(54) **Process for transporting and laying or replacing railway switches, tracks and sleepers**

(57) A process for transporting and laying or replacing railway switches, tracks and sleepers, in which the switches or tracks are lifted and grabbed by means of at least one gripping machine, and the machine/track or machine/switch assembly thus formed is moved in a longitudinal direction, by repeated operation of linearly slid-

ing means of the gripping machine to carry out a cycle for lifting the track/machine assembly, displacing the track/machine or machine/switch in said longitudinal direction; laying back onto the ground the track/machine assembly; restoring the relative positions of the means of the machine.

FIG. 1



## Description

**[0001]** The present invention relates to a process for transporting and laying or replacing railway switches, tracks and sleepers implemented by a machine for carrying out such operation.

**[0002]** Railway switches or turnouts or tracks, as well as their respective sleepers, are currently laid and replaced using mechanized equipment.

**[0003]** A first type of such equipment, now obsolete, is a self-propelled, truck-mounted hydraulic lift having rail gripping hooks susceptible of both height and width motion by means of special cross members.

**[0004]** A further equipment type is a support member consisting of a beam which extends longitudinally above the switch or track to be handled and also has gripping hooks; it further comprises

- one or more trolleys for beam support and longitudinal translation on tracks;
- one or more self-propelled crawler tractors for taking off the beam off-track;
- one or more hydraulic lifts with retractable support feet.

**[0005]** Operation of the above machine is as follows: the beam picks up and lifts the track, switch or turnout through the lifts, and transfers it to the laying site, first through the trolleys and then through the crawler tractor.

**[0006]** Actually, the present machine operates with the so-called incremental launching technique by carrying forward the track to be replaced using the crawler wheels.

**[0007]** In fact, prior art drawbacks include the use of such bulky crawler wheels, which require temporary suspension of the adjacent railway lines, even when they are not involved in the replacement of the track, switch or turnout.

**[0008]** Another drawback, still associated to the presence and use of crawler transport means lies in that the soil next to the line may have a steep slope, and crawler means may not easily run thereon, or cause such ground to collapse.

**[0009]** The object of the present invention is to provide a novel and improved process for transporting and laying or replacing railway switches, tracks and sleepers.

**[0010]** The advantages provided thereby include:

- Ready use of the machine, with no installation, fitting or preparation step being required on site and/or on the yard.
- Fast replacement of the track, with quick removal or laying thereof.
- Minimized space requirements, due to the lack of crawler means, thereby allowing the passage of adjacent railway lines
- No additional service tracks shall be laid for allowing the machine to run.

**[0011]** These objects and advantages are achieved by the process for transporting and laying or replacing railway switches, tracks and sleepers implemented by the machine for carrying out such operation, according to the present invention, which is characterized as defined in the annexed claims.

**[0012]** These and other features will be more apparent from the following description of a few embodiments, which are shown by way of example and without limitation in the accompanying drawings, in which:

- Figure 1 is a side view of a machine for transporting and laying or replacing railway switches, tracks and sleepers according to the present invention
- Figure 2 is a front view with the machine retracted and the posts in lifted positions
- Figure 3 is a front view of the machine during a transportation cycle;
- Figure 4 shows a step of the transportation cycle carried out in the process of the present invention, namely the one in which the switch or turnout is lifted
- Figure 5 shows a next step of the cycle, namely the one in which the machine/switch assembly is moved forward
- Figure 6 shows a third step of the transportation cycle, i.e. the one in which the switch is lowered
- Figure 7 shows the last position recovery step of the cycle.

**[0013]** Referring to Figure 1, numeral 1 shows a gripping machine for carrying out the process of transporting and laying or replacing railway switches, tracks and sleepers.

**[0014]** In other words, the present gripping machine 1, alone or in combination with other identical gripping machines 1, may be used for lifting and grabbing switches or tracks and displacing in a longitudinal direction the machine/track or machine/switch assembly so formed, by repeated operation of certain linearly sliding means thereof, to obtain a real incremental launching of the switch without using any crawler means and suffering from any associated drawback.

**[0015]** The gripping machine 1 has a truck-mounted frame 10, with wheels 11, whether powered or not, designed to rest on the tracks, gripping means, or jaws 12, for holding the tracks or the switch 13 fixed to the machine 1.

**[0016]** The machine further has a motor for driving the sliding means and performing the operating steps as provided by the process of the invention.

**[0017]** As mentioned above, the machine 1 also incorporates sliding drive means 2 and 4, external to and on each sidewall, adapted to generate the transportation cycle as described below; said means include first means, such as posts 2 and second means such as post sliding beams 4, which may be displaced to more or less open positions, as shown in Figures 2 and 3, by two cross members 5 and 6 sliding in corresponding guides of the

machine frame 10.

**[0018]** Each cross member 5 and 6 is connected to the corresponding post sliding beam 4, and the latter slides in a corresponding guide support 7 attached to the post 2.

**[0019]** The posts 2 are oriented in the vertical direction and are adapted to allow a respective rod 3 of a vertically extending hydraulic cylinder to slide, a free end of the latter being fitted with a foot 9 of such a length as to allow proper distribution of the machine weight.

**[0020]** It will be appreciated that the post 2 is oriented with its rod 3 facing towards the ground, and the foot 9 may act thereagainst to lift the machine 1.

**[0021]** As mentioned above, the posts 2 operate laterally with respect to the frame 10 and external to the maximum size  $I_{max}$  given by the machine/track or machine/switch assembly, also including the sleepers of the switch or track.

**[0022]** Nevertheless, the presence of the feet 9 reduces the required maximum size relative to the case of a crawler machine.

**[0023]** On the other hand, the guide support 7 faces towards the framework 10 of the machine, i.e. the inner side between the posts 2 and is conformed to allow horizontal sliding of the post sliding beam 4 introduced therein.

**[0024]** Said post sliding beam 4 is operated by means of a device 20, in this example a hydraulic cylinder, which is mounted, i.e. hinged or fixed between said post sliding beam 4 and the post 2, i.e. acting between said first and second means, so that its operation can act on the ones rather than the others, depending on the configuration of the machine 1 and the respective posts 2, particularly on the constraint condition imposed by the latter.

**[0025]** While the cross members 5 and 6 of the post sliding beams 4 of this example are operated by hydraulic cylinders, any means adapted to ensure the above motions is deemed to be a technical equivalent, not shown because for its being obvious in the art.

**[0026]** Referring to Figures 4, 5, 6 and 7, the process for transporting and laying or replacing railway switches, tracks and sleepers will be now described.

**[0027]** Such process first includes the steps of lifting and grabbing the switch or track using at least one of the above mentioned gripping machines 1 and displacing in a longitudinal direction the machine/track or machine/switch assembly thus obtained, by repeated operation of linearly sliding means of the gripping machine.

**[0028]** A cycle is thus obtained, for:

- lifting the track/machine assembly,
- displacing in said longitudinal direction the track/machine or machine/switch assembly,
- laying back onto the ground the track/machine assembly,
- restoring the relative positions of the means of the machine.

**[0029]** More specifically the lifting step (see Fig. 4) is

accomplished by lowering the first linearly sliding means, i.e. the posts 2, which discharge the weight of the machine/track or machine/switch to the soil, or ground, through respective feet 9.

**[0030]** Furthermore, thanks to the movable cross members 5 and 6 of the machine, said first means 2 are located and operate laterally and external to the maximum size given by the machine/track or machine/switch assembly.

**[0031]** Such size also accounts for the sleepers of the switch or track.

**[0032]** The longitudinal displacement step S is accomplished by operating the second means, i.e. the post sliding beams 4, sliding in the corresponding guide support 7 which is fixed to the first means 2 and such sliding motion occurs between a first position (PI) and a second position (PF) (see Fig. 5).

**[0033]** Also, the sliding motion S occurs in a horizontal direction, so that displacement is held substantially parallel to the laying soil.

**[0034]** The step of laying back onto the ground (see Fig. 6) the machine/track or machine/switch assembly is accomplished by lifting the first means to such an extent that the feet 9 are lifted from the ground.

**[0035]** Finally, the starting position is recovered (see Fig. 7) by operating the device which drives the second means during the transportation step.

**[0036]** Such device, in this example the cylinder 20, is mounted, i.e. hinged or fixed, both relative to the first and to the second means 4, so that it can be operated on the ones or on the others, depending on the degree of freedom, or constraint, defined by the position of said first means 2.

**[0037]** While reference has been made in this example to a laying and/or replacement operation carried out with the help of two gripping machines, such number will obviously not be susceptible of the required protection, as a single machine may be employed for short track sections, or two or more machines may be employed for longer sections.

**[0038]** Such gripping machines that hold the same track and/or switch to be laid or replaced may be handled each independently of the others or in a synchronous manner.

**[0039]** Such machines may be operated by wire-connected or wireless remote communication means of the known type.

**[0040]** The transportation process as described above and claimed below may also be implemented in any existing railway machine or equipment for laying or replacing railway switches, tracks and sleepers, provided that it is modified by suitable integration of the sliding means 2 and 4, i.e. the lateral lifting posts 2 and the post 2 sliding beams 4 or the whole machine assembly 10 depending, as mentioned, on the constraint imposed by the posts.

**[0041]** As a result, the protection requested for the process for transporting and laying or replacing railway switches, tracks and sleepers, as well as the machine as

shown in the above example is deemed to be extended to any type of railway machine used for incremental launching operations without using crawler means.

## Claims

1. A process for transporting and laying or replacing railway switches (13), tracks and sleepers, **characterized in that** said switches or tracks are lifted and grabbed by means of one or more gripping machines (1), and the machine/track or machine/switch assembly thus formed is moved in a longitudinal direction (S), by repeated operation of linearly sliding means (2, 4) of the gripping machine (1) to carry out a cycle for:
  - a. lifting the track/machine assembly,
  - b. displacing in said longitudinal direction the track/machine or machine/switch assembly,
  - c. laying back onto the ground the track/machine assembly,
  - d. restoring the relative positions of the means of the machine.
2. A process as claimed in claim 1, **characterized in that** lifting is obtained by lowering members (3, 9) sliding in said first means (2), which discharge the weight of the machine/track or machine/switch assembly to the ground.
3. A process as claimed in claim 1, **characterized in that** it provides longitudinal displacement (S) by operation of second means (4) sliding in a corresponding guide support (7) fixed to said first means (2) between a first position (PI) and a second position (PF) in a horizontal direction.
4. A process as claimed in claim 1, **characterized in that** laying on the ground occurs by raising the members (3, 9) of the first means (2).
5. A process as claimed in claim 1, **characterized in that** it ensures recovery of the starting position by operating a device (20) which acts on said second means (4), said device (20) being hinged or fixed both to the first and second means (2 and 4) so that it can be operated on the ones or on the others, depending on the degree of freedom, or constraint, defined by the position of said first means (2) relative to the ground.
6. A process as claimed in claim 1, **characterized in that** said first means (2) operate laterally and externally to the maximum size (l<sub>max</sub>) given by the machine/track or machine/switch assembly, also including the sleepers of the switch (13) or track, said positioning occurring thanks to the sliding cross members (5, 6) of the machine (1).
7. A process as claimed in claim 1, **characterized in that** said means are posts (2) oriented in the vertical direction and adapted to allow a respective rod (3) to slide, a free end of the latter being fitted with a foot (9).
8. A process as claimed in claim 1, **characterized in that** said second means are post sliding beams (4), sliding in corresponding guide supports (7) fixed to the post (2).
9. A process as claimed in claim 1, **characterized in that** the track or switch is displaced by means of one or more gripping machines that hold the same track and/or switch to be laid or replaced which may be handled each independently of the others or in a synchronous manner.
10. A process as claimed in claim 1, **characterized in that** the sliding means (2, 4) and the hooks (12) and the cross members (5, 6) may be operated by wire connected or wireless remote communication means, of the known type.

FIG. 1

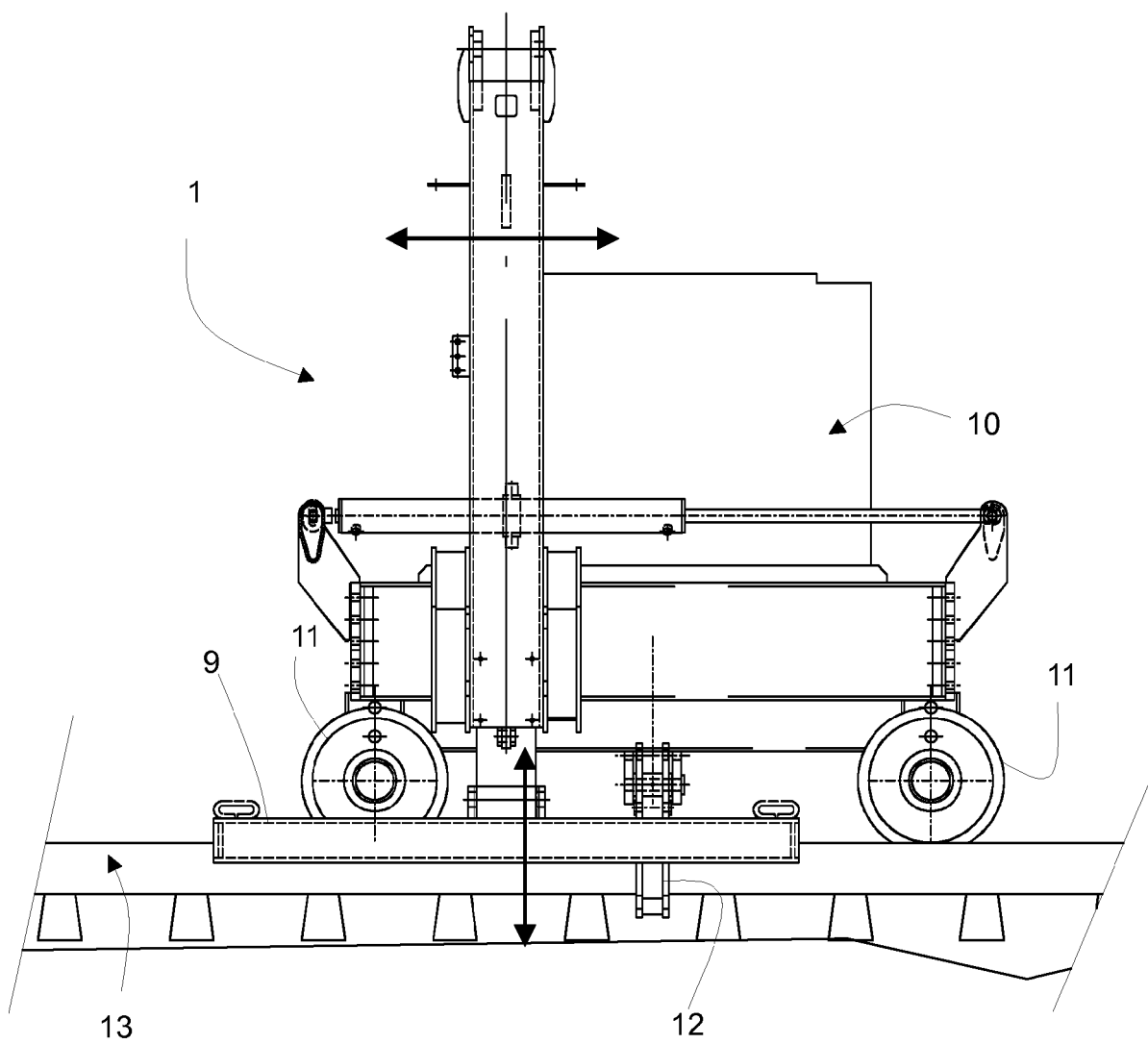


FIG. 2

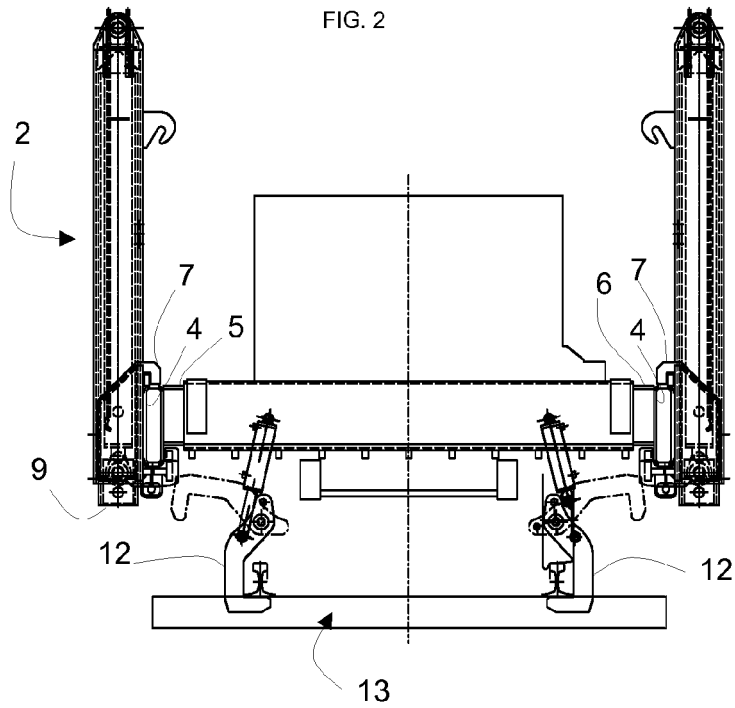
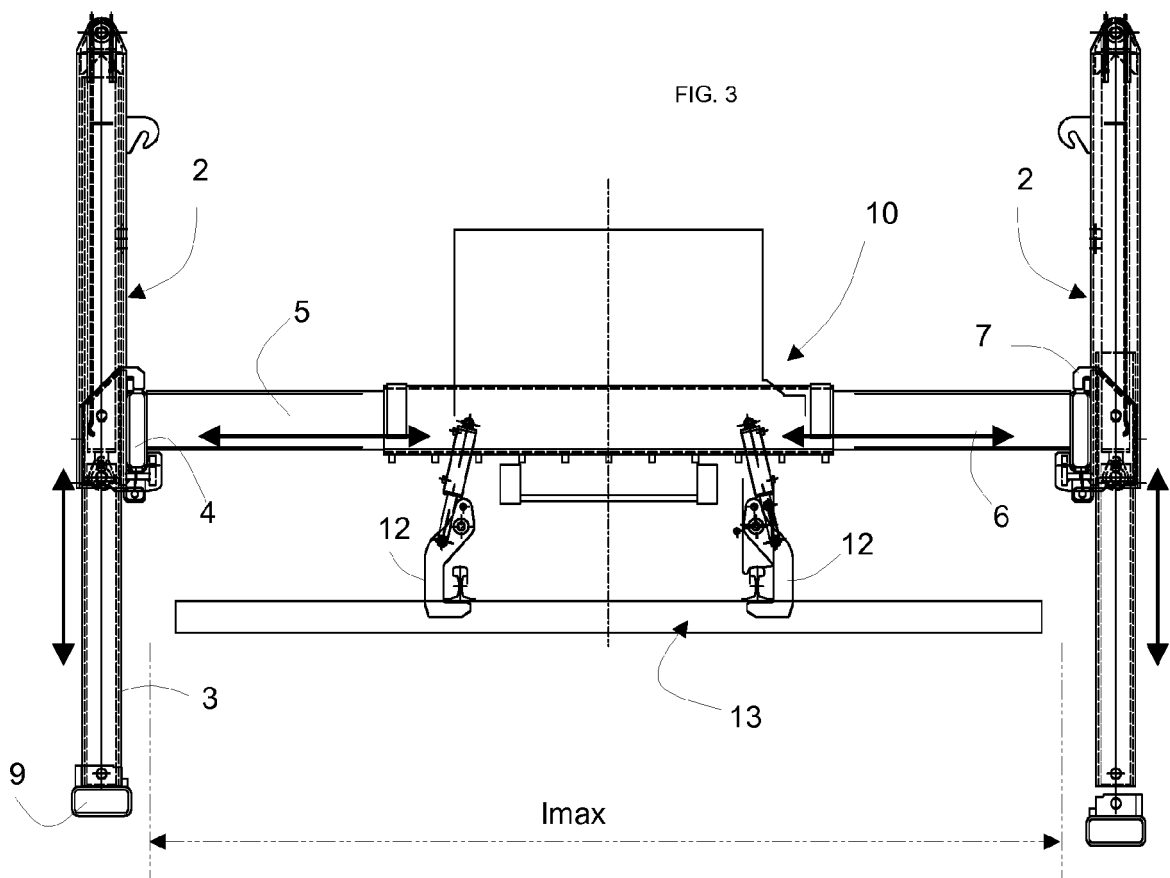
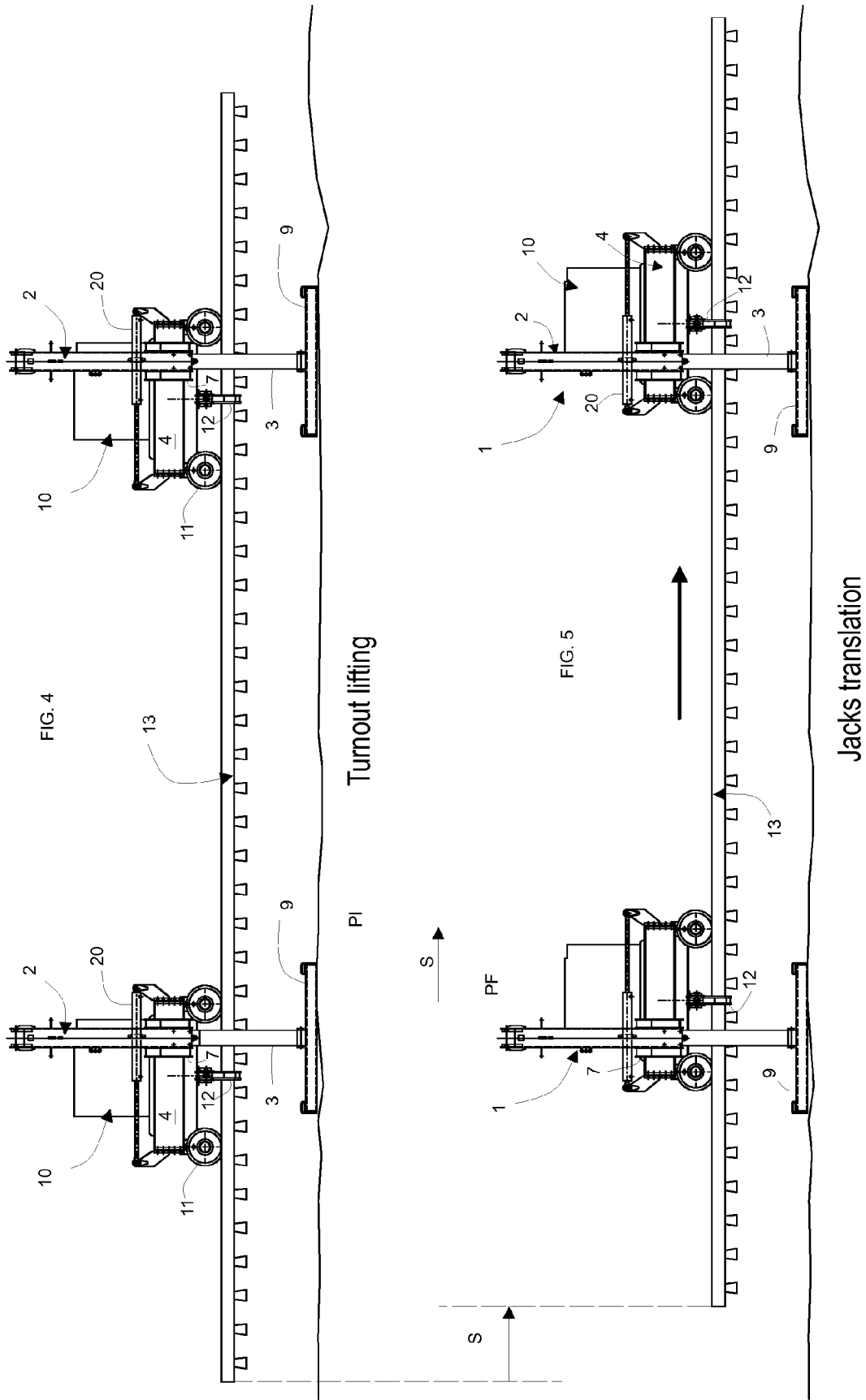
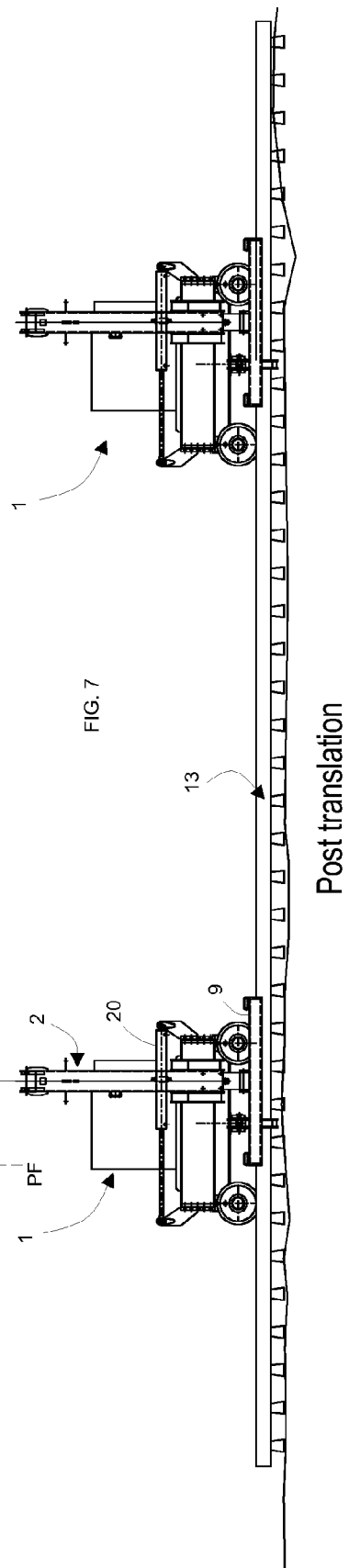
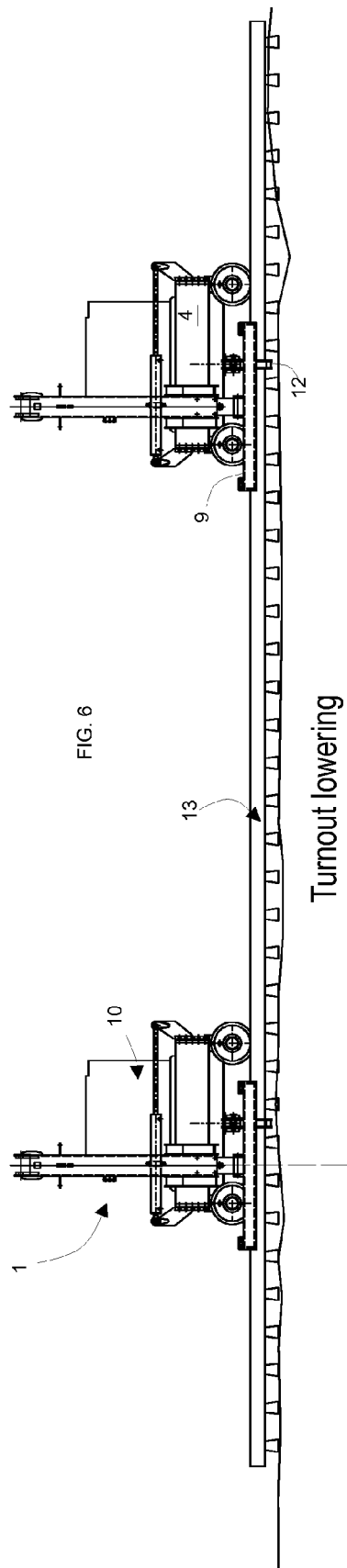


FIG. 3







PI  
S