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(72) Inventors:
• **BECCARISI, Alessandro**
00135 ROMA (IT)
• **BIAGIOTTI, Maurizio**
56124 PISA (IT)

(74) Representative: **Celestino, Marco et al**
ABM Agenzia Brevetti & Marchi,
Viale Giovanni Pisano, 31
56123 Pisa (IT)

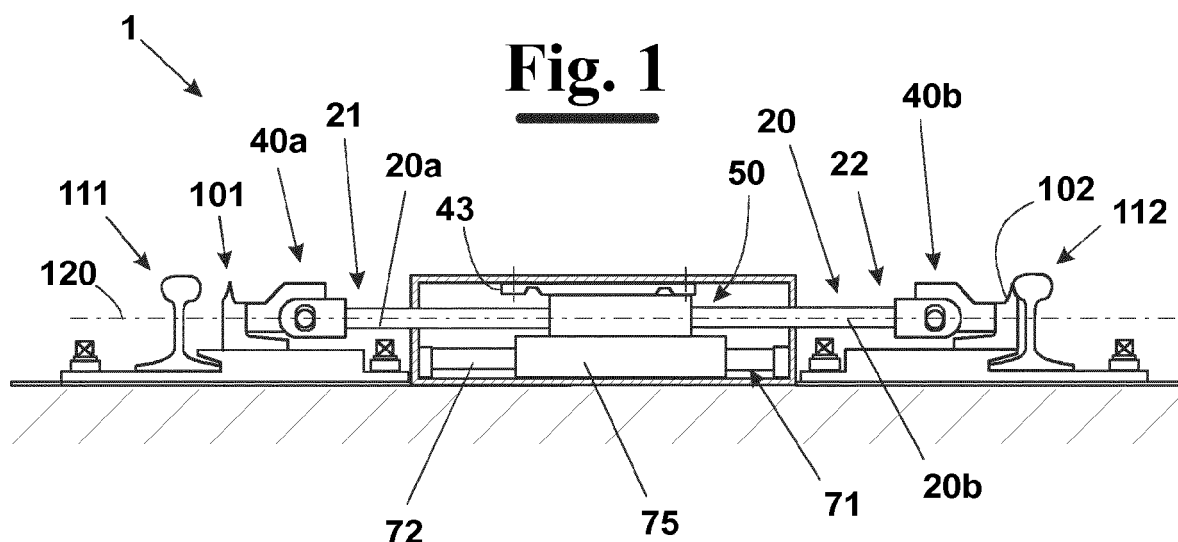
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(71) Applicant: **Silsud S.R.L.**
03013 Ferentino, Frosinone (IT)

(54) **SYSTEM AND SWITCH MACHINE FOR RAILROAD SWITCHES**

(57) A switch machine for railroad switches (1) comprises a movement group (20) provided with at least an operating tie-rod (20a,20b) engaged at opposite ends (21,22) to a first and to a second switch point (101,102) by respective movement transmission members (40a,40b). The operating tie-rod (20a,20b), in use, translates along a movement direction (120) in order to shift the first and the second switch point (101,102) between two limit positions. An actuation group (70) is then provided operating the translation of the, or each, operating tie-rod (20a,20b) along the movement direction (120),

and a locking/unlocking group (50) movable between a locking configuration, in which it prevents the above disclosed translation of the, or each, operating tie-rod (20a,20b), and an unlocking configuration, in which it permits the above disclosed translation. The switch machine (1) provides, furthermore, a first control rod (31) and a second control rod (32) movable independently one with respect to the other, and configured in such a way to translate along a direction parallel to the movement direction (120).



Description

Field of the invention

[0001] The present invention relates to the railway technical field and in particular it relates to an improved switch machine for railroad switches, in particular used in highspeed switches.

Description of the prior art

[0002] As known, the switch machines of the railroad switches generally provide at least one shifting actuator, which translates, by movement transmission means, the switch points of the railroad switch between two limit positions. More precisely, at the above mentioned limit positions, one switch point is drawn to the respective switch stock rail and is, therefore, called closed-by switch point, instead the other switch point is far from the respective switch stock rail and is called, therefore, far-removed switch point. At the opposite limit position, instead, the opposite situation occurs, and, therefore, the switch point that in the previous limit position was the closed-by switch point, is arranged at a predetermined distance from the respective switch stock rail and, therefore, becomes the far-removed switch point, instead the switch point that was previously far-removed is arranged close to the respective switch stock rail and, therefore, becomes the closed-by switch point.

[0003] The movement from a limit position to the other is caused, as above disclosed, by an actuator, usually a hydraulic actuator having a predetermined actuation stroke arranged along an actuation direction.

[0004] The switch machines of known type, furthermore, provide locking/unlocking members, also known as switch point lock means, that block the switch points in one of the above disclosed limit positions. Usually, the switch point lock means are moved from an unlocking configuration to a locking configuration through an over-stroke of the actuator along the actuation direction.

[0005] The switch machines of prior art have the drawback that if one of the switch points, in particular the one that acts as closed-by switch point, disengages from the operating tie-rod, for example at the respective "paw", owing to a damage of the above mentioned movement transmission means, the system can fail to detect the technical failure. In this situation, in fact, in the switch machines of prior art the operating tie-rod continues to be moved along the above mentioned movement direction by the actuation group anyway.

[0006] As can be easily understood, the above disclosed drawback of switch machines of prior art makes the railway tract at which they are installed not able to satisfy the necessary safety requirements, thus, the safety of passengers is seriously compromised, or, however, damages to the railway carriages traveling in that railway tract can occur, thus causing difficulties and delays because of the interventions that have to be carried out to

open up again the railway tract closed for the above mentioned technical failure.

[0007] According to another aspect of the present invention, a switch machine is configured, in particular has a dimension, such that it is possible to mount it on a rail sleeper of the railroad switch.

Summary of the invention

[0008] It is therefore an object of the present invention to provide an improved switch machine that is able to overcome the above mentioned drawbacks of the switch machines of prior art and, therefore, that are able to assure a high level of safety for the passengers and for the railway carriages traveling in the corresponding railway tract.

[0009] This and other objects are achieved by a switch machine for railroad switches, according to the invention, comprising:

- a movement group provided with:
 - at least an operating tie-rod configured in such a way to engage at opposite ends, respectively, a first and a second switch point by means of respective movement transmission members, said, or each, operating tie-rod being arranged to translate along a movement direction in order to move said first and said second switch point between two limit positions in such a way to alternatively displace one between said first and said second switch point in a position closed to the respective switch stock rail, whereby it is called closed-by switch point, and the other switch point in a far position from the respective switch stock rail, whereby it is called far-removed switch point, and vice versa;
 - an actuation group arranged to actuate said translation of said, or each, operating tie-rod along said movement direction;
 - a locking/unlocking group arranged to move from a locking configuration, in which is arranged to prevent said translation of said, or each, operating tie-rod, from moving from an unlocking configuration, in which it is arranged to allow said translation of said, or each, operating tie-rod, said locking/unlocking group being configured in such a way to be positioned in said locking configuration when said, or each, operating tie-rod is positioned in a position such that one between said first and said second switch point is positioned in a position closed to respective switch stock rail;

whose main characteristic is to provide, furthermore, a first control rod and a second control rod movable independently one with respect to the other, each said first and second control rod being configured in such a way

to translate along a direction parallel to said movement direction of said, or each, operating tie-rod, said first and said second control rod having an end that is fixed, respectively, to said first and to said second switch point, and a control device being provided configured in such a way to prevent said locking/unlocking group from moving from said unlocking configuration to said locking configuration, if said first and said second control rod, and accordingly if said first and said second switch point, are not positioned in predetermined positions. Further characteristics of the present invention are set out in the dependent claims.

[0010] In particular, the actuation group can comprise:

- an actuator provided with a fixed stem;
- an actuation slider provided with a cam portion and slidingly mounted on the fixed stem of the actuator;
- a movable body housed within a housing integral to said, or each, operating tie-rod, said movable body and said cam portion configured in such a way that said translation of said actuation slider and, therefore, of said cam portion along said fixed stem is adapted to cause the movement of said movable body from a locking position, in which it is arranged to engage in a fixed body in order to prevent said, or each, operating tie-rod from translating, and an unlocking position, in which said movable body is not engaged in said fixed body and is arranged to translate integrally to said, or each, operating tie-rod along said movement direction.

[0011] Advantageously, the above disclosed translation of the actuation slider and of the cam portion integral to it, along the fixed stem of the actuator, is adapted to cause a rotation of the movable body about a rotation axis, in particular orthogonal to the movement direction, in order to cause the movable body to move from the unlocking position to the locking position, with respect to the fixed body.

[0012] Advantageously, the control device is configured in such a way to prevent the movable body from rotating about the rotation axis and, therefore, from moving from the unlocking position to the locking position, if the first and the second control rods are not positioned in the above mentioned respective predetermined positions.

[0013] According to an embodiment of the invention, the control device provides mutual engagement members positioned in predetermined positions of the first and of the second control rod and adapted to engage with respective mutual engagement members integral to the movable body only if the first and the second control rod are positioned in the predetermined positions. More in particular, the locking/unlocking group is adapted to move from the unlocking configuration to the locking configuration only if both the mutual engagement members are mutually engaged. For example, the mutual engagement members can be gears, for example gear wheels,

adapted to be in gear only if the control rods are positioned in the above mentioned predetermined positions, in particular with respect to the locking/unlocking group. Advantageously, the control device comprises:

- a first and a second recessed portion each of which provided at a predetermined position of a respective control rod;
- a first and a second touching arm integral to said movable body, each said first and second touching arm adapted to be arranged in a respective recessed portion of a respective control rod allowing to said movable body to rotate about said rotation axis to move from said unlocking position to said locking position, only if said first and second control rod are positioned in said respective predetermined positions, in particular with respect to said locking/unlocking group.

[0014] Preferably, the actuator is a double-effect hydraulic actuator. In particular, the hydraulic actuator is provided with a first and a second feeding channel of an actuation fluid and is configured in such a way to define a first and a second opposite push chambers. These are hydraulically connected to the first and to the second feeding channel, respectively. The actuation slider is driven to slide in a direction, or in the opposite direction, by pressure exerted on the first and/or on the second push chamber, by the actuation fluid.

[0015] Preferably, the movable body provides a first and a second engagement portion adapted to engage, respectively, in a first and in a second locking seat provided in the fixed body, respectively, at a first and at a second position of the fixed body.

[0016] In particular, each recessed portion can be a circumferential groove made on a respective control rod.

[0017] Advantageously, each touching arm provides a contact portion substantially "fork-shaped" having a first and a second end arranged, in use, at opposite sides of the same control rod. More precisely, each end of the same touching arm is adapted to be positioned alternatively and selectively in the same circumferential groove, but at the opposite side with respect to the control rod.

Brief description of the drawings

[0018] The invention will now be shown with the following description of its exemplary embodiments, exemplifying but not limitative, with reference to the attached drawings in which:

- Fig. 1 diagrammatically shows a front view partially sectioned, in order to highlight some constitutive elements, of a switch machine according to the invention;
- Fig. 2 diagrammatically shows a plan view of the switch machine of figure 1;
- Fig. 3 diagrammatically shows a perspective front

- view of the switch machine of figure 1;
- Fig. 4 shows an enlargement of a portion of figure 3 in order to highlight some technical features;
 - Fig. 5 diagrammatically shows a rear perspective view of the switch machine of figure 3;
 - Fig. 6 diagrammatically shows a longitudinal section of a possible embodiment, according to the invention, of the actuation group that operates the translation of the, or each, operating tie-rod;
 - Fig. 7 diagrammatically shows a front view partially sectioned of the locking/unlocking group according to the invention, in a locking configuration;
 - Fig. 8 shows an enlargement of the engagement portion of the movable body and of the respective engagement seat of the locking/unlocking group of figure 7;
 - Fig. 9 shows a perspective view of the switch machine according to the invention with the locking/unlocking group in a locking configuration;
 - Fig. 10 shows in detail a front view partially sectioned of the control device, according to the invention, in a position in which it permits the unlocking of the locking/unlocking group, and therefore of the translation of the operating actuator;
 - Fig. 11 shows in detail a front view partially sectioned of the control device according to the invention in a impediment position in which it prevents the locking/unlocking group from be locked;
 - Figures 12 and 13 show the locking/unlocking group in an unlocking configuration in which it translates from a first to a second locking position;
 - Fig. 14 shows the locking/unlocking group in a locking configuration alternative to the locking configuration of figure 9.

Detailed description of some exemplary embodiments of the invention

[0019] As diagrammatically shown in figure 1, a switch machine for railroad switches 1, according to the invention, essentially provides a movement group 20 comprising at least an operating tie-rod having a first and a second portion 20a, 20b that are integrally movable with each other. More in particular, the portions 20a and 20b of the operating tie-rods engage, at the opposite ends 21 and 22, a first and a second switch point 101 and 102 by respective movement transmission members 40a and 40b. In particular, the, or each, operating tie-rod 20a, 20b is arranged to translate along a movement direction 120, that is in particular substantially orthogonal to the tracks 111, 112, of railway tract at which the switch machine 1 is positioned. More in particular, the translation of the portions 20a and 20b of operating tie-rod causes a movement of the first and of the second switch point 101 and 102 between two limit positions. In this way, it is possible to alternatively displace one between the first and the second switch point 101, or 102, in a position closed to the respective switch stock rail 111, or 112, whereby it

is called closed-by switch point, and the other switch point 102, or 101, in a far position from the respective switch stock rail 112, or 111, whereby it is called far-removed switch point, and vice versa. Furthermore, an actuation group 70 is provided adapted to actuate the translation of the operating tie-rod 20, or of each portion 20a, 20b of the same, along the above mentioned movement direction 120.

[0020] The switch machine 1 furthermore, provides, a locking/unlocking group 50 arranged to move from a locking configuration, in which it prevents the operating tie-rod 20 from moving along the movement direction 120, to an unlocking configuration, in which, instead, it allows the above disclosed translation. More in particular, the locking/unlocking group 50, also known as switch point lock means, is configured in such a way to arrange itself in the locking configuration when the operating tie-rod 20, or each portion 20a, 20b of the same, is positioned in a position such that one between the first and the second switch point 101, 102 is positioned in a position closed to respective switch stock rail 111, 112 and the other in the far position from the respective switch stock rail.

[0021] Furthermore, according to the invention, and illustrated in figure 2, the switch machine 1 provides a first control rod 31 and a second control rod 32, advantageously but not essentially coaxially arranged one with respect to the other, adapted to translate independently one with respect to the other, along a direction parallel to the above mentioned movement direction 120. More precisely, the first and the second control rod 31 and 32 provide a respective end 31a, 32a that is fixed, respectively, to the first switch point 101 and to the second switch point 102.

[0022] In particular, the first and the second control rod 31 and 32 are, respectively, fixed to the first and to the second switch point 101 and 102 in engagement points B and B' different from the engagement points A and A' at which the ends 21 and 22 of the portions 20a and 20b of operating tie-rod 20 are fixed to the switch points 101 and 102. More in particular, the first and the second control rod 31 and 32 are fixed to the switch points 101 and 102 by movement transmission members 38a, 39a different from the movement transmission members 40a and 40b through which the ends 21 and 22 of the portions 20a and 20b of operating tie-rod 20 are fixed to the switch points 101 and 102 (figure 2).

[0023] The ends 31b and 32b opposite to the ends 31a and 32a of each control rod 31 and 32 are, furthermore, supported by a support body 34.

[0024] In particular, the actuation group 70 comprises an actuator 71 provided with a fixed stem 72, which is supported at opposite support portions 76a and 76b. An actuation slider 75 is, then, provided slidably mounted on the fixed stem 72 and provided with a cam portion 73.

[0025] The actuation group 70, furthermore, provides a movable body 41 housed within a housing 42 integral to, or each, operating tie-rod 20a, 20b. More in particular,

each portion 20a and 20b of the operating tie-rod, in addition to the above disclosed respective end 21 and 22 connected, as above anticipated, to a respective switch point 101 and 102, provides another end 23 and 24 fixed to a containment body 45 in which the above disclosed housing 42 of the movable body 41 is provided.

[0026] In particular, the movable body 41 and the cam portion 73 are configured in such a way that the translation of actuation slider 75 and, therefore, of cam portion 73 integral to it, along the fixed stem 72, causes the movable body 41 to move from a locking position, in which it is arranged to engage in a fixed body 43, in particular integral to a rail sleeper 200 of the railway tract at which the switch machine 1 is provided, in order to prevent the operating tie-rod 20, or each its portion 20a, 20b, to an unlocking position, in which the movable body 41 is not engaged in the fixed body 43 and is arranged to translate integrally to the, or each, operating tie-rod 20a, 20b, along the movement direction 120. The movement from the unlocking configuration to the locking configuration of locking/unlocking group 50 is caused, in particular, by an overstroke of actuator 71 along an actuation direction parallel to the movement direction 120 of operating tie-rod 20a, 20b.

[0027] In particular, the translation of the actuation slider 75, and in particular of cam portion 73, along the stem 72 of the actuator 71, causes a rotation of the movable body 41 about a rotation axis 141 that is orthogonal to the movement direction 120. In particular, the movable body 41 is pivoted to the containment body 45 at a pivot 44.

[0028] In this way, the movement is caused of the movable body 41 from the unlocking position (figures 12 and 13) to the locking position (figures 7 and 8) about the rotation axis 141. More precisely, the cam portion 73 provides a pushing surface 37 arranged to cooperate with at least a guide roller, for example 2 guide rollers 47 and 48, mounted free to rotate about a rotation shaft integral to the above disclosed movable body 41, in order to guide the movement of the movable body 41 into the housing 42. At this regards, it is suitable to specify that, even though in the embodiment shown in the figures a first and a second guide roller 47 and 48 are provided mounted free to rotate about a respective rotation shaft, according to the present invention, only a single guide roller, or a greater number of guide rollers can be provided. In particular, the pushing surface 37 provides a first and a second portion 37a and 37b with opposite inclination, and connected by a straight portion 37c, in such a way to substantially define a trapezium-shaped cam portion (see example of figure 12).

[0029] More precisely, at determined positions of the movable body 41, the guide rollers 47 and 48 are adapted to be positioned into contact with the above mentioned pushing surface 37 by which they are guided towards above, or below, depending on the translation direction of cam portion 73, causing, alternatively a translation along a movement direction 120, or a clockwise, or an

anticlockwise rotation, of movable body 41 about the rotation axis 141. In this way, the movement is caused of movable body 41, in particular of a first engagement portion 41a, or of a second engagement portion 41b, of the same, into, or out (depending on the direction of rotation that has been driven), respectively of a first, or of a second, locking seat 43a, 43b provided in the fixed body 43, at the locking position, or the unlocking position, respectively.

[0030] A control device 60 is furthermore provided configured in such a way to prevent the locking/unlocking group 50 from moving from the unlocking configuration to the locking configuration if both the first and the second control rod 31 and 32, and, accordingly, if the first and the second switch point 101, 102, to which they are fixed, are not positioned in respective predetermined correct positions.

[0031] In particular, the control device 60 is configured in such a way to prevent movable body 41 from rotating about the rotation axis 141 and, therefore, from moving from the unlocking position to the locking position, if the first and the second control rod 31 and 32 are not positioned in the respective predetermined correct positions (see for example figure 11). More in particular, the control device 60 prevent the engagement portions 41a, or 41b, of movable body 41, depending if in that operative condition the first, or the second, switch point 101, 102, is the closed-by switch point, from engaging in the respective locking seat 43a, or 43b of the fixed body 43.

[0032] The above disclosed situation, i.e. the missing positioning of both the control rods 31 and 32 in the predetermined correct positions, can occur, for example, because one of the 2 switch points 101, or 102, disengages from the operating tie-rod 20, for example owing to a disengagement occurred at the respective "paw". In this situation, in fact, in the switch machines of prior art, the operating tie-rod continue, however, to be moved along the above disclosed movement direction by the actuation group e, therefore, the system does not detect the failure occurring. The technical solution proposed by the present invention, instead, allows to detect the above disclosed drawback, because the control device 60 "detects" a relative motion between the control rod 31 and the containment body 45, to which the support body 34 is integral, and, therefore, does not permit the locking/unlocking group 50 to move from the unlocking configuration to the locking configuration. In fact, if one of the two switch points, in particular if the closed-by switch point, due to the above disclosed mechanical failure, or for any other reason, is not actually moved by the operating tie-rod, and therefore remains closed to the respective switch stock rail, or, however, is not moved in the correct position of closed-by switch point, the control rod 31, or 32, fixed to it at an end is not positioned in the correct predetermined position. Therefore, the control device 60, owing to the missing detection of the correct position of the control rods 31, 32, does not allow to the locking/unlocking group 50 to move in the locking configuration. In view of

the above, the switch machine 1, according to the present invention allows to considerably increase, with respect to the prior art solutions, the level of safety of the railway tract where it is installed.

[0033] Practically the control device 60 is arranged to move from a consent position, in which it allows the locking/unlocking group 50 to move from the unlocking configuration to the locking configuration, if the control rods 31 and 32 are positioned in the correct positions (figure 10), to an impediment position, in which it prevents the locking/unlocking group 50 from moving from the unlocking configuration to the locking configuration, if the control rods 31 and 32, are, instead, not positioned in the correct predetermined positions (figure 11).

[0034] In the embodiment shown, in detail, in figure 4, the control device 60 provides a first and a second recessed portion 35 and 36 each of which made at a predetermined position of a respective control rod 31, 32.

[0035] As shown in the figures from 3 to 14, the control device 60, furthermore, provides a first and a second touching arm 65 and 66 integral to the movable body 41, in particular at opposite sides of it, advantageously at, or in proximity of, the engagement portions 41a, 41b. More in particular, the touching arms 65 and 66 can protrude towards the control rods 31 and 32 through respective apertures, or windows, 46a and 46b provided in the containment body 45.

[0036] In this way, the touching arms 65 and 66 are adapted to move in a respective recessed portion 35, 36 of a respective control rod 31, 32, permitting the movable body 41 to rotate about the rotation axis 141 in order to move from the unlocking position to the locking position, only if both the first and the second control rod 31 and 32 are positioned in the above disclosed predetermined correct position with respect to the locking/unlocking group 50. Instead, if, for example owing to the disengagement of a switch point from the operating tie-rod, one of the two control rods 31, or 32, is not positioned in the correct position, the rotation of the movable body 41, that is caused from pushing surface 37, is stopped. In fact, the corresponding touching arm 65, or 66, is not able to make a complete rotation owing to the greater thickness of the control rod 31, or 32, with respect to the recessed portion 35, or 36, and therefore, the engagement portion of movable body 41 is not able to exit the locking seat 43a, or 43b, of fixed body 43. In other words, the control device 60 "does not permit" the locking/unlocking group 50 to move from the unlocking configuration to the locking configuration.

[0037] In the embodiment shown, for example, in the figures 10 and 11, each recessed portion 35, 36, is a circumferential groove made in a respective control rod 31, 32. In particular, each touching arm 65, 66 can have a contact portion 67, 68 substantially "fork-shaped", i.e. substantially "U-shaped", or "V-shaped", and having a first and a second end 67a, 67b and 68a, 68b arranged, in use, at the opposite sides of the same control rod 31, 32. More precisely, when the above disclosed movable

body 41 is positioned at the first locking position, i.e. when the engagement portion 41a is positioned at the locking seat 43a, if the control rods 31 and 32 are positioned in the respective correct positions, rotation of movable body 41 about the rotation axis 141 is not prevented by the control device 60, and, therefore, the engagement portion 41a can disengage from the locking seat 43a. This is because, the ends 67a, 67b and 68a, 68b of the touching arms 65 and 66, during the rotation of the movable body 41 to which they are fixed, about axis 141, arrange in the respective recessed portions 35 and 36. More precisely, each of the first and second end 67a, 67b, and 68a, 68b of a same touching arm 65, and 66, are arranged to move alternatively and selectively, in the same circumferential groove 35, or 36, but at the opposite side with respect to control rod 31, or 32, depending on the engagement portions 41a, 41b of movable body 41 and the respective engagement seats 43a, 43b of fixed body 43, are arranged in the first locking position (figures 7-9), or in the second locking position (figure 14).

[0038] As shown in detail in figure 6, the above disclosed actuator 71 can be a hydraulic actuator, in particular a double-effect hydraulic actuator. More in particular, the hydraulic actuator 71 provides a first and a second feeding channel 74a and 74b of an actuation fluid. In particular, the hydraulic actuator 71 is configured in such a way to define a first and a second opposite push chambers 77 and 78. These are, in particular, hydraulically connected to the first and to the second feeding channel 74a and 74b, respectively. The actuation slider 75 is, therefore, driven to slide in a direction, or in the opposite direction, by pressure exerted in the first and/or in the second push chamber 77, or 78, by actuation fluid.

[0039] Once the operating tie-rod 20 is positioned in the correct position with the switch point lock means locked, i.e. with the locking/unlocking group 50 in the locking configuration, an electric control device of the switch points is furthermore provided, that is not in figure for reasons of simplicity, but of known type in the technical field.

[0040] Notwithstanding reference has been always made to the case in which the control device prevents the locking/unlocking group from moving from the unlocking configuration to the locking configuration when the control rods are not positioned in the respective predetermined positions, the skilled person in the art will have, however, no difficulty to adopt the solution according to the present invention also in the case that the control device is configured in such a way to prevent the locking/unlocking group from moving from the locking configuration to the unlocking configuration in the same condition, i.e. when the control rods are not positioned in the respective predetermined positions.

[0041] According to another aspect of the invention, a system for operating a multipoint switch machine provides a plurality of switch machines for railroad switches as above disclosed and illustrated in the figures from 1 to 14.

[0042] The foregoing description exemplary embodiments of the invention will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such embodiment without further research and without parting from the invention, and, accordingly, it is therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiments. The means and the materials to realize the different functions described herein could have a different nature without, for this reason, departing from the field of the invention. It is to be understood that the phraseology or terminology that is employed herein is for the purpose of description and not of limitation.

Claims

1. A switch machine for railroad switches (1) comprises:

- a movement group (20) provided with:

- at least an operating tie-rod (20a,20b) configured to be engaged at opposite ends (21,22), respectively, to a first and to a second switch point (101,102) by respective movement transmission members, said, or each, operating tie-rod (20a,20b) being arranged to translate along a movement direction (120) in order to shift said first and said second switch point (101,102) between two limit positions, in such a way to alternatively displace one between said first and said second switch point (101,102) in a position closed to the respective switch stock rail (111,112), whereby it is called closed-by switch point, and the other switch point (101,102) in a far position from the respective switch stock rail (111,112), whereby it is called far-removed switch point, and vice versa;

- an actuation group (70) arranged to actuate said translation of said, or each, operating tie-rod (20a,20b) along said movement direction (120);

- a locking/unlocking group (50) arranged to move from a locking configuration, where is arranged to prevent said, or each, operating tie-rod (20a,20b) from moving to an unlocking configuration, where is arranged to allow said, or each, operating tie-rod (20a,20b) to translate, said locking/unlocking group (50) being configured in such a way to place in said locking configuration when said, or each, operating tie-rod (20a,20b) is positioned in a position such that

one between said first and said second switch point (101,102) is positioned in a position closed to the respective switch stock rail (111,112);

said switch machine (1) being **characterised in that** it, furthermore, provides a first control rod (31) and a second control rod (32) movable independently one with respect to the other, each said first and second control rod (31,32) being configured in such a way to translate along a direction parallel to said movement direction (120) of said, or each, operating tie-rod (20a,20b), **in that** said first and said second control rod (31,32) have an end respectively fixed to said first and to said second switch point (101,102), **and in that** a control device (60), is furthermore provided, configured in such a way to prevent said locking/unlocking group (50) from moving from said unlocking configuration to said locking configuration, if said first and second control rod (31,32), and, therefore, if said first and said second switch point (101,102), are not positioned in respective predetermined positions.

2. Switch machine for railroad switches (1), according to claim 1, wherein said actuation group (70) comprises:

- an actuator (71) provided with a fixed stem (72);
 - an actuation slider (75) provided with a cam portion (73) and slidably mounted on said fixed stem (72) of said actuator (71);
 - a movable body (41) housed within a housing (42) provided in a containment body (45) integral to said, or each, operating tie-rod (20), said movable body (41) and said cam portion (73) configured in such a way that said translation of said actuation slider (75) and, therefore, of said cam portion (73) along said fixed stem (72) is arranged to cause said movable body (41) to move from a locking position, where is arranged to engage in a fixed body (43) in order to prevent said translation of said, or each, operating tie-rod (20), and an unlocking position, where said movable body (41) is not engaged in said fixed body (43) and is arranged to translate integrally to said, or each, operating tie-rod (20) along said movement direction (120).

3. Switch machine for railroad switches (1), according to claim 2, wherein said translation of said actuation slider (75) and of said cam portion (73) integral to it, along said fixed stem (72) of said actuator (71), is arranged to cause a rotation of said movable body (41) about a rotation axis (141) in order to cause said movable body (41) to move from said unlocking position to said locking position.

4. Switch machine for railroad switches (1), according

to claim 3, wherein said rotation axis (141) is orthogonal to said movement direction (120).

5. Switch machine for railroad switches (1), according to claim 3, or 4, wherein said control device (60) is configured to prevent said movable body (41) from rotating about said rotation axis (141) and, therefore, from moving from said unlocking position to said locking position, if said first and said second control rod (31,32) are not positioned in respective predetermined positions. 5

6. Switch machine for railroad switches (1), according to any previous claim, wherein said control device (60) provides mutual engagement members positioned in predetermined portions of said first and of said second control rod (31,32) and arranged to engage with respective mutual engagement members integral to said movable body (41) only if said first and said second control rod (31,32) are positioned in said respective predetermined positions, said locking/unlocking group (50) being arranged to move from said locking configuration to said unlocking configuration only if said mutual engagement members are mutually engaged. 10 15 20 25

7. Switch machine for railroad switches (1), according to any claim from 3 to 6, wherein said control device (60) comprises: 30
 - a first and a second recessed portion (35,36) each of which provided at a predetermined position of a respective control rod (31,32);
 - a first and a second touching arm (65,66) integral to said movable body, each said first and second touching arm (65,66) arranged to position in a respective recessed portion (35,36) of a respective control rod (31,32) allowing said movable body to rotate about said rotation axis (141) in order to move from said unlocking position to said locking position, only if said first and second control rod (31,32) are positioned in said predetermined positions, in particular with respect to said locking/unlocking group (50). 35 40 45

8. Switch machine for railroad switches (1), according to any previous claim, wherein said control rod (31,32) have respective end (31a,32a) integral to respective switch points (101,102) at engagement points (B,B') different from the engagement points (A,A') at which the ends of said, or each, operating tie-rod (20) are connected to said switch points (101,102), at the opposite ends (31b,32b), said control rod (31,32) being supported by a support body (34) integral to said containment body (45). 50 55

9. Switch machine for railroad switches (1), according

to any claim from 2 to 8, wherein said movable body (41) provides a first and a second engagement portion (41a,41b) arranged to engage, respectively, in a first and in a second locking seat (43a,43b) made in said fixed body (43), respectively, at a first and at a second position of said fixed body (43).

10. Switch machine for railroad switches (1), according to claim 7, wherein each said recessed portion (35,36) is a circumferential groove provided in a respective control rod (31,32).

11. Switch machine for railroad switches (1), according to claim 10, wherein each touching arm (65,66) has a contact portion (67,68) substantially "fork-shaped" having a first and a second end (67a,67b, 68a,68b) arranged, in use, at the opposite sides of the same control rod (31,32), each said first and second end (67a,67b, 68a,68b) of the same touching arm (65,66) being arranged to alternatively and selectively position in the same circumferential groove (35,36), but at the opposite side with respect to the control rod.

12. Switch machine for railroad switches (1), according to claim 7, or 11, wherein each said touching arm (65,66) is integral to said movable body (41) at, or in the proximity of, a respective engagement portion (41a, 41b).

13. Switch machine for railroad switches (1), according to any claim from 7 to 12, wherein said touching arms (65,66) are arranged to protrude towards said control rods (31,32) through respective apertures, or windows, (46a,46b) provided in said containment body (45).

14. Switch machine (1) for railroad switches, according to any previous claim, **characterised in that** it is configured to be mounted on a rail sleeper (200) of the railway tract of interest.

15. A system for operating railroad switches **characterised in that** it comprises a plurality of switch machines (1) for railroad switches according to any claim from 1 to 14.

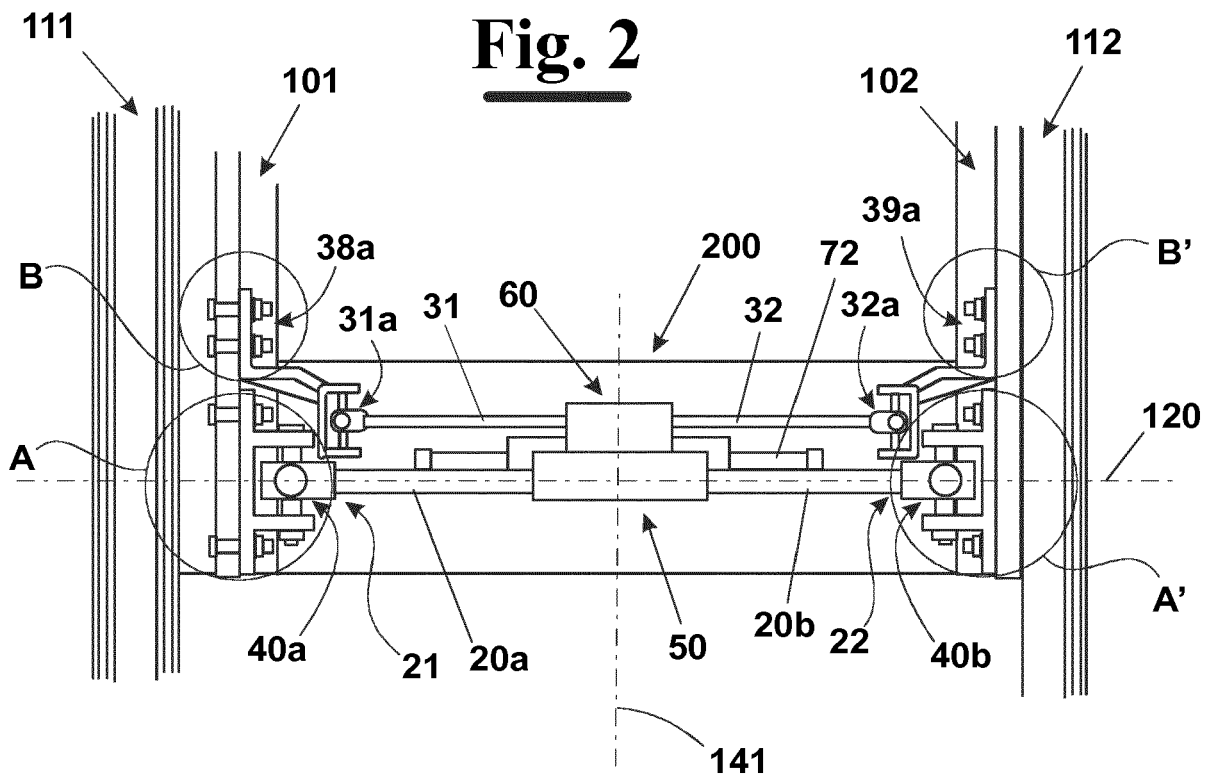
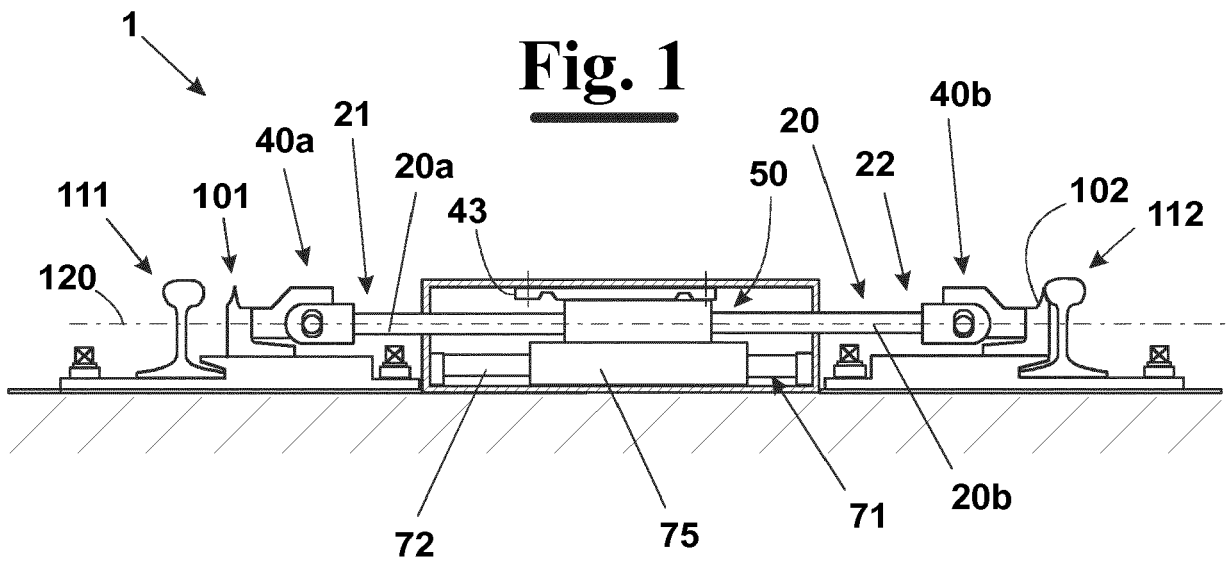


Fig. 3

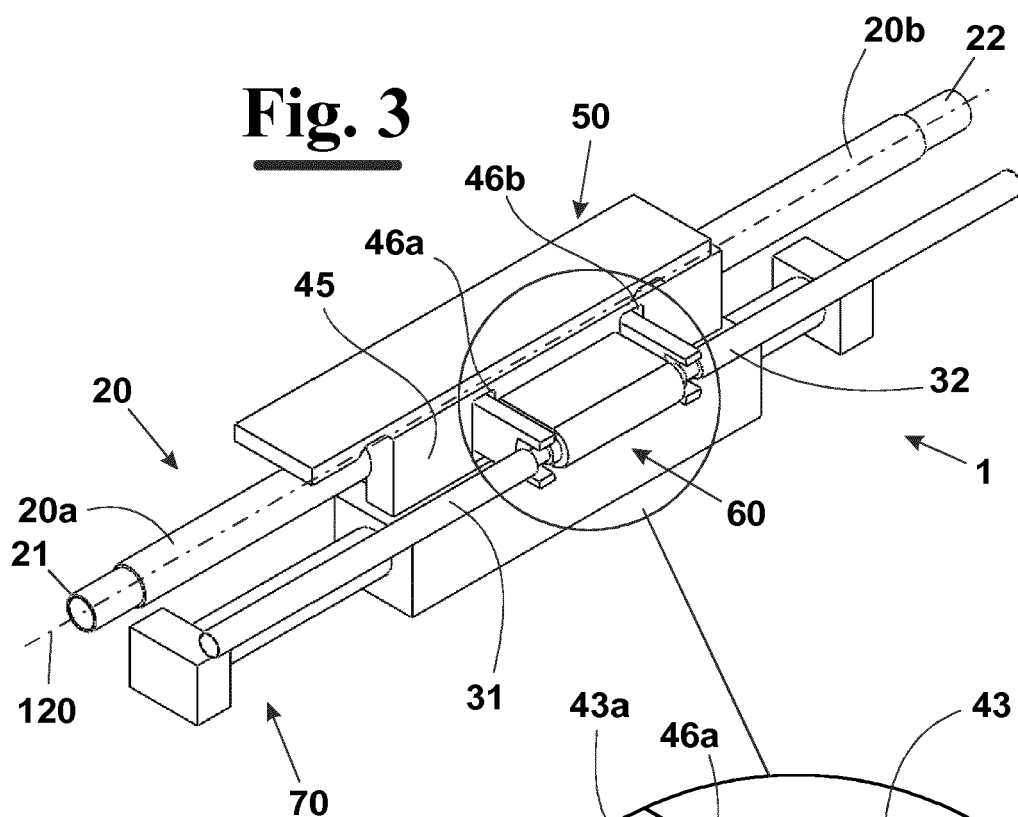


Fig. 4

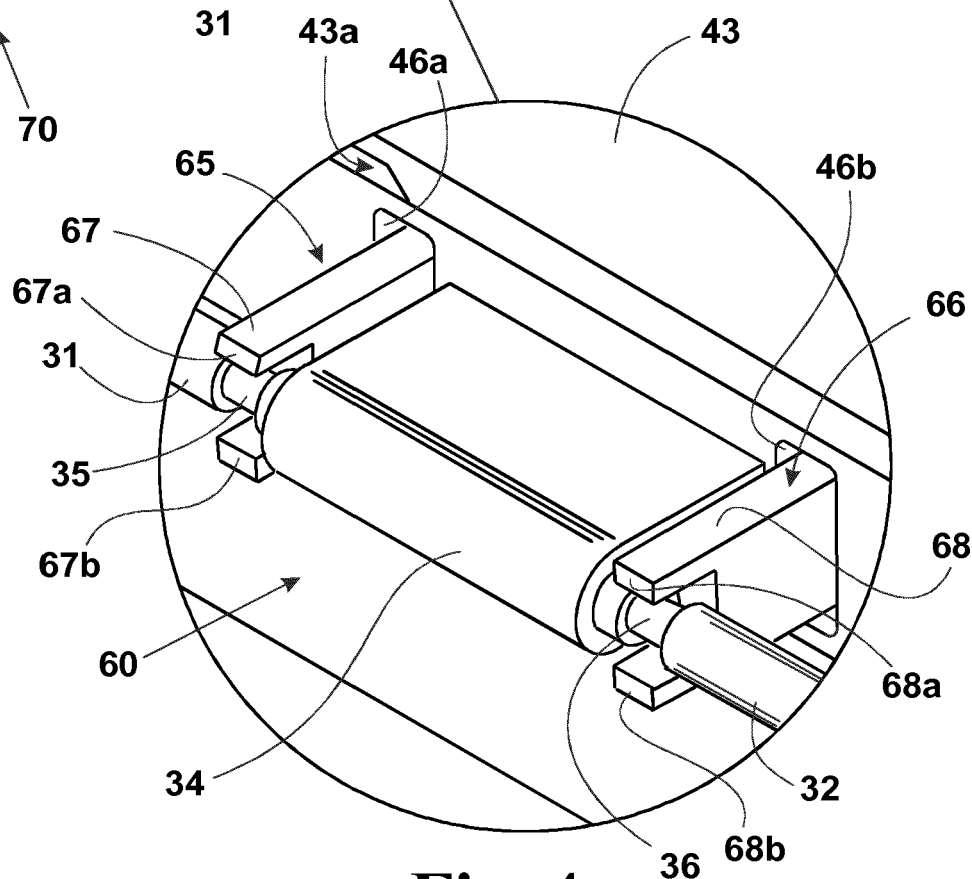


Fig. 5

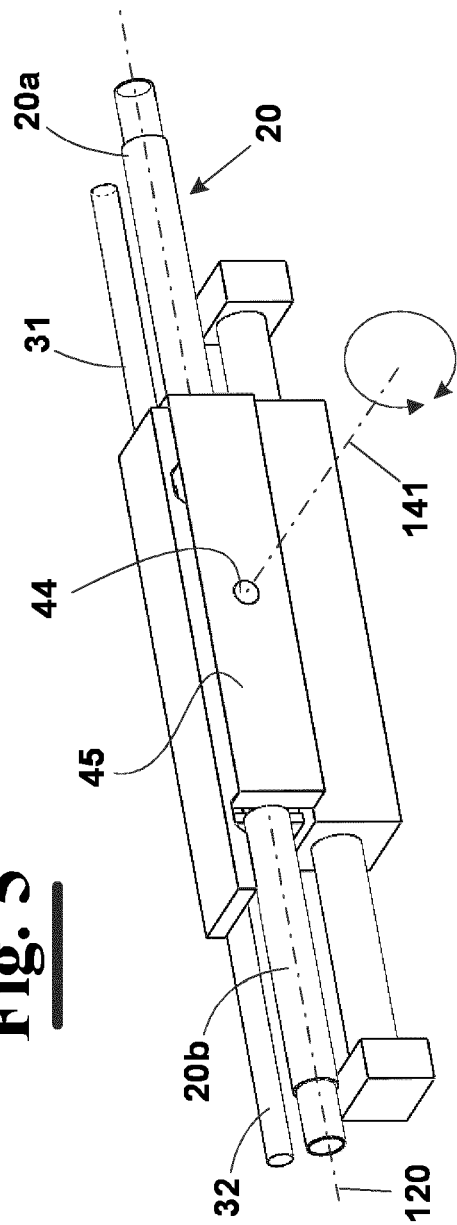


Fig. 6

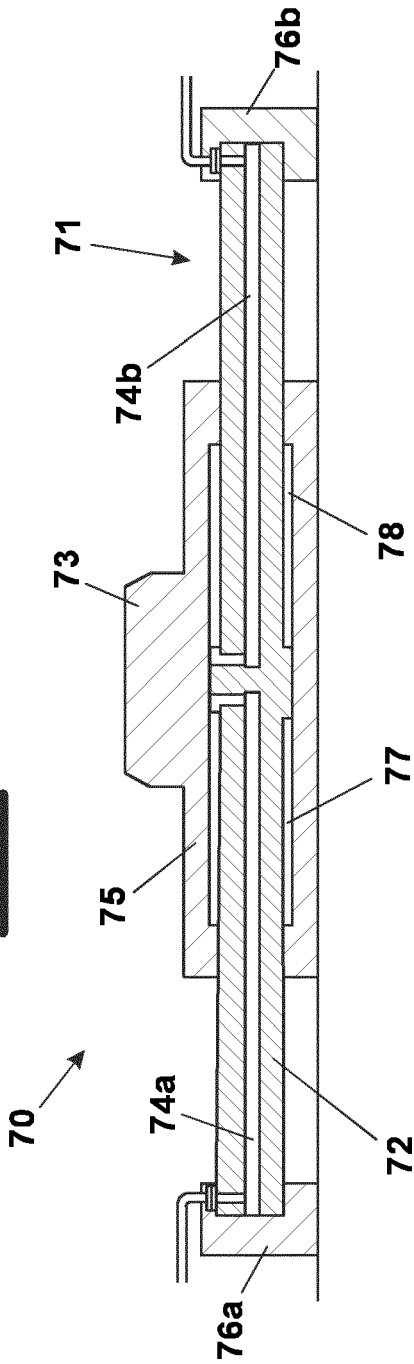


Fig. 8

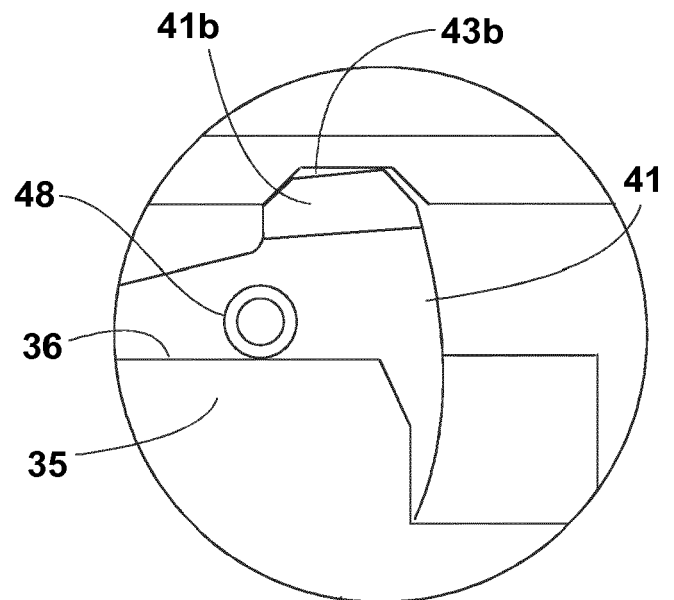


Fig. 7

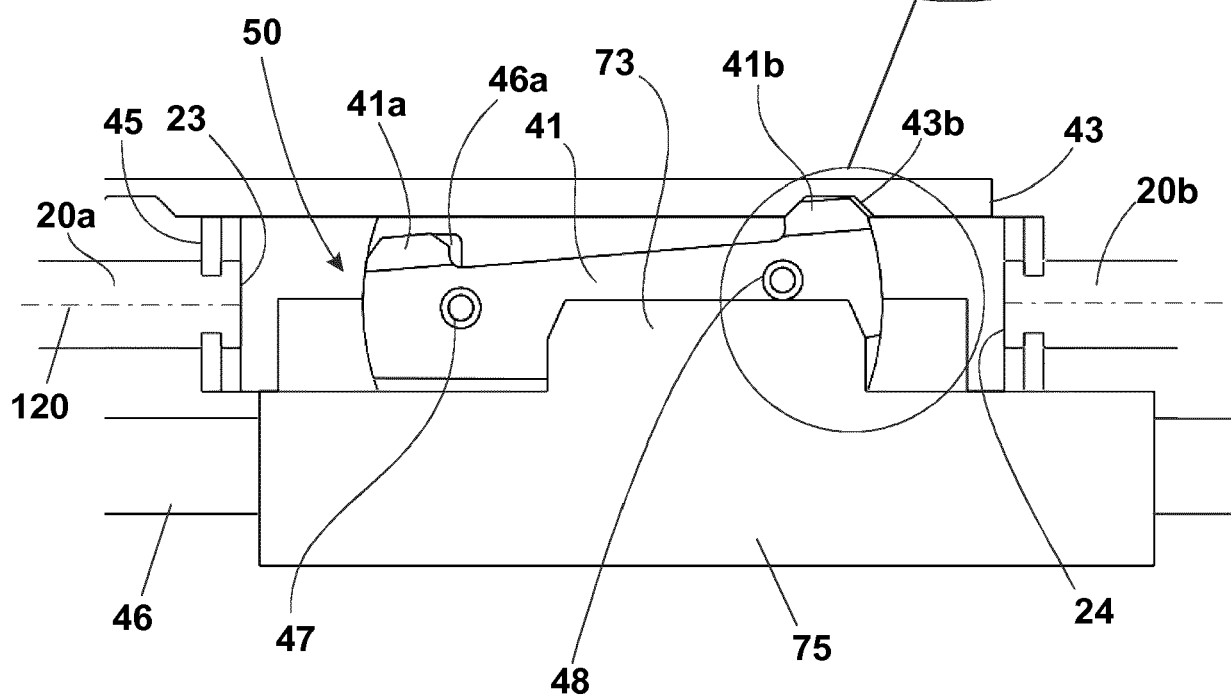


Fig. 9

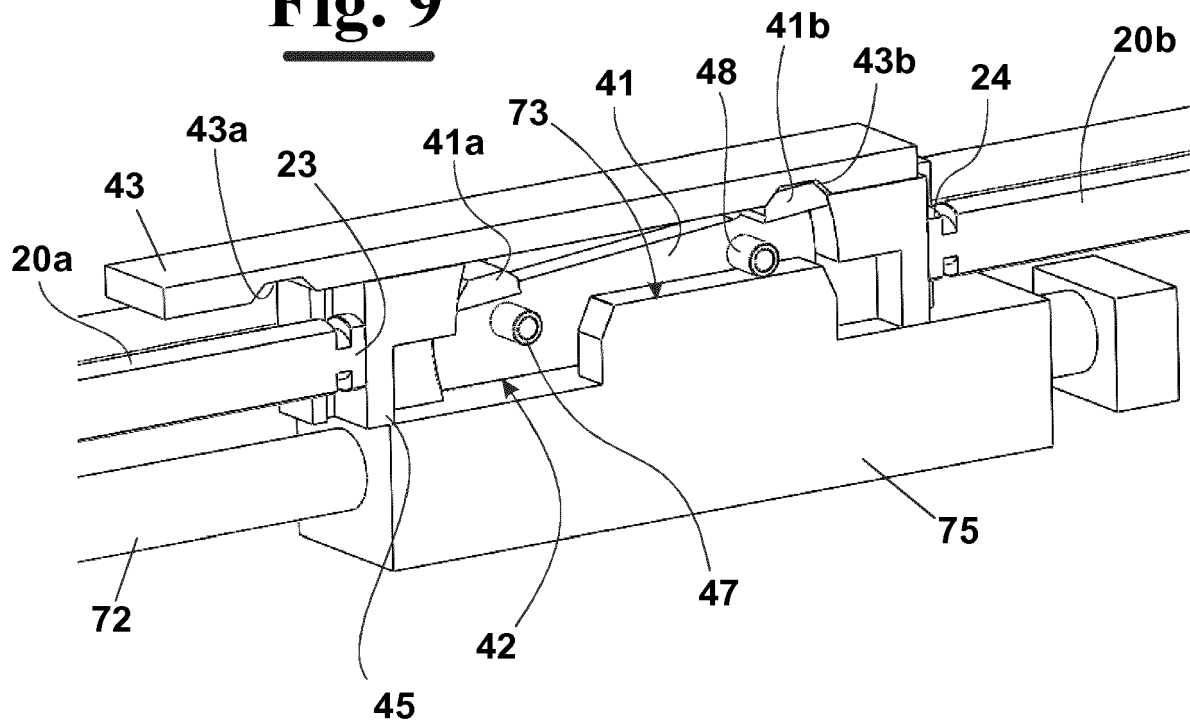


Fig. 10

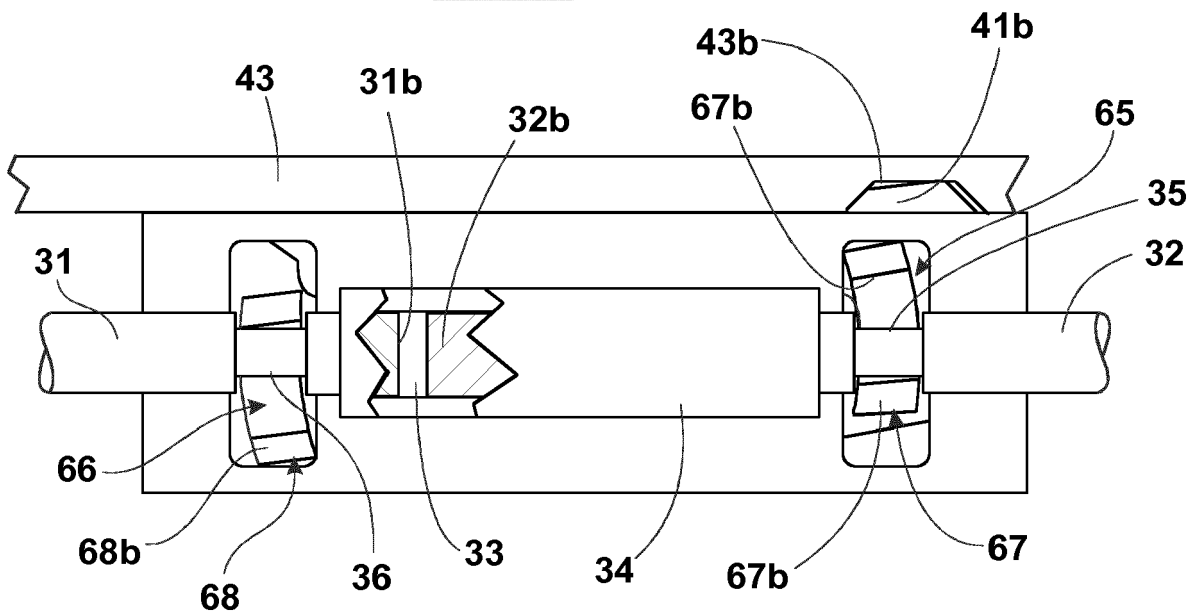


Fig. 11

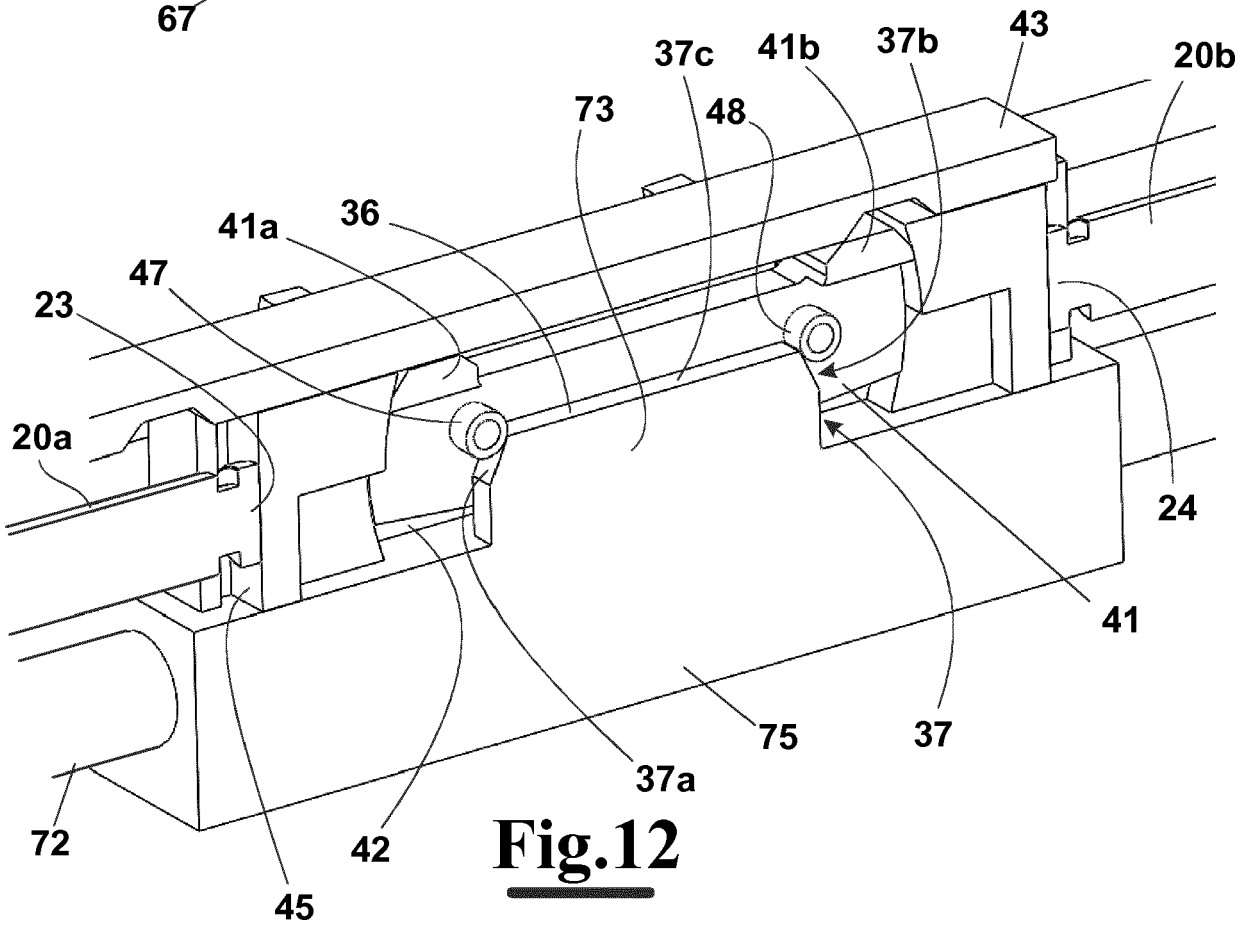
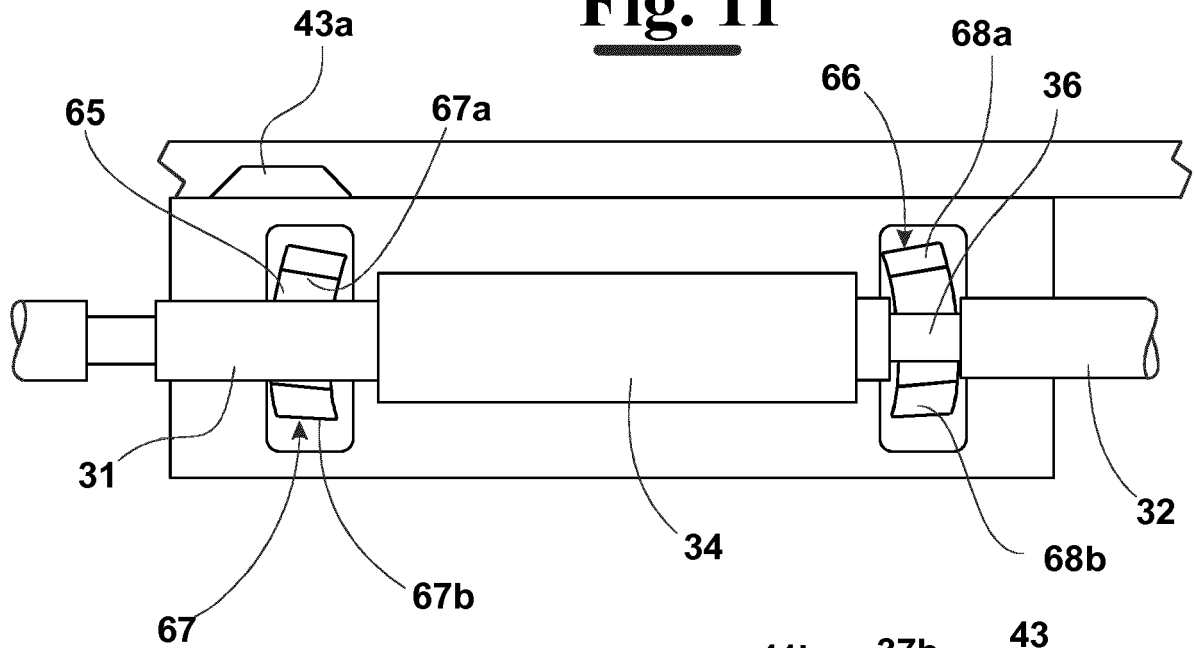


Fig.12

Fig. 13

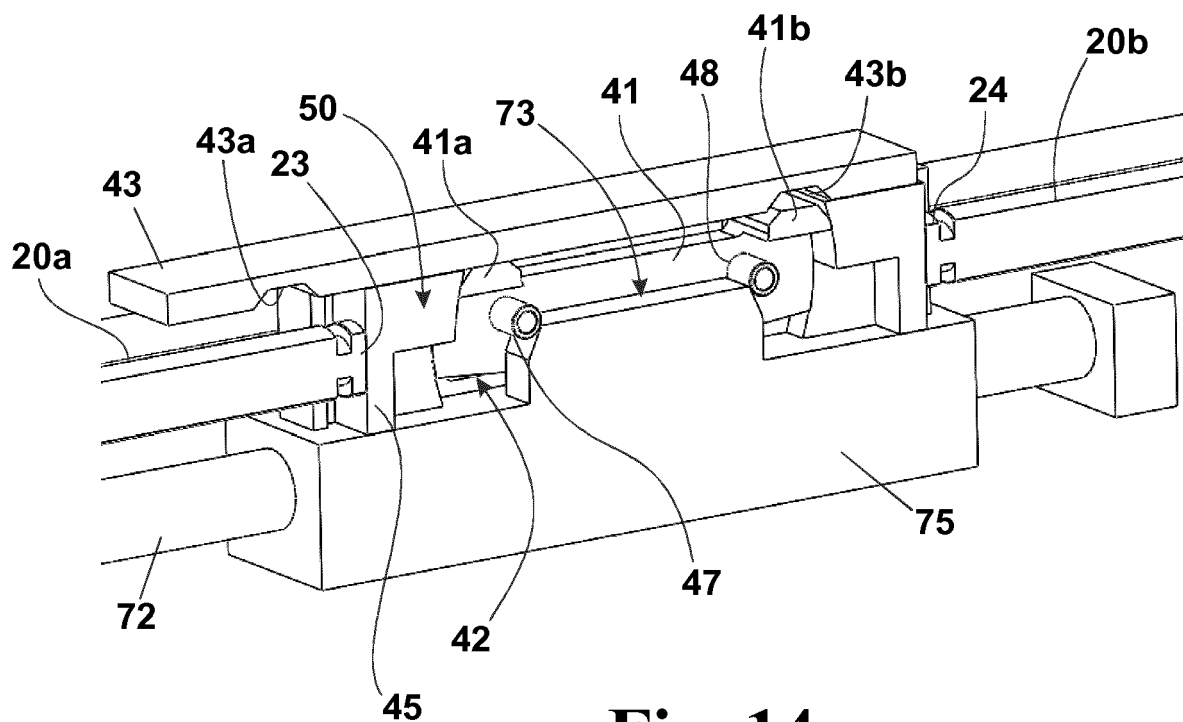
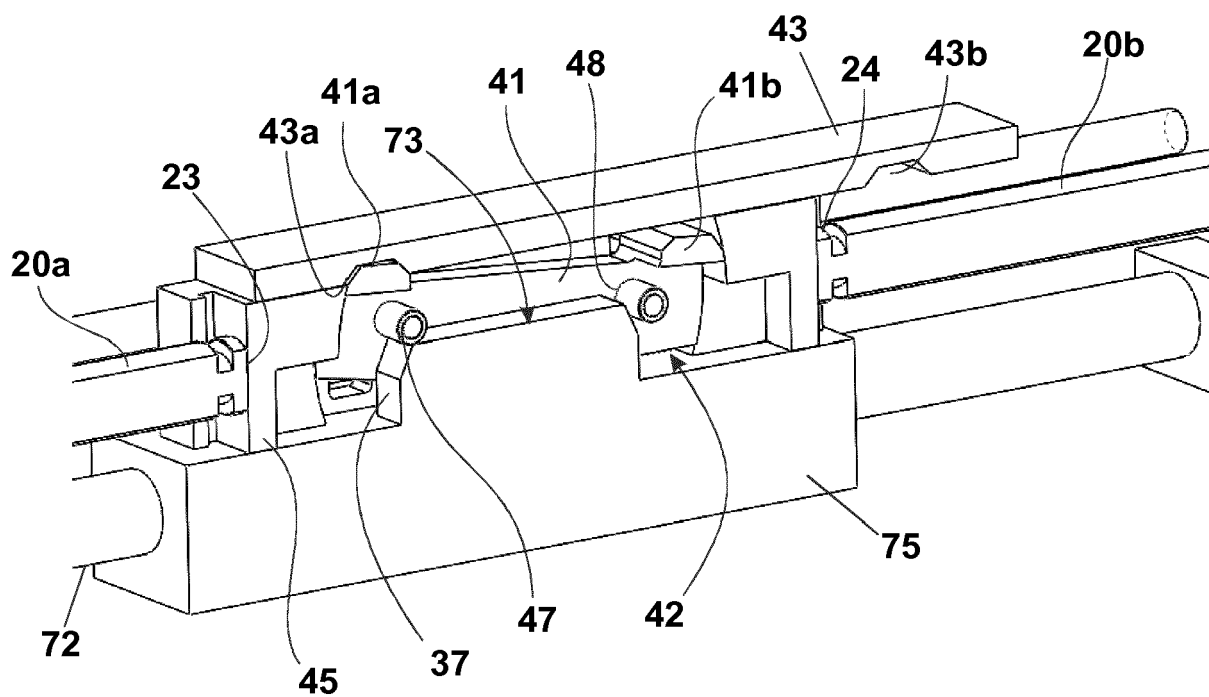


Fig. 14





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 Application Number
 EP 18 16 3275

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A	DE 35 11 891 A1 (SIEMENS AG [DE]) 16 October 1986 (1986-10-16) * page 4, line 18 - page 5, line 19 * * page 13, line 16 - line 34 * * figures 2,3 *	1-15	
A	DE 296 10 174 U1 (SIEMENS AG [DE]) 14 August 1996 (1996-08-14) * figures 1-4 * * page 4, line 25 - page 9, line 14 * * page 1, line 8 - line 19 *	1-15	
A	DE 29 28 194 B1 (SIEMENS AG) 16 October 1980 (1980-10-16) * figure 1 * * column 2, line 39 - column 3, line 8 *	1-15	
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			B61L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 19 July 2018	Examiner Janssen, Axel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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