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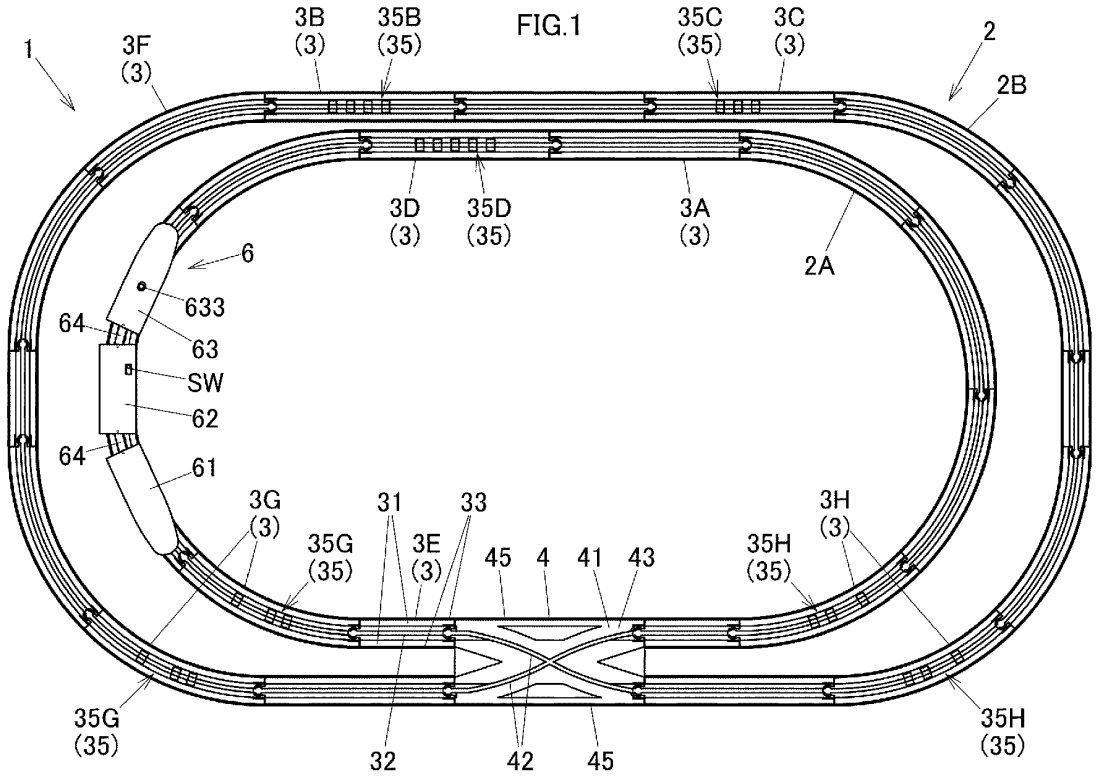
(54) TRACK DEVICE AND RUNNING BODY

(57) A track device includes a switching section configured to switch a running path for guiding a wheel of a running body to running paths in multiple directions, and a traveling path guide portion disposed along the running path which follows a different direction from an inertial direction of the running body.

FIG.1



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Description

Field of the Invention

[0001] The present invention relates to a track device and a running body.

Description of the Related Art

[0002] There have conventionally been proposed track devices for enabling the switching of a traveling direction of a running body imitating a vehicle. For example, Japanese Utility Model Publication No. 51-129893 (JP-B-51-129893U) discloses a switch device for a toy vehicle track which includes a movable element which is pivotally supported at a switch point on the track on which a running body (a toy vehicle) runs so as to rotate between a first switching position and a second switching position to change the traveling direction of the running body at the switch point. The movable element is provided within a guide groove in the track. A guide projection, which is provided at a lower portion of the running body, is brought into engagement with the guide groove, whereby the traveling direction of the running body is guided in accordance with the switching position where the movable element is rotated to stay.

[0003] With the switch device disclosed in JP-B-51-129893U, however, the movable element needs to change its position every time the traveling direction of the running body is switched over, which requires a bit of time to operate a switching control.

SUMMARY OF THE INVENTION

[0004] The present invention has been made in view of the situations described above, and an object thereof is to provide a track device and a running body with which running body tracks can easily be changed.

[0005] According to an aspect of the present invention, there is provided a track device including a switching section configured to switch a running path for guiding a wheel of a running body to running paths in multiple directions and a traveling path guide portion disposed along the running path which follows a different direction from an inertial direction of the running body.

[0006] According to another aspect of the present invention, there is provided a running body including a wheel configured to run on a running path of a track member while being guided, a traveling path switching portion configured to be brought into engagement with a traveling path guide portion disposed along the running path which follows a different direction from an inertial direction of running at a switching section where the running path is switched in multiple directions, and a control unit configured to cause the traveling path switching portion to be brought into engagement with or disengaged from the traveling path guide portion at the switching section to thereby determine whether or not a running direction is guided along the traveling path guide portion.

[0007] According to the present invention, the track device and the running body can be provided with which the running body tracks can easily be changed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Examples of track devices and running bodies in accordance with embodiments of the invention will now be described with reference to the accompanying drawings, in which:

FIG. 1 shows an overall plan view of a running toy according to an embodiment of the present invention;
FIG. 2 is a plan view of a single-line track member according to the embodiment of the present invention;
FIG. 3 is a plan view of a switching track member according to the embodiment of the present invention;
FIG. 4A is an end view of the switching track member according to the embodiment of the present invention shown in Fig. 3, as viewed from an end of the switching track member where an entrance section is provided;
FIG. 4B is a cross-sectional view of the switching track member according to the embodiment of the present invention as taken along a line IVb-IVb of the switching track member shown in Fig. 3;
FIG. 5 is a schematic diagram of a running body according to the embodiment of the present invention;
FIG. 6 is a block diagram of the running body according to the embodiment of the present invention;
FIG. 7 is a block diagram of a remote controller terminal according to the embodiment of the present invention; and
FIG. 8 is a control flow chart of the running body according to the embodiment of the present invention.

DETAILED DESCRIPTION

[0009] Hereinafter, referring to drawings, an embodiment of the present invention will be described. A running toy 1 shown in FIG. 1 includes a track device 2 formed by combining multiple track members (single-line track members 3, a switching track member 4) and a running body 6 designed to run on the track device 2. In FIG. 1, the single-line track members 3 and the switching track member 4 are combined together so as to form the track device 2 having two closed tracks of a first track 2A, which constitutes an inner track, and a second track 2B, which constitutes an outer track. When the running body 6 enters the switching track member 4, the switching track member 4 can switch a running direction of the running body 6 from the first track 2A to the second track 2B or from the second track 2B to the first track 2A. Alterna-

tively, the switching track member 4 can allow the running body 6 to continue running on the first track 24 or the second track 2B without switching the running direction of the running body 6.

[0010] The single-line track members 3 shown in Fig. 1 include single-line track members 3A to 3E for straight-line running and single-line track members 3F to 3H for curvilinear running. The single-line track members 3A to 3E for straight-line running include the single-line track members 3A to 3D, which are long, and the single-line track member 3E, which is shorter than the single-line track members 3A to 3D. In addition, the single-line track members 3F to 3H for curvilinear running are each curved at 45 degrees so as to change gradually the running direction (a traveling direction) of the running body 6 through 45 degrees.

[0011] Identifiers 35 are provided individually on some single-line track members 3B to 3D, 3G, 3H. In the present embodiment, the identifier 35 is a bar code (a one dimensional code) in which one or both of signs 351 and 352 are arranged with respect to the running direction of the running body 6.

[0012] Next, referring to FIG. 2, the configuration of the single-line track member 3 will be described by illustrating the single-line track member 3G for curvilinear running on which the identifier 35 is provided.

[0013] The single-line track member 3 has a main body portion 30, which has a flat plate-like shape and is long in the running direction of the running body 6. End faces 3a1 and 3b1 of both longitudinal end portions 3a, 3b of the single-line track member 3 are inclined at 45 degrees relative to each other. A coupling portion 51, which constitutes a projecting portion, is formed on one end face 3a1 of the main body portion 30. In addition, a coupled or coupling target portion 52 is provided on the other end face 3b1 of the main body portion 30, and this coupling target portion 52 is formed into a recessed portion which is configured to be brought into fitting engagement with another coupling portion 51 of another single-line track member 3 so that both the single-line track members 3 are coupled together. As shown in a cross-sectional view of the single-line track member 3 taken along a line II-II in Fig. 2, a track surface 3c is provided on one side of the single-line track member 3, and a flat placement surface 3d is provided on the other side thereof. The single-line track member 3 has running paths 31 on which pairs of wheels 611, 612, 621, 631 (refer to FIG. 5) of the running body 6 can run and a traveling path guide portion 32 which is formed deeper than the running paths 31.

[0014] The running paths 31 are individually provided on both longitudinal sides of the single-line track member 3 in such a manner as to match a transverse distance defined between each of the pairs of wheels 611, 612, 621, 631 and are disposed substantially parallel to each other. The running paths 31 are each formed into a recessed groove-like shape by a running guide portion 36 which is surrounded by a side wall 33 and an inner wall 34, which project towards the track surface 3c. As shown in the cross-sectional view of the single-line track member 3 taken along the line II-II in Fig. 2, each inner wall 34 is disposed transversely inwards of the corresponding side wall 33 of the single-line track member 3. The inner wall 34 is formed lower and transversely thicker than the side wall 33.

[0015] The traveling path guide portion 32 is provided transversely inwards of the running path 31 and substantially at a transverse center of the single-line track member 3. The traveling path guide portion 32 is formed into a recessed groove-like shape which is surrounded by the inner walls 34 on both sides thereof. In addition, the traveling path guide portion 32 is formed deeper and narrower in width than the running path 31 (refer to the cross-sectional view taken along the line II-II). The traveling path guide portion 32 is disposed substantially parallel to the traveling paths 31, which are formed along both the longitudinal sides of the main body portion 30.

[0016] The coupling portion 51 has a neck portion 511, which projects substantially from a transverse (width direction) center of the main body portion 30 at the end portion 3a, and a widthwise broadened portion 512, having a substantially circular shape in a plan view, which is provided at a distal end of the neck portion 511. The neck portion 511 is formed so as to have a width which is smaller than a transverse distance defined between inner surfaces 311 of both the running paths 31 and is larger than a width of the traveling path guide portion 32. Portions of the inner walls 34, which are disposed along both longitudinal sides of the traveling path guide portion 32, are made to extend to the neck portion 511 and the widthwise broadened portion 512 at the same height. As a result, the traveling path guide portion 32 is also made to extend into the coupling potion 51. The traveling path guide portion 32 at an end portion of the coupling portion 51 is cut out into the same width as the width of the traveling path guide portion 32 in the main body portion 30, so that a traveling path guide portion 32 in a coupling target portion 52 of another single-line track member 3 can be contiguous with the coupling portion 51 when the coupling target portion 52 is brought into fitting engagement with the coupling portion 51.

[0017] The coupling target portion 52 has arm portions 523 which are formed by an opening portion 521, which is formed by cutting out a substantially transverse (width direction) center portion of the main body portion 30, and slits 522, which are each provided at an inner surface 311 side of the running path 31 at the end portion 3b. The arm portions 523 so provided form a bifurcate shape. The opening portion 521 and the slits 522 are both cut into the main body portion 30 substantially to the same extent or depth from the end face 3b1. Projecting portions 523a are formed at distal end portions (the end face 3b1) of both the arm portions 523 in such a manner as to project towards each other to narrow a transverse distance defined between the arm portions 523 more at the distal end portions than at proximal portions. Respective facing surfaces of the projecting portions 523a are

formed to the same width and substantially parallel to each other over a full extent thereof in the longitudinal direction of the main body portion 30.

[0018] A widthwise broadened portion 521a, which is defined between the proximal portions of the arm portions 523, has a substantially circular shape in a plan view. The arm portion 523 has the same thickness as that of the inner wall 34 of the main body portion 30, and the inner wall 34 is formed in such a manner as to extend to the arm portion 523. A width of the opening portion 521 of the coupling target portion 52 is formed larger than the widths of the neck portion 511 and the widthwise broadened portion 512 of the coupling portion 51.

[0019] An identifier 35 is provided on the track surface 3c of the single-line track member 3. In the present embodiment, the identifier 35 is a one-dimensional bar code in which signs 351, 352 are arranged in the running direction of the running body 6. The identifier 35 includes a sign 351 of a low reflectance and a sign 352 of a reflectance which is higher than the reflectance of the sign 351. The running body 6 can read an arrangement of signs 351, 352 using an optical sensor 615, which will be described later, to thereby detect the type of the identifier 35. For example, as an input into the optical sensor 615, the sign 351 corresponds to "1", and the sign 352 corresponds to "0". In the track device 2 shown in Fig. 1, an identifier 35 is provided on the single-line track member 3G located on an entrance side of a switching section 441 (refer to FIG. 3) of the switching track member 4. The identifier 35 enables the running body 6 to detect an entry to the switching section441. With an identifier 35G, a sign 351, a sign 352, a sign 351, and a sign 351 are sequentially arranged in this order. In this case, the running body 6 can detect an input of "1011" by the optical sensor 615. The identifier 35G indicates that the running body 6 is in a position immediately before the switching track member 4 with respect to the running direction of the running body 6.

[0020] The signs 351, 352 are each provided in such a manner as to extend continuously over a bottom surface and facing inner surfaces of the traveling guide portion 32 and upper surfaces of the inner walls 34 so as to have a substantially rectangular shape in a plan view in FIG. 2. In the present embodiment, the sign 351 is formed black and can be provided in an arbitrary method such as affixing an adhesive tape, painting, disposing a separate member from the single-line track member 3, or the like. Additionally, the single-line track member 3 is formed of a white base material, and a portion of the base material is exposed to provide an area of a high reflectance as a sign 352.

[0021] In the present embodiment, as shown in FIG. 1, a single-line track member 3G including an identifier 35G is disposed on each of the first track 2A, constituting the inner track, and the second track 2B, constituting the outer track. In addition, an identifier 35H, whose arrangement of signs 351, 352 is opposite to that of the identifier 35G, is provided on the single-line track member 3H. The identifier 35H enables the running body 6 to detect that the running body 6 is in a position immediately before the switching track member 4 in the case that the running body 6 is caused to run in a counterclockwise direction on the first track 2A and the second track 2B in FIG. 1.

[0022] In the track device 2 in FIG. 1, identifiers 35B to 35D are provided respectively on the single-line track members 3B to 3D for straight-line running. The identifiers 35B to 35D indicate positions of stations in the running toy 1, and different arrangements of signs 351, 351 denote different stations. In the present embodiment, the identifier 35B ("111") denotes a "station 1", the identifier 35C ("1111") denotes a "station 2", and the identifier 35D ("11111") denotes a "station 3". As will be described later, receiving a "stop-at-station command", the running body 6 can stop in the position of an arbitrary station so designated.

[0023] FIG. 3 is a plan view of the switching track member 4. The switching track member 4 has a main body portion 40 of a substantially rectangular flat plate-like shape which is long in the running direction of the running body 6. The switching track member 4 has two entrance portions 401, 402 at one longitudinal end portion 4a and two exit portions 403, 404 at the other longitudinal end portion 4b thereof. In the switching track member 4, the running body 6 can enter from either of the entrance portion 401 and the entrance portion 402 and can exit from either of the exit portion 403 and the exit portion 404. The switching track member 4 is formed vertically symmetrical as viewed in the plan view of FIG. 3.

[0024] End faces 4a1, 4b1 of both longitudinal end portions 4a, 4b of the switching track member 4 are formed substantially parallel to each other. Coupling portions 51, constituting projecting portions, are formed on one end face 4a1 of the main body portion 40. In addition, coupling target portions 52, each constituting a recessed portion which is brought into fitting engagement with a coupling portion 51 of another single-line track member 3 so as to couple both the track members together, are provided on the other end face 4b1 of the main body portion 40. The configurations of the coupling portion 51 and the coupling target portion 52 of the switching track member 4 are substantially the same as those of the coupling portion 51 and the coupling target portion 52 of the single-line track member 3.

[0025] As shown in FIGS. 4A and 4B, a track surface 4c is provided on one side of the switching track member 4, and a flat placement surface 4d is provided on the other side thereof. The switching track member 4 has running paths 41, on which the pairs of wheels 611, 612, 621, 631 of the running body 6 can run, and traveling path guide portions 42, which are formed deeper than the running paths 41.

[0026] The running paths 41 are formed on a running surface 43, which is a flat surface provided on most portions of the switching track member 4. The running paths 41 are provided parallel to and apart from each other so as to define a transverse distance which is substantially

the same as a distance defined between the pairs of left and right wheels 611, 612, 621, 631 of the running body 6. In the present embodiment, running paths 41a to 41d are provided in such a manner as to extend in four directions. The running paths 41a to 41d guide the pairs of wheels 611, 612, 621, 631 of the running body 6 by side walls 45, side surfaces (or inner surfaces) of island portions 46, and the like, which project from the running surface 43. The running paths 41a are formed in such a manner as to extend from the entrance portion 401 towards the exit portion 403, and the running paths 41b are formed in such a manner as to extend from the entrance portion 401 towards the exit portion 404. In addition, the running paths 41c are formed in such a manner as to extend from the entrance portion 402 towards the exit portion 403, and the running paths 41d are formed in such a manner as to extend from the entrance portion 402 towards the exit portion 404. The running paths 41a and the running paths 41d are disposed substantially parallel and straight. The running paths 41b and the running paths 41c are disposed diagonally so as to intersect each other crosswise in to an X-shape.

[0027] The switching track member 4 has the side walls 45, which project towards the track surface 4c, along both longitudinal edge portions thereof (refer to FIG. 4A). In addition, the switching track member 4 has multiple island portions 46 which project towards the track surface 4c and are located transversely inwards of the side walls 45. The side walls 45 are formed substantially at the same height as that of the side walls 33 of the single-line track members 3, so that the side walls 33 of the single-line track members 3 can extend continuously to the side walls 45 of the switching track member 4 when the single-line track members 3 are coupled to the switching track member 4 at the entrance portions 401, 402 or the exit portions 403, 404.

[0028] The island portions 46 include inner island portions 461, which are disposed individually between the two running paths 41a and the two running paths 41d, endwise disposed island portions 462, 464, which are provided at an end portion where the entrance portions 401, 402 are provided, and endwise disposed island portion 463, 465, which are provided at an end portion where the exit portions 403, 404 are provided. As shown in FIGS. 4A and 4B, the endwise disposed island portions 462, 463 are formed substantially at the same height as that of the side walls 45. The inner land portions 461 and the endwise disposed island portions 464, 465 are formed lower than the side walls 45 (or the endwise disposed land portions 462, 463) and substantially at the same height as that of the inner walls 34 of the single-line track member 3 shown in FIG. 2 (also refer to FIGS. 4A and 4B).

[0029] The endwise disposed island portions 462, 463 are disposed between the running path 41b and the running path 41c and are each formed into an isosceles triangle with an apex formed by two sides of equal length being directed inwards of the switching track member 4 in a plan view. The endwise disposed island portions 464 are adjacent to the corresponding coupling portions 51 and are disposed between the two running paths 41a and the two running paths 41d, respectively. In addition, the endwise disposed island portions 465 are adjacent to the corresponding coupling target portions 52 and are disposed between the two running paths 41a and the two running paths 41d, respectively.

[0030] An inner wall 471, whose height is substantially the same as that of the corresponding endwise disposed island portion 464, is provided on an opposite side to the endwise disposed island portion 464 with respect to the traveling path guide portion 42 in such a manner as to be adjacent to the neck portion 511 at each of the entrance portions 401, 402. In addition, an inner wall 472, whose height is substantially the same as that of the corresponding endwise disposed island portion 465, is provided on an opposite side to the endwise disposed island portion 465 with respect to the traveling path guide portion 42 in such a manner as to be adjacent to the opening portion 521 at each of the exit portions 403, 404.

[0031] The traveling path guide portions 42 are each formed into a recessed groove shape which is recessed deeper than the running path 41 in the running surface 43 where the running path 41 is formed. The traveling path guide portion 42 is disposed along the running paths 41b which extend in a different direction from the running paths 41a which extend in an inertial direction of the running body 6 which travels from the entrance portion 401 towards the exit portion 403. As a result, the traveling path guide portion 42 is provided so as to extend over a full length of the running paths 41b from the entrance portion 401 to the exit portion 404. In addition, the traveling path guide portion 42 is disposed along the running paths 41c which extend in a different direction from the running paths 41d which extend in the inertial direction of the running body 6 which travels from the entrance portion 402 towards the exit portion 404. As a result, the switching track member 4 has the multiple traveling path guide portions 42 which intersect each other crosswise into an X-shape along the multiple running paths 41b, 41c, respectively. The traveling path guide portion 42, which corresponds to the running paths 41b, is provided transversely inwards of or between the two running paths 41b on which the pairs of left and right wheels 611, 612, 621, 631 of the running body 6 pass. In addition, the traveling path guide portion 42, which corresponds to the running paths 41c, is provided transversely inwards of or between the two running paths 41c on which the pairs of left and right wheels 611, 612, 621, 631 of the running body 6 pass.

[0032] The running path 41a, which extends from the entrance portion 401 towards the exit portion 403, includes a switching section 441, a guide section 442, and a merging portion 443. The running path 41 which extends from the entrance portion 401 is switched to the running path 41a and the running path 41b at the switching section 441. The running path 41a extends in the

inertial direction (in the present embodiment, a straight traveling direction) of the running body 6 which runs while being guided or not being guided by the side wall 45 or the endwise disposed land portion 464 at the switching section 441.

[0033] The guide section 442 guides the running direction of the running body 6 by the side wall 45 and the inner island portion 461. The running paths 41a and the running paths 41c merge together at the merging section 443, whereby the running body 6 is guided from the exit portion 403 to another subsequent single-line track member 3 which is continuously coupled thereto.

[0034] The running paths 41b, which extend from the entrance portion 401 towards the exit portion 404, includes a switching section 441, a guide section 444, a crossing section 445, a guide section 446, and a merging section 443. A side surface of the inner island portion 461 is positioned to the side of the running path 41b at the guide section 444, and even in the case that the wheels 611, 612, 621, 631 of the running body 6 are brought into abutment with the inner island portion 461, the running direction of the running body 6 can be guided towards the crossing section 445 along the running paths 41b. The crossing section 445 is disposed between the switching section 441 and a switching termination section (the merging section 443 in the present embodiment) where the switching of the running paths 41b which are switched by the switching section 441 terminates, and the running paths 41b and the other running paths 41c intersect each other crosswise at the crossing section 445. The crossing section 445 is disposed between the switching section 441 and the switching termination section (the merging section 443 in the present embodiment) of the running paths 41b switched by the switching section 441. In addition, the running paths 41b are formed substantially straight-line (a straight traveling direction) at the crossing section 445. As a result, the running body 6, which enters from the guide section 444, can run towards the guide section 446 with or even without a traveling path switching portion 618b being guided by the traveling path guide portion 42.

[0035] A side surface of the inner island portion 461 is positioned to the side of the running path 41b at the guide section 446, and in the case that the wheels 611, 612, 621, 631 of the running body 6 are brought into abutment with the inner island portion 461, the running direction of the running body 6 can be guided towards the merging section 443 along the running paths 41b. The running paths 41b and the running paths 41d merge together at the merging section 443 for the exit portion 404, whereby the running body 6 can be guided from the exit portion 404 to another subsequent single-line track member 3 which is coupled thereto.

[0036] The running paths 41d are configured vertically symmetrical with the running paths 41a as viewed in FIG. 3, and as with the running paths 41a, the running paths 41d also include a switching section 441, a guide section 442, and a merging section 443. In addition, the running paths 41c are configured vertically symmetrical with the running paths 41b as viewed in FIG. 3, and as with the running paths 41b, the running paths 41c include a switching section 441, a guide section 444, a crossing section 445, a guide section 446, and a merging section 443.

[0037] In addition, the switching track member 4 is configured laterally symmetrical as viewed in FIG. 3 without the coupling portions 51 and the coupling target portions 52, whereby the running body 6 can also enter the switching track member 4 from the exit portions 403, 404 and exit from the entrance portions 401, 402. In this case, the merging section 443 shown in FIG. 3 functions as the switching section, and the switching section 441 functions as the merging section.

[0038] The switching track member 4 has the coupling portions 51, which are provided at the one ends of the running paths 41, and the coupling target portions 52, which are provided at the other ends of the running paths 41. As with the single-line track member 3, the traveling path guide portions 42 are caused to extend into the coupling portions 51. A coupling portion 51 of another single-line track member 3 can be brought into fitting engagement with the opening portion 521 of the coupling target portion 52 from a thickness direction of the switching target member 4. When the coupling portion 51 and the coupling target portion 52 are coupled together, the widthwise broadened portion 512 of the coupling portion 51 is disposed inside the widthwise broadened portion 521a of the coupling target portion 52. In addition, the projecting portions 523a of the arm portions 523 are brought into engagement with the neck portion of the coupling portion 51. As a result, in such a state that the coupling portion 51 and the coupling target portion 52 are coupled together, the coupling portion 51 and the coupling target portion 52 are restricted from moving in the direction in which the running path 31 (or the running path 41) extends. As a result, the coupled state of the single-line track member 3 to the switching track member 4 can be held stably. The switching track member 4 is configured so that single-line track members 3 can be coupled to the switching track member 4 individually at the switching section 441, which constitutes an initiating end where the coupling portion 51 is provided, and the merging section 443, which constitutes a terminating end of the running paths 41.

[0039] FIG. 5 is a schematic diagram of the running body 6 which shows casings of constituent cars in section and shows schematically internal configurations of the constituent cars. FIG. 6 is a block diagram of the running body 6. The running body 6 includes a leading car 61, a middle car 62, and a trailing car 63 and is configured as a set of three cars. The wheels 611, 621, 631 of the leading car 61, the middle car 62, and the trailing car 63 are supported in such a manner as to rotate freely, and a part of the wheels, that is, the wheels 612 of the leading car 61 function as drive wheels. The leading car 61, the middle car 62, and the trailing car 63 are coupled together

by hollow cylindrical coupling members 64, which are each opened at the front and rear thereof. Wirings for multiple circuit boards 632, 613, mounted components, and the like inside the individual cars 61 to 63 are connected by wirings which pass through hollow portions of the coupling members 64, although not shown. The coupling members 64 are connected to the corresponding cars 61 to 63 with hinges in such a manner as to move around a vertical direction as an axis, whereby the coupling members 64 are coupled to the corresponding cars in such a manner as to rotate to the left and right with respect to the running direction of the running body 6.

[0040] The middle car 62 includes power supplies 622 and a power supply switch 623. In the present embodiment, two primary batteries are used for the power supplies 622, but secondary batteries may be used. In addition, in the present embodiment, a slide switch is used for the power supply switch 623, and an operating portion of the power supply switch 623 projects from an opening provided in an upper surface of the middle car 62.

[0041] Multiple circuit boards 632 are disposed in the trailing car 63. The circuit boards 632 include a control unit 632a made up of a microcomputer or the like (refer to FIG. 6), a regulator, switch circuits for individual drive units, and the like. The trailing car 63 includes a reception unit 633 for receiving a control directive from a remote controller terminal 7 (refer to FIG. 7) in the form of a wireless signal such as infrared signal and a speaker 634 for outputting voice. A light receiving portion of the reception unit 633 is exposed from an opening provided in an upper surface of the trailing car 63. The speaker 634 is disposed on an upper surface side of the trailing car 63, so that voice and sound can be emitted upwards of the trailing car 63.

[0042] The leading car 61 is equipped with a running drive unit 614, which is a motor for driving the wheels 612, an optical sensor 615, and a switching drive unit 616, which is a motor for controlling lifting and lowering movements of a slide member 618. The wirings pulled out from the circuit boards 632 in the trailing car 63 are connected to the running drive unit 614, the optical sensor 615, and the switching drive unit 616 by way of the circuit board 613. The running drive unit 614 rotates a driven gear fixed to an axle portion of the wheels 612 via multiple gears so as to control the rotation of the wheels 612. The optical sensor 615 is a light projecting and receiving sensor employing an arbitrary wavelength such as an infrared ray or the like. The optical sensor 615 can shine light to a running surface (the single-line track member 3 or the switching track member 4) which is located below the leading car 61 and read the intensity of reflected light. In the present embodiment, the control unit 632a can detect a running position of the running body 6 by use of a sign pattern (an order in which the sign 351 and the sign 352 are arranged) of the identifier 35 shown in FIG. 1 which is read by the optical sensor 615. The optical sensor 615 is positioned substantially middle between the pairs of left and right wheels 611, 612 as shown in a bottom view of the leading car 61.

[0043] The slide member 618 is configured so as to be moved up and down by a pressure member 617, which is connected with the switching drive unit 616 via multiple gears, and an elastic member S, which is a compression coil. The slide member 618 has an upper circular disc-shaped receiving portion 618a and the traveling path switching portion 618b, which is a cylindrical projection which extends downwards substantially from a center of a lower surface of the receiving portion 618a. The slide member 618 is accommodated in a cylindrical accommodation unit 618c in such a manner as to move up and down. The elastic member S is disposed between the receiving portion 618a and a bottom portion of the accommodation unit 618c and biases the slide member 618 upwards.

[0044] The pressure member 617 has a shaft portion 617a, which is provided rotatably as a result of meshing engagement with a gear provided on the switching drive unit 616, and an arm portion 617b which extends from the shaft portion 617a to the front. The pressure member 617 is caused to rotate around the shaft portion 617a by the switching drive unit 616 and is caused to be shifted between a state shown in FIG. 5 in which the pressure member 617 does not press against the slide member 618 and a state in which the pressure member 617 moves the slide member 618 downwards against a spring-back force of the elastic member S by use of the arm portion 617b. In the state in which the slide member 618 is pressed downwards, the traveling path switching portion 618b projects outwards from the lower surface of the leading car 61 to thereby be positioned further downwards than the wheels 611, 612 at a distal end thereof as indicated by chain lines. As shown in the bottom view of the leading car 61, the traveling path switching portion 618b is positioned further forwards than an axle portion of the front wheels and substantially in a middle position between the left and right wheels 611 of the leading car 61.

[0045] Additionally, as shown in FIG. 6, the functional units described above (the reception unit 633, the speaker 634, the running drive unit 614, the optical sensor 615, and the switching drive unit 616) are controlled by the control unit 632a. As will be described by reference to FIG. 8, the control unit 632a causes the traveling path switching portion 618b to be brought into engagement with and disengagement from the traveling path guide portion 42 to thereby determine whether or not the running body 6 is guided along the traveling path guide portion 42.

[0046] FIG. 7 is a block diagram of the remote controller terminal 7. The remote controller terminal 7 includes a control unit 71, a transmission unit 72, and an input unit 73. The transmission unit 72 transmits a control directive to the reception unit 633 of the running body 6 in the form of a wireless signal such as an infrared signal. The input unit 73 has slide switches 731, 732 for instructing a start and a stop, respectively, a push button 733 for instructing

a switch of the track (the first track 2A or the second track 2B) of the running body 6, and push buttons 734 to 736 for designating a stopping station from "station 1" to "station 3".

[0047] The user can remote control a start and a stop of the running body 6, a switch at the switching track member 4, and the like by operating the remote controller terminal 7.

[0048] Next, an example of control of the running toy 1 will be described. FIG. 8 is a flow chart illustrating a control to be carried out by the control unit 632a of the running body 6. First of all, the user puts the running body 6 in an arbitrary position on the track device 2 shown in FIG. 1. Then, when a power supply switch SW is operated, the running body 6 is caused to be waiting in a stopped state (Step S01).

[0049] When the control unit 632a of the running body 6 receives a "start directive signal" from the remote controller terminal 7 in Step S02, the control unit 632a causes the running drive unit 614, which is the motor, to be driven to cause the running body 6 to start running (Step S03). The control unit 632a determines in Step S04 whether any signal has been received from the remote controller terminal 7, and if no signal has been received (S04, NO), the control unit 632a repeats the operation in Step S04 while the running body 6 keeps running. If control unit 632a receives in Step S04 a "stop-at-station directive" as a result of depressing any of the push buttons 734 to 736 of the remote controller terminal 7, the control unit 632a proceeds to Step S05. If the control unit 632a receives a "switch directive" as a result of depressing the push button 733, the control unit S632a proceeds to Step S11. If the control unit 632a receives a "stop directive", the control unit 632a proceeds to Step S14.

[0050] In Step S05, the control unit 632a reproduces a voice message informing of a station where the running body 6 is going to stop from "station 1", "station 2", and "station 3" from the speaker 634. This voice message can include a voice message notifying of the station where the running body 6 is going to stop and a piece of music corresponding to the stopping station in question.

[0051] The control unit 632a determines in Step S06 whether the station where the running body 6 is going to stop is detected. For example, if the identifier 35 read by the optical sensor 615 is the identifier 35B, the control unit 632a determines that the station where the running body 6 is going to stop is "station 1". If the identifier 35 read by the optical sensor 615 is the identifier 35C, the control unit 632a determines that the station where the running body 6 is going to stop is "station 2". If the identifier 35 read by the optical sensor 615 is the identifier 35D, the control unit 632a determines that the station where the running body 6 is going to stop is "station 3". As a result, if the identifier 35 is detected which denotes the station coinciding with the stopping station received in Step S04, the control unit 632a proceeds to Step S07. If no identifier 35 is detected or the station denoted by the identifier 35 detected does not coincide with the stopping station received in Step S04, the control unit 632a proceeds to an operation in Step S08.

[0052] Since the stopping station received coincides with the station denoted by the identifier 35 detected, the control circuit 632a stops the running body 6 in Step S07. In this way, the control unit 632a can stop the running body 6 at any of the stations designated by the remote controller terminal 7.

[0053] In Step S08, the control unit 632a determines that the stopping station received in Step S04 exists within the track (within the first track 2A on which the running body 6 is currently running or the second track 2B). For example, if an elapsing time that has elapsed since the receipt of the "stop-at-station directive" in Step S04 is equal to or smaller than a predetermined threshold value, the control unit 632a temporarily determines that there is a designated station to stop the running body 6 (S08, YES) and can return to the operation in Step S06. On the other hand, the control unit 632a repeats the operations in Step S06 and Step S08 until the designated station is detected while keeping the running body 6 running, and if the elapsing time exceeds the predetermined threshold value, the control unit 632a determines that there is no designated station within the track (within the first track 2A on which the running body 6 is currently running or the second track 2B) (S08, NO), and then, the control unit 632a proceeds to an operation in Step S09. Alternatively, if none of the identifiers 35B to 35D which corresponds to the designated station is detected while the identifier 35G is detected twice while causing the running body 6 to circulate the first track 2A or the second track 2B shown in FIG. 1 (that is, if the designated station is not detected while causing the running body 6 to circulate the first track 2A or the second track 2B once), the control unit 632a may determine that the designated station does not exist within the track (within the first track 2A on which the running body 6 is currently running or the second track 2B) (S08, NO).

[0054] In Step S09, the control unit 632a determines whether the identifier 35G is detected by the optical sensor 615. If the identifier 35G is not detected (S09, NO), the control unit 632a returns to the operation in Step S06 and repeats the operations of Step S09 and Step S07 until the identifier 35G is detected by the optical sensor 617. On the other hand, if the identifier 35G is detected (S09, YES), the control unit 632a proceeds to an operation in Step S10.

[0055] The traveling path of the running body 6 is switched at the switching track member 4 in Step S10. If the identifier 35G is detected, the running body 6 is in a position immediately before the switching track member 4. In Step S10, the control unit 632a causes the switching drive unit 616 of the running body 6 to be driven to lower the slide member 618, causing the traveling path switching portion 618b to project from the lower surface side of the running body 6. Then, as indicated by a chain line in FIG. 4B, the traveling path switching portion 618b is brought into engagement with the traveling path guide

portion 42, whereby the running direction of the running body 6 is guided towards the running paths 41b whose directions are different from the inertial direction of the running body 6 (also refer to FIG. 3). The running body 6 advances from the exit portion 404 to a subsequent single-line track member 3 while being guided by the traveling path guide portion 42, whereby the running body 6 can run on the second track 2B (refer to FIG. 1). The control unit 632a can cause the traveling path switching portion 618b to keep projecting for a predetermined period of time until the traveling path of the running body 6 is switched completely. For example, the control unit 632a may cause the traveling path switching portion 618b to keep projecting while the leading car 61 is running through the switching section 441 or may cause the traveling path switching portion 618b to keep projecting from a point in time before the leading car 61 enters the switching section 441 until a point in time when the leading car 61 or the trailing car 63 has passed through the merging section 443 after the traveling path has been switched completely. Thereafter, the control unit 632a returns to the operation in Step S06. In addition, if any one of the identifiers 35B to 35D which denotes the designated station is detected in Step S06 (S06, YES), the control unit 632a causes the running body 6 to stop at the designated station (S07), returning to the waiting operation in Step S01.

[0056] In Step S11, the control unit 632a reproduces an alarming sound and causes it to be emitted from the speaker 634. In Step S12, the control unit 632a determines whether the optical sensor 615 detects the identifier 35G. If the optical sensor 615 does not detect the identifier 35G (S12, NO), the control unit 632a repeats the operation in Step S2 until the identifier 35G is detected. On the other hand, if the optical sensor 615 detects the identifier 35G (S12, YES), the control unit 632a proceeds to an operation in Step S13.

[0057] As with Step S10, in Step S13, the control unit 632a switches the traveling path of the running body 6 from the first track 2A to the second track 2B or the second track 2B to the first track 2A at the switching track member 4. Thereafter, the control unit 632a returns to the operation in Step S04.

[0058] In addition, in Step S14, the control unit 632a causes the running drive unit 614 to stop the running body 6.

[0059] Thus, in the present embodiment, the configuration of the track device 2 has been described which includes the switching section 441 which switches the running paths 41 for guiding the pairs of wheels 611, 612, 621, 631 of the running body 6 in the multiple directions and the traveling guide portions 42 which are disposed along the running paths 41 whose directions differ from the inertial direction of the running body 6. The running body 6 can select the running direction without directly operating the switching track member 4 (or the switching section 441). As a result, the running toy 1 can be configured in which the tracks of the running body 6 can easily be changed.

[0060] Thus, while the embodiment of the present invention has been described heretofore, the present invention is not limited by the embodiment in any way and can be carried out while being modified or altered variously. For example, in the present embodiment, in the identifier 35, the sign 351 is described as being black and the sing 352 is described as being white; however, the sing 351 and the sign 352 can adopt any colors as long as two values ("1" or "0") can be read by the optical sensor 615.

[0061] In the present embodiment, while the bar code is described as being used as the identifier 35, another configuration can be used which includes another one-dimensional code, a non-contact tag such as RFID, or the like. In the case that a non-contact tag is used as the identifier 35, a reading unit for reading a non-contact tag can be disposed in place of the optical sensor 615.

[0062] In the present embodiment, while the running drive unit 614, the optical sensor 615, the switching drive unit 616, the power supply switch SW, the power supplies 622, the reception unit 633, and the speaker 634 are scattered to be provided in the individual cars 61 to 63, those constituent units may be combined altogether so as to be provided in any one of the cars 61 to 63. Alternatively, the constituent units may be scattered over the cars 61 to 63 in arbitrary different combinations.

[0063] In the present embodiment, while the traveling path guide portion 32, which has substantially the same width and depth as those of the traveling guide portion 42, is provided in the single-line track member 3, a configuration can be adopted in which the traveling path guide portion 32 is not provided in the single-line track member 3. In this case, too, the running body 6 can switch its running direction as a result of the traveling path switching portion 618b being brought into engagement with the traveling path guide portion 42 at the switching track member 4.

[0064] The direction of the running path 41 which extends in the inertial direction of the running body 6 in the switching section 441 of the switching track member 4 is not limited to the direction in which the running path 41 extends straight (the straight traveling direction), and hence, the running path 41 may extend in a curvilinear direction in which the wheels 611, 612, 621, 631 of the running body 6 are guided by the side wall 45 and the like. In this case, as the running path 41 whose direction differs from the inertial direction of the running body 6, a curvilinear direction can be adopted whose curvature is larger (further inwards) than that of the curvilinear direction which is guided by the wheels 611, 612, 621, 631. The traveling path guide portion 42 can be provided along the running path 41 which extends in the curvilinear direction of the larger curvature. As a result, the running body 6 can select the running path 41 in any direction by activating the traveling path switching portion 618b.

Claims

1. A track device comprising:

   a switching section configured to switch a running path for guiding a wheel of a running body to running paths in multiple directions; and
   a traveling path guide portion disposed along the running path which follows a different direction from an inertial direction of the running body.

2. The track device according to claim 1,
   wherein the traveling guide portion is formed into a groove shape which is deeper than the running path.

3. The track device according to claim 1 or 2,
   wherein the traveling path guide portion is provided inside the running path.

4. The track device according to any one of claims 1 to 3,
   wherein an identifier configured to cause the running body to detect an entry to the switching section is provided on an entrance side of the switching section.

5. The track device according to any one of claims 1 to 4, comprising further:

   a switching track member including the running paths which are switched in the multiple directions by the switching section,
   wherein the switching track member is configured so that a single-line track member can be coupled to an end thereof where the switching section is provided and an end thereof where the running paths terminate.

6. The track device according to claim 5,

   wherein the switching track member comprises a coupling portion provided at a first end of the running path and a coupling target portion provided at a second end of the running path, and
   wherein the traveling path guide portion is provided in the coupling portion.

7. The track device according to any one of claims 1 to 6,
   wherein a crossing section where the running path so switched intersects the running path in a different direction crosswise is provided between the switching section and a switching termination section where switching of the running paths switched by the switching section terminates.

8. A running body comprising:

   a wheel configured to run on a running path of a track member while being guided;
   a traveling path switching portion configured to be brought into engagement with a traveling path guide portion disposed along the running path which follows a different direction from an inertial direction of running at a switching section where the running path is switched to running paths in multiple directions; and
   a control unit configured to cause the traveling path switching portion to be brought into engagement with or disengaged from the traveling path guide portion at the switching section to thereby determine whether or not a running direction is guided along the traveling path guide portion.

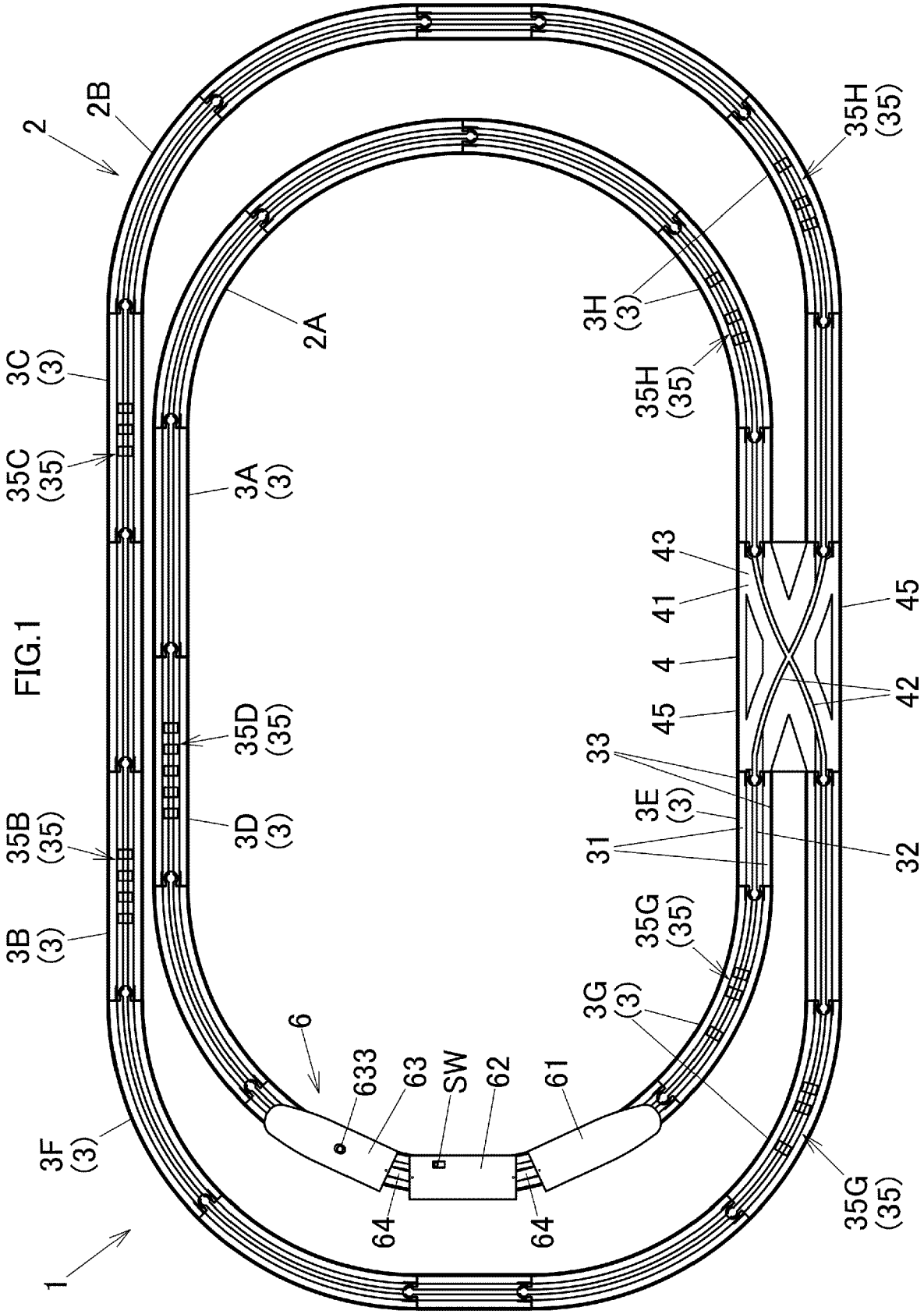

2
2B
35H (35)
3H (3)
2A
3C (3)
35H (35)
35C (35)
3A (3)
43
41
45
4
42
45
35D (35)
33
3E (3)
35B (35)
3D (3)
31
32
35G (35)
3B (3)
3G (3)
6
633
63
SW
62
61
3F (3)
64
64
35G (35)
1

FIG.1

FIG.2

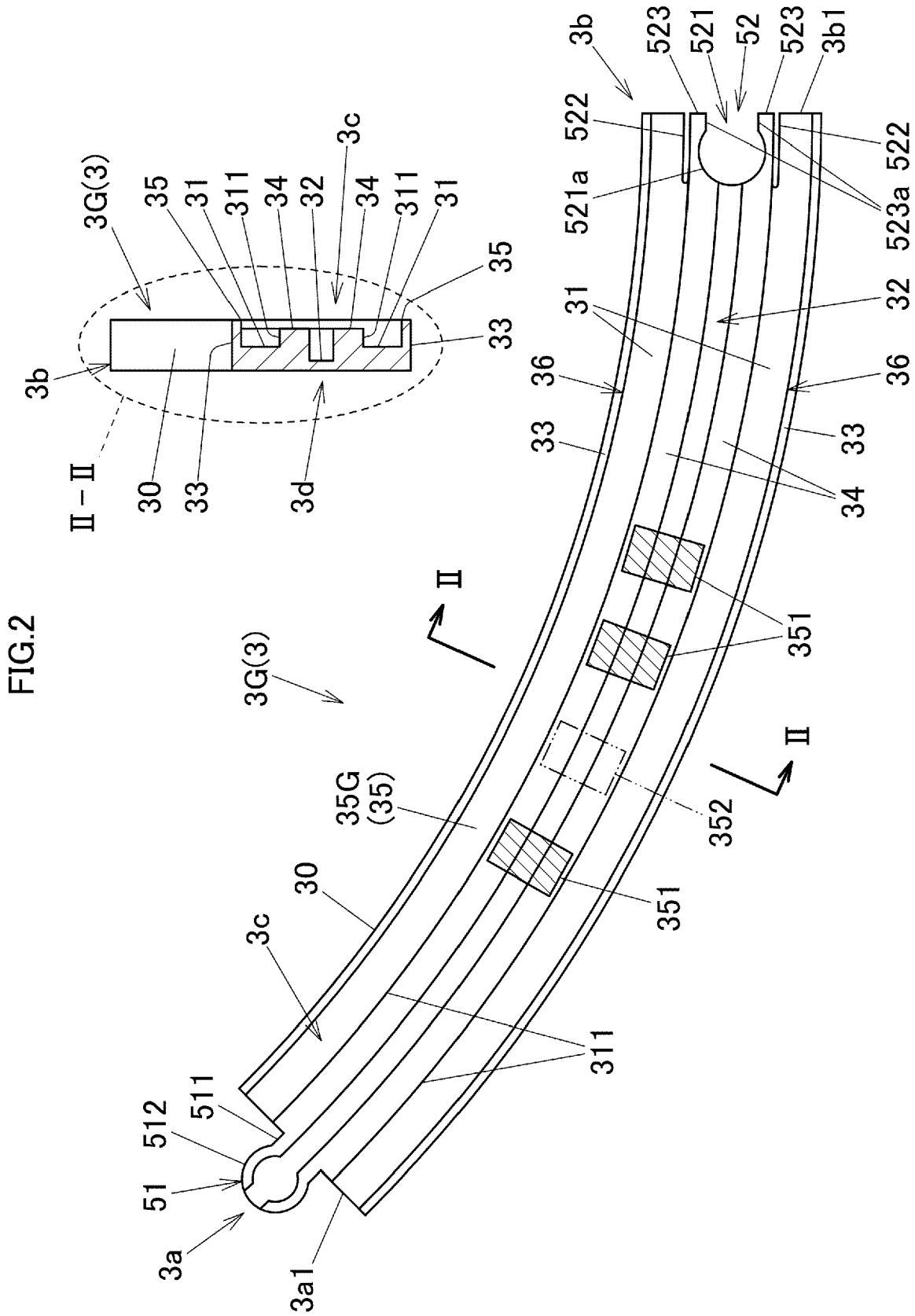

3b
523
521
52
523
3b1
522
521a
522
523a
31
32
36
36
33
33
34
351
II
3G(3)
II
35G
(35)
352
351
30
3c
311
511
512
51
3a
3a1
3G(3)
35
31
311
34
32
34
311
31
3c
35
33
3b
II – II
30
33
3d

FIG.3

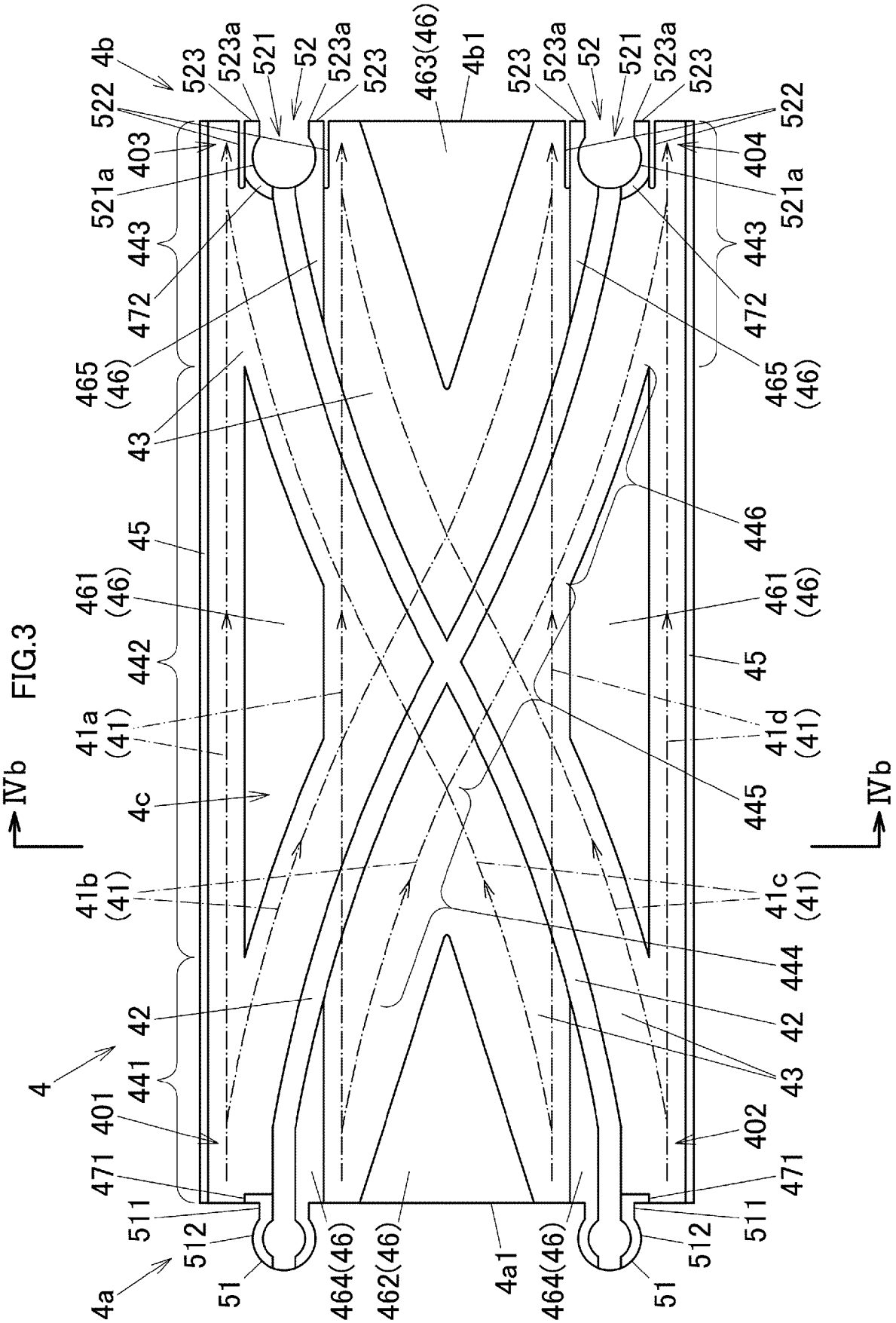

4b
522
523
523a
521
52
523a
523
463(46)
4b1
523
523a
52
521
523a
523
522
403
404
521a
521a
443
443
472
472
465
(46)
465
(46)
43
446
45
461
(46)
461
(46)
442
45
41a
(41)
41d
(41)
4c
445
IVb
IVb
41b
(41)
41c
(41)
444
42
42
4
441
43
401
402
471
471
511
511
512
512
4a
51
464(46)
462(46)
4a1
464(46)
51

FIG.4A

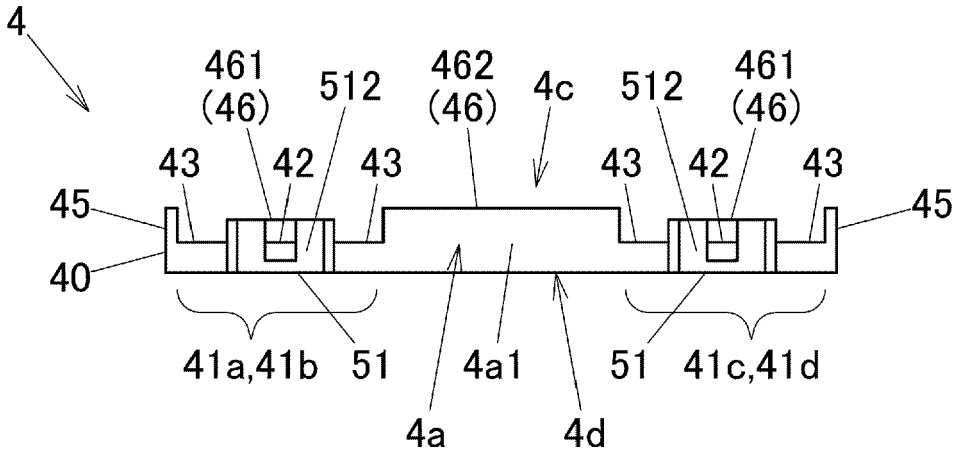

4
461
(46)
512
462
(46)
4c
512
461
(46)
43
42
43
43
42
43
45
45
40
41a,41b
51
4a1
51
41c,41d
4a
4d

FIG.4B

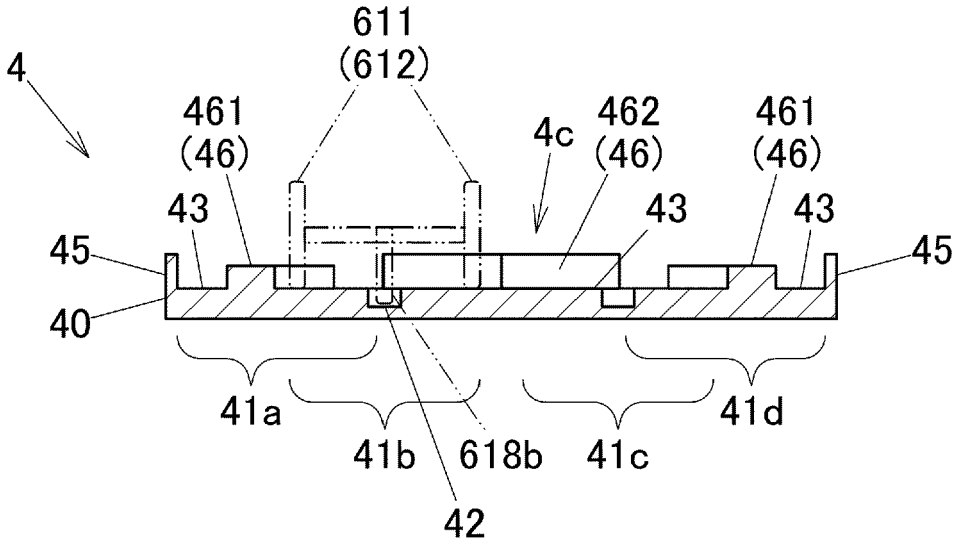

611
(612)
4
461
(46)
4c
462
(46)
461
(46)
43
43
43
45
45
40
41a
41b
618b
41c
41d
42

FIG.5

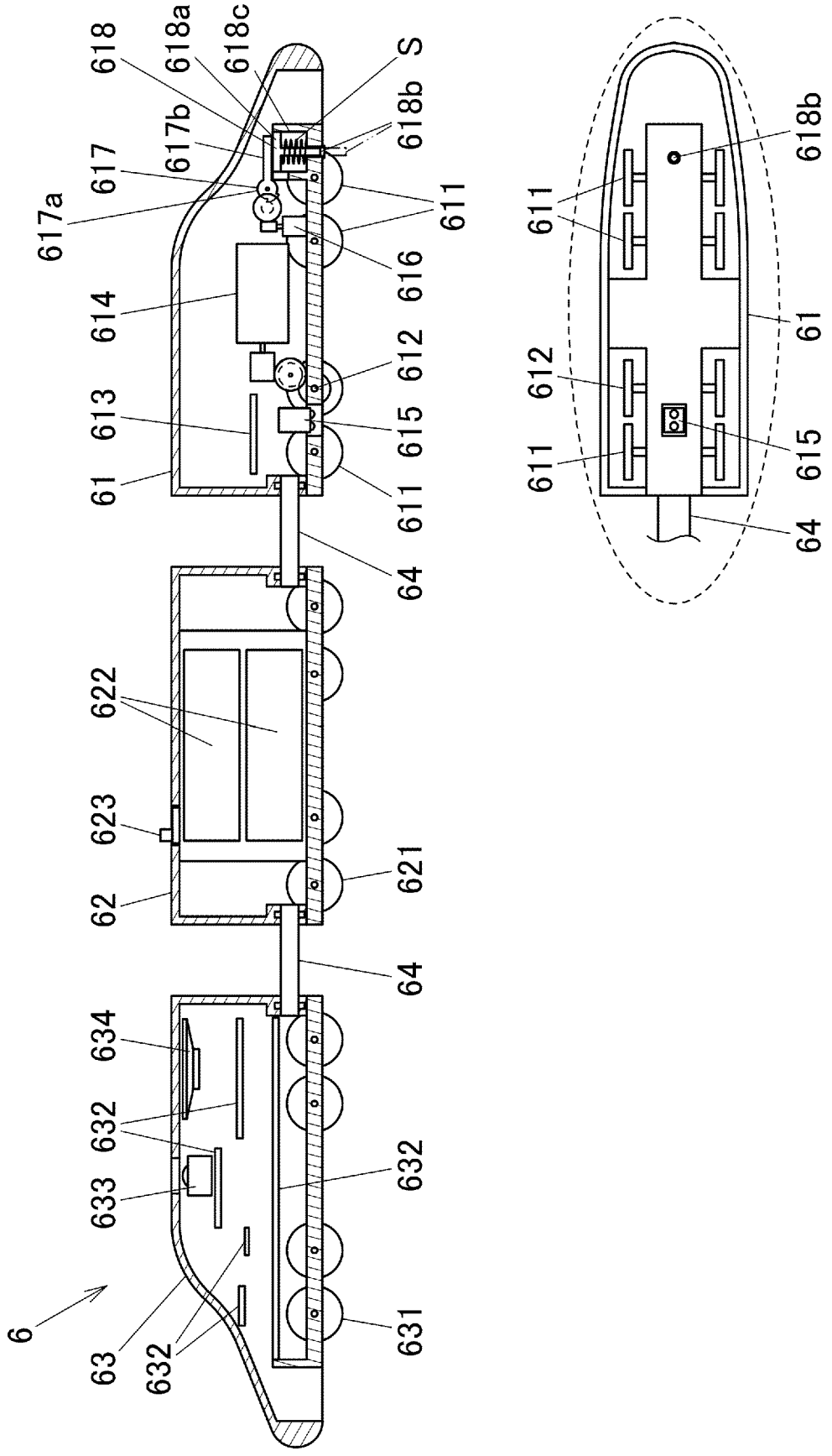

618
618a
618c
S
618b
617b
617
617a
611
616
614
612
613
615
61
611
64
622
623
62
621
64
634
632
633
632
6
63
632
631
611
618b
611
61
612
615
611
64

FIG.6

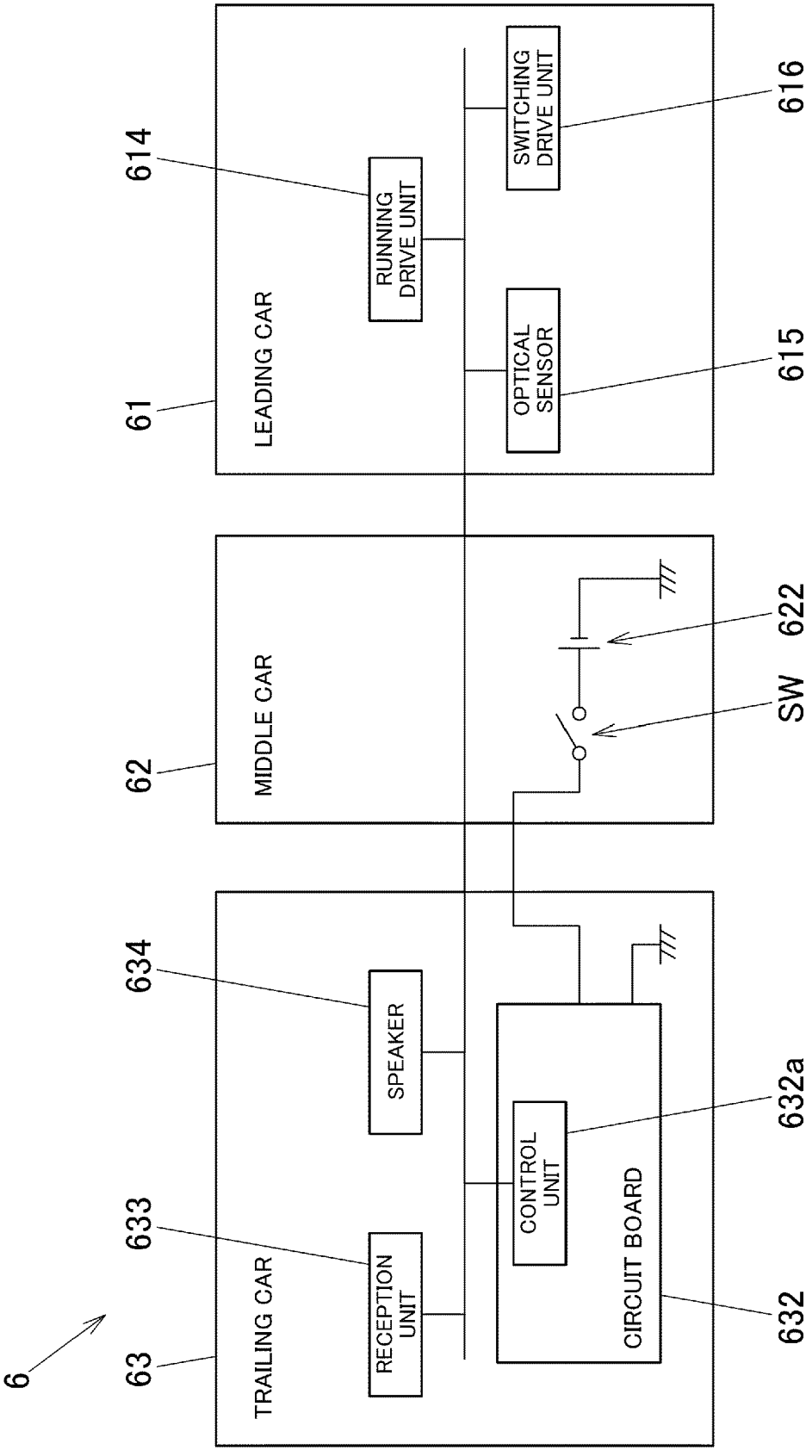

6
63
TRAILING CAR
633
RECEPTION UNIT
634
SPEAKER
632
CIRCUIT BOARD
632a
CONTROL UNIT
62
MIDDLE CAR
SW
622
61
LEADING CAR
614
RUNNING DRIVE UNIT
615
OPTICAL SENSOR
616
SWITCHING DRIVE UNIT

FIG.7

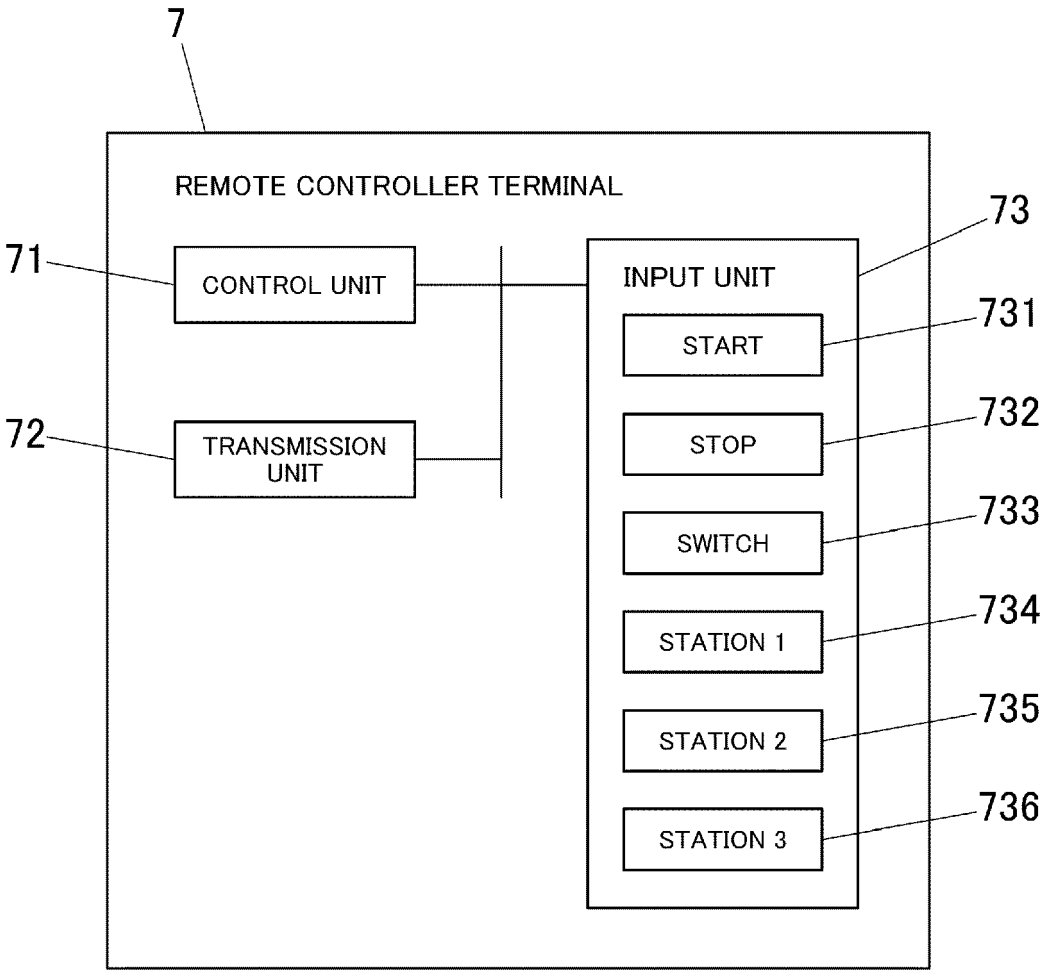
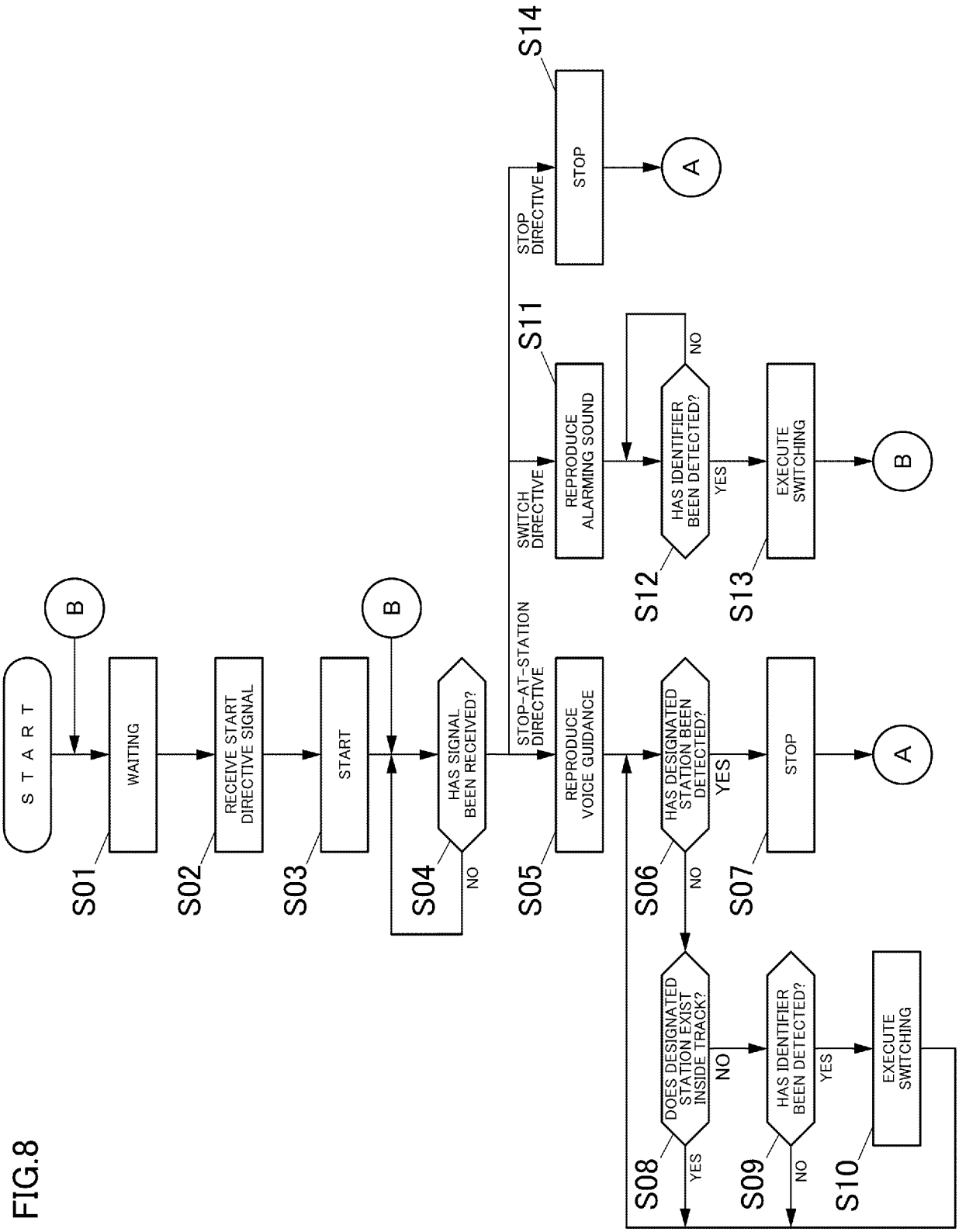

7
REMOTE CONTROLLER TERMINAL
71
CONTROL UNIT
72
TRANSMISSION UNIT
73
INPUT UNIT
START
731
STOP
732
SWITCH
733
STATION 1
734
STATION 2
735
STATION 3
736

FIG.8


START
B
WAITING
S01
RECEIVE START DIRECTIVE SIGNAL
S02
START
S03
B
HAS SIGNAL BEEN RECEIVED?
S04
NO
STOP-AT-STATION DIRECTIVE
REPRODUCE VOICE GUIDANCE
S05
HAS DESIGNATED STATION BEEN DETECTED?
S06
YES
STOP
S07
A
NO
DOES DESIGNATED STATION EXIST INSIDE TRACK?
S08
YES
NO
HAS IDENTIFIER BEEN DETECTED?
S09
YES
NO
EXECUTE SWITCHING
S10
SWITCH DIRECTIVE
REPRODUCE ALARMING SOUND
S11
HAS IDENTIFIER BEEN DETECTED?
S12
NO
YES
EXECUTE SWITCHING
S13
B
STOP DIRECTIVE
STOP
S14
A

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EUROPEAN SEARCH REPORT

Application Number
EP 21 21 3528

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A	ES 2 304 120 A1 (WINKLER INT SA [LU]) 1 September 2008 (2008-09-01) * the whole document *	1-8	
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			TECHNICAL FIELDS SEARCHED (IPC) A63H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 May 2022	Turmo, Robert

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02-05-2022

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- JP 51129893U B **[0002] [0003]**