(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 344 484 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.09.2003 Bulletin 2003/38

(51) Int Cl.[7]: **A47L 11/06**, A47L 11/12, A47L 11/284

(21) Application number: **02017236.7**

(22) Date of filing: **31.07.2002**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **14.03.2002 JP 2002069739**

(71) Applicant: **PENGUIN WAX CO., LTD.**
Osaka (JP)

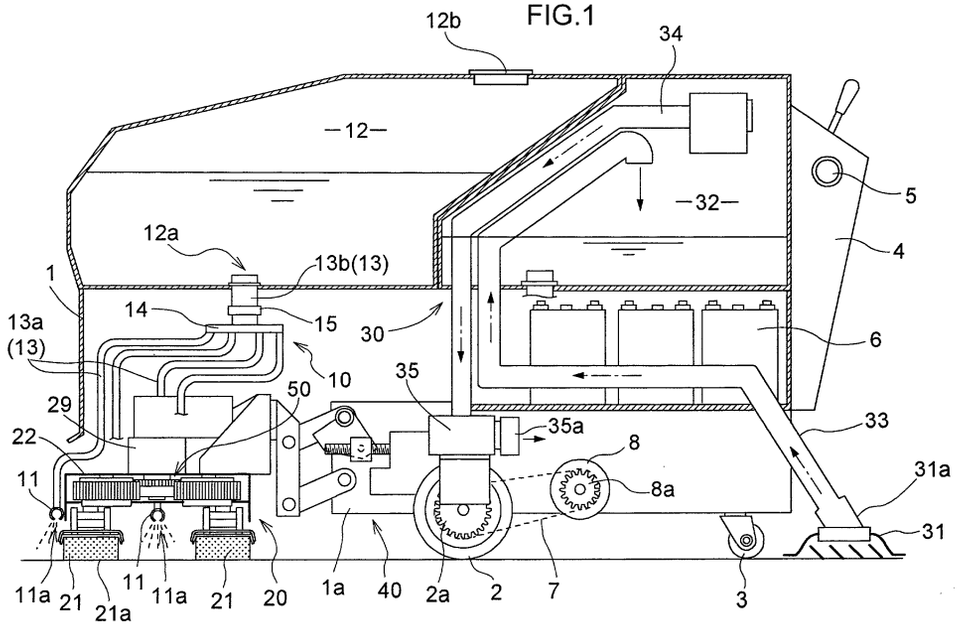
(72) Inventors:
- **Ueda, Yasuhiro**
  Higashinari-ku, Osaka (JP)
- **Morita, Isao**
  Higashinari-ku, Osaka (JP)
- **Suzuki, Hiroshi**
  Higashinari-ku, Osaka (JP)

(74) Representative:
GROSSE BOCKHORNI SCHUMACHER
Patent- und Rechtsanwälte
Forstenrieder Allee 59
81476 München (DE)

(54) Floor working machine

(57) A floor working machine includes a body frame (1), an electric drive unit (29), a pad unit including a first pad (21) and a second pad (21) having polishing surfaces (21a) for contacting a floor surface, the first pad and second pad being opposed to each other, and a pad control mechanism (50) for controlling the pad unit by using drive of the electric drive unit. The pad control mechanism (50) controls the first pad (21) and second pad (21) such that the first pad and second pad reciprocate, with the respective polishing surfaces (21a) contacting the floor surface, in a first direction (A) in which the first pad and second pad approach each other and in a second direction (B) in which the first pad and second pad move away from each other. A guiding device (23, 25) guides the first pad and second pad in reciprocating movement such that the first direction and second direction are linear and parallel to the floor surface.

FIG.1



EP 1 344 484 A2

Description

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] This invention relates to a non-rotating pad type floor working machine including a body frame, an electric drive unit, a pad unit having a first pad and a second pad opposed to each other and defining polishing surfaces for contacting a floor surface, and a pad control mechanism for reciprocating the pads by using drive of the electric drive unit.

DESCRIPTION OF THE RELATED ART

[0002] The floor working machine of the type noted above has an advantage over a floor working machine for polishing a floor surface with pads rotated by using torque of an electric motor, in that a cleaning solution does not easily scatter to the ambient. For, with the rotating pad type floor working machine, each pad is rotatable at a higher speed at the periphery than near the axis of rotation, and the peripheral speed becomes too fast when the speed near the axis of rotation is adjusted to an optimal value for cleaning or polishing the floor. This problem becomes the more serious, the larger diameter the pads have for an enlarged range of treatment.

[0003] One example of non-rotating pad type floor working machine having an advantage over the rotating pad type floor working machine as noted above is known from Japanese patent publication (unexamined) H7-39506, for example. This floor working machine has two pads supported by a body frame through elastically movable fulcrums. These two pads are swung elliptically by eccentric cams rotatable by an electric motor. To increase the range of movement of the pads, it is necessary to increase the elastic deformation of the movable fulcrums. However, an increased elastic deformation of the movable fulcrums makes it difficult for the polishing surfaces of the two pads to move synchronously with appropriateness on a fixed horizontal plane. Moreover, reaction forces that the pads receive from the floor surface deform the elastically movable fulcrums in the direction of extension also, whereby the pads are struck against the floor surface. It is thus impossible to perform a smooth polishing operation.

SUMMARY OF THE INVENTION

[0004] The object of this invention is to provide a floor working machine having a pad control mechanism for synchronously reciprocating at least two pads so that polishing surfaces thereof follow accurately along a horizontal floor surface.

[0005] The above object is fulfilled, according to this invention, by a floor working machine including a body frame, an electric drive unit, a pad unit including a first pad and a second pad having polishing surfaces for contacting a floor surface, the first pad and second pad being opposed to each other, and a pad control mechanism for controlling the pad unit by using drive of the electric drive unit, in which the pad control mechanism controls the first pad and second pad such that the first pad and second pad reciprocate, with the respective polishing surfaces contacting the floor surface, in a first direction in which the first pad and second pad approach each other and in a second direction in which the first pad and second pad move away from each other, and a guiding device is provided for guiding the first pad and second pad in reciprocating movement such that the first direction and second direction are linear and parallel to the floor surface.

[0006] With this construction, even at increased treatment speed, the first pad and second pad are synchronously driven to repeat the reciprocation toward and away from each other, and the reciprocating directions of the first pad and second pad are linear and parallel to the floor surface. Thus, the polishing surfaces of the first pad and second pad are movable accurately along the horizontal floor surface. The moving tracks of the pads are not elliptical as in the prior art, but linear to smooth the polishing operation.

[0007] Preferably, the guiding device comprises a linear guide unit including linear rails, and sliders for sliding along the linear rails. Such linear guide units are readily available in the market, and desired specifications may be selected from a wide variety of products. It will be convenient if the linear rails are supported the body frame as guide rails common to the first pad and second pad, at least one of the sliders being supported by the first pad, and at least another of the sliders being supported by the second pad.

[0008] The least expensive electric drive unit is an electric motor. Where an electric motor is employed as the electric drive unit, the pad control mechanism may be constructed as a rotational displacement to linear displacement converting eccentric mechanism for converting a rotational displacement from the electric drive unit into a linear reciprocation of the first pad and second pad toward and away from each other. A specific construction of the rotational displacement to linear displacement converting eccentric mechanism may be selected according to specifications required of the floor working machine.

[0009] In one preferred embodiment, the rotational displacement to linear displacement converting eccentric mechanism includes a drive gear connected to an output shaft of the electric drive unit to be rotatable together, a plurality of driven gears meshed with the drive gear, eccentric cams provided for the driven gears, respectively, and linear cam followers provided for the pads for engaging the eccentric cams, respectively. This construction has an advantage that the pads make a steady linear reciprocation.

[0010] In another preferred embodiment, the rotational displacement to linear displacement converting eccentric mechanism includes a drive gear connected to an output shaft of the electric drive unit to be rotatable together, a plurality of driven gears meshed with the drive gear, and slider/crank mechanism links extending between the driven gears and the pads, respectively. This construction has an advantage of being simple and requiring a reduced number of components.

[0011] In one preferred embodiment of this invention, the floor working machine includes a cleaning solution supplying device for supplying a cleaning solution to the floor surface at least between the first pad and second pad. With this construction, since the cleaning solution is supplied to the floor surface between the pads, the part of the cleaning solution remaining on the floor surface after the solution spreading action of the pads tends to collect between the pads. Such part of the cleaning solution is held between the pads and does not readily flow out from between the pads. Thus, the part of the cleaning solution remaining on the floor surface after the solution spreading action of the pads does not readily scatter.

[0012] Where the first pad and second pad are arranged in the traveling (fore and aft) direction of the working machine, and are reciprocable in the traveling (fore and aft) direction, the machine may engaging in an operation along a wall, with lateral ends of the pads moving close along the wall. With the rear pad following the front pad, no part of the floor remains untreated even though the pads are spaced from each other.

[0013] The floor working machine according to this invention may be the type moved by an operator, or may be the self-propelled type.

[0014] Other features and advantages of this invention will be apparent from the following description of the embodiments to be taken with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 is a side view in vertical section of a floor working machine in a first embodiment of this invention;

Fig. 2 is a perspective view of a polisher device;

Fig. 3 is a plan view of the polisher device;

Fig. 4 is a side view in vertical section of the polisher device;

Fig. 5 is a front view of a pad control mechanism;

Fig. 6 is a plan view of the pad control mechanism;

Fig. 7 is a perspective view of a floor working machine in a second embodiment of this invention;

Fig. 8 is an explanatory view showing a mode of transporting the floor working machine shown in Fig. 7;

Fig. 9 is a side view in vertical section of a polisher device of the floor working machine shown in Fig. 7; and

Fig. 10 is a plan view of a pad control mechanism of the floor working machine shown in Fig. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[First Embodiment]

[0016] As shown in Fig. 1, a floor working machine in this embodiment includes a body frame 1, one front wheel 2 disposed in a longitudinally and transversely middle position of the body frame 1, freely rotatable rear wheels 3 of the caster type disposed at opposite sides adjacent the rear end of body frame 1, a steering post 4 disposed at the rear end of body frame 1, steering handles 5 fixed to opposite upper sides of the steering post 4, a power supply unit with a plurality of batteries 6 arranged fore and aft in a rear region of the body frame 1, and a cleaning solution collecting device 30. Further, a cleaning solution supplying device 10 and a polisher device 20 are disposed below the front end of the body frame 1. A squeegee 31 is attached to the rear end of the body frame 1 and connected to the cleaning solution collecting device 30. The cleaning solution supplying device 10 has a pair of cleaning nozzles 11 arranged in the fore and aft direction.

[0017] The polisher device 20 includes a pad unit with a first pad 21 and a second pad 21 arranged in the traveling direction (fore and aft direction) of the machine. This embodiment provides two pads which are named the first pad and the second pad. However, they may be called just the pads when no distinguishment is needed therebetween. Each pad 21 is shaped rectangular parallelopiped with a bottom surface acting as a polishing surface 21a for contacting a floor surface.

[0018] The front wheel 2 has a wheel drive sprocket 2a connected to the rim thereof to be rotatable together. The sprocket 2a is interlocked through a transmission chain 7 to an output sprocket 8a attached to an output shaft of an electric propelling motor 8. With the front wheel 2 driven by the electric propelling motor 8, the floor working machine moves in a self-propelled mode as supported by the front wheel 2 and the pair of rear wheels 3. At the same time, the polisher device 20 is operated to clean and polish the floor surface continuously. That is, as the machine moves, the cleaning solution supplying device 10 supplies a cleaning solution stored in a cleaning solution tank 12 mounted in a front

region of the machine body, through the pair of cleaning nozzles 11 to the floor surface. The polisher device 20 with the pad unit cleans and polishes the floor surface supplied with the cleaning solution. The cleaning solution collecting device 30 collects the cleaning solution contaminated as a result of cleaning treatment, into a collection tank 32 mounted in a rear region of the machine body.

[0019] As shown in Figs. 1 and 2, for example, the cleaning solution supplying device 10 includes a front cleaning nozzle 11 formed of one long metal pipe extending transversely of the machine body, a rear cleaning nozzle 11 formed of one long metal pipe extending transversely of the machine body, and the cleaning solution tank 12 having an outlet port 12a communicating with opposite ends of each cleaning nozzle 11 through cleaning solution supplying hoses 13. The front cleaning nozzle 11 is fixed through a pair of right and left support brackets 22b to an outer surface of a front wall 22a of a box-like sub-frame 22 vertically adjustably attached to a front portion of the body frame 1 through a lift mechanism 40. The rear cleaning nozzle 11 is fixed to right and left side walls 22c of the sub-frame 22 and disposed above and between the first pad 21 and second pad 21.

[0020] The cleaning solution supplying hoses 13 include a plurality of nozzle-side hoses 13a each communicating at one end thereof with one end of one cleaning nozzle 11, and a tank-side hose 13b having one end thereof communicating with the other ends of the plurality of nozzle-side hoses 13a through a distributing pipe 14, and the other end communicating with the outlet port 12a of cleaning solution tank 12. The tank-side hose 13b has an electromagnetic switch valve 15 mounted thereon.

[0021] As shown in Figs. 3 and 4, for example, the lift mechanism 40 includes a connecting member 41 fixed to the sub-frame 22, two pairs of upper and lower swing links 42 extending between the connecting member 41 and opposite sides of a support member 1a forming part of the body frame 1, a control member 44 rigidly connected to one end of a rotary shaft 43 swingably connecting the upper swing links 42 to the support member 1a, a female screw member 45 rotatably attached to the control member 44, and an electric lift motor 46 having an output screw shaft 46a meshed with the female screw member 45.

[0022] When the lift motor 46 is rotated forward or backward, the control member 44 is swung in an ascending or descending direction by the drive of lift motor 46. As a result, the swing links 42 are swung to raise or lower the sub-frame 22. Thus, the lift motor 46 drives the sub-frame 22 upward or downward for selectively establishing a lower operative state and an upper inoperative state. In the lower operative state, the polisher device 20 is in a lower position with the pad unit contacting the floor surface with a contact pressure necessary for polishing treatment. In the upper inoperative state, the polisher device 20 is in an upper position with the pad unit afloat above the floor surface, for the machine to move while the pads 21 remain clear of the floor surface. Further, when the polisher device 20 is lowered to the lower operative position, the pair of front and rear cleaning nozzles 11 are lowered to a level close to the floor surface. When the polisher device 20 is raised to the upper inoperative position, the pair of front and rear cleaning nozzles 11 are raised high above the floor surface.

[0023] The cleaning solution tank 12 has an inlet port formed in an upper rearward position thereof and opened and closed by a removable lid 12b. The cleaning solution is supplied through the inlet port into and stored in the cleaning solution tank 12. With the polisher device 20 switched to the lower operative position, the cleaning solution supplying device 10 opens the electromagnetic switch valve 15 to supply the cleaning solution to the floor surface.

[0024] That is, when the polisher device 20 is switched to the lower operative position, the pair of cleaning nozzles 11 assume an operative state close above the floor surface. The cleaning solution flows down by gravity from the cleaning solution tank 12 into the tank-side hose 13b of the cleaning solution supplying hoses 13. The distributing pipe 14 distributes the cleaning solution to each nozzle-side hose 13a whereby the cleaning solution flows in from the opposite ends of each cleaning nozzle 11. Then, the front cleaning nozzle 11 allows the cleaning solution to drip from a plurality of supply bores 11a formed longitudinally of the nozzle 11, to the floor surface forwardly of the pad unit. The rear cleaning nozzle 11 allows the cleaning solution to drip from a plurality of supply bores 11a formed longitudinally of the nozzle 11, to the floor surface between the first pad 21 and second pad 21.

[0025] As shown in Figs. 4 and 5, for example, the polisher device 20 includes a pair of right and left guide rails 23 formed of round rods arranged at opposite sides in the sub-frame 22 and extending straight longitudinally of the machine body, pad supports 24 rectangular in plan view, extending transversely of the machine body and arranged fore and aft in a lower region of the sub-frame 22 for supporting the first pad 21 and second pad 21, respectively, and a pad control mechanism 50 having a drive gear 51 mounted in the sub-frame 22.

[0026] As shown in Fig. 6, for example, each of the right and left guide rails 23 extends between and fixed to the front wall 22a and rear wall 22e of the sub-frame 22. Each pad support 24 has rail receiving blocks 25 fixed to upper surfaces adjacent opposite ends thereof and acting as sliding elements for sliding along the guide rails 23. The rail receiving blocks 25 adjacent one end of each pad support 24 receive one of the guide rails 23, while the rail receiving blocks 25 adjacent the other end receive the other guide rail 23. The straight guide rails 23 and rail receiving blocks 25 act as a device for guiding the pad supports 24 or the pads 21. Thus, the pads 21 are guided to reciprocate straight along the traveling di-

rection of the machine. As a result, each pad 21 reciprocates linearly while maintaining a track of its polishing surface 21a in one plane. The polishing surface 21a thereby contacts the floor surface reliably and smoothly.

[0027] The first pad 21 is removably connected to the lower surface of the front pad support 24 by a mounting pawl 26a disposed at one end of a mounting plate 26 attached to the upper surface of the first pad 21, the mounting pawl 26a engaging a mounting bore formed in the pad support 24, and a mounting bracket 27 at the other end of the mounting plate 26 fastened to the pad support 24 by a hook 28 of the pad support 24. Similarly, the second pad 21 is removably connected to the rear pad support 24. The pad supports 24 carrying the pads 21 are supported by the sub-frame 22 to be slidable along the traveling direction of the machine by the pad control mechanism 50 and the guiding device.

[0028] As shown in Figs. 4, 5 and 6, for example, the pad control mechanism 50 includes a polisher motor 29 fixed to an upper surface of a top board 22d of the sub-frame 22 to act as an electric drive unit of the polisher device 20, the drive gear 51 connected, to be rotatable together, to an output shaft 29a projecting downward from the motor 29, and four driven gears 53 acting as rotatable control elements arranged equidistantly around the drive gear 51 and meshed with the drive gear 51. Each driven gear 53 is supported by a support shaft 52 attached to the top board 22d to be rotatable about the axis 52a, with a gear portion 53a thereof having a smaller number of teeth than the drive gear 51.

[0029] Each driven gear 53 has an eccentric cam 55 formed of a bearing disposed below a main body 54 thereof and having an axis of rotation offset from the axis of rotation 52a of driven gear 53. This eccentric cam 55 is slidably and rotatably fitted in a control groove 57 formed in a profile member acting as a linear cam follower 56 formed on the upper surface of the pad support 24. That is, the drive gear 51, driven gears 53, eccentric cams 55 and linear cam followers 56 constitute a rotational displacement to linear displacement converting eccentric mechanism.

[0030] Thus, by appropriately adjusting a position of each eccentric cam 55, the first pad 21 and second pad 21 are driven to reciprocate in a first direction A in which the first pad 21 and second pad 21 approach each other and in a second direction B in which the first pad 21 and second pad 21 move away from each other. Moreover, by the aid of the guiding device described above, the first direction A and second directions B for reciprocating the first pad 21 and second pad 21 may be made linear and parallel the floor surface.

[0031] More particularly, when the polisher motor 29 is operated, the drive gear 51 is driven by the polisher motor 29 to rotate all the driven gears 53. Then, the eccentric cams 55 of the pair of right and left driven gears 53 disposed forwardly of the drive gear 51 with respect to the traveling direction of the machine reciprocate the first pad 21 in the traveling direction of the machine along the right and left guide rails 23. Similarly, the eccentric cams 55 of the pair of right and left driven gears 53 disposed rearwardly of the drive gear 51 with respect to the traveling direction of the machine reciprocate the second pad 21 in the traveling direction of the machine along the right and left guide rails 23.

[0032] By appropriately selecting a relative position (phase relationship) between the eccentric cams 55 of driven gears 53 that drive the first pad 21 and the eccentric cams 55 of driven gears 53 that drive the second pad 21, the first pad 21 and second pad 21 repeat a linear reciprocation toward and away from each other.

[0033] As described hereinbefore, the polisher device 20 is placed in the lower operative state by lowering action of the lift mechanism 40 driven by the lift motor 46. In this state, the polisher motor 26 may be driven to clean and polish the floor surface.

[0034] That is, the polisher motor 29 drives the drive gear 51, whereby the pads 21 repeat the linear reciprocation toward and away from each other as noted above, to polish the floor surface while spreading the cleaning solution dripping from the cleaning nozzles 11 over the floor surface. At this time, the front cleaning nozzle 11 supplies the cleaning solution forwardly of the first pad 21, and the rear cleaning nozzle 11 supplies the cleaning solution between the first pad 21 and second pad 21. Even if each cleaning nozzle 11 supplies a relatively small quantity of the cleaning solution, a proper quantity of the cleaning solution reliably adheres to both pads 21 to be spread over the floor surface. As a result, a minimum quantity of the cleaning solution will remain on the floor surface as excess. With the first pad 21 and second pad 21 repeating the linear reciprocation toward and away from each other, any excess quantity of the cleaning solution spread and remaining on the floor surface is collected and held between the pads 21. As a result, such part of the cleaning solution does not readily flow out or scatter to the ambient.

[0035] As shown in Fig. 1, the cleaning solution collecting device 30 includes the squeegee 31 disposed below the steering post 4, the collection tank 32 having its interior communicating through a suction hose 33 with a suction port 31a disposed in a middle position of the squeegee 31 transversely of the machine body, and an electric vacuum pump 35 communicating through an exhaust hose 34 with the interior of the collection tank 32.

[0036] The squeegee 31 is connected to the body frame 1 to be vertically movable between a lower operative position having a lower end thereof in contact with the floor surface, and an upper inoperative position above the floor surface. With the squeegee 31 placed in the lower operative position and the vacuum pump 35 driven, the cleaning solution collecting device 30 collects into the collection tank 32 the cleaning solution contaminated as a result of the cleaning and polishing action of the polisher device 20.

[0037] Specifically, the vacuum pump 35 takes air out

of the collection tank 32 through the exhaust hose 34, and discharges the air from an exhaust port 35a, to generate a suction force in the collection tank 32. The squeegee 31, by flexion, rakes to its middle portion the contaminated cleaning solution remaining on the floor surface after the polisher device 20. The suction hose 33, by virtue of the suction force in the collection tank 32, sucks the cleaning solution collected to the middle portion of the squeegee 31, from the suction port 31a into the collection tank 32.

[Second Embodiment]

[0038] Fig. 7 shows a floor working machine in the second embodiment. This working machine includes a body frame 60, a pair of right and left transport wheels 61 attached to the rear end of the body frame 60, a control handle 62 with legs 62a connected to opposite sides of a middle portion in the fore and aft direction of the body frame 60, a cleaning solution supplying device 70 having a pair of front and rear cleaning nozzles 71 arranged in the fore and aft direction under the body frame 60, and a polisher device 20 having a first pad 21 and a second pad 21 arranged in the fore and aft direction.

[0039] This working machine may be moved to a site of operation by the operator holding the control handle 62 by grips 62b and using the transport wheels 61 as shown in Fig. 8. At the site of operation, the machine is allowed to rest on the floor surface through the pair of pads 21, with the entire weight thereof falling on the pads 21. A cleaning solution stored in a cleaning solution tank 72 installed in a halfway position on the control handle 62 is supplied to the floor surface through the pair of cleaning nozzles 71. A pad unit having the first pad 21 and second pad 21 cleans and polishes the floor surface supplied with the cleaning solution.

[0040] The cleaning solution supplying device 70 includes the front cleaning nozzle 71 formed of one long metal pipe fixed to an outer surface of a front wall of the body frame 60 and extending transversely of the machine body, the rear cleaning nozzle 171 formed of one long metal pipe disposed between the first pad 21 and second pad 21, extending transversely of the machine body and fixed to right and left side walls of the machine frame 60, and the cleaning solution tank 72 having an outlet port 72a communicating with opposite ends of each cleaning nozzle 71 through cleaning solution supplying hoses 73.

[0041] The cleaning solution supplying hoses 73 include a plurality of nozzle-side hoses 73a each communicating at one end thereof with one end of one cleaning nozzle 71, and a tank-side hose 73b having one end thereof communicating with the other ends of the plurality of nozzle-side hoses 73a through a distributing pipe 74, and the other end communicating with the outlet port 72a of cleaning solution tank 72.

[0042] A switch valve 75 is mounted in the outlet port 72a of cleaning solution tank 72. Control levers 76 are disposed on the control handle 62 below the grips 62b for operating the switch valve 75 through a control cable.

[0043] Thus, the cleaning solution is supplied through an inlet port 72b disposed in an upper position of the cleaning solution tank 72 and stored in the cleaning solution tank 72. The cleaning solution is supplied to the floor surface by operating the switch lever 76 to open the switch valve 75.

[0044] That is, the cleaning solution flows down by gravity from the cleaning solution tank 72 into the tank-side hose 73b of the cleaning solution supplying hoses 73. The distributing pipe 74 distributes the cleaning solution to each nozzle-side hose 73a whereby the cleaning solution flows in from the opposite ends of each cleaning nozzle 71. Then, the front cleaning nozzle 71 allows the cleaning solution to drip from a plurality of supply bores formed longitudinally thereof, to the floor surface forwardly of the pad unit. The rear cleaning nozzle 71 allows the cleaning solution to drip from a plurality of supply bores formed longitudinally thereof, to the floor surface between the first pad 21 and second pad 21.

[0045] As shown in Figs. 9 and 10, the polisher device 20, as in the preceding embodiment, includes a pair of right and left guide rails 23 formed of round rods arranged at opposite sides in the machine frame 60 and extending straight longitudinally of the machine body, a pair of front and rear pad supports 24 rectangular in plan view, extending transversely of the machine body and arranged fore and aft in a lower region of the machine frame 60, the first pad 21 and second pad 21 supported by the pad supports 24, respectively, and a pad control mechanism 80 having a drive gear 81 mounted centrally of the machine frame 60.

[0046] Each of the right and left guide rails 23 extends between and fixed to the front wall and rear wall of the machine frame 60. Each of the front and rear pad supports 24 has rail receiving blocks 25 fixed to upper surfaces adjacent opposite ends thereof and acting as sliding elements for sliding along the guide rails 23. In this embodiment also, the guide rails 23 and rail receiving blocks 25 act as a device for guiding the first pad 21 and second pad 21.

[0047] The first pad 21 disposed forwardly with respect to the traveling direction of the machine is detachably attached to the lower surface of the front pad support 24 by the same mounting structure as in the preceding embodiment. As a result, the first pad 21 is supported by the body frame 60 to be slidable longitudinally of the machine body through the pad support 24 and the pair of right and left guide rails 23. Similarly, the second pad 21 disposed rearwardly with respect to the traveling direction of the machine is detachably attached to the lower surface of the rear pad support 24, and supported by the body frame 60 to be slidable longitudinally of the machine body through the pad support 24 and the pair of right and left guide rails 23.

[0048] The pad control mechanism 80 includes a polisher motor 29 fixed to an upper surface of a top board

60a of the machine frame 60 through a motor deck 64, the drive gear 81 connected, to be rotatable together, to an output shaft 29a projecting downward from the motor 29, and two driven gears 82 acting as rotatable control elements distributed forwardly and rearwardly and to the right and left of the drive gear 51 and supported by support shafts 82a fixed to the top board 60a of the machine frame 60 to be rotatable about the axes 82b of the support shafts 82a, and links 83 each having one end thereof pivotally connected to a position of one of the driven gears 82 offset from the axis of rotation 82b, and the other end pivotally connected to the upper surface of one of the pad supports 24. Both of the driven gears 82 are meshed with the drive gear 81. The drive gear 81, driven gears 82 and links 83 constitute a slider/crank mechanism for the pad unit.

[0049] The pad control mechanism 80 acting as the slider/crank mechanism is driven by the polisher motor 29 to reciprocate the first pad 21 and second pad 21 in a first direction A in which the first pad 21 and second pad 21 approach each other and in a second direction B in which the first pad 21 and second pad 21 move away from each other. Moreover, by the aid of the guiding device described above, the first direction A and second directions B for reciprocating the first pad 21 and second pad 21 are linear and parallel the floor surface.

[0050] More particularly, when the polisher motor 29 is operated, the drive gear 81 is driven by the polisher motor 29 to rotate the two driven gears 82. Then, the links 83 connected to the driven gears 53 convert the rotation of the driven gears 82 to a linear reciprocal displacement. This converted drive slides the pad supports 24 back and forth along the right and left guide rails 23. As a result, the two pads 21 also reciprocate in the fore and aft direction of the machine frame 60 along the right and left guide rails 23.

[0051] By adjusting a phase of assembly between the two driven gears 82 and corresponding links 83, the first pad 21 and second pad 21 may make a linear reciprocation toward and away from each other.

[0052] With the machine body 60 resting on the floor surface through the pads 21, the polisher motor 29 may be operated to drive the drive gear 81. Then the pad control mechanism 80 is driven to reciprocate the two pads 21 linearly toward and away from each other in the fore and aft direction on the floor surface. The two pads 21 polish the floor surface while spreading the cleaning solution dripping from the front and rear nozzles 11 over the floor surface.

[0053] This working machine is operable with the weight of the entire machine body falling on the pads 21. The two pads 21 are slidably supported by the body frame 60 through the pad supports 24 and guide rails 23 to make a linear reciprocation toward and away from each other. Thus, reaction forces applied from the floor to the respective pads 21 cancel each other. The machine can operate while suppressing slippage and vibration due to the reaction forces from the floor. As a result, the machine body is maintained steady by the operator lightly holding the control handle 62, and the operation may be carried out easily with little vibration transmitted to the operator's hands holding the control handle 62.

[0054] In each of the above embodiments, the pad unit includes two pads 21. Instead, the pad unit may include three or more pads 21. In this case, an adjacent pair of pads among the plurality of pads 21 may be arranged linearly reciprocable toward and away from each other.

[0055] The cleaning solution supplying device 10 or 70 may have only a cleaning nozzle for supplying the cleaning solution forwardly of the pad unit, or only a cleaning nozzle for supplying the cleaning solution between the pads 21.

Claims

1. A floor working machine with:

a body frame (1);

an electric drive unit (29);

a pad unit including a first pad (21) and a second pad (21) having polishing surfaces (2 1a for contacting a floor surface, said first pad and second pad being opposed to each other; and

a pad control mechanism (50) for controlling said pad unit by using drive of said electric drive unit;

characterized in that said pad control mechanism (50) controls said first pad (21) and second pad (21) such that said first pad and second pad reciprocate, with the respective polishing surfaces (21a) contacting the floor surface, in a first direction (A) in which said first pad and second pad approach each other and in a second direction (B) in which said first pad and second pad move away from each other; and

guide means (23, 25) is provided for guiding said first pad and second pad in reciprocating movement such that said first direction and second direction are linear and parallel to the floor surface.

2. A floor working machine as defined in claim 1, **characterized in that** said guide means includes linear rails (23), and sliders (25) for sliding along said linear rails.

3. A floor working machine as defined in claim 2, **characterized in that** said linear rails are supported said body frame as guide rails common to said first pad and second pad, at least one of said sliders being

supported by said first pad, and at least another of said sliders being supported by said second pad.

4. A floor working machine as defined in any one of claims 1 to 3, **characterized in that** said pad control mechanism is constructed as a rotational displacement to linear displacement converting eccentric mechanism for converting a rotational displacement from said electric drive unit into a linear reciprocation of said first pad and second pad toward and away from each other.

5. A floor working machine as defined in claim 4, **characterized in that** said rotational displacement to linear displacement converting eccentric mechanism includes a drive gear (51) connected to an output shaft (29a) of said electric drive unit (29) to be rotatable together, a plurality of driven gears (53) meshed with said drive gear, eccentric cams (55) provided for said driven gears, respectively, and linear cam followers (56) provided for said pads for engaging said eccentric cams, respectively.

6. A floor working machine as defined in claim 4, **characterized in that** said rotational displacement to linear displacement converting eccentric mechanism includes a drive gear (81) connected to an output shaft of said electric drive unit to be rotatable together, a plurality of driven gears (82) meshed with said drive gear, and slider/crank mechanism links (83) extending between said driven gears and said pads, respectively.

7. A floor working machine as defined in any one of claims 1 to 6, **characterized in that** a cleaning solution supplying device (10) is provided for supplying a cleaning solution to the floor surface at least between said first pad and second pad.

8. A floor working machine as defined in any one of claims 1 to 6, **characterized in that** said first direction and second direction correspond to a traveling direction of said working machine.

9. A floor working machine as defined in any one of claims 1 to 7, **characterized in that** said floor working machine is movable by an operator over the floor surface to be polished.

10. A floor working machine as defined in any one of claims 1 to 7, **characterized in that** said floor working machine is self-propelled to move over on the floor surface to be polished.

FIG.1

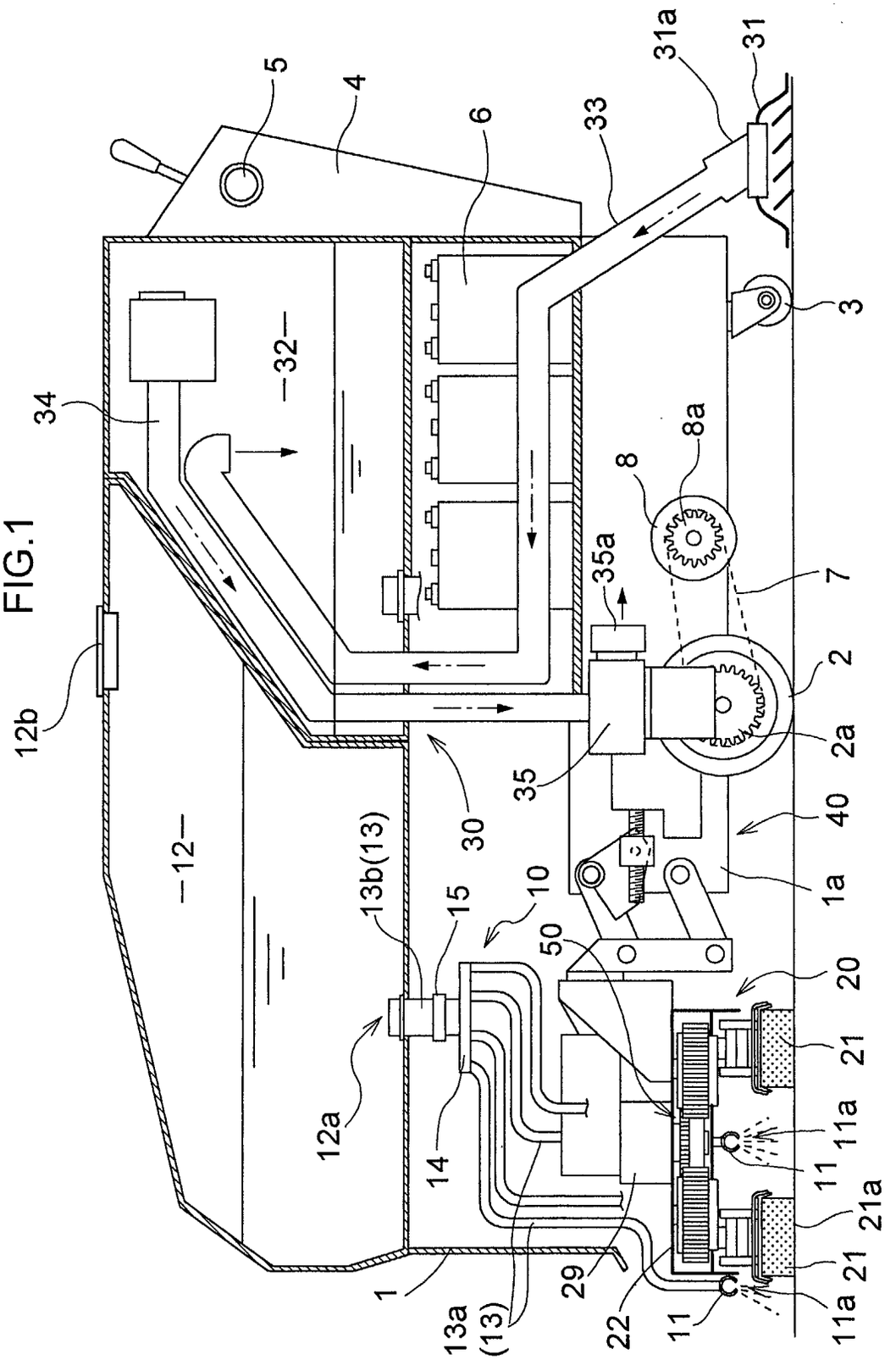

5
4
6
33
31a
31
3
32
34
8a
8
35a
7
2
2a
12b
35
30
40
1a
12
13b(13)
15
10
50
20
21
12a
14
11a
11
21a
21
1
13a
(13)
29
22
11
11a

FIG.2

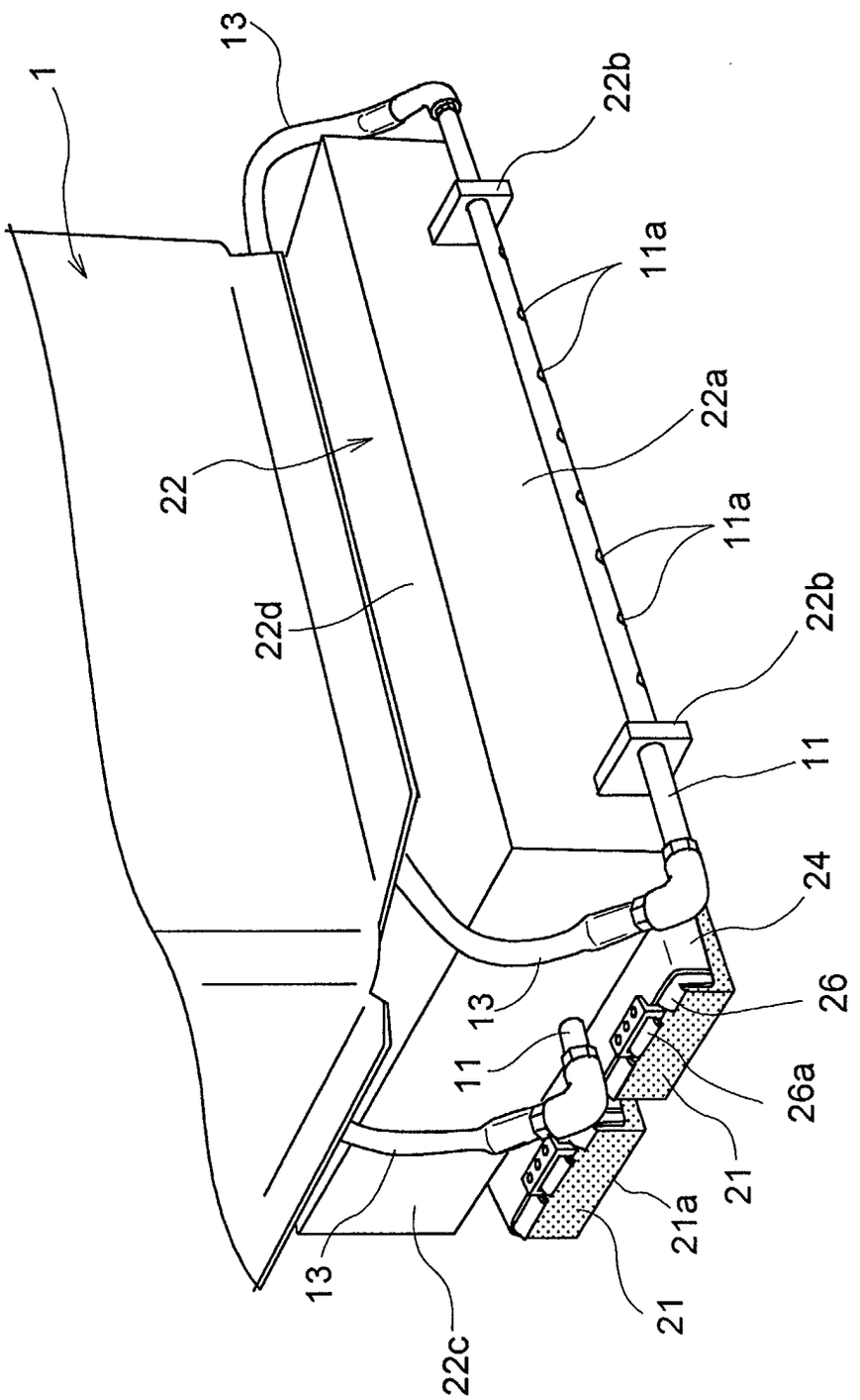


FIG.3

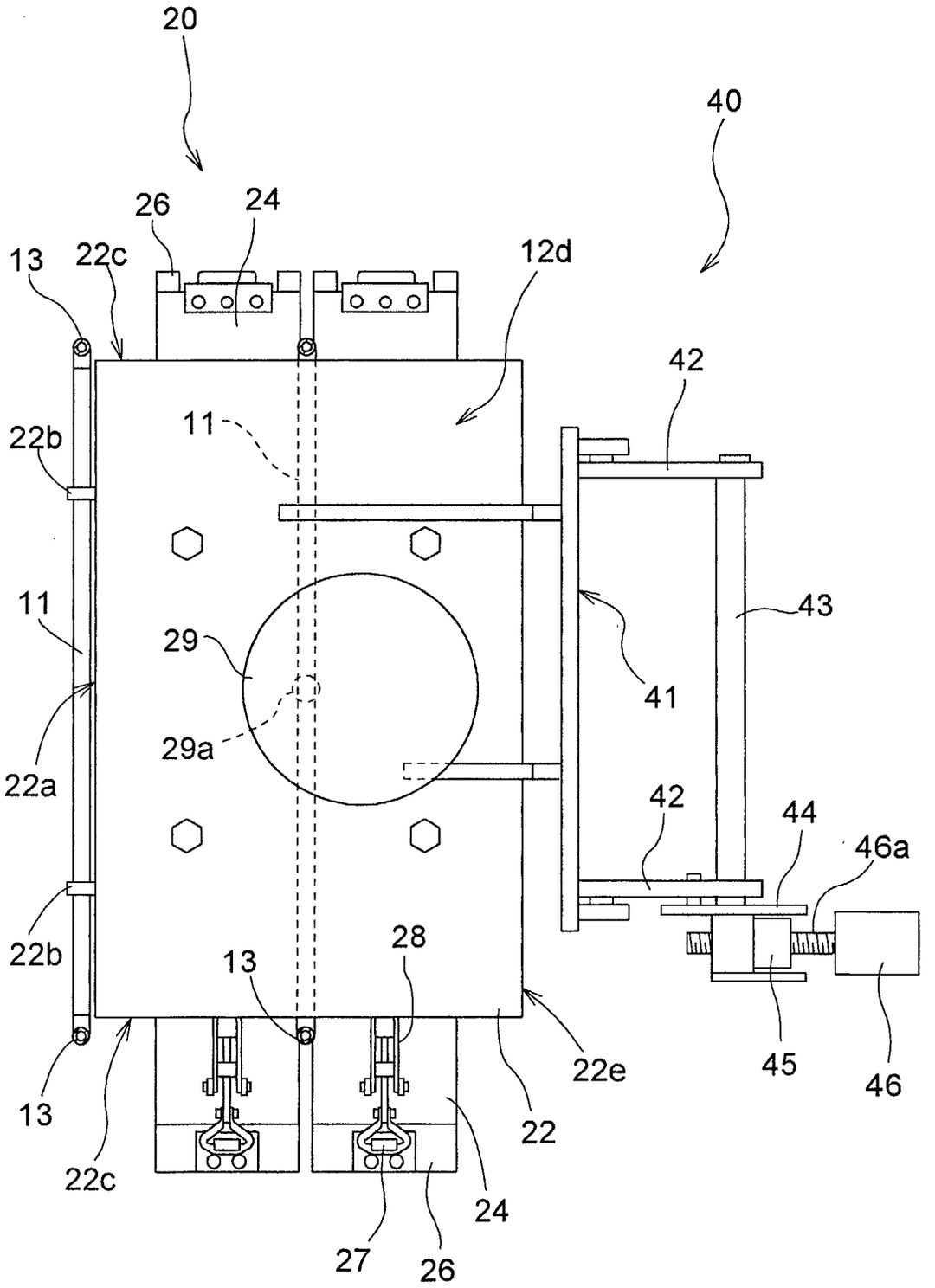

20
40
26
24
13
22c
12d
42
22b
11
11
29
43
41
29a
22a
42
44
46a
22b
28
13
45
46
13
22e
22c
22
24
27
26

FIG.4

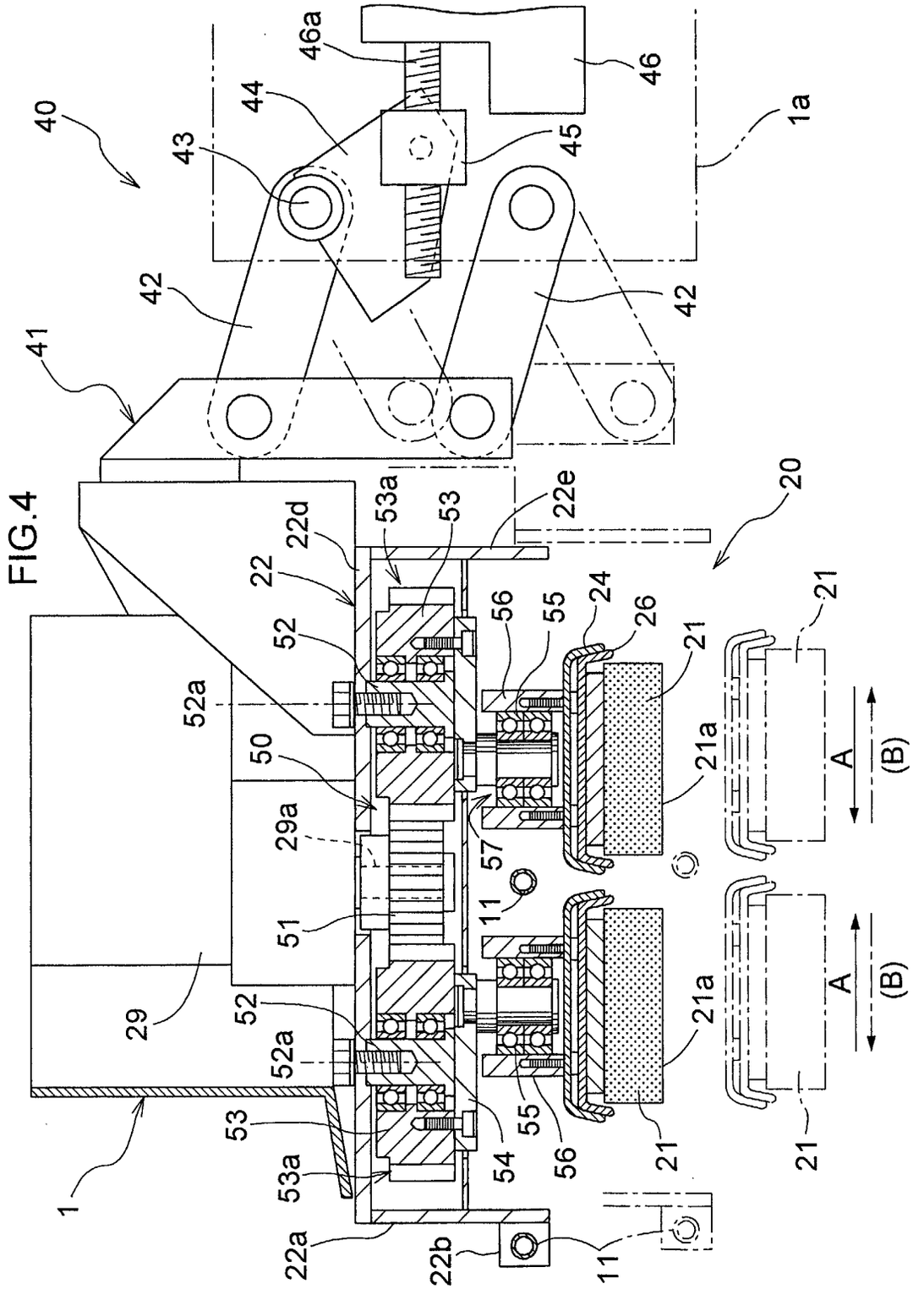

40
41
42
43
44
45
46
46a
1a
20
21
21a
22
22a
22b
22d
22e
24
26
29
29a
50
51
52
52a
53
53a
54
55
56
57
11
1
A
(B)

FIG.5

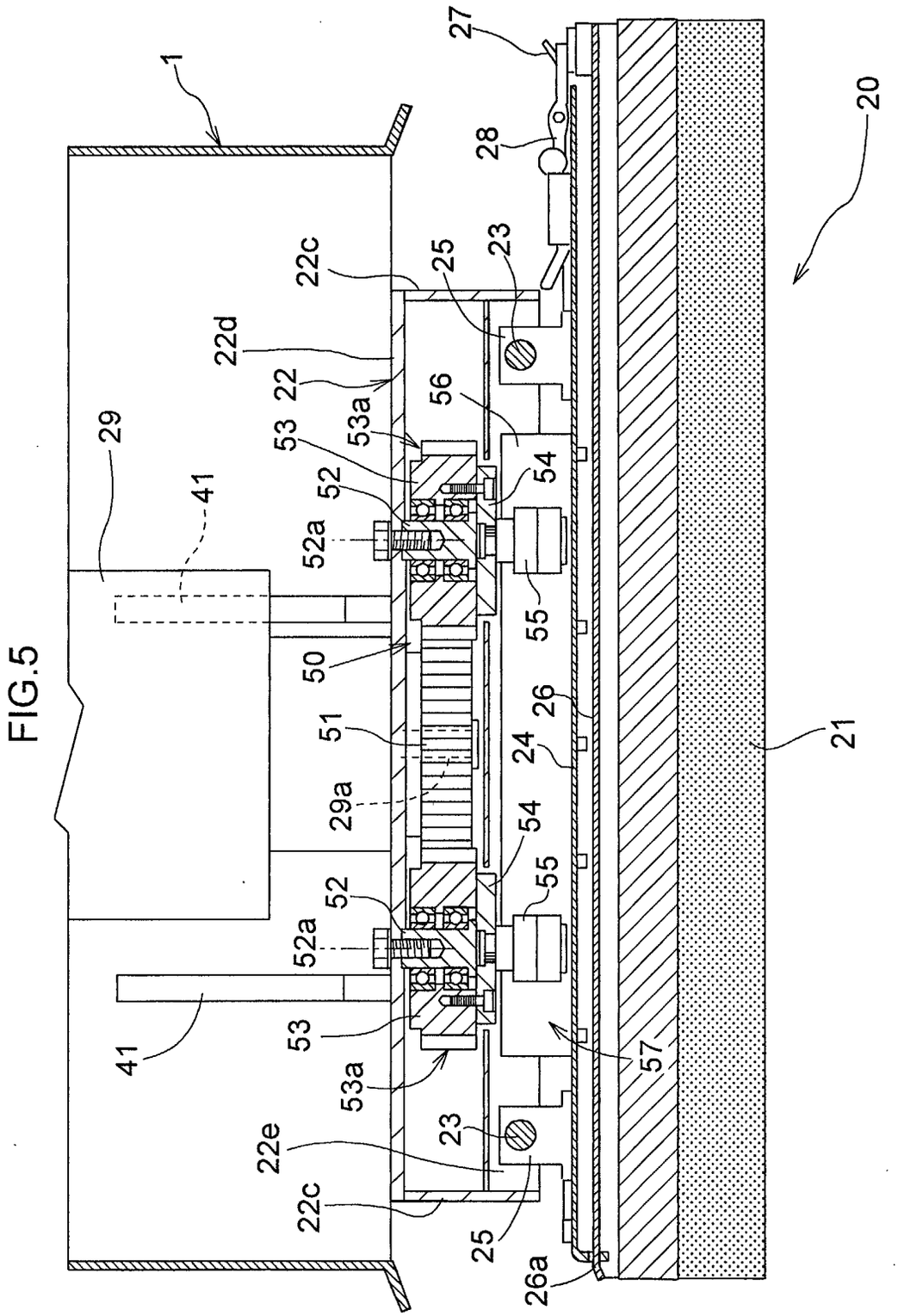

1
20
21
22
22c
22d
22e
23
24
25
26
26a
27
28
29
29a
41
50
51
52
52a
53
53a
54
55
56
57

FIG.6

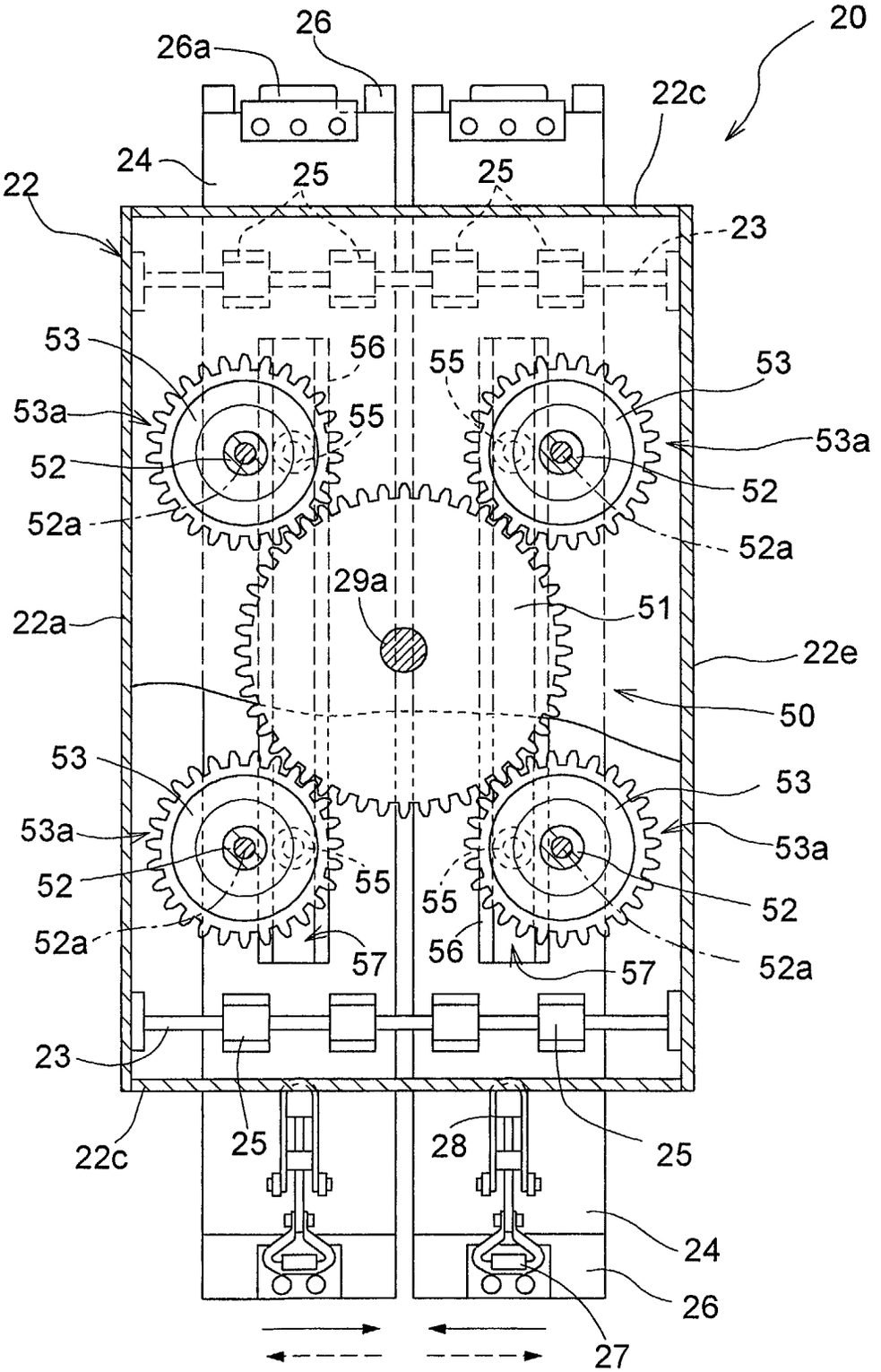

20
26
26a
22c
24
25
25
22
23
53
56
55
53
53a
55
53a
52
52
52a
52a
29a
51
22a
22e
50
53
53
53a
53a
52
55
55
52
52a
56
57
57
52a
23
22c
25
28
25
24
26
27

FIG.7

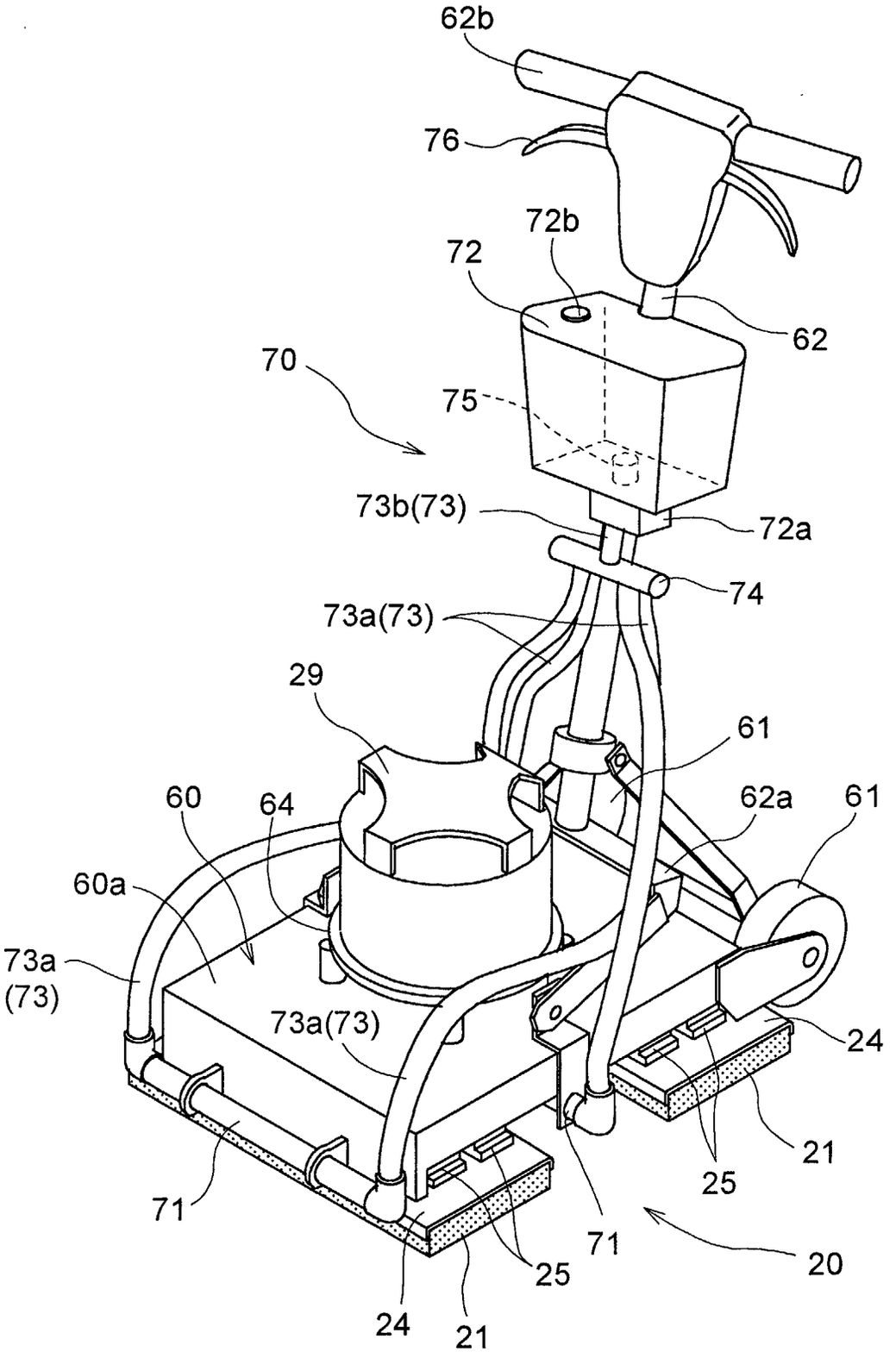

62b
76
72b
72
62
70
75
73b(73)
72a
74
73a(73)
29
61
60
64
62a
61
60a
73a
(73)
73a(73)
24
21
25
71
71
20
25
24
21

FIG.8

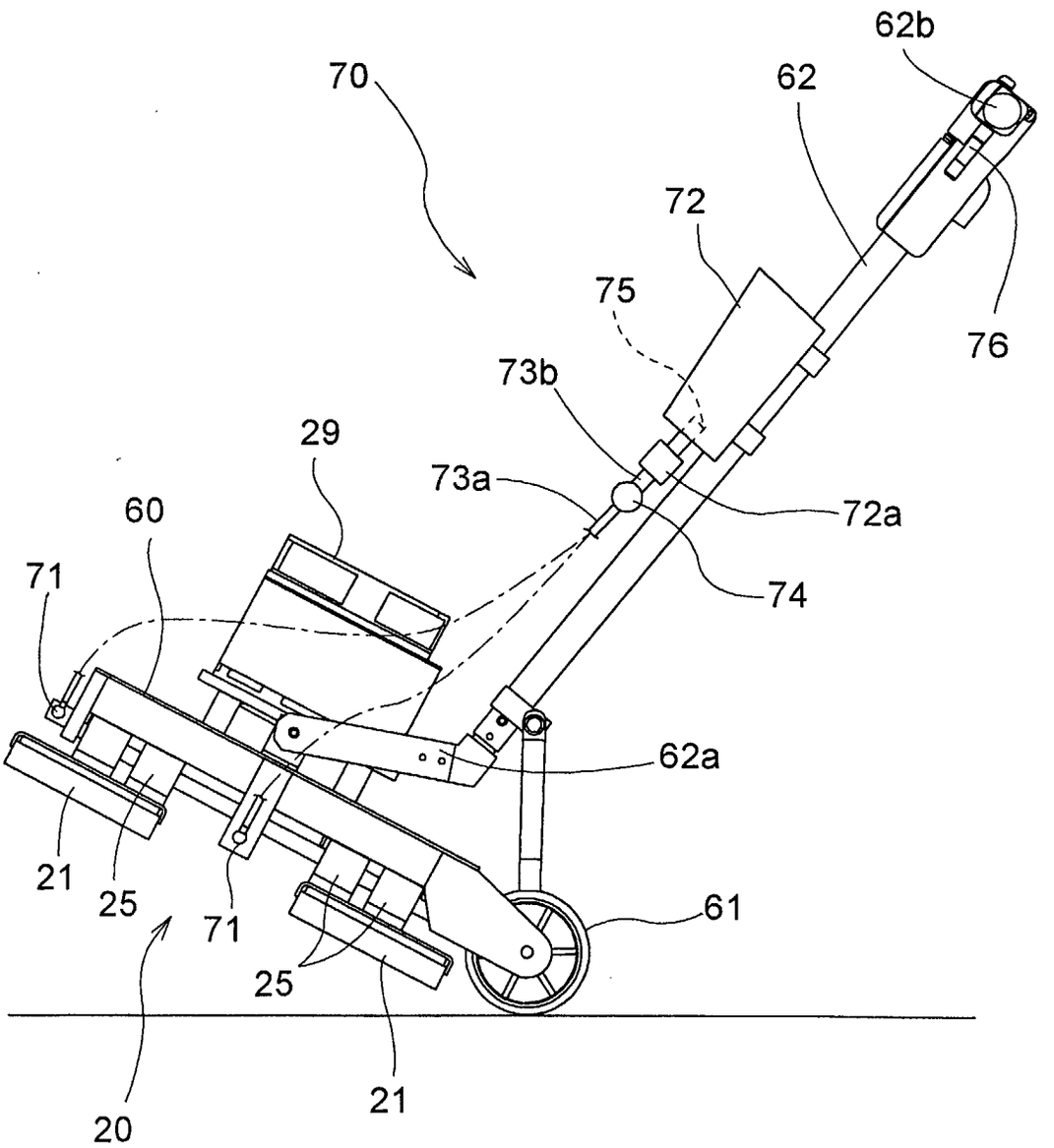


FIG.9

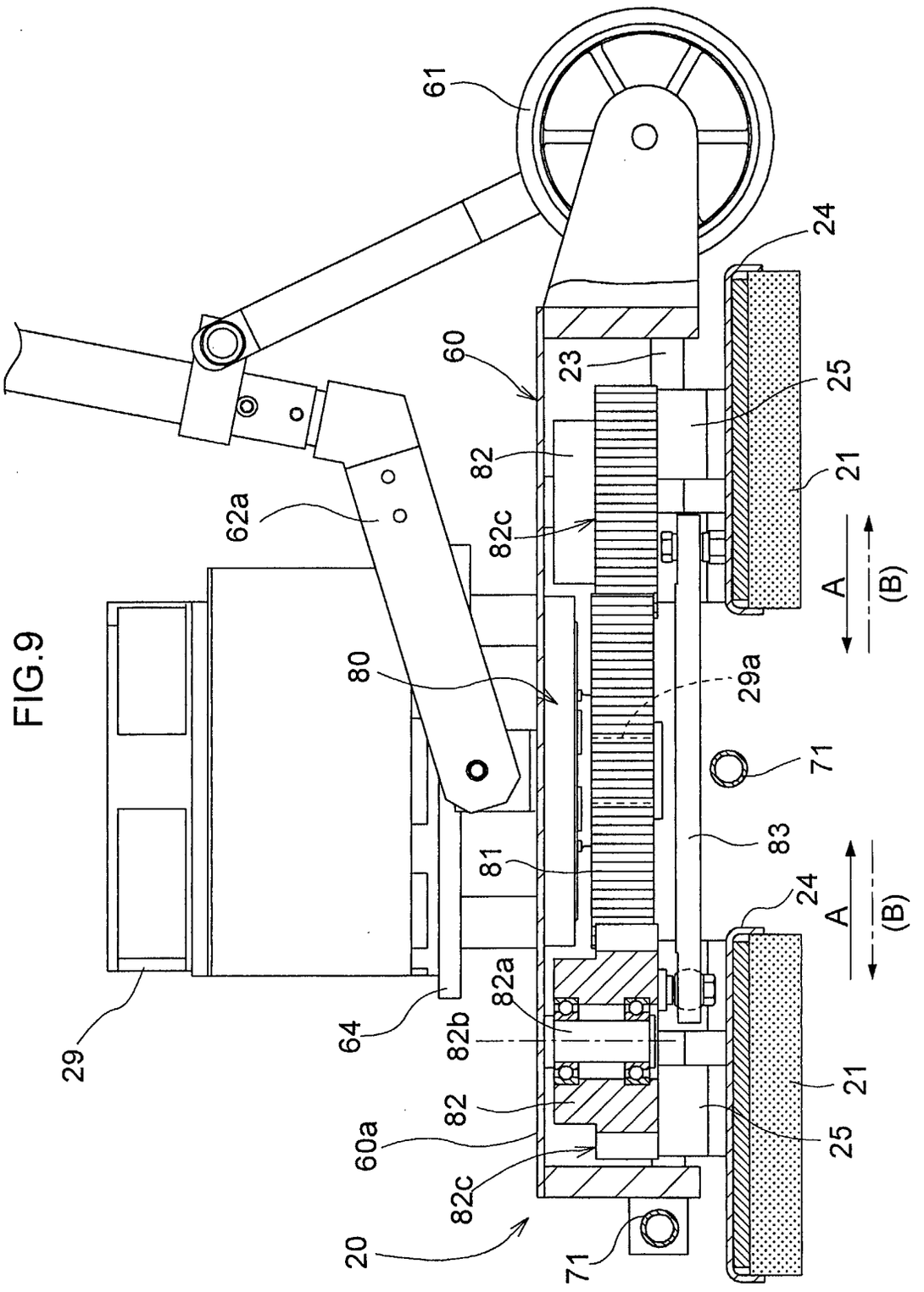
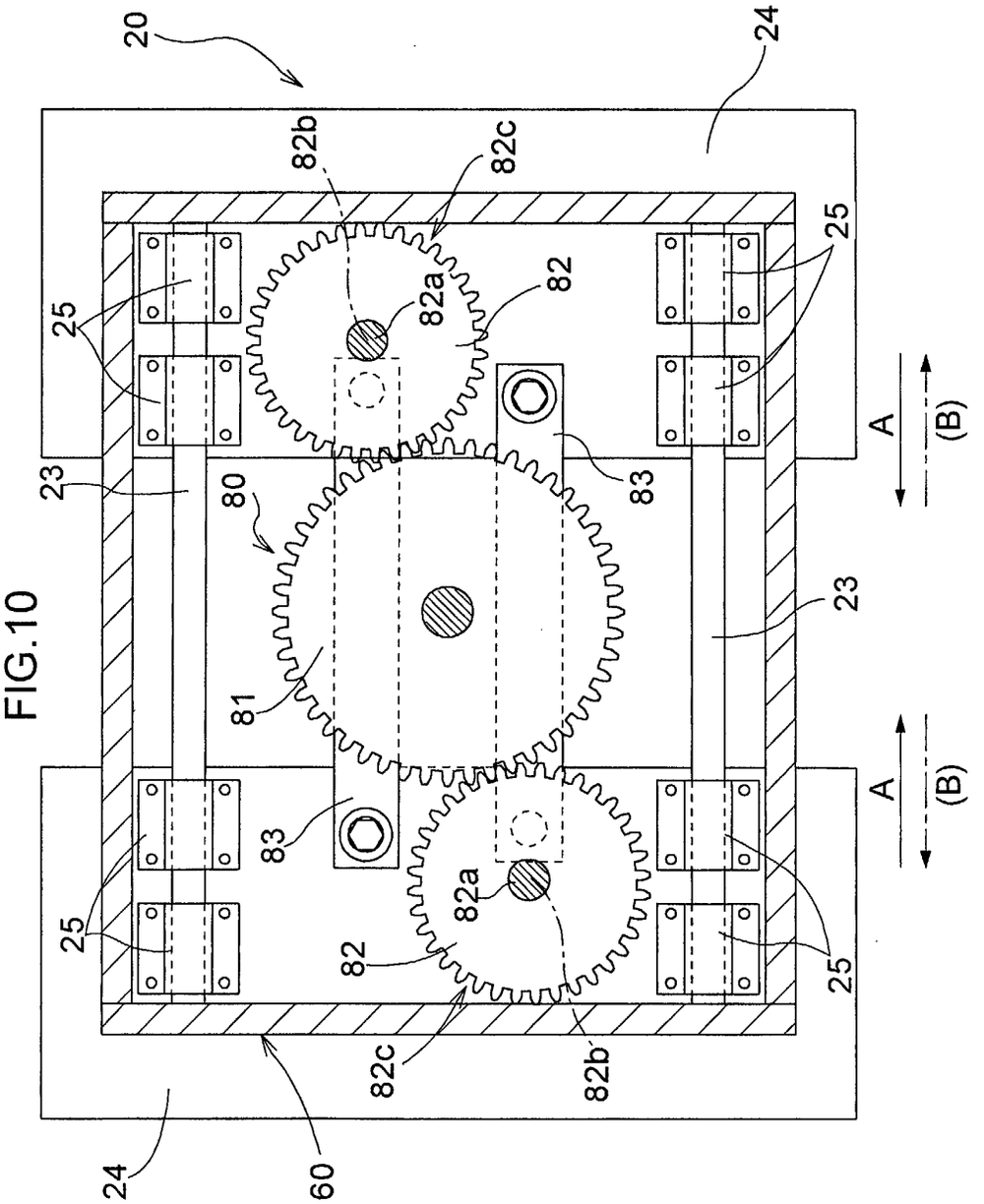

61
24
60
23
25
82
21
62a
82c
A
(B)
80
29a
71
83
81
24
A
(B)
82a
29
64
82b
21
82
25
60a
82c
20
71

FIG.10


20
24
82b
82c
25
82a
82
25
23
80
83
A
(B)
23
81
A
(B)
83
25
82a
82
25
82c
82b
24
60