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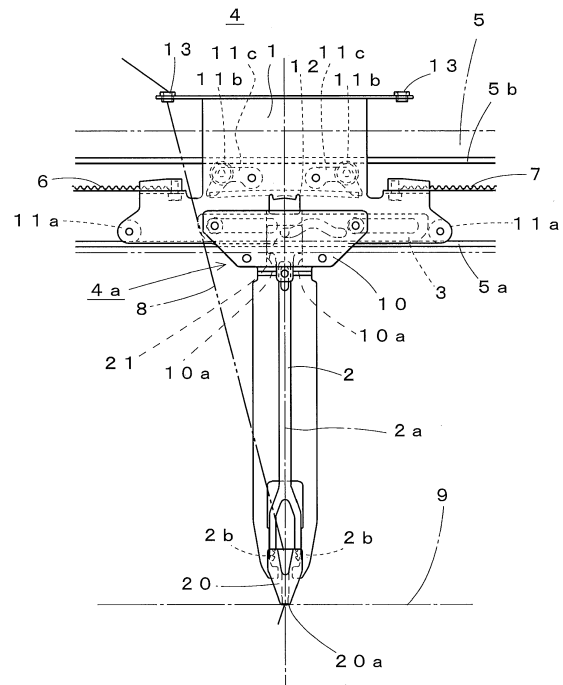
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(54) **YARN FEEDER FOR FLATBED KNITTING MACHINE**

(57) [Object] It is an object of the present invention is to provide a yarn feeder for a flatbed knitting machine, which is capable of self-running while reducing sliding resistance.

[Solving Means] When a base body 1 runs in a right-left direction in the drawing by being towed with belts 6, 7, a yarn feeder port 20a of a feeder rod 2 is descended to a yarn feeding position 9. Lower rollers 11a and upper rollers 11b roll, so that sliding resistance in running is reduced. When running of the base body 1 to one side is once stopped and is caused to run a little to the other side, the brake member 3 is caused to make pressure contact with the lower rail 5a and increases sliding resistance. The increase in the sliding resistance makes a braking state in which the brake member 3 stops on the running path 5 and the feeder rod 2 is made into an ascended state.

Fig. 1



Description**[Summary of Invention]****[Technical Field]****[Technical Problem]**

[0001] The present invention relates to a self-running yarn feeder installed in a flatbed knitting machine capable of feeding yarns for knitted fabric knitting to knitting needles arranged in line in needle beds.

[Background Art]

[0002] Conventionally, a flatbed knitting machine is provided with a large number of knitting needles arranged in line along a needle bed gap and the knitting needles are driven so as to advance to and retract from the needle bed gap in order to knit a knitted fabric. A general flatbed knitting machine is provided with a plurality of running paths bridged above the needle bed gap and a plurality of yarn feeders running on the running paths. Yarn feeder ports for feeding knitting yarns to the knitting needles are provided at the lower ends of the yarn feeders (for example, see Fig. 1 of Patent Literature 1).

[0003] The plurality of yarn feeders are configured so as to be capable of moving the yarn feeder ports in the up-down direction (for example, see Patent Literatures 1 and 2). Yarn feeding positions at which the yarn feeders feed the knitting yarns to the knitting needles are positions at which the yarn feeder ports are descended, and the knitting yarns are fed to the knitting needles under equivalent conditions by making them close to each other. Collision and interference between the yarn feeder ports are prevented at standby positions at which the knitting yarns are not fed to the knitting needles and the yarn feeder ports are ascended.

[0004] Running of the yarn feeders are entrained by running of a carriage along needle beds in some cases, and self-run independently from the running of the carriage in other cases. In the cases when the yarn feeders are entrained by the carriage so as to move, the yarn feeder ports are moved in the up-down direction by entraining pins that are engaged for entraining (for example, see Figs. 2 to 10 of Patent Literature 1). In the cases when the yarn feeders are caused to self-run, sliding resistance against the running of the yarn feeders is used for the up-down movement of the yarn feeder ports (see, Figs 11 and 12 of Patent Literature 1 and a paragraph 0058 of Patent Literature 2).

[Citation List]**[Patent Literatures]****[0005]**

Patent Literature 1: EP 0898002 A
Patent Literature 2: JP 5042844 B

[0006] The sliding resistance for the self-running yarn feeders, that is used for the up-down movement of the yarn feeder ports, increases load for driving to run. When the plurality of yarn feeders are caused to self-run, large driving force is required for running, and driving parts are caused to grow in size. Large sliding resistance indicates large friction between the yarn feeders and railways along which they are caused to run, and there is a concern over abrasion of the railways. On the other hand, small sliding resistance might cause uncertainty for switching the up-down movement of the yarn feeder ports reliably.

[0007] An object of the present invention is to provide a yarn feeder for a flatbed knitting machine, which is capable of self-running while reducing sliding resistance.

[Solution of Problem]

[0008] The present invention is a yarn feeder for a flatbed knitting machine provided with:

a base body that self-runs on a running path bridged above a needle bed gap in the flatbed knitting machine; and

a feeder rod that droops downward from the base body, has a yarn feeder port on a lower end, moves in an up-down direction relative to the base body, feeds a knitting yarn to a knitting needle from the yarn feeder port at a descended yarn feeding position, and is capable of ascending the yarn feeder port to a standby position, characterized in that the base body has a pressing part, and

the yarn feeder further provided with a brake member that is supported on the base body so as to move relatively in a functioning range which is previously set to the base body, and has:

a braking surface facing the running path; and
a pressure receiving part receiving pressure from the pressing part at an intermediate position of the functioning range,

when the pressing part presses the pressure receiving part, the braking surface is compressed to the running path and sliding resistance of the brake member against the running path is increased to be larger than resistance received by movement of the brake member relative to the base body, so that a braking state is made in which the brake member stops relative to the running path even when the base body runs relative to the running path, when the brake member moves to either of both end portions of the functioning range with movement relative to the base body, pressure from the pressing

part is reduced and the sliding resistance of the braking surface against the running path is reduced to release the braking state, so that the brake member is entrained by the base body so as to run, and an elevation mechanism that converts relative movement between the base body and the brake member into up-down movement of the feeder rod, and ascends the feeder rod in the braking state of the brake member, is formed among the feeder rod, the base body, and the brake member.

[0009] In the present invention, said pressing part and said pressure receiving part slide in said functioning range.

[0010] In the present invention, said elevation mechanism comprises:

a guiding part that is installed on said base body and guides aid up-down movement of said feeder rod;
a cam plate that is installed on said brake member and drives the up-down movement of the feeder rod;
and
a driven part that is installed on the feeder rod and is driven by the cam plate.

[0011] In the present invention, said brake member has such shape that pressure from said pressing part is increased on said pressure receiving part rather than on said both end portions, and the brake member is provided with shift parts on which the pressure is smoothly increased by moving to the pressure receiving part from the both end portions on which the pressure is decreased.

[0012] In the present invention, said elevation mechanism comprises:

a guiding part and a cam plate for guiding and driving said up-down movement of said feeder rod respectively, which are installed on said brake member, and a driven arm that is installed on the feeder rod and is driven by the cam plate.

[0013] In the present invention, said pressing part and aid pressure receiving part oscillate about an oscillation shaft installed on said base body in said functioning range.

[0014] In the present invention, said base body has rollers running on a rail installed on said running path, and said sliding resistance is generated by the rail and said braking surface of said brake member.

[Advantageous Effects of Invention]

[0015] According to the present invention, a brake member is capable of moving relatively within a functioning range which is previously set to a base body. When the yarn feeder runs while a yarn feeder port is descended at a yarn feeding position, the brake member is made

into a state of being moved to either of both end portions of the functioning range with the movement thereof relative to the base body. The base body entrains the brake member and the yarn feeder can self-run while reducing sliding resistance against a running path. If the base body is stopped running, moved a little in an opposite direction, and then stopped, the brake member is moved to an intermediate position of the functioning range with the movement thereof relative to the base body to become a braking state. This relative movement enables an elevation mechanism to ascend the yarn feeder port to a standby position reliably. The ascended yarn feeder port can be caused to stand by in a state in which collision and interference with other yarn feeder ports are prevented and the sliding resistance against the running path is increased by the brake member.

[0016] In addition, according to the present invention, between the braking state and a braking-released state, the state can be shifted by sliding between a pressing part of the base body and a pressure receiving part of the brake member.

[0017] In addition, according to the present invention, the feeder rod runs together with the base body on which a guiding part is installed, so that the running position of the yarn feeder port can be caused to correspond to the base body.

[0018] In addition, according to the present invention, the relative movement of the base body and the brake member causes the pressing part of the base body to be moved to the pressure receiving part from the end portion of the brake member while passing through a shift part. When the state in which pressure is reduced on the end portion shifts to the braking state in which the pressure is increased on the pressure receiving part, large force with a wedge effect can be caused to work as pressing force perpendicular to a penetrating direction as in the case in which a wedge with a small angle is caused to penetrate into a narrow space.

[0019] In addition, according to the present invention, the guiding part for guiding the up-down movement of the feeder rod is installed on the brake member, so that the feeder rod runs together with the brake member. When the base body is started running in a state in which the brake member is stopped in the braking state against the running path, the feeder rod is descended with the elevation mechanism before the brake member is relatively moved to the end portion of the functioning range and is entrained. The feeder rod can be caused to run so as to be entrained by the base body together with the brake member after the yarn feeder port is descended to the yarn feeding position.

[0020] In addition, according to the present invention, the brake member can be shifted between the braking state and the braking-released state by relative movement with oscillation about an oscillation shaft installed on the base body. A movement range of the brake member is restricted to a range about the oscillation shaft and a space necessary for the functioning range is reduced,

thereby it is performed to reduce the mechanism in size.

[0021] In addition, according to the present invention, rollers and the brake member share a rail of the running path and the braking part of the brake member is caused to directly work on the rail, thereby it is performed to increase the sliding resistance.

[Brief Description of Drawings]

[0022]

Fig. 1 is a front view illustrating a schematic configuration of a yarn feeder 4 as an example 1 of the present invention.

Fig. 2 is a simplified rear view illustrating a state in which a yarn feeder port 20a is descended to a yarn feeding position 9 by the yarn feeder 4 in Fig. 1 and a state in which the yarn feeder port 20a is ascended to a rest position.

Fig. 3 is a front view and a right side view of a portion related to a base body 1 illustrated in Fig. 1.

Fig. 4 is a front view and a right side view of a portion related to a feeder rod 2 illustrated in Fig. 1.

Fig. 5 is a front view and a right side view of a portion related to a brake member 3 illustrated in Fig. 1.

Fig. 6 is a simplified front view illustrating a variation of the yarn feeder 4 in Fig. 1.

Fig. 7 is a simplified front view illustrating an operation principle of up-down movement of a feeder rod 52 by a yarn feeder 50 as an example 2 of the present invention.

Fig. 8 is a simplified front view illustrating an operation principle of up-down movement of a feeder rod 62 by a yarn feeder 60 as an example 3 of the present invention.

[Description of Embodiments]

[0023] Hereinafter, a schematic configuration and operations of a yarn feeder (hereinafter, abbreviated as YF in some cases) 4 as an example 1 of the present invention will be described with reference to Figs. 1 to 6. Figs. 7, 8 illustrates schematic configuration of an example 2, 3 of the present invention respectively. In description of the examples 2 and the example 3, components corresponding to those described in the example 1 are referred in a simplified manner while the same reference numerals denote them in some cases. Further, for the convenience of description, components that are not illustrated in the drawing as a description target are referred by using reference numerals as illustrated in other drawings in some cases.

[Example 1]

[0024] Fig. 1 is a front view illustrating a schematic configuration of a YF 4 including a base body 1, a feeder rod 2, and a brake member 3 as an example 1 of the present

invention. The YF 4 is mounted on a running path 5 bridged above a needle bed gap in a flatbed knitting machine, and is towed to run by belts 6, 7. A mechanism (not illustrated) to drive the belts 6, 7 is installed on an end portion of the running path 5 in the longitudinal direction. To substitute the belts 6, 7, wires or chains may also be used. A driving source such as a motor may be mounted on the YF 4.

[0025] A knitting cam, which runs above knitting needles arranged in line on needle beds and causes the knitting needles to advance and retract, is mounted on a cam carriage (not illustrated). The YF 4 and the cam carriage synchronously run to feed knitting yarns to the knitting needles driven by the knitting cam. A supporting plate 10, lower rollers 11a, and upper rollers 11b are attached to the base body 1 of the YF 4. The upper rollers 11b are supported by a lever 11c and are compressed to an upper rail 5b by urging of a wire spring 12. The lower rollers 11a and the upper rollers 11b respectively roll on a lower rail 5a and the upper rail 5b. The brake member 3 is movable in the up-down direction and makes pressure contact with the lower rail 5a when moved downward to increase sliding resistance between the base body 1 and the running path 5.

[0026] The feeder rod 2 droops from the base body 1 and is movable in the up-down direction along an alternate long and short dash line 2a relatively to the base body 1 by an elevation mechanism 4a, which will be described later. The knitting yarn is fed from the lateral side or the upper side of the needle bed, passes through a yarn guide 13 installed on the base body 1, reaches to a yarn feeder port 20a of a yarn feeding chip 20, which is installed on the lower end of the feeder rod 2 and descended to a yarn feeding position 9, and then is fed to the knitting needles for knitting fabric. An upper portion of the yarn feeding chip 20 is held by holding parts 2b at the lower end of the feeder rod 2. The feeder rod 2 forms a driven part 21 in an upper portion thereof. The up-down movement of the driven part 21 is guided by guiding grooves 10a provided in the supporting plate 10. The feeder rod 2 and the driven part 21 are arranged on the front surface side of the base body 1 and the supporting plate 10 is arranged on the further front surface side of the base body 1 relative to the driven part 21.

[0027] Fig. 2 is a simplified rear view of Fig. 1 illustrating (a) a state in which the yarn feeder port 20a of the feeder rod 2 is descended to the yarn feeding position 9 and (b) a state in which the yarn feeder port 20a of the feeder rod 2 is ascended to a standby position. The YF 4 feeds the knitting yarn to the knitting needle from the yarn feeder port 20a descended to the yarn feeding position 9 while running to one side of the running path 5, for example, to the right side in Fig. 2(a) by being towed with the belts 6, 7. On the occasion when making the YF 4 stop to run, it is stopped to tow to the one side with the belts 6, 7. When towing with the belts 6, 7 to the one side is restarted, the YF 4 restarts running in the state in which the yarn feeder port 20a is descended to the yarn feeding

position 9. In order to ascend the yarn feeder port 20a to the standby position and to cause the YF 4 to rest, the towing is stopped after pulling the belts 6, 7 a little to the other side and causing the base body 1 to run leftward to shift the state to a braking state illustrated in Fig. 2(b). When the YF 4 is caused to continuously run while the running direction of the YF 4 is reversed from the one direction to the other direction, the towing direction with the belts 6, 7 is switched from the one direction to the other direction. During the switching of the direction, even when the base body 1 and the brake member 3 are once stopped, the base body 1 is towed to the other side by being towed to the other side by the belts 6, 7 and the brake member 3 is entrained to the other side. Before the brake member 3 is entrained, the yarn feeder port 20a is once ascended to the standby position from the yarn feeding position 9, and then, is descended to the yarn feeding position 9 again. The above-described operations of the YF 4 towed by the belts 6, 7 are performed in the same manner in the example 2 and the example 3, which will be described later.

[0028] The brake member 3 is supported on the base body 1 so as to be relatively movable in a predetermined functioning range in the running direction of the YF 4. The functioning range is determined by function long holes 30 provided in the brake member 3. The brake member 3 is in a state of being located on the side of one end portions 30a in the functioning range (Fig. 2(a)) or in a state of being located at an intermediate positions in the functioning range (Fig. 2(b)). The lower surfaces of the function long holes 30 are formed by the one end portions 30a to the other end portions 30c with intermediate pressure receiving parts 30b interposed therebetween. The lower ends of the brake member 3 function as braking surfaces 31 facing the lower rail 5a of the running path 5. Rollers 14, which are supported on the base body 1 with the supporting plate 10 interposed therebetween, are inserted into the function long holes 30. The pressure receiving parts 30b are formed from the lower end of the brake member 3, so as to be higher than the bottom surfaces of the one end portions 30a and the other end portions 30c. When the rollers 14 are located on the pressure receiving parts 30b at the intermediate positions of the function long holes 30, the brake member 3 moves downward relative to the base body 1. The rollers 14 work as pressing parts on the lower surfaces of the function long holes 30 including the pressure receiving parts 30b.

[0029] As illustrated in Fig. 2(b), the pressure receiving parts 30b receive downward pressures from the rollers 14 at the intermediate positions of the functioning range. The braking surfaces 31 of the brake member 3 are compressed to the lower rail 5a of the running path 5, so that the sliding resistances against the running path 5 are increased. When the towing with the belts 6, 7 is stopped, the YF 4 ascends the yarn feeder port 20a to the standby position and stops in the braking state. Even in the state in which the rollers 14 press downward the pressure re-

ceiving parts 30b, the resistances of the rollers 14 and the brake member 3 against the relative movement are not so large, so that the braking state can be easily released by towing with the belts 6, 7.

[0030] When the base body 1 is towed leftward of the drawing with the belts 6, 7 from the braking state illustrated in Fig. 2(b), as illustrated in Fig. 2(a), the rollers 14 reach the one end portions 30a. When the rollers 14 move to either of both end portions, including the case in which the rollers 14 reach the other end portions 30c, pressures on the lower surfaces of the function long holes 30 from the rollers 14 are reduced and the sliding resistances of the braking surfaces 31 against the running path 5 are reduced, so that the braking state is released. When the base body 1 is further towed leftward, the brake member 3 is also entrained by the base body 1 through the rollers 14 on the one end portions 30a of the function long holes 30. With this entraining, overall the YF 4 including the brake member 3 runs leftward while keeping the state illustrated in Fig. 2 (a). An elevation cam 32 is also installed on the brake member 3. The elevation cam 32 is formed as a groove cam having a chevron shape in which the center is higher and both ends are lower. In to the elevation cam 32, a follower 22, which is supported by the driven part 21 installed on the upper portion of the feeder rod 2, is inserted.

[0031] As illustrated in Fig. 2(a), in the state in which the brake member 3 is entrained by the base body 1, the follower 22 is located at a low position at one end of the elevation cam 32. In this case, the feeder rod 2 is also descended from the follower 22 through the driven part 21. The sliding resistance against the running path 5 can be made smaller than that in the conventional technique because the braking state by the brake member 3 is released while the base body 1 runs.

[0032] In the braking state as illustrated in Fig. 2(b), the follower 22 is ascended to a high position at the center of the elevation cam 32 with the movement of the base body 1 relative to the brake member 3, and the feeder rod 2 is also ascended. The follower 22 is supported by the driven part 21 on the front surface side of the base body 1 based on the front view in Fig. 1, penetrates through a through hole 15 provided in the base body 1, and receives work of the elevation cam 32 of the brake member 3 on the back surface side of the base body 1. Although the elevation cam 32 is the groove cam installed on the inner side relative to an outer periphery of the plate-like brake member 3, for example, the feeder rod 2 may be descended by its own weight or spring urging by installing a cam plate having a projecting shape and pushing up the feeder rod 2 on the upper edge of the outer periphery of the brake member 3. An elevation mechanism 4a is formed across the feeder rod 2, the base body 1, and brake member 3, and the elevation mechanism 4a converts the relative movement of the base body 1 to the brake member 3 into up-down movement of the feeder rod 2 and ascends the feeder rod 2 in the braking state of the brake member 3. The elevation

mechanism 4a can move the follower 22 to the high position at the center of the elevation cam 32 to ascend the feeder rod 2 reliably by the movement of the base body 1 relative to the brake member 3 stopping in the braking state relative to the running path 5.

[0033] Fig. 3 illustrates the configuration of a portion related to the base body 1 illustrated in Fig. 1. In the base body 1, there are provided respectively with pressing holes 16 to cause the rollers 14, which is supported by the supporting plate 10, to project to the rear side, and with the attachment holes 17 to attach the supporting plate 10 to the front surface side. A spring receiver 18 for receiving a center portion of the wire spring 12 illustrated in Fig. 1 is also formed. Attachment holes 19 to attach the levers 11c, which are urged by the wire spring 12, in a state capable of oscillation, are also provided. The base body 1 has a drooping part 1c with guiding protrusions 1b provided at the lower end thereof. The guiding protrusions 1b are guiding parts to guide the up-down movement of the yarn feeding chip 20.

[0034] Fig. 4(a) is a front view and Fig. 4(b) is a right side view illustrating the configuration of a portion related to the feeder rod 2 illustrated in Fig. 1. The yarn feeding chip 20 is attached to the lower portion of the feeder rod 2 and the driven part 21 is attached to the upper portion thereof. As illustrated in Fig. 4(a), guiding grooves 20b are provided at the lateral sides of the yarn feeding chip 20. The guiding protrusions 1b of the base body 1 are inserted into the guiding grooves 20b to guide the up-down movement of the feeder rod 2 to which the yarn feeding chip 20 is attached.

[0035] Fig. 5 illustrates the configuration of a portion related to the brake member 3 illustrated in Fig. 1. Fig. 5(a) illustrates the brake member 3 and the supporting plate 10 in a state in which the rollers 14 supported by the supporting plate 10 are inserted into the function long holes 30 of the brake member 3. The left side drawing illustrates the braking-released state corresponding to Fig. 2(a) and the center drawing illustrates the braking state corresponding to Fig. 2(b). The right side drawing illustrates the configuration of the right side surface. The supporting plate 10 is provided with screw holes 10b, and is able to be attached to the base body 1 through attachment holes 17 of the base body 1 with screws 10c. Between the supporting plate 10 and the brake member 3, the base body 1 is interposed.

[0036] Fig. 5(b) illustrates the shape of the brake member 3. The braking surfaces 31 that face the lower rail 5a and make close contact with the lower rail 5a by crimping are formed on the lower end of the brake member 3. The lower rail 5a are shared by the lower rollers 11a and the brake member 3, and the braking surfaces 31 of the brake member 3 is able to directly work on the lower rail 5a to thereby increase the sliding resistances.

[0037] Fig. 5(c) illustrates the shape of the function long hole 30. The function long hole 30 is an oval hole having such shape that the lower side as the pressure receiving part 30b and the upper side facing the pressure

receiving part 30b with an interval 30h extend in the right-left direction of the drawing and both ends have circular shapes. Note that the one end portion 30a has a circular shape including the left half of the outer periphery of a virtual circle 30x having a diameter 30y larger than the interval 30h. The other end portion 30c has a circular shape including the right half of the outer periphery of the virtual circle 30x. The one end portion 30a and the other end portion 30c are formed such that the upper top of the virtual circle 30x has the same height of the upper side and the bottom surfaces thereof as the lower top of the virtual circle 30x are lower than the pressure receiving part 30b. The interval 30h is set to be slightly larger than the diameter of the rollers 14.

[0038] The function long hole 30 has shift parts 30d, 30e guiding the roller 14 and increasing the pressure smoothly on portions thereof, which shift to the pressure receiving part 30b from the bottom surface of the virtual circle 30x on the one end portion 30a and the other end portion 30c. The roller 14 of the base body 1 moves to the pressure receiving parts 30b after passing through the shift part 30d or the shift part 30e, respectively, from the one end portion 30a or the other end portion 30c of the brake member 3 with the relative movement of the base body 1 and the brake member 3. When the state shifts to the braking state on the pressure receiving parts 30b from the braking-released state on the one end portion 30a or the other end portion 30c, the braking surfaces 31 and the pressure receiving parts 30b of the brake member 3 are inserted into between the rollers 14 and the lower rail 5a. This insertion enables large force with a wedge effect to generate pressing force in the downward direction of the drawing as in the case of insertion of a wedge with a small angle into a narrow space. The one end portion 30a and the other end portion 30c are not limited to such shapes that only the lower tops of the virtual circles 30x form the bottom surfaces and may have such shapes that the bottom surfaces extend in the lateral direction of the drawing as indicated by the one end portion 30a with a dashed curve.

[0039] Fig. 5(d) illustrates the configuration of the supporting plate 10. The rollers 14 are supported in a manner capable of rotating about shafts 14a. The resistance in the relative movement of the base body 1 and the brake member 3 is smaller than the sliding resistance between the rollers 14 roll, including a case in which the braking state is released and the braking surfaces 31 are not compressed to the lower rail 5a. Therefore, the base body 1 and the brake member 3 are capable of relative moving in the functioning range all the time. The pressing parts are not limited to the rollers 14 and may be replaced by pins or the like as long as the resistance in the movement of the pressing parts relative to the brake member 3 is smaller than the sliding resistance between the brake member 3 and the running path 5.

[0040] Fig. 6 illustrates a variation of the above-described YF 4 in a simplified manner. In description of

Figs. 1 to 5, the brake member 3 is provided with the two function long holes 30, alternatively, this is an example in which only one portion corresponding to the lower side of the function long hole is provided. It is sufficient that portions corresponding to the one end portion 30a, the pressure receiving part 30b, the other end portion 30c, and the shift parts 30d and 30e are formed on the upper side of the brake member 3 and are pressed by the roller 14. The roller 14 presses the brake member 3 downward, but the brake member 3 may be pressed upward to make the braking state. When the brake member 3 is pressed upward, it is sufficient that the brake member 3 is pressed against the upper rail 5b while a portion corresponding to the braking surface 31 is provided on an upper portion of the brake member 3 and a portion which is pressed by the roller 14 is provided on a lower portion of the brake member 3.

[Example 2]

[0041] Fig. 7 illustrates an operation principle of up-down movement of a feeder rod 52 by an YF50 as an example 2 of the present invention in a simplified manner. In the example 2, a base body 51 does not directly support the feeder rod 52 but a brake member 53 supports the feeder rod 52 movably in the up-down direction using a support guiding part 54. The brake member 53 is basically equivalent to the brake member 3 of Fig. 6 and the follower 22 is inserted through the elevation cam 32. The follower 22 is supported on an upper portion of a driven arm 56 and a lower portion of the driven arm 56 is connected to the feeder rod 52 with a driven shaft 55 interposed therebetween to form an elevation mechanism 50a. That is, the driven arm 56 is installed so as to transmit driving of the up-down movement which the follower 22 receives in the elevation cam 32, to the feeder rod 52 by oscillation.

[0042] In Fig. 7, a state shifts between a braking state in Fig. 7(b) and a braking-released state in Figs. 7(a), (c) by changing from slide of the roller 14 relative to the brake member 53 to oscillation of the driven arm 56 about the driven shaft 55. The support guiding part 54 installed on the brake member 53 serves as a guiding part to guide the up-down movement of the feeder rod 52. The support guiding part 54, the elevation cam 32, and the driven arm 56 form the elevation mechanism 50a. On the occasion when the base body 51 is started running from a state in which the brake member 53 stops in the braking state against the running path 5, the feeder rod 52 is descended by the elevation mechanism 50a by the movement of the base body 51 relative to the brake member 53. The feeder rod 52 is able to be entrained to run by the base body 51 together with the brake member 53 after being descended.

[Example 3]

[0043] Fig. 8 illustrates an operation principle of up-

down movement of a feeder rod 62 by an YF60 as an example 3 of the present invention in a simplified manner. The feeder rod 62 is directly supported by a base body (not illustrated) and up-down movement of the feeder rod 62 is also guided thereby.

[0044] A brake member 63 oscillates about an oscillation shaft 65 installed on the base body, and an outer periphery of the lower end of the brake member 63 having a fan-like shape has a portion functioning as a braking surface 63b, which makes contact with the lower rail 5a, between one end portion 63a and the other end portion 63c. The fan-like shape is set such that diameters, to the oscillation shaft 65, of the one end portion 63a and the other end portion 63c as end portions of the outer periphery are smaller than a diameter, to the oscillation shaft 65, of the braking surface 63b at an intermediate position of the outer periphery. In states as illustrated in Figs. 8(a) and 8(c), shift parts 63d, 63e on which the diameter to the oscillation shaft 65 from the outer periphery is decreased from the diameter of the braking surface 63b to the diameters of the end portions make contact with the lower rail 5a. Note that the states as illustrated in Figs. 8(a) and 8(c) are unstable, and when the base body runs leftward in Fig. 8(a), the brake member 63 oscillates a little about the oscillation shaft 65 in the clockwise direction such that the one end portion 63a makes contact with the lower rail 5a to release braking. In Fig. 8(c) if the base body runs rightward, the other end portion 63c makes contact with the lower rail 5a to release braking. If the base body is made to rightward run in Fig. 8(a) or to leftward run in Fig. 8(c) respectively, the braking state as illustrated in Fig. 8(b) is made. The brake member 63 is the outer periphery making contact with the lower rail 5a whereas the oscillation shaft 65 functions as a pressing part. The end portions of the outer periphery of the brake member 63 are the one end portion 63a and the other end portion 63c similar to the one end portion 30a and the other end portion 30c in the example 1 and the example 2. As illustrated in Fig. 8(b), the braking surface 63b provided on the intermediate position of the outer periphery, makes contact with the lower rail 5a and functions as a pressure receiving part similar to those in the example 1 and the example 2.

[0045] Upper portions of the feeder rod 62 and the brake member 63 are connected to each other with a link plate 66 interposed therebetween. A long hole 62a is formed in the feeder rod 62 and the oscillation shaft 65 is inserted therethrough to enable the up-down movement of the feeder rod 62. That is, the brake member 63, the oscillation shaft 65, and the link plate 66 form an elevation mechanism 60a that converts oscillation of the brake member 63 with the relative movement of the base body and the brake member 63 into up-down movement of the feeder rod 62 and ascends the feeder rod 62 in the braking state of the brake member 63.

[0046] In the above-described example 3, the movement range of the brake member 63 is restricted to a range about the oscillation shaft 65 and a space neces-

sary for the functioning range is reduced, thereby reducing the mechanism in size.

[Reference Signs List]

[0047]

1, 51 Base body
 1b Guiding protrusion
 2, 52, 62 Feeder rod
 3, 53, 63 Brake member
 4, 50, 60 Yarn feeder (YF)
 4a, 50a, 60a Elevation mechanism
 5 Running path
 5a Lower rail
 5b Upper rail
 6, 7 Belt
 8 Knitting yarn
 9 Yarn feeding position
 10 Supporting plate
 12 Wire spring
 14 Roller
 20 Yarn feeding chip
 20a Yarn feeder port
 21 Driven part
 22 Follower
 30 Function long hole
 30a, 63a One end portion
 30b Pressure receiving part
 30c, 63c Other end portion
 30d, 30e, 63d, 63e Shift part
 31; 63b Braking surface
 32 Elevation cam
 54 Support guiding part
 55 Driven shaft
 56 Driving arm
 65 Oscillation shaft

Claims

1. A yarn feeder (4, 50, 60) for a flatbed knitting machine provided with:

a base body (1, 51) that self-runs on a running path (5) bridged above a needle bed gap in the flatbed knitting machine; and
 a feeder rod (2, 52, 62) that droops downward from the base body (1, 51), has a yarn feeder port (20a) on a lower end, moves in an up-down direction relative to the base body (1, 51), feeds a knitting yarn to a knitting needle from the yarn feeder port (20a) at a descended yarn feeding position (9), and is capable of ascending the yarn feeder port (20a) to a standby position, **characterized in that** the base body (1, 51) has a pressing part (14, 65), and the yarn feeder (2, 52, 62) further provided with

a brake member (3, 53, 63) that is supported on the base body (1, 51) so as to move relatively in a functioning range which is previously set to the base body (1, 51), and has:

a braking surface (31; 63b) facing the running path (5); and
 a pressure receiving part (30b; 63b) receiving pressure from the pressing part (14, 65) at an intermediate position of the functioning range,

when the pressing part (14, 65) presses the pressure receiving part (30b; 63b), the braking surface (31; 63b) is compressed to the running path (5) and sliding resistance of the brake member (3, 53, 63) against the running path (5) is increased to be larger than resistance received by movement of the brake member (3, 53, 63) relative to the base body (1, 51), so that a braking state is made in which the brake member (3, 53, 63) stops relative to the running path (5) even when the base body (1, 51) runs relative to the running path (5),

when the brake member (3, 53, 63) moves to either of both end portions (30a, 30c; 63a, 63c) of the functioning range with movement relative to the base body (1, 51), pressure from the pressing part (14, 65) is reduced and the sliding resistance of the braking surface (31; 63b) against the running path (5) is reduced to release the braking state, so that the brake member (3, 53, 63) is entrained by the base body (1, 51) so as to run, and an elevation mechanism (4a, 50a, 60a) that converts relative movement between the base body (1, 51) and the brake member (3, 53, 63) into up-down movement of the feeder rod (2, 52, 62), and ascends the feeder rod (2, 52, 62) in the braking state of the brake member (3, 53, 63), is formed among the feeder rod (2, 52, 62), the base body (1, 51), and the brake member (3, 53, 63).

2. The yarn feeder (4, 50) for the flatbed knitting machine according to claim 1,
 wherein said pressing part (14) and said pressure receiving part (30b) slide in said functioning range.
3. The yarn feeder (4) for the flatbed knitting machine according to claim 1 or 2,
 wherein said elevation mechanism (4a) comprises:

a guiding part (1b) that is installed on said base body (1) and guides aid up-down movement of said feeder rod (2);
 a cam plate (32) that is installed on said brake member (3) and drives the up-down movement of the feeder rod (2); and
 a driven part (21) that is installed on the feeder

rod (2) and is driven by the cam plate (32).

4. The yarn feeder (4,50,60) for the flatbed knitting machine according to any one of claims 1 to 3,
 wherein said brake member (3,63) has such shape
 that pressure from said pressing part (31,65) is in-
 creased on said pressure receiving part (30b,63b)
 rather than on said both end portions
 (30a,30c;63a,63c), and
 the brake member (3,63) is provided with shift parts
 (30d,30e;63d,63e) on which the pressure is smooth-
 ly increased by moving to the pressure receiving part
 (30b,63b) from the both end portions
 (30d,30e;63d,63e) on which the pressure is de-
 creased.

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5. The yarn feeder (50) for the flatbed knitting machine
 according to any one of claims 1, 2, and 4,
 wherein said elevation mechanism (50a) comprises:

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a guiding part (54) and a cam plate (32) for guid-
 ing and driving said up-down movement of said
 feeder rod (52) respectively, which are installed
 on said brake member (53), and
 a driven arm (56) that is installed on the feeder
 rod (52) and is driven by the cam plate (32).

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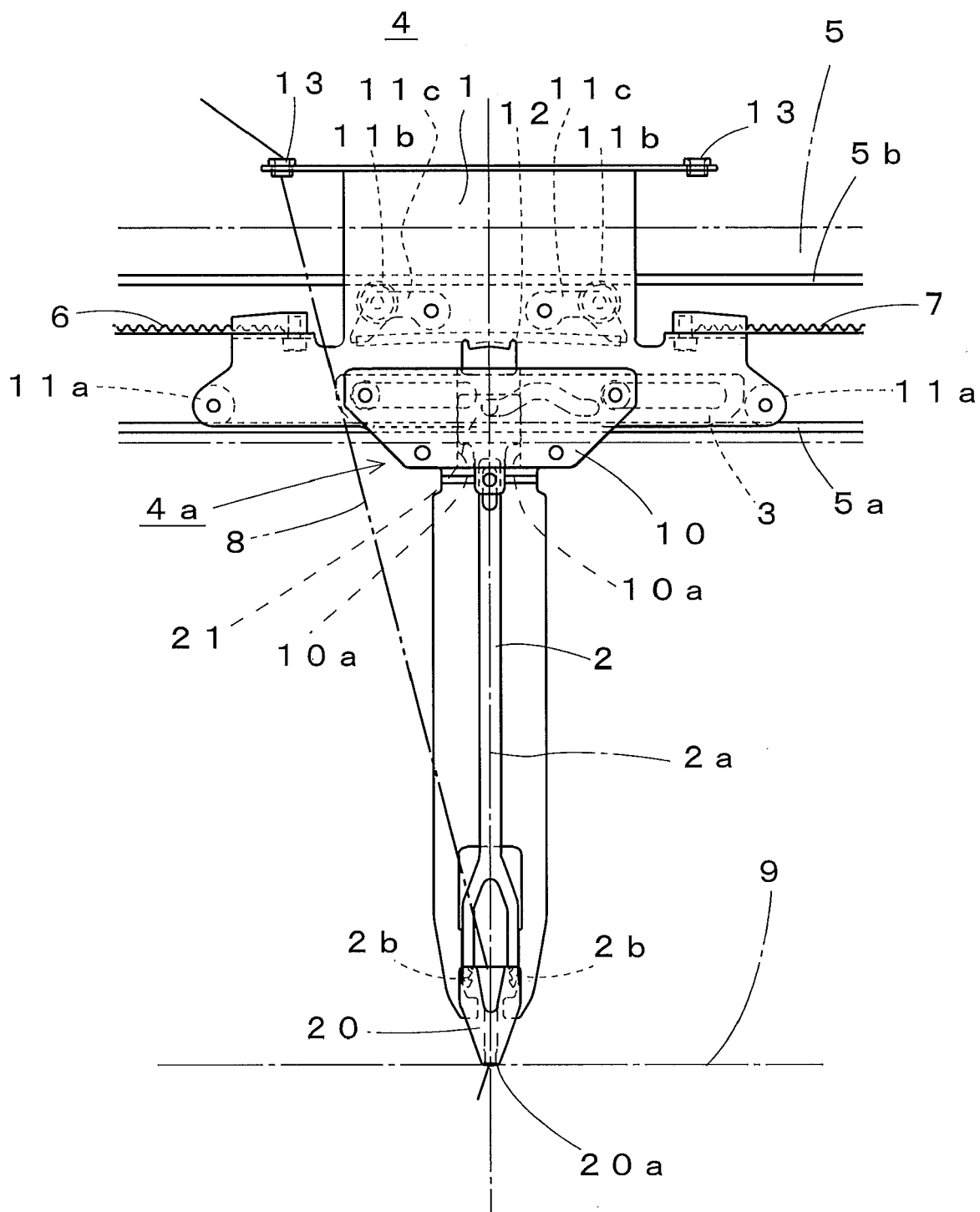
6. The yarn feeder (60) for the flatbed knitting machine
 according to claim 1,
 wherein said pressing part (65) and aid pressure re-
 ceiving part (63b) oscillate about an oscillation shaft
 (65) installed on said base body in said functioning
 range.

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7. The yarn feeder (4,50,60) for the flatbed knitting ma-
 chine according to any one of claims 1 to 6,
 wherein said base body (1,51) has rollers (11a,11b)
 running on a rail (5a,5b) installed on said running
 path (5), and
 said sliding resistance is generated by the rail and
 said braking surface (31;63b) of said brake member
 (3,53,63).

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Fig. 1



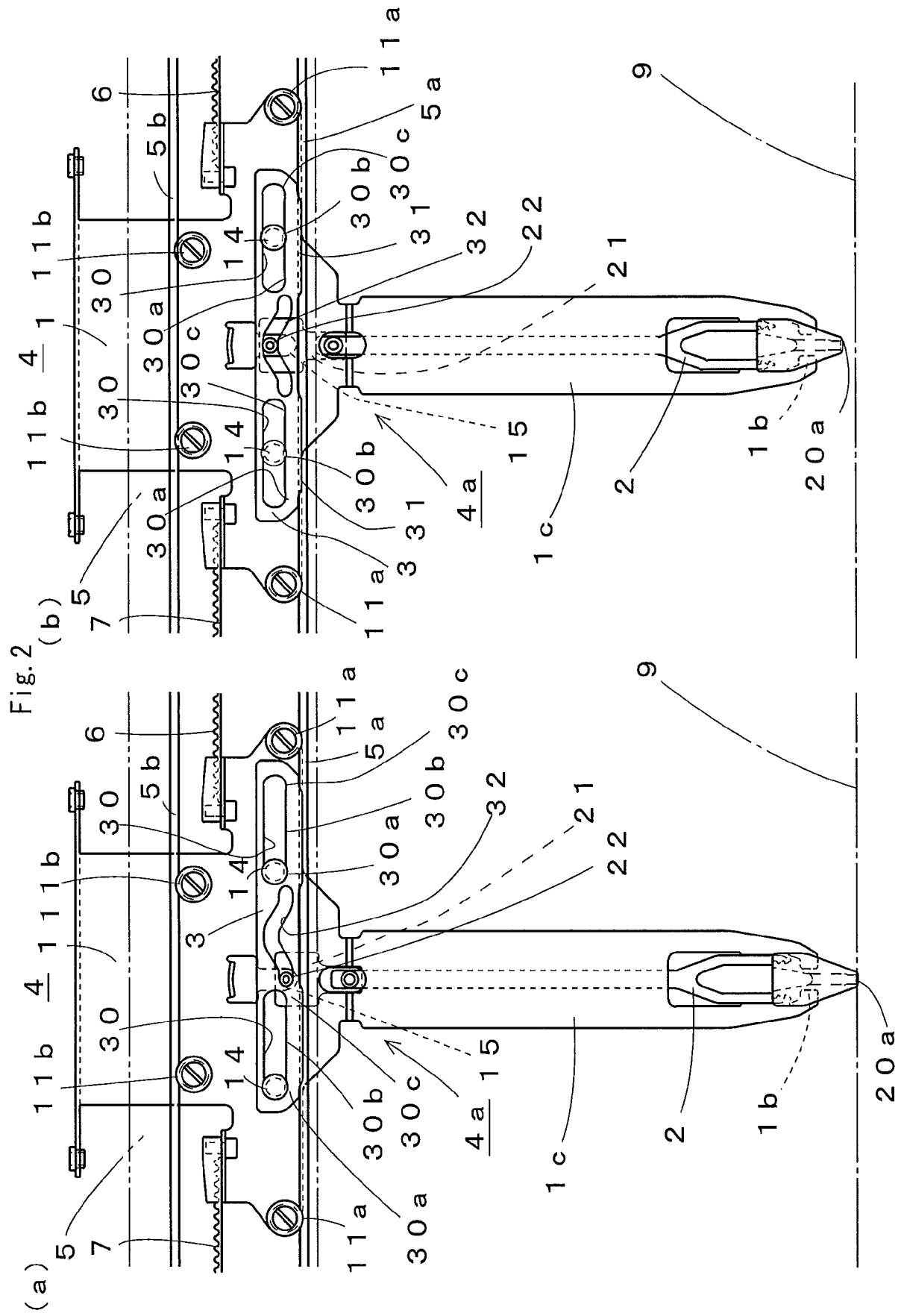
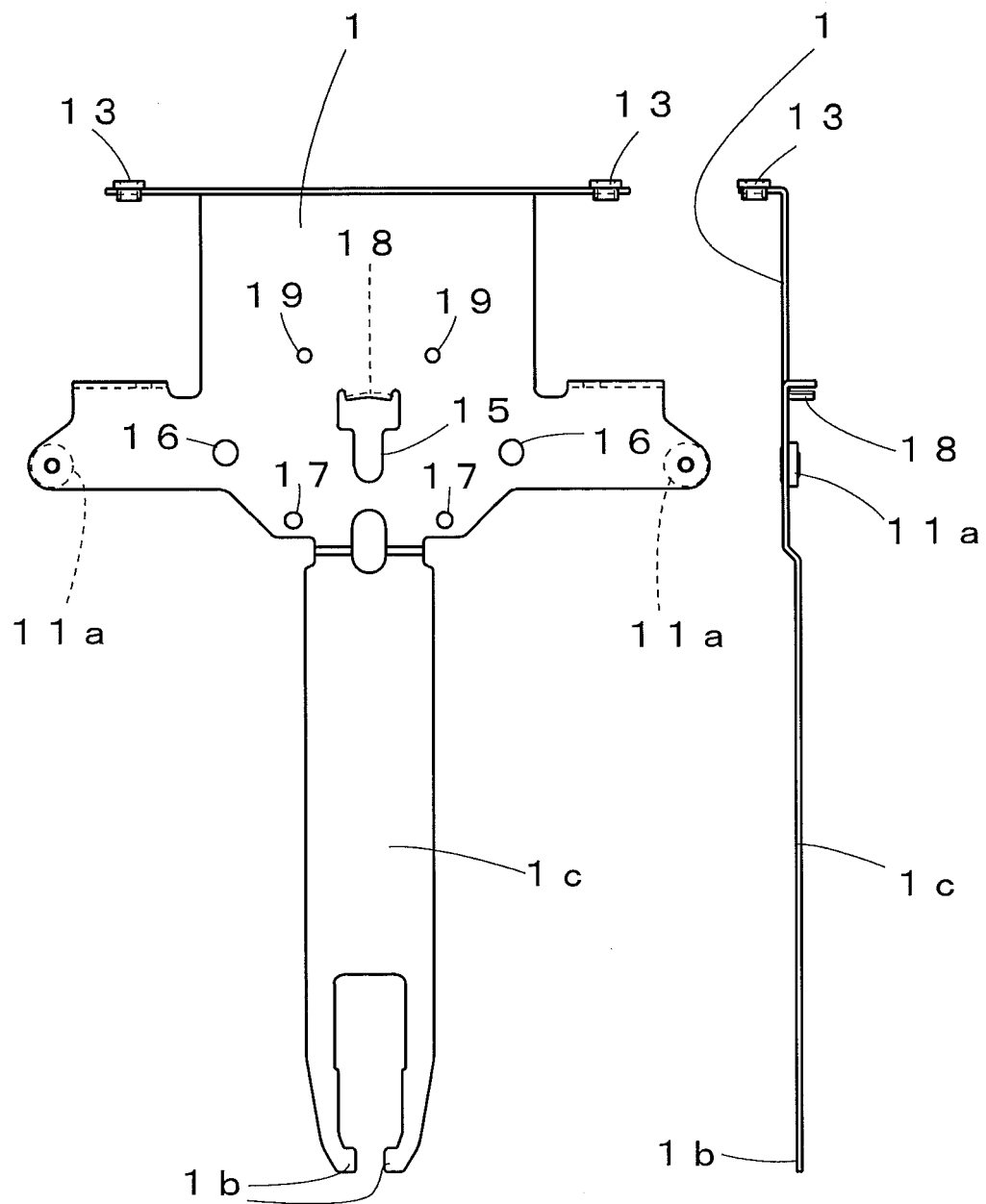


Fig. 3



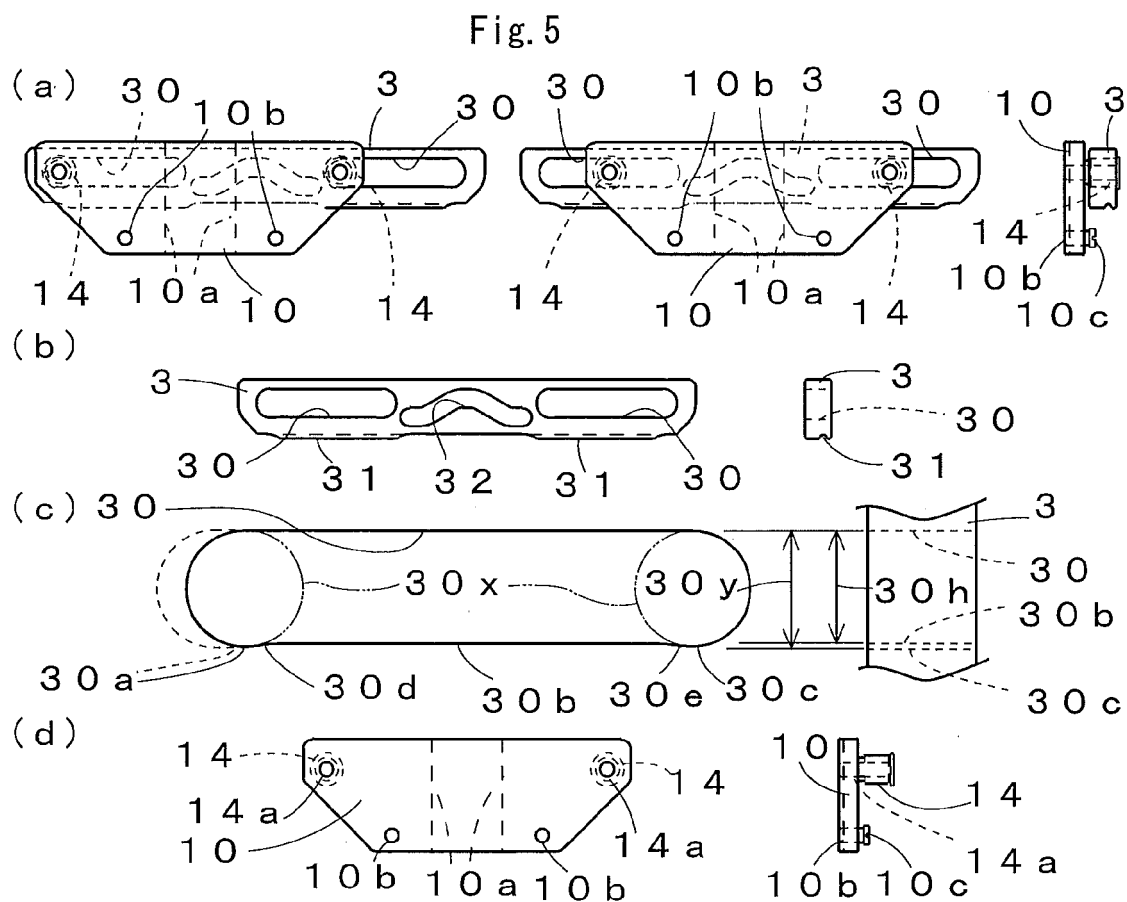
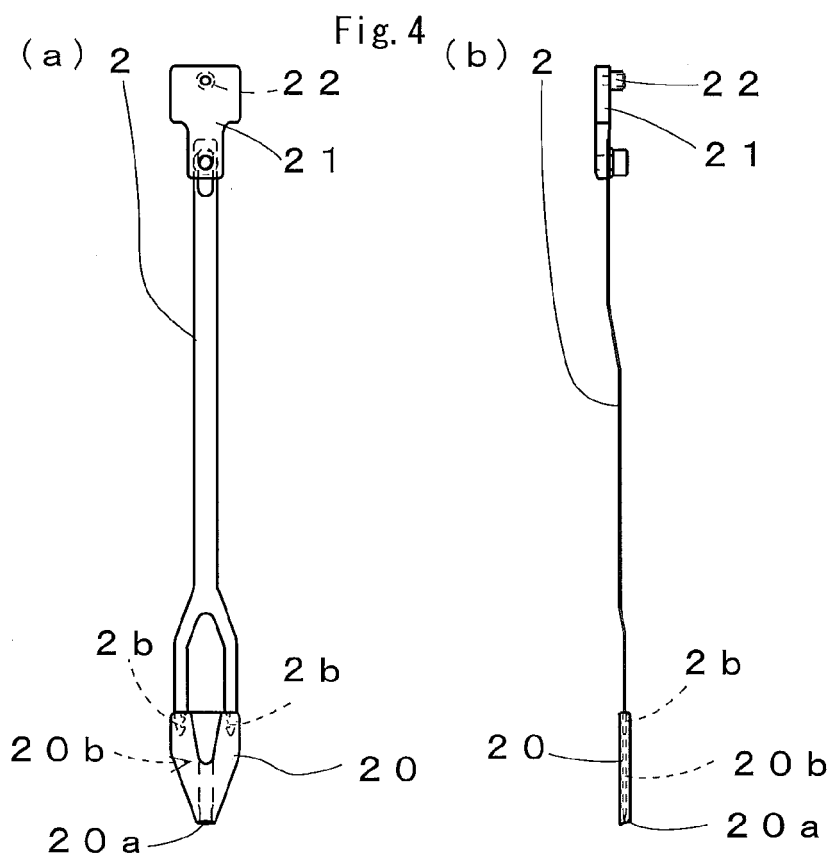


Fig. 6

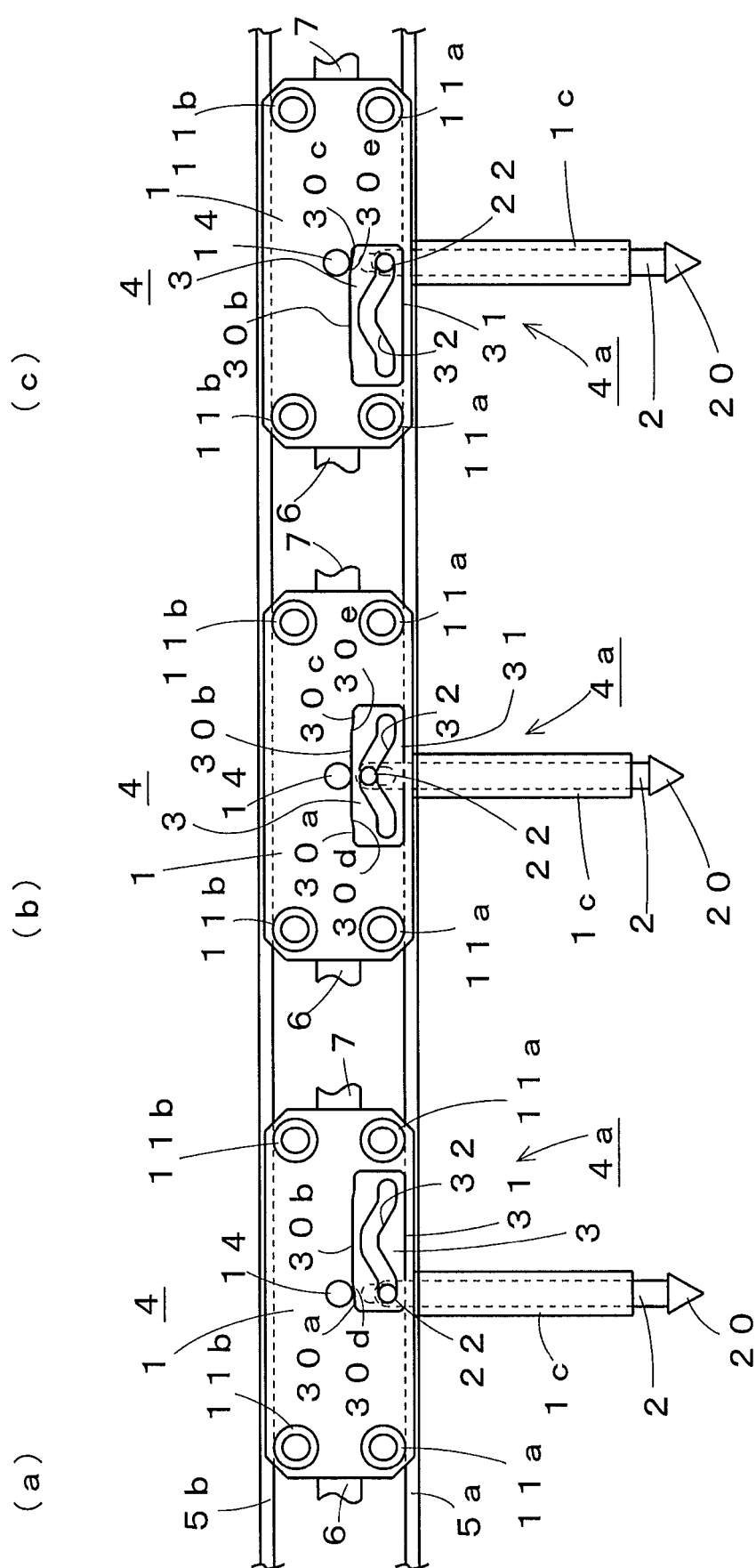


Fig. 7

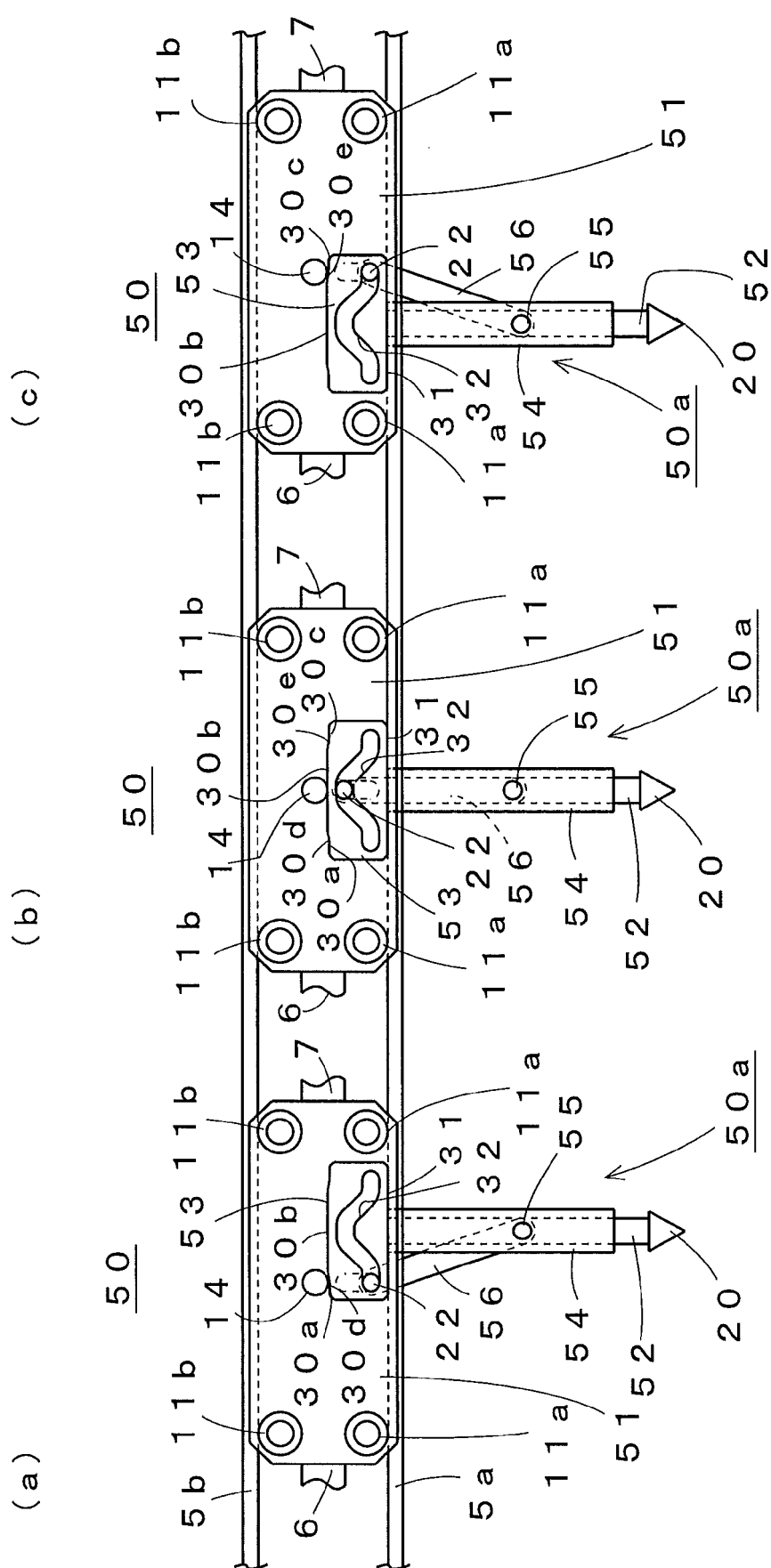
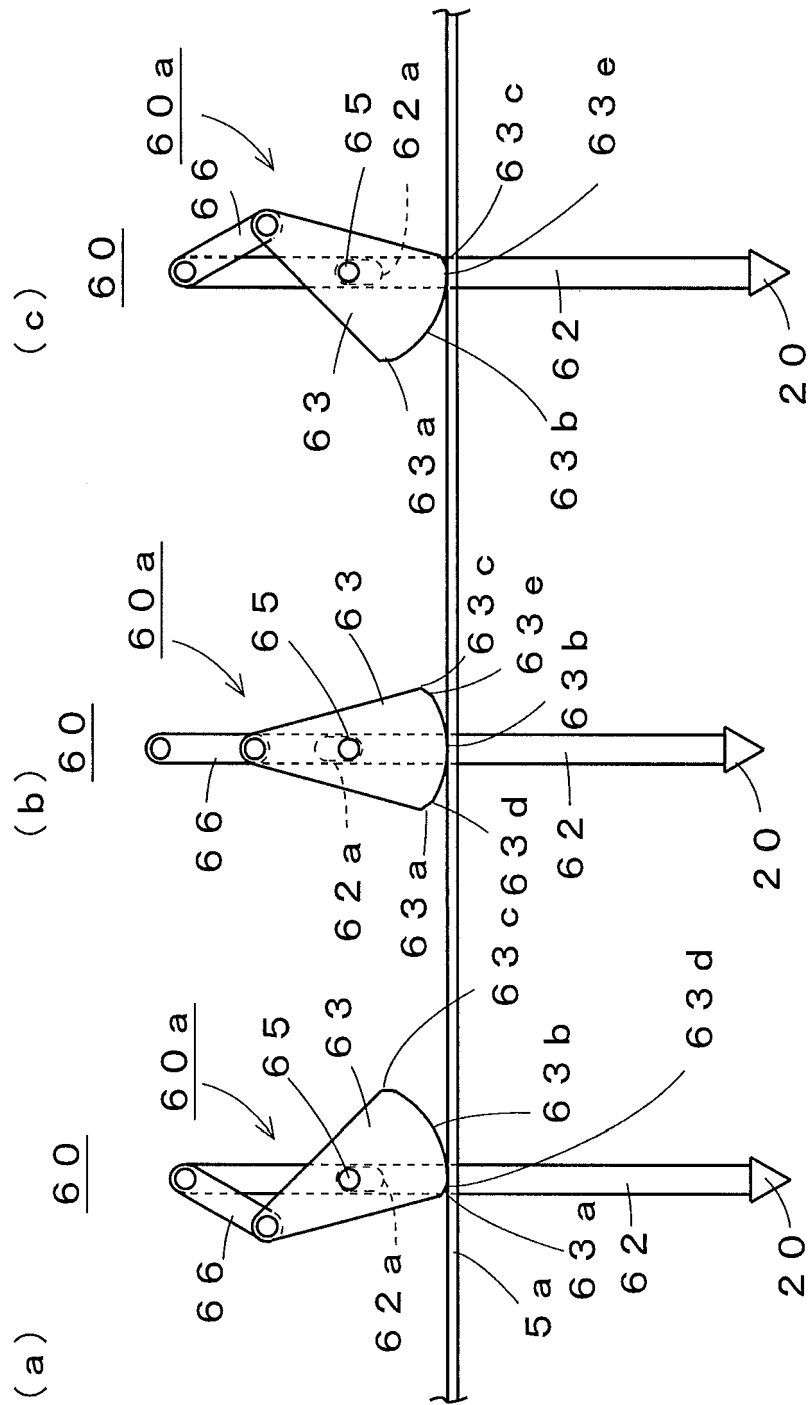


Fig. 8





EUROPEAN SEARCH REPORT

Application Number
EP 19 16 6013

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A	US 4 738 124 A (STOLL THOMAS [DE] ET AL) 19 April 1988 (1988-04-19) * column 3, line 22 - column 4, line 44; claims 1, 3, 4, 9, 10; figures 1-4 *	1-3,5-7	INV. D04B15/56
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			D04B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 June 2019	Examiner Messai, Sonia
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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