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(71) Applicant: **MURATA KIKAI KABUSHIKI KAISHA**
Minami-ku Kyoto-shi Kyoto 601 (JP)

(72) Inventor: **Yamasaki, Masaru**
Nagaokakyo-shi Kyoto (JP)

(74) Representative: **Liedl, Christine et al**
c/o Hansmann & Vogeser,
Albert-Rosshaupter-Strasse 65
81369 München (DE)

(54) Yarn twisting machine comprising a yarn package supply

(57) In a yarn twisting machine in which a supply yarn package is provided at an upper side of a machine frame, since the supply yarn package is located higher than an average height of a worker, a replacing work is difficult.

In a yarn twisting machine 1 in which a supply yarn package 10 is provided at an upper side of a machine frame 2, a supply yarn bobbin elevating and lowering supporting device 9 is provided for elevating and lowering the supply yarn package 10. The supply yarn bobbin elevating and lowering supporting device 9 includes a spring 36 for urging in an elevating direction, a bobbin supporting frame 28 which supports the supply yarn package 10, and a stopping means 40 for stopping the bobbin supporting frame 28 at a lowered position. By the bobbin supporting frame 28 being held at the lowered position, the stopping means 40 is operated automatically. A gripper 39 is provided on the bobbin supporting frame 28 and a releasing lever 45 is provided on the gripper 39 for releasing the operation of the stopping means 40.

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a yarn twisting machine in which a supply yarn package is provided at an upper side of a machine frame. In particular, the present invention relates to technology of a yarn twisting machine for industrial materials such as a cable yarn twisting machine for a tire cord.

Description of the Related Art

[0002] Conventionally, technology of a yarn twisting machine for industrial materials is publicly known. For example, there is technology disclosed in the Patent Document 1. In such a yarn twisting machine, supply yarn packages are disposed at upper and lower sides of a machine frame, and winding packages, which twisted yarn is wound around each of the winding packages, are disposed at a center part of the machine frame. A first yarn and a second yarn fed from the upper and the lower supply yarn packages are twisted together, and twisted yarn is produced. Here, the lower supply yarn package is supported in a stationary state inside a yarn twisting device, and the first yarn is fed from the lower supply yarn package. The second yarn fed from the upper supply yarn package is guided to the yarn twisting device located at the lower side, and rotated in a radiating direction by a yarn twisting rotor of the yarn twisting device. Then, the rotated second yarn is entangled with the first yarn and both of the yarns are twisted together.

[0003] Patent Document 1: Japanese Registered Patent Publication No. 2598516

[0004] According to the yarn twisting machine disclosed in the Patent Document 1, the upper supply yarn package is supported on a bobbin supporting frame provided at the upper side of the machine frame. The supply yarn package on the bobbin supporting frame is located higher than a head of a general worker. When the worker replaces the supply yarn package, the worker needs to work at a high place by using a ladder, a stool or the like. Therefore, there are many inconveniences in the work.

[0005] That is, the problem to be solved is that in the yarn twisting machine in which the supply yarn package is provided at the upper side of the machine frame, since the supply yarn package is located higher than an average height of the worker, the replacing work is difficult.

SUMMARY OF THE INVENTION

[0006] The problem to be solved by the present invention is as described above. In the following, means for solving the problem will be described.

[0007] That is, according to the present invention, in a yarn twisting machine in which a supply yarn package is provided at an upper side of a machine frame, an elevating and lowering supporting device is provided for elevating and lowering the supply yarn package. The elevating and lowering supporting device includes an urging means for urging in an elevating directing, a supporting member which supports the supply yarn package. The elevating and lowering supporting device also includes a stopping means for stopping the supporting member at a lowered position.

[0008] According to the present invention, the stopping means is preferable to be operated automatically by the supporting member being held at the lowered position.

[0009] Furthermore, according to the present invention, a gripper is preferable to be provided on the supporting member. In addition, an operating means is preferable to be provided on the gripper for releasing the operation of the stopping means.

[0010] As effects of the present invention, there are following effects.

[0011] That is, according to the present invention, since load of the worker is reduced in the elevating and lowering work of the supporting member, operationality is improved. In addition, since the supporting member can be held at the lowered position, when removing an empty bobbin or supplying a supply yarn package, the worker is not necessary to work at a high place and the operationality is improved.

[0012] According to the present invention, by the preferred embodiment in which the stopping means is operated automatically by the supporting member being held at the lowered position, the operationality is improved even more when removing an empty bobbin or supplying a supply yarn package.

[0013] Furthermore, according to the present invention, by the preferred embodiment in which the gripper is provided on the supporting member and the operating means is provided on the gripper for releasing the operation of the stopping means, the operationality is improved even more when removing an empty bobbin or supplying a supply yarn package.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Figure 1 is a front view showing a yarn twisting machine according to an embodiment of the present invention.

Figure 2 is a front view showing a supply yarn bobbin elevating and lowering supporting device of the yarn twisting machine located at an elevated position.

Figure 3 is a side view showing the supply yarn bobbin elevating and lowering supporting device.

Figure 4 is a front view showing the supply yarn bobbin elevating and lowering supporting device located at a lowered position.

Figure 5 is a side view showing a tensor frame of the yarn twisting machine.

Figure 6 is a rear view showing the tensor frame.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] A yarn twisting machine for industrial materials 1, which is an embodiment of the present invention, will be described with reference to drawings.

[0016] First, referring to Figure 1, the entire configuration of the yarn twisting machine for industrial materials (hereinafter referred to as the "yarn twisting machine") 1 will be described. Figure 1 is a view of the yarn twisting machine 1 when viewing the yarn twisting machine 1 from a longitudinal direction of a machine frame 2. When viewing the yarn twisting machine 1 from this direction, yarn twisting units 3 are disposed at left and right of the machine frame 2, respectively. The left and the right yarn twisting units 3 are provided in a plurality along the longitudinal direction of the machine frame 2. Each of the plurality of the yarn twisting units 3 of the yarn twisting machine 1 has the same configuration. Therefore, in the following, the configuration of one of the yarn twisting units 3 will be described. Further, in the following, the longitudinal direction of the machine frame 2 will be referred as a front-back direction of the yarn twisting machine 1, and a lateral direction of the machine frame 2 will be referred as a left-right direction of the yarn twisting machine 1.

[0017] A yarn twisting device 8 is provided in a lower part of the yarn twisting unit 3. The yarn twisting device 8 is a device adopting a method for twisting together two yarns into one yarn. The yarn twisting device 8 includes a stationary bobbin case 4 and a yarn twisting rotor 8a. A supply yarn package 5 is provided in the stationary bobbin case 4. A first yarn Y1 fed from the supply yarn package 5 is guided through a tension applying device 6 and reaches a length adjuster 7. A supply yarn bobbin elevating and lowering supporting device 9 is provided in an upper part of the yarn twisting unit 3. A supply yarn package 10 is supported on the supply yarn bobbin elevating and lowering supporting device 9. A second yarn Y2 fed from the supply yarn package 10 is fed via a nip tensor 12, guided through a guide pipe 11 and lead to a lower end of the yarn twisting device 8. The second yarn Y2 is fed in a radiating direction by the yarn twisting rotor 8a. The second yarn Y2 is ballooned by being circled around the stationary bobbin case 4 and guided to the length adjuster 7. Further, the length adjuster 7 is a device that evens twisting lengths of both of the yarns Y1 and Y2.

[0018] A twisted yarn Y produced via the length adjuster 7 is guided via a guide roller 13 and a feed roller 14 to between a winding roller 23 and a winding package 24. Then, the twisted yarn Y is wound around the winding package 24. Further, the winding package 24 is formed on an outer periphery of an empty bobbin supported on a bobbin supporting shaft 22. The empty bobbin is a flanged bobbin having flanges at both ends. A shaft diameter and an outer diameter of the winding roller 23 are set according to a size of the flanges of the empty bobbin. Devices such as a yarn monitor are disposed along a yarn path leading from the length adjuster 7 to the winding package 24.

[0019] Next, referring to Figure 2 through Figure 4, the supply yarn bobbin elevating and lowering supporting device 9 will be described. As shown in Figure 2 and Figure 3, the supply yarn bobbin elevating and lowering supporting device 9 includes a bobbin supporting frame 28 on which bobbin supporting shafts 25, 26 and 27 are provided in standing conditions. Bobbins 10a of the supply yarn packages 10 are supported on each of the bobbin supporting shafts 25, 26 and 27, respectively. As shown in Figure 3, when compared with the bobbin supporting shafts 25 and 26, the bobbin supporting shaft 27 is displaced in the front-back direction. Therefore, even when the supply yarn packages 10 are disposed on all of the bobbin supporting shafts, each of the supply yarn packages 10 do not contact with one another.

[0020] The bobbin supporting frame 28 and a supporting frame 29, which is secured on the upper part of the machine frame 2, are connected via a parallel link. The parallel link consists of a first link arm 30 and a second link arm 31. Both of the link arms 30 and 31 are respectively provided on both the bobbin supporting frame 28 and the supporting frame 29, in a manner capable of being swung. A rotary supporting shaft 32 is provided between the bobbin supporting frame 28 and the first link arm 30. A rotary supporting shaft 33 is provided between the bobbin supporting frame 28 and the second link arm 31. A rotary supporting shaft 34 is provided between the supporting frame 29 and the first link arm 30. A rotary supporting shaft 35 is provided between the supporting frame 29 and the second link arm 31.

[0021] Since the parallel link is formed by the first link arm 30 and the second link arm 31, if one of the link arms is stopped, the other link arm is also stopped and the elevating and the lowering of the bobbin supporting frame 28 are also stopped. A spring 36 is provided between the bobbin supporting frame 28 and the first link arm 30. The spring 36 urges the bobbin supporting frame 28 and the first link arm 30 so that the bobbin supporting frame 28 and the first link arm 30 are approached closer to one another around the rotary supporting shaft 32. A damper 37 is provided between the rotary supporting shafts 33 and 34. The damper 37 slows by the spring 36, an approaching speed of the bobbin supporting frame 28 and the first link arm 30, in other words, an elevating and lowering speed of the bobbin supporting frame 28.

[0022] As shown in Figure 2, under a state in which an external force of a worker or the like is not applied, the bobbin supporting frame 28 moves to an elevated position by the urging force of the spring 36. In the following, the elevated position of the bobbin supporting

frame 28 refers to a stable position under a condition in which the external force is not applied, as shown in Figure 2. Under a state in which the bobbin supporting frame 28 is located at the elevated position, the twisted yarn Y is produced by the yarn twisting unit 3.

[0023] Here, the bobbin supporting frame 28 is urged downward by an empty weight at all times. In particular, under a state in which the supply yarn packages 10 are disposed on all of the bobbin supporting shafts 25, 26 and 27 (maximum loading state), the bobbin supporting frame 28 is urged downward by the total weight of the supply yarn packages 10. On the contrary, the urging force of the spring 36 is set at magnitude sufficient for elevating the bobbin supporting frame 28 even under the maximum loading state. Under the state in which the external force is not applied, the bobbin supporting frame 28 is supported stably at the elevated position. Further, stoppers 38 and 38 that can make a contact with the second link arm 31 are provided on the first link arm 30. Under a state in which the second link arm 31 is contacting with the stoppers 38 and 38, the second link arm 31 is restricted from moving towards the first link arm 30. By the restriction of the stoppers 38 and 38, a range in which the bobbin supporting frame 28 swings to an elevating side is limited. Accordingly, the bobbin supporting frame 28 located at the elevated position is stabilized, and the left and the right supply yarn bobbin elevating and lowering supporting devices 9 and 9 do not contact with one another.

[0024] As shown in Figure 2 and Figure 3, a pair of grippers 39 and 39 that protrude forward and backward are provided on a lower end of the bobbin supporting frame 28. The worker can lower the bobbin supporting frame 28 by gripping and pulling down the gripper 39.

[0025] The supply yarn bobbin elevating and lowering supporting device 9 includes a stopping means 40 for stopping the bobbin supporting frame 28 at a lowered position. The stopping means 40 will be described. The stopping means 40 consists of a lock arm 41, engaging members 44 and a spring 43. In the following, the lowered position of the bobbin supporting frame 28 refers to a position in which the bobbin supporting frame 28 is stopped by receiving a restriction of the stopping means 40 (detail will be described later) , as shown with solid lines in Figure 4. Under a state in which the bobbin supporting frame 28 is located at the lowered position, an empty bobbin is removed from the bobbin supporting frame 28 or a new supply yarn package 10 is supplied to the bobbin supporting frame 28.

[0026] The lock arm 41 is provided on an end part of the first link arm 30, located to the side of the rotary supporting shaft 34. The lock arm 41 is provided capable of swinging around a rotary supporting shaft 42. The spring 43 is provided between the lock arm 41 and the first link arm 30. A tip end of the lock arm 41 (the end located to an opposite side of the rotary supporting shaft 34) is urged towards the rotary supporting shaft 34 by the spring 43. Meanwhile, a pair of plate-like engaging members 44 and 44 are secured on left and right of the supporting frame 29. Each of the engaging members 44 and 44 can be engaged with the lock arm 41 of each of the supply yarn bobbin elevating and lowering supporting device 9. In more detail, the engaging member 44 and the lock arm 41 are engaged with one another by an engagement of a hook 41a formed at a tip end of the lock arm 41 and a bottom surface 44a of the engaging member 44.

[0027] As shown in Figure 4, the engaging member 44 and the lock arm 41 are engaged with one another at the lowered position of the bobbin supporting frame 28. Under the engaged state, the lock arm 41 is urged by the spring 36 towards the elevating side of the bobbin supporting frame 28. Therefore, a force is applied in a direction in which the bottom surface 44a and the hook 41a are contacted with one another. In other words, the engaging member 44 and the lock arm 41 are urged by the spring 36 to be engaged even more. Moreover, the lock arm 41 is urged by the spring 43 towards the rotary supporting shaft 34 and pushed against the engaging member 44. Therefore, the lock arm 41 is prevented from swinging around the rotary supporting shaft 42, and the engaging member 44 and the lock arm 41 are not disengaged.

[0028] Further, the lock arm 41 can be engaged with the engaging member 44 by an operation of the worker gripping the grippers 39 and 39 and pushing down the bobbin supporting frame 28. That is, the locking operation of the bobbin supporting frame 28 by the worker becomes unnecessary. The lock arm 41 is urged to swing towards the rotary supporting shaft 42 by the spring 43 at all times. Therefore, accompanying the lowering of the bobbin supporting frame 28, after the lock arm 41 makes a contact with the side surface of the engaging member 44, the hook 41a moves into below the bottom surface 44a. Then, the lock arm 41 and the engaging member 44 are engaged. After the lock arm 41 and the engaging member 44 are engaged, the lock arm 41 and the engaging member 44 are not disengaged easily due to the above-described reasons.

[0029] The supply yarn bobbin elevating and lowering supporting device 9 also includes an operating means for releasing an operation of the stopping means 40. A releasing lever 45 as the operating means for releasing the operation of the stopping means 40 is provided to the gripper 39. A link wire 46 is provided between the releasing lever 45 and the tip end of the lock arm 41 (the end located to an opposite side of the rotary supporting shaft 42). By operating the releasing lever 45, the lock arm 41 is swung towards an opposite side of the rotary supporting shaft 34 (in a direction to be separated from the engaging member 44). Further, the bottom surface 44a of the engaging member 44 is formed as a horizontal surface. Therefore, when the lock arm 41 swings around the rotary supporting shaft 34, the hook 41a does not resist against the bottom surface 44a.

[0030] The above-described structure of the supply

yarn bobbin elevating and lowering supporting device 9 will be summarized. In the structure in which the supply yarn packages 10 are disposed at the upper side of the machine frame 2, the yarn twisting unit 3 (the yarn twisting machine 1) includes the supply yarn bobbin elevating and lowering supporting device 9 for elevating and lowering and supporting the supply yarn packages 10. The supply yarn bobbin elevating and lowering supporting device 9 includes an urging means (the spring 43) for urging in the elevating direction, a supporting member (the bobbin supporting frame 28) that supports the supply yarn packages 10. The supply yarn bobbin elevating and lowering supporting device 9 also includes the stopping means 40 for stopping the supporting member (the bobbin supporting frame 28) at the lowered position.

[0031] Thus, the vertical position of the supporting member (the bobbin supporting frame 28) can be changed, and the exterior force (force applied by the worker) applied when elevating the supporting member (the bobbin supporting frame 28) becomes unnecessary. By providing the stopping means 40, the supporting member (the bobbin supporting frame 28) can be held at the lowered position.

[0032] Therefore, since load of the worker is reduced in the elevating and lowering work of the supporting member (the bobbin supporting frame 28), operationality is improved. Moreover, since the supporting member (the bobbin supporting frame 28) can be held at the lowered position, when removing an empty bobbin or supplying a new supply yarn package 10, the worker is not required to work at a high place and the operationality is improved.

[0033] The supply yarn bobbin elevating and lowering supporting device 9 (the yarn twisting machine 1) is formed so that the stopping means 40 operates automatically by the supporting member (the bobbin supporting frame 28) being held at the lowered position.

[0034] Further, in the present embodiment, as described above, the stopping means 40 consists of the lock arm 41 provided on the first link arm 30, the engaging member 44 provided on the supporting frame 29 and the spring 43 provided between the lock arm 41 and the first link arm 30. Since the lock arm 41 is urged towards the engaging member 44 by the spring 43, when the bobbin supporting frame 28 is lowered, the lock arm 41 and the engaging member 44 are engaged. Here, the structure in which the stopping means 40 operates automatically by the bobbin supporting frame 28 being held at the lowered position is not limited to the present embodiment.

[0035] Therefore, by moving the supporting member (the bobbin supporting frame 28) to the lowered position, without carrying out a locking operation separately, the supporting member (the bobbin supporting frame 28) is stopped (restricted) at the lowered position.

[0036] Thus, the operationality is further improved when removing an empty bobbin or supplying a new supply yarn package 10.

[0037] Moreover, the grippers 39 and 39 are provided on the supporting member (the bobbin supporting frame 28), and an operating means (the releasing lever 45) for releasing the operation of the stopping means 40 is provided to the grippers 39.

[0038] Therefore, the gripper 39 which is the operating means for lowering the supporting member (the bobbin supporting frame 28), and the operating means (the releasing lever 45) for releasing the operation of the stopping means 40 are located close together, and the worker can operate the operating means (the releasing lever 45) with a hand gripping the gripper 39. In other words, since operation parts involved in the elevating and the lowering of the supporting member (the bobbin supporting frame 28) are disposed concentrated, the worker can easily carry out the operation.

[0039] As a result, the operationality is improved even more for removing an empty bobbin or supplying a new supply yarn package 10.

[0040] Next, referring to Figure 1 and Figure 5, a tension adjusting means of the second yarn Y2 leading from the supply yarn package 10 to the yarn twisting device 8 will be described. As shown in Figure 1, the second yarn Y2 unwound from the supply yarn package 10 is fed via a ball tensor 48 and a gate tensor 49 provided on the bobbin supporting frame 28 to the nip tensor 12. Then, the second yarn Y2 is supplied via the guide pipe 11 to the yarn twisting device 8. The ball tensor 48 and the gate tensor 49 are provided on a tensor frame 50 that is secured on an upper end of the bobbin supporting frame 28.

[0041] The second yarn Y2 located downstream of the nip tensor 12 is applied with appropriate tension in the nip tensor 12. In addition, the second yarn Y2 is guided by the guide pipe 11. Therefore, defects such as hanging down of the yarn due to the lack of the tension are not generated. On the contrary, immediately after being unwound from the supply yarn package 10 and until reaching the nip tensor 12, the second yarn Y2 is fed without being guided by a guiding means such as the guide pipe 11. Therefore, when the lack of the tension is generated in this part of the second yarn Y2, the hanging down of the second yarn Y2 is generated. To prevent the lack of the tension, as a tension applying device for the second yarn Y2, the ball tensor 48 and the gate tensor 49 are provided on the bobbin supporting frame 28.

[0042] Referring to Figure 2 and Figure 5, positions where the ball tensor 48 and the gate tensor 49 are provided will be described. As shown in Figure 2, a supporting frame 47 extends from the upper end of the bobbin supporting frame 28 towards a side of the machine frame 2. As shown in Figure 2 and Figure 5, the tensor frame 50 is secured on the tip end of the supporting frame 47. The ball tensor 48 and the gate tensor 49 are provided on the tensor frame 50. The second yarn Y2 unwound from the supply yarn package 10 passes

through the ball tensor 48, then, passes through the gate tensor 49 and is fed towards the nip tensor 12.

[0043] As shown in Figure 5, a through-hole 50d is formed on the tensor frame 50 at a side of the supporting frame 47. The second yarn Y2 passes the through-hole 50d in an upward direction. Further, the supply yarn package 10 is located below the tensor frame 50. The second yarn Y2 that passed through the through-hole 50d passes through the ball tensor 48 located above the through-hole 50d.

[0044] Referring to Figure 5 and Figure 6, a structure of the ball tensor 48 will be described. A first plate 51 and a second plate 52 having a shape of approximately the letter "L" in a lateral cross-sectional view are secured on an upper surface of the tensor frame 50. Both of the plates 51 and 52 having the shape of approximately the letter "L" are formed into secured portions 51a and 52a and opened portions 51b and 52b with a bent part as a boundary. The secured portions 51a and 52a are placed in an overlapping relation one on the other. In addition, the opened portions 51b and 52b are disposed with an interval therebetween. A through-hole is formed penetrating vertically through the opened portion 51b. A yarn guide 53, which is a tubular member, is fit inside the through-hole. A releasing hole 52c is formed penetrating vertically through the opened portion 52b. A tensor ball 54 is disposed between the yarn guide 53 and the releasing hole 52c. The tensor ball 54 is supported by the yarn guide 53 on the first plate 51 and the second plate 52 in a manner capable of moving vertically and incapable of falling out. The tensor ball 54 is urged by an empty weight to cover an inner part of the yarn guide 53. The second yarn Y2 that passed through the yarn guide 53 is sandwiched by the yarn guide 53 and the tensor ball 54 that covers the inner part of the yarn guide 53, and initial tension is applied to the second yarn Y2. That is, the ball tensor 48 consists of the tensor ball 54 which is a weight applying means for the yarn, the yarn guide 53 which sandwiches the yarn with the tensor ball 54, and a supporting mechanism of the tensor ball 54 consisting of the plates 51 and 52 or the like.

[0045] The second yarn Y2 fed by the ball tensor 48 is inserted into the gate tensor 49 along an extending direction (front-back direction) of the tensor frame 50.

[0046] Referring to Figure 5 and Figure 6, a structure of the gate tensor 49 will be described. The gate tensor 49 is formed by collecting a plurality of plate members on which a through-hole of the yarn is formed. A part of the plate members are formed capable of swinging with respect to other plate members. The plate members correspond to parallel parts 50a, 50b, 50e, 55a and 55b. The through-holes formed on the plate members correspond to yarn guides 57, 58, 59, 60 and 61. When viewing from a direction in which the yarn passes through, the through-holes of each of the plate members approach to one another and separate from one another by the swing of the part of the plate members. By using this movement of the through-holes, tension is applied to the yarn that passes through the gate sensor 49.

[0047] As shown in Figure 5, an end part of the tensor frame 50 located to an opposite side of the supporting frame 47 is protruding upward than the upper surface of other parts of the tensor frame 50, and formed in a shape of a horseshoe. The part having the shape of a horseshoe consists of a pair of parallel parts 50a and 50b, and a connecting part 50c which connects the parallel parts 50a and 50b. The parallel part 50e is provided downwards in a standing condition at a center of the connecting part 50c. The parallel parts 50a, 50b and 50e are parallel to one another. A lateral cross-sectional shape of the end part of the tensor frame 50 located to the opposite side of the supporting frame 47 is formed in a shape of letter "E", together with the parallel part 50e. A through-hole is formed through each of the parallel parts 50a, 50e and 50b, respectively. The yarn guides 57, 59 and 61, which are the tubular members, are fit inside the through-hole. The second yarn Y2 can pass through the inside of the yarn guides 57, 59 and 61.

[0048] A swinging member 55 is disposed inside the parallel parts 50a and 50b. The swinging member 55 is supported capable of swinging on the tensor frame 50 by a rotary supporting shaft 56 of the front-back direction. The swinging member 55 is formed in a shape of a horseshoe. An opened side of the shape of the horseshoe is disposed to face an opened side of the part having the shape of the letter "E" of the tensor frame 50. Further, the opened side of the swinging member 55 is facing upward, and the opened side of the tensor frame 50 is facing downward. The swinging member 55 consists of a pair of parallel parts 55a and 55b, and the connecting part 55c that connects the parallel parts 55a and 55b. A through-hole is formed through each of the parallel parts 55a and 55b, respectively. The yarn guides 58 and 60, which are the tubular members, are fit inside the through-hole. The second yarn Y2 can pass through the inside of the yarn guides 58 and 60.

[0049] As shown in Figure 6, when the bobbin supporting frame 28 is located at the elevated position (working state position) , the tensor frame 50 is supported under a slanted state by the bobbin supporting frame 28 so that the yarn guides 57, 59 and 61 are located at positions displaced sideward, instead of vertically below the rotary supporting shaft 56. Meanwhile, under a state in which no external force is applied, the swinging member 55 is stabilized under a state in which the yarn guides 58 and 60 are located directly below the rotary supporting shaft 56 by an empty weight. By the above-described structure, when viewing from the direction in which the second yarn Y2 is fed on the tensor frame 50 (front-back direction), the yarn guides 57, 59, 61 and the yarn guides 58, 60 are capable of approaching to one another and separating from one another by the swing of the swinging member 55. Here, when the second yarn Y2 is inserted through the yarn guides 57, 58, 59, 60, 61 and the second yarn Y2 is fed, the second yarn Y2 makes a contact with the yarn guides 58 and 60 and the

swinging member 55 is swung. The swinging member 55 is swung by contacting with the second yarn Y2. When the swinging member 55 is swung, the swinging member 55 makes a contact with the second yarn Y2 again to adjust the tension of the second yarn Y2.

[0050] As described above, the gate sensor 49 consists of the parallel parts 50a, 55a, 50e, 55b, 50b having the yarn guides 57, 58, 59, 60, 61, and the supporting mechanism of the parallel parts.

[0051] The second yarn Y2 fed from the yarn guide 61 of the gate sensor 49 is fed from an upper position of the machine frame 2 to the nip tensor 12 located at a lower position in the machine frame 2, without being guided. Here, the tension of the second yarn Y2 located at this part is adjusted by the ball tensor 48 and the gate sensor 49. Therefore, defects due to the lack of the tension are prevented.

[0052] The above-described tension adjusting means of the second yarn Y2 will be summarized. In the yarn twisting unit 3 (the yarn twisting machine 1), the supply yarn packages 10 are provided at the upper side of the machine frame 2. In addition, the tension applying device (the gate tensor 49) is provided for applying tension to the second yarn Y2 unwound from the supply yarn package 10 at the upstream side of the yarn twisting device 8. Furthermore, in the yarn twisting unit 3 (the yarn twisting machine 1), the initial tension applying device (the ball tensor 48) is provided at the yarn introducing side of the tension applying device (the gate tensor 49). Further, in the yarn feeding direction of the second yarn Y2, the supply yarn package 10 is disposed at the uppermost upstream side, the ball tensor 48 is disposed downstream of the supply yarn package 10, the gate tensor 49 is disposed downstream of the ball tensor 48 and the yarn twisting device 8 is disposed downstream of the gate tenor 49.

[0053] Therefore, in the initial tension applying device (the ball tensor 48), a fluctuation in the unwinding tension of the second yarn Y2 unwound from the supply yarn package 10 is absorbed. Moreover, since the second yarn Y2 applied with the tension by the initial tension applying device (the ball tensor 48) is fed to the tension applying device (the gate tensor 49), the second yarn Y2 is not slacked at the tension applying device (the gate tensor 49). That is, tension is applied appropriately to the second yarn Y2 in the tension applying device (the gate tensor 49).

[0054] Therefore, in the yarn path of the second yarn Y2 leading from the supply yarn package 10 located at the upper side of the machine frame 2 to the yarn twisting device 8 located at the lower side of the machine frame 2, the second yarn Y2 is fed without being slacked.

[0055] In the yarn twisting unit 3 (the yarn twisting machine 1) , the tension applying device (the gate tensor 49) and the initial tension applying device (the ball tensor 48) are provided at the bent part of the yarn path of the second yarn Y2.

[0056] Therefore, at the part where the yarn path of the second yarn Y2 is bent by the guide members or the like, the tension applied to the second yarn Y2 becomes even. In case the tension applying device is not provided at the bent part, the fluctuation in the tension applied by the guide members or the like at the bent part becomes large. Moreover, the second yarn Y2 is fed from the initial tension applying device (the ball tensor 48) towards the tension applying device (the gate tensor 49) without being bent.

[0057] As a result, the fluctuation in the tension of the second yarn Y2 is suppressed. Moreover, an angle at which the second yarn Y2 is introduced into the tension applying device (the gate tensor 49) can be set appropriately, and the efficiency in which the tension is applied by the tension applying device (the gate tensor 49) is improved.

[0058] Moreover, in the yarn twisting unit 3 (the yarn twisting machine 1), the initial tension applying device is a ball-method tensor (the ball tensor 48).

[0059] Therefore, when the second yarn Y2 passes through the tensor (the ball tensor 48), the second yarn Y2 is not rasped against the tensor ball 54 or the receiving member (the yarn guide 53) of the tensor ball 54. In case of applying the initial tension, in other words, in case of applying tension to the slacked yarn, it is effective to apply resistance to the yarn by sandwiching the yarn. However, in case the method for sandwiching the yarn is a disk method and not the ball method, there are defects that the yarn is rasped against the disk.

[0060] Therefore, in case of applying the initial tension, in other words, in case of applying the tension to the slacked yarn, the yarn is not damaged in the ball tensor 48.

Claims

1. A yarn twisting machine in which a supply yarn package is provided at an upper side of a machine frame, the yarn twisting machine comprising:

   an elevating and lowering supporting device for elevating and lowering the supply yarn package;

   characterized in that the elevating and lowering supporting device includes an urging means for urging in an elevating direction, a supporting member which supports the supply yarn package, and a stopping means for stopping the supporting member at a lowered position.

2. The yarn twisting machine according to claim 1, **characterized in that** by the supporting member being held at the lowered position, the stopping means is operated automatically.

3. The yarn twisting machine according to claim 2, **characterized in that** a gripper is provided on the supporting member and an operating means is provided on the gripper for releasing the operation of the stopping means.

FIG. 1

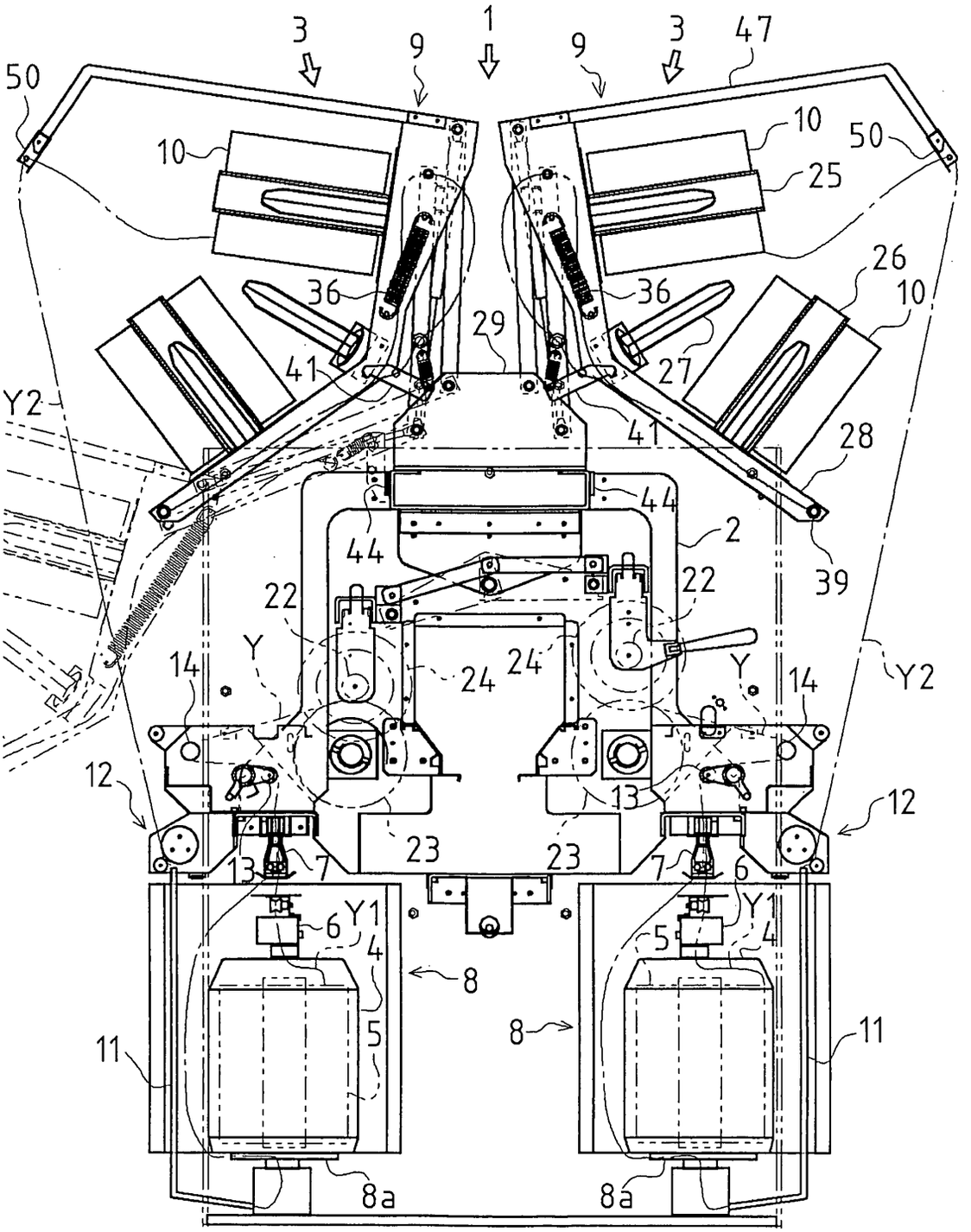

3
9
1
9
3
47
50
10
10
50
25
26
10
36
36
29
41
27
Y2
41
28
44
2
44
22
22
39
Y
24
24
Y
14
14
Y2
12
13
12
23
23
13
7
7
6
Y1
6
Y1
4
5
4
8
8
11
11
8a
8a

FIG. 2

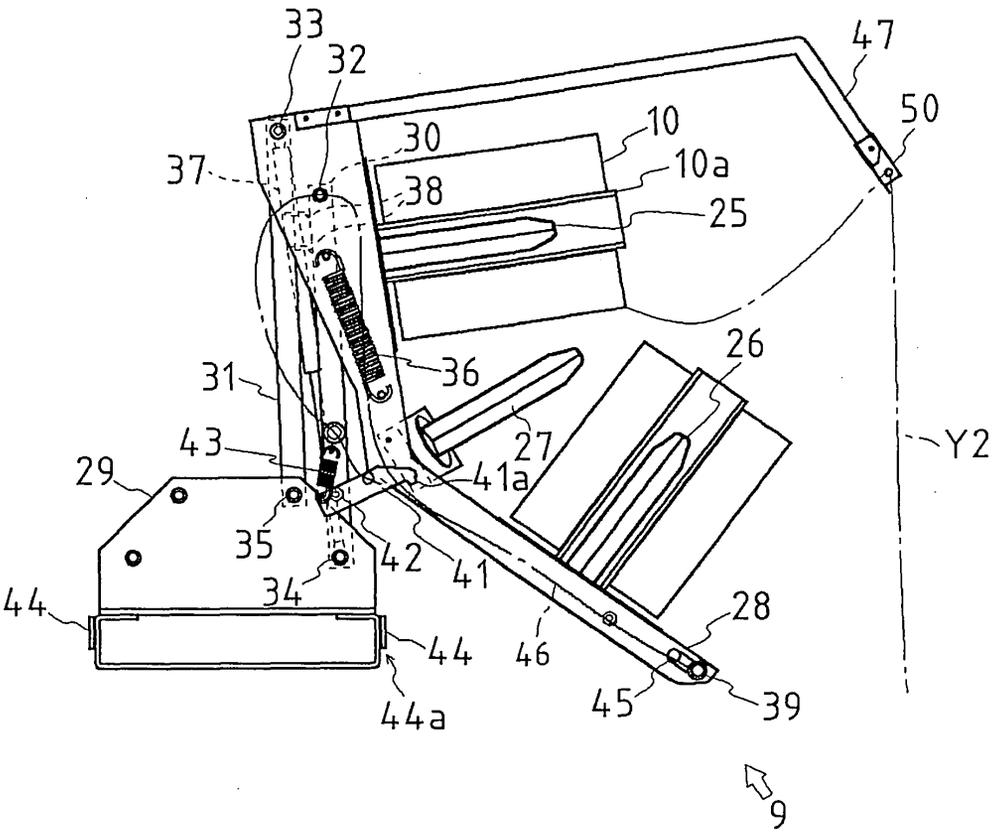

33
32
47
50
30
10
10a
37
38
25
26
36
31
27
43
41a
Y2
29
35
42
41
34
28
44
46
44
45
39
44a
9

FIG. 3

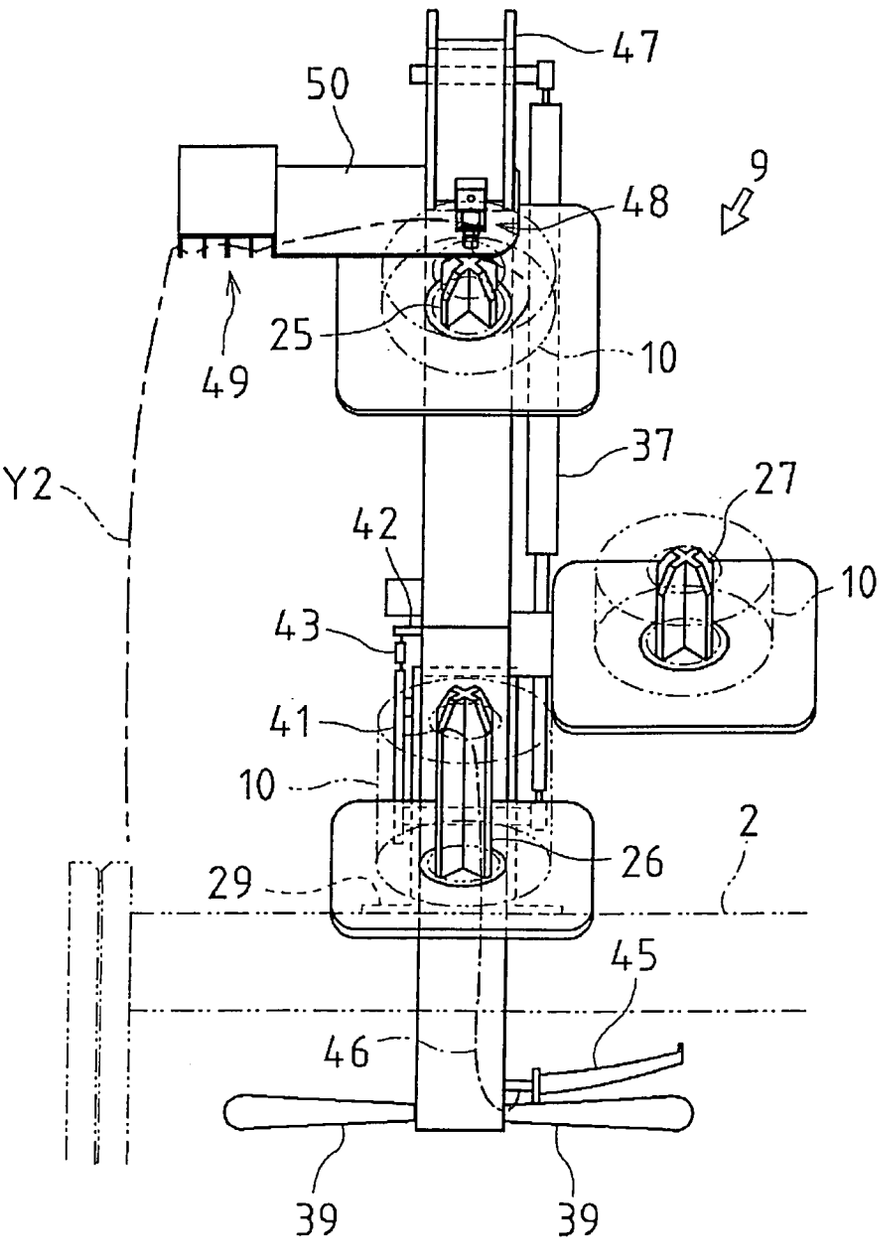


FIG. 4

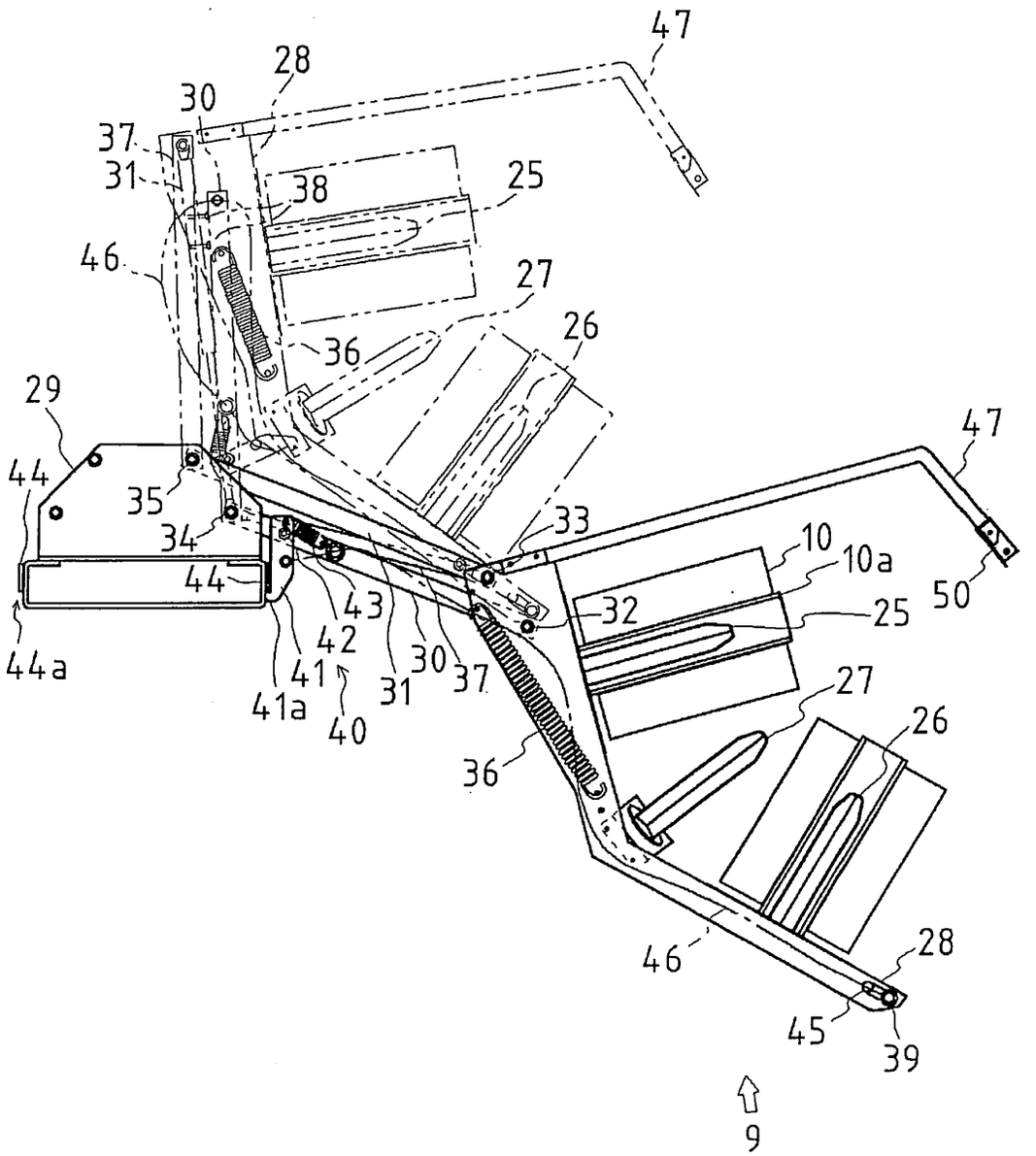

47
28
30
37
31
38
25
46
27
26
36
29
47
44
35
34
33
10
10a
50
44
32
25
43
42
44a
41
30
37
27
41a
40
31
26
36
46
28
45
39
9

FIG. 5

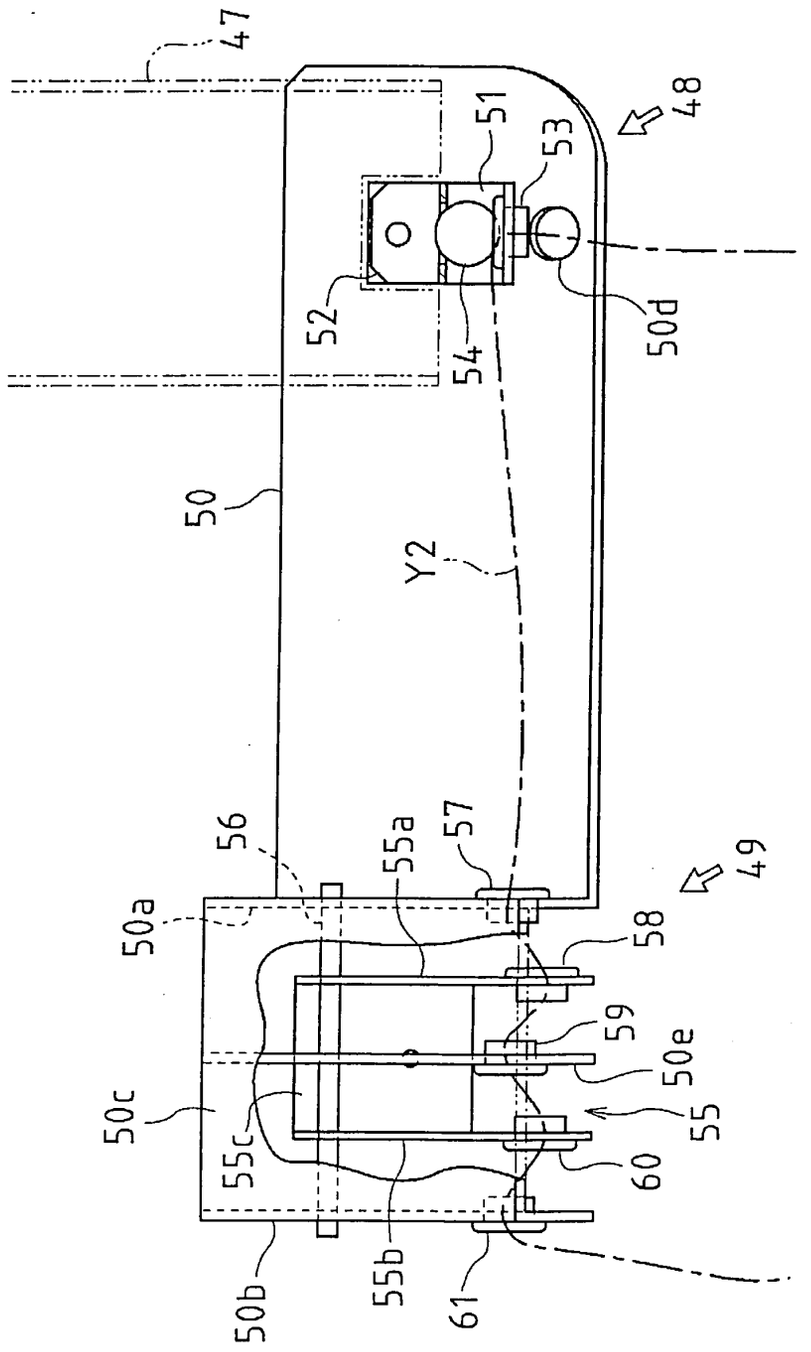
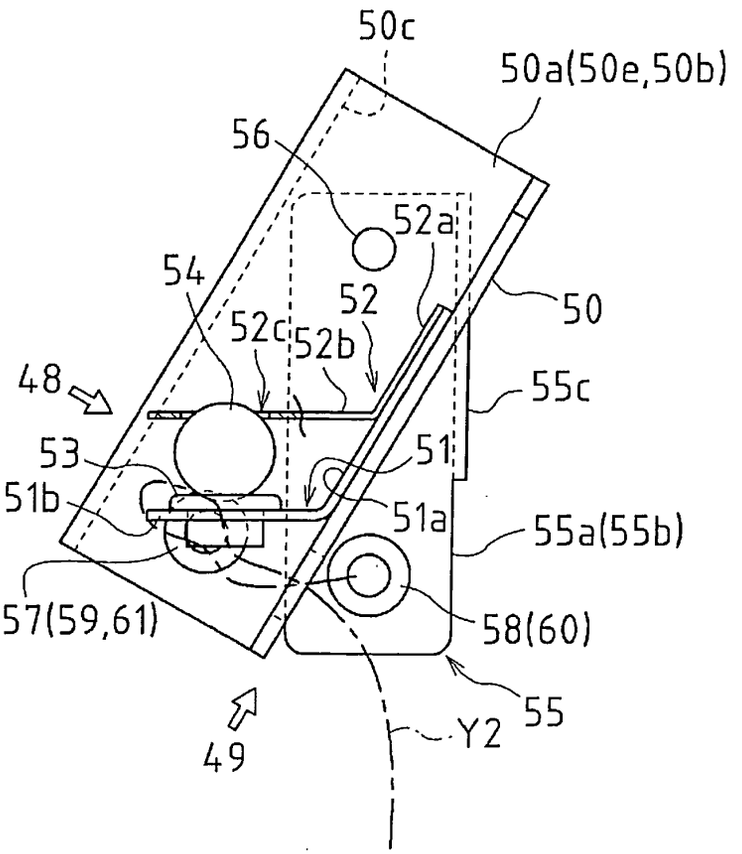

47
48
51
53
52
54
50d
50
Y2
56
55a
57
49
50a
58
59
50e
50c
55
55c
60
55b
61
50b

FIG. 6


50c
50a(50e,50b)
56
52a
54
52
50
52c
52b
48
55c
53
51
51b
51a
55a(55b)
57(59,61)
58(60)
55
49
Y2