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Abstract

To adjust a print pressure and to move a plate cylinder relative to an impression cylinder by a simple mechanism while preventing a change in a contact pressure between the plate cylinder and an anilox roll.

A pair of supporting shafts 5, 6 is opposed with each other across the web 2.

A plate cylinder sleeve 7 and an impression cylinder sleeve 8 are detachably attached to supporting shafts 5, 6 different from each other.

An ink supply device 40 includes an anilox roll 41 and is moved in alignment with a position of the plate cylinder sleeve 7 attached to a supporting shaft 5 or 6.

A turning body 50 holds one of the pair of supporting shafts 5, 6 and is turned together with one supporting shaft 5.

A center of rotation 43 of the anilox roll 41 is matched with a center of turning 51 of the turning body 50, when the ink supply device 40 has been moved in alignment with the position of the plate cylinder sleeve 7 attached to the one supporting shaft 5.

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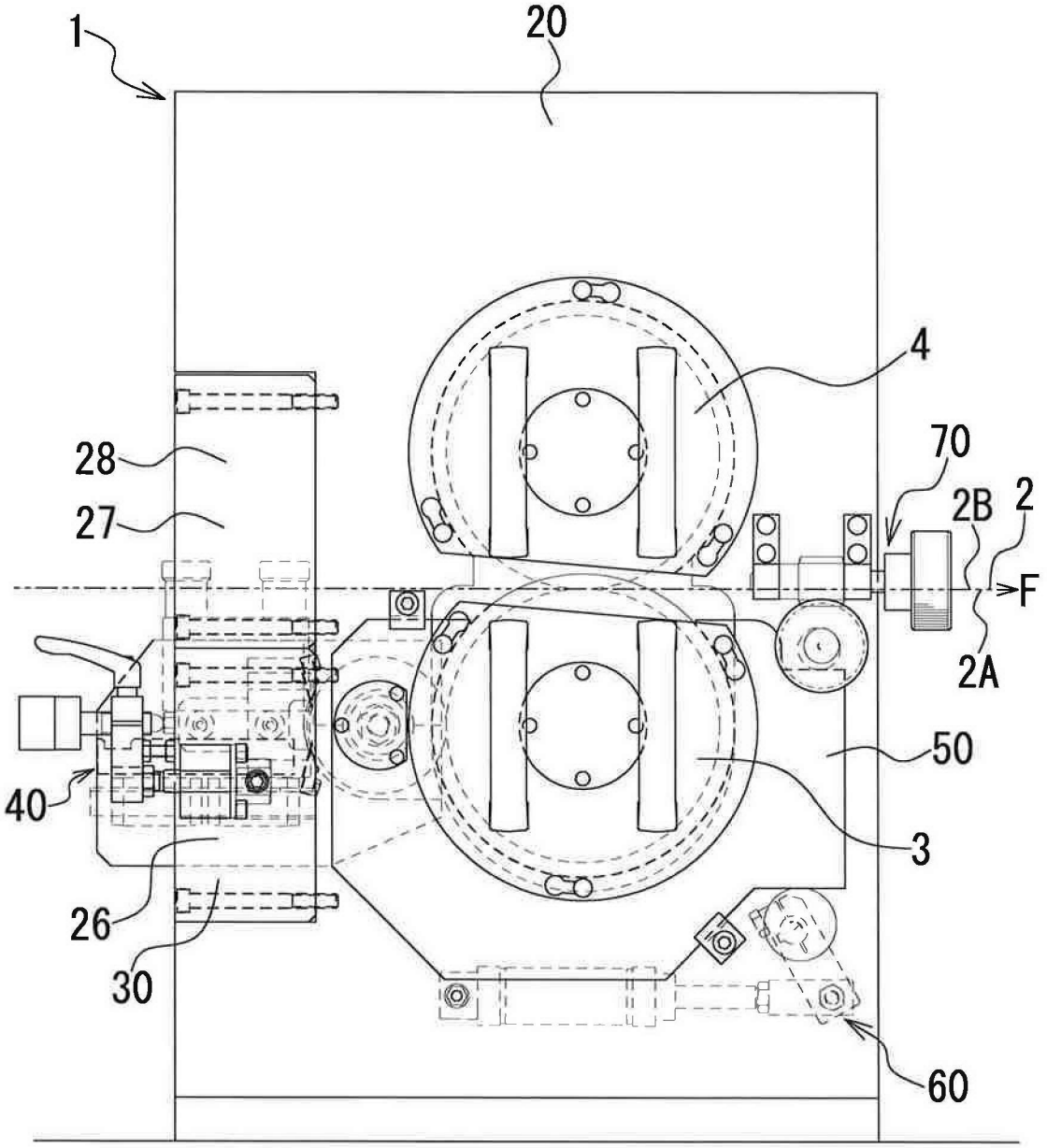
Fig. 1



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PRINTING APPARATUS

Technical Field

[0001]

The present invention relates to a printing apparatus capable of switching between front face printing of a web and rear face printing of the web.

Background art

[0002]

In a printing apparatus printing on a web by a plate cylinder and an impression cylinder, print pressure applied to the web is adjusted by moving at least one of the plate cylinder and the impression cylinder so as to separate from each other or to make contact with each other.

Under the condition, ink is supplied from an anilox roll to the plate cylinder, and the web is passed through between the plate cylinder and the impression cylinder.

The printing apparatus performs printing on each face of the web by switching between front face printing of the web and rear face printing of the web.

As such printing apparatus, a roll paper rotary printing apparatus capable of switching between a plate cylinder and an impression cylinder with each other has been known (see patent document 1).

[0003]

In the conventional printing apparatus described in the patent document 1, the plate cylinder and the impression cylinder are connected to a carriage respectively.

The carriage is movably supported by a guide member.

A flexographic printing ink device includes a chamber doctor and an anilox roll and comes into contact with a sleeve-like flexographic printing plate of the plate cylinder.

The flexographic printing ink device is moved simultaneously with a movement of the plate cylinder by fixing the flexographic printing ink device together with the plate cylinder to the carriage.

[0004]

In the conventional printing apparatus, a sleeve is pulled out of a main body of the impression cylinder and the flexographic printing plate is put on the main body of the impression cylinder, and the flexographic printing plate is pulled out of a main body of the plate cylinder and the sleeve is put on the main body of the plate cylinder.

Thereby, the impression cylinder is switched to the plate cylinder, and the plate cylinder is switched to the impression cylinder.

The flexographic printing ink device is detached from a former carriage and fixed to another carriage in a reversed direction.

[0005]

In the conventional printing apparatus, when only one cylinder (e.g. plate cylinder) is moved, the other cylinder (e.g. impression cylinder) is connected to inner walls of side walls by bearings.

A bearing is attached to an inner wall by screws.

Moreover, the printing apparatus includes screw nuts,

screw shafts and a driving means for the screw shafts to move each carriage.

As stated above, in the conventional printing apparatus, its structure is apt to be complicated, and a lot of work to adjust each mechanism is feared to be required.

Moreover, the printing apparatus becomes bigger in size, and the number of components is feared to be increased.

Therefore there is a concern over a cost increase of the printing apparatus.

[0006]

Whereas, a sheet printing apparatus in which a plate cylinder is moved relative to an impression cylinder by a double eccentric mechanism has been also known. In this conventional sheet printing apparatus, the plate cylinder or the impression cylinder is supported by the double eccentric mechanism.

The double eccentric mechanism includes an outer eccentric bearing and an inner eccentric bearing arranged inside the outer eccentric bearing.

The print pressure is adjusted by a movement of the plate cylinder or the impression cylinder due to two eccentric movements of the double eccentric mechanism.

In addition, the plate cylinder and the impression cylinder are separated from each other or are made contact with each other by the movement of the plate cylinder or the impression cylinder.

However, the double eccentric mechanism is required to increase the number of components, and to process the

components accurately.

Accordingly, the printing apparatus is feared to be increased in cost, and since it is also required to move the double eccentric mechanism accurately, there is a problem that a lot of work to adjust the print pressure is required.

Prior art document

Patent document

[0007]

[Patent Document 1] Japanese Patent Laid open No.2002-254598

Summary of the Invention

[0008]

The present invention is made in view of the above mentioned conventional problems. Thus, it is desirable to provide a printing apparatus that can adjust a print pressure and move a plate cylinder relative to an impression cylinder by a simple mechanism, while preventing a change in a contact pressure between the plate cylinder and an anilox roll in the printing apparatus capable of switching between front face printing of a web and rear face printing of the web.

[0009]

In accordance with an aspect of the present invention, there is provided a printing apparatus capable of switching between front face printing of a web and rear face printing of the web by exchanging positions of a plate cylinder and an impression cylinder relative to the web.

The printing apparatus includes a pair of supporting shafts opposed with each other across the web, a plate cylinder

sleeve and an impression cylinder sleeve detachably attached to supporting shafts different from each other, the supporting shafts to be attached being changeable, an ink supply device including an anilox roll and being movable in alignment with a position of the plate cylinder sleeve attached to a supporting shaft, and a turning body holding one of the pair of supporting shafts and being turned together with one supporting shaft.

A center of rotation of the anilox roll is matched with a center of turning of the turning body, when the ink supply device has been moved in alignment with the position of the plate cylinder sleeve attached to one supporting shaft.

Advantageous Effects of the Invention

[0010]

According to the present invention, it is possible to adjust the print pressure and to move the plate cylinder relative to the impression cylinder by the simple mechanism, while preventing a change in contact pressure between the plate cylinder and the anilox roll in the printing apparatus capable of switching between front face printing of the web and rear face printing of the web.

Brief Description of the Drawings

[0011]

Fig.1 is a front view of a printing apparatus of the present embodiment.

Fig.2 is a rear view of the printing apparatus of the present embodiment.

Fig.3 is a schematic view of the printing apparatus of

the present embodiment.

Fig.4 is a schematic view of a main part of the printing apparatus of the present embodiment.

Fig.5 is a schematic view of a main part of the printing apparatus of the present embodiment.

Fig.6 is a schematic view of a structure of the printing apparatus when printing on a front face of a web.

Fig.7 is a schematic view of the printing apparatus when printing on the front face of the web.

Fig.8 is a schematic view of the printing apparatus when printing on the front face of the web.

Fig.9 is a view of a part of Fig.3 containing a plate cylinder and an impression cylinder and a rotation device.

Fig.10 is a schematic view of a turning body shown in Fig.5 in a turned state.

Fig.11 is a sectional view of the turning body and a turning device attached to a main body frame.

Fig.12 is a view of a print pressure adjusting mechanism viewed in an arrow X3 direction illustrated in Fig.11.

Description of the Embodiments

[0012]

An embodiment of a printing apparatus of the present invention will be described with reference to the drawings.

A printing apparatus of the present embodiment is the printing apparatus capable of switching between front face printing of a web and rear face printing of the web.

The web is a belt-like printing sheet which is wound into a roll shape.

The web is supplied from a supply device to the printing apparatus, and images are printed on the web by the printing apparatus.

The printing apparatus of the present embodiment is a flexographic printing apparatus, and images are printed on the web by a plate (letter press) of the plate cylinder.

[0013]

Fig.1 is a front view of a printing apparatus 1 of the present embodiment, and shows the printing apparatus 1 viewed from one side in a width direction of a web 2.

Fig.2 is a rear view of the printing apparatus 1 of the present embodiment, and shows the printing apparatus 1 viewed from the other side in the width direction of the web 2.

As shown in the drawings, the printing apparatus 1 is provided with a plate cylinder 3, an impression cylinder 4, a rotation device 10 for rotating the plate cylinder 3 and the impression cylinder 4, a main body frame 20, a sub frame 30 detachably attached to the main body frame 20, an ink supply device 40 held by the sub frame 30, a turning body 50 turnably connected to the main body frame 20, and a turning device 60 for turning the turning body 50.

The plate cylinder 3 is rotatably supported by the turning body 50, and the impression cylinder 4 is rotatably supported by the main body frame 20.

A diameter of the plate cylinder 3 is the same as that of the impression cylinder 4.

[0014]

The web 2 is moved in a predetermined moving direction F

in the printing apparatus 1 to pass through between the plate cylinder 3 and the impression cylinder 4.

At that time, the printing apparatus 1 prints images on one face of the web 2.

The plate cylinder 3 and the impression cylinder 4 are opposed with each other across the web 2 and are in contact with the one face and the other face of the web 2 respectively.

The web 2 is sandwiched between the plate cylinder 3 and the impression cylinder 4.

Here, the moving direction F of the web 2 is horizontal.

Furthermore, the one face of the web 2 is a rear face 2A of the web 2, and the other face of the web 2 is a front face 2B of the web 2.

The plate cylinder 3 is located on the rear face 2A side of the web 2, and the impression cylinder 4 is located on the front face 2B side of the web 2.

[0015]

Fig.3 is a schematic view of the printing apparatus 1 of the present embodiment, containing a sectional view of a part of the printing apparatus 1.

Further, Fig.3 shows each part of the printing apparatus 1 in one drawing by combining.

Figs.4, 5 are schematic views of a main part of the printing apparatus 1 of the present embodiment and show a part of the printing apparatus 1 taken along the line X1-X1 of Fig.3 in a simple manner.

Fig.4 shows the printing apparatus 1 before the sub frame 30 is attached to the main body frame 20, and Fig.5 shows the

printing apparatus 1 after the sub frame 30 is attached to the main body frame 20.

[0016]

As shown in the drawings, a center of an outer peripheral surface of the plate cylinder 3 and a center of an outer peripheral surface of the impression cylinder 4 are arranged horizontally and in parallel with each other in the same vertical plane.

Under the condition, the plate cylinder 3 and the impression cylinder 4 are arranged to be in parallel and opposed with each other in a vertical direction.

Moreover, the printing apparatus 1 is provided with a pair of supporting shafts 5, 6 (a first supporting shaft 5, a second supporting shaft 6) which is a shaft member of the plate cylinder 3 and the impression cylinder 4, respectively, a plate cylinder sleeve 7 which is an outer peripheral member of the plate cylinder 3, and an impression cylinder sleeve 8 which is an outer peripheral member of the impression cylinder 4.

[0017]

The pair of supporting shafts 5, 6 is arranged in parallel and arranged in the width direction of the web 2.

Specifically, centers of outer peripheral surfaces of supporting shafts 5, 6 are arranged horizontally and in parallel with each other in the same vertical plane as is the case with the plate cylinder 3 and the impression cylinder 4.

Under the condition, the pair of supporting shafts 5, 6 is arranged to be in parallel and opposed with each other in the vertical direction.

Moreover, the web 2 is arranged between the pair of supporting shafts 5, 6, and the pair of supporting shafts 5, 6 is opposed with each other across the web 2.

[0018]

Here, the first supporting shaft 5 is a lower supporting shaft located on a lower side of the web 2, and the second supporting shaft 6 is an upper supporting shaft located on an upper side of the web 2.

Supporting shafts 5, 6 are rotated around centers of rotation, respectively.

The plate cylinder sleeve 7 and the impression cylinder sleeve 8 are formed in a cylindrical shape and attached to outer peripheral parts (attaching parts 5A, 6A) of the supporting shafts 5, 6.

The plate cylinder sleeve 7 and the impression cylinder sleeve 8 are held by the supporting shafts 5, 6 and are rotated integrally with the supporting shafts 5, 6.

[0019]

The plate cylinder sleeve 7 and the impression cylinder sleeve 8 are attachable to both of the pair of supporting shafts 5, 6, respectively.

Therefore, an attaching part 5A of the first supporting shaft 5 and an attaching part 6A of the second supporting shaft 6 are formed in the same shape.

The plate cylinder sleeve 7 and the impression cylinder sleeve 8 are detachably attached to the supporting shafts 5, 6 different from each other, and the supporting shafts 5, 6 to be attached are changeable.

When the plate cylinder sleeve 7 is attached to one of the pair of supporting shafts 5, 6, the plate cylinder 3 is made by the plate cylinder sleeve 7 and one supporting shaft.

Moreover, when the impression cylinder sleeve 8 is attached to the other of the pair of supporting shafts 5, 6, the impression cylinder 4 is made by the impression cylinder sleeve 8 and the other supporting shaft.

[0020]

In the printing apparatus 1, the rear face printing (printing on one face (rear face 2A)) of the web 2 and the front face printing (printing on the other face (front face 2B)) of the web 2 are switched by exchanging positions of the plate cylinder 3 and the impression cylinder 4 with respect to the web 2.

At that time, the front face printing and the rear face printing can be switched without changing the moving direction F of the web 2.

Moreover, the front face printing and the rear face printing can be switched without changing each rotational direction of the pair of supporting shafts 5, 6.

When the positions of the plate cylinder 3 and the impression cylinder 4 are exchanged, the plate cylinder sleeve 7 and the impression cylinder sleeve 8 are exchanged corresponding to the positions of the plate cylinder 3 and the impression cylinder 4.

[0021]

When printing on the rear face of the web 2 (see Figs.3, 4, 5), the plate cylinder sleeve 7 is attached to the first

supporting shaft 5, and the impression cylinder sleeve 8 is attached to the second supporting shaft 6.

The plate cylinder sleeve 7 and the plate cylinder 3 are located on the lower side (the rear face 2A side) of the web 2 and arranged along the rear face 2A of the web 2.

The impression cylinder sleeve 8 and the impression cylinder 4 are located on the upper side (the front face 2B side) of the web 2 and arranged along the front face 2B of the web 2.

The printing apparatus 1 prints images on the rear face 2A of the web 2 moving between the plate cylinder 3 (the plate cylinder sleeve 7) and the impression cylinder 4 (the impression cylinder sleeve 8).

[0022]

Fig.6 is a schematic view of a structure of the printing apparatus 1 when printing on the front face of the web 2 and shows each part of the printing apparatus 1 in one drawing by combining as with in Fig.3.

Figs.7, 8 are schematic views of the printing apparatus 1 when printing on the front face of the web 2, and show a part of the printing apparatus 1 taken along the line X2-X2 of Fig.6 in a simple manner.

Fig.7 shows the printing apparatus 1 before the sub frame 30 is attached to the main body frame 20, and Fig.8 shows the printing apparatus 1 after the sub frame 30 is attached to the main body frame 20.

[0023]

As shown in the drawings, when printing on the front face

of the web 2, the impression cylinder sleeve 8 is attached to the first supporting shaft 5, and the plate cylinder sleeve 7 is attached to the second supporting shaft 6.

The impression cylinder sleeve 8 and the impression cylinder 4 are located on the lower side (the rear face 2A side) of the web 2 and arranged along the rear face 2A of the web 2.

The plate cylinder sleeve 7 and the plate cylinder 3 are located on the upper side (the front face 2B side) of the web 2 and arranged along the front face 2B of the web 2.

The printing apparatus 1 prints images on the front face 2B of the web 2 moving between the plate cylinder 3 and the impression cylinder 4.

[0024]

When exchanging the plate cylinder sleeve 7 with the impression cylinder sleeve 8, the plate cylinder sleeve 7 and the impression cylinder sleeve 8 are moved toward one sides in axial directions of each of the supporting shafts 5, 6 (one ends 5B, 6B sides of each of the supporting shafts 5, 6) and detached from each of the supporting shafts 5, 6.

Then, the supporting shafts 5, 6 to which the plate cylinder sleeve 7 and the impression cylinder sleeve 8 to be attached are changed, and the plate cylinder sleeve 7 and the impression cylinder sleeve 8 to be attached to the pair of supporting shafts 5, 6 are exchanged.

The positions of the plate cylinder 3 and the impression cylinder 4 with respect to the web 2 are exchanged by exchanging the plate cylinder sleeve 7 and the impression

cylinder sleeve 8.

At that time, the plate cylinder sleeve 7 and the impression cylinder sleeve 8 are moved toward the other sides in the axial directions of each of the supporting shafts 5, 6 (the other ends 5C, 6C sides of each of the supporting shafts 5, 6), then, the supporting shafts 5, 6 are inserted into the plate cylinder sleeve 7 and the impression cylinder sleeve 8.

The plate cylinder sleeve 7 and the impression cylinder sleeve 8 are fitted to the supporting shafts 5, 6 after being changed and are fixed to the supporting shafts 5, 6 different from each other by fixing members 5D, 6D respectively.

[0025]

Fig.9 is a view of a part of Fig.3 containing the plate cylinder 3 and the impression cylinder 4 and the rotation device 10.

As shown in the drawing, the rotation device 10 includes a motor 11 and a transmission mechanism 12, and is attached to the main body frame 20.

The transmission mechanism 12 includes a first transmission gear 13 fixed to an output shaft of the motor 11, a second transmission gear 14 meshed with the first transmission gear 13,and a third transmission gear 15.

The third transmission gear 15 is coaxially arranged with the second transmission gear 14 and rotated integrally with the second transmission gear 14.

The rotation device 10 rotates transmission gears 13, 14, 15 of the transmission mechanism 12 by the motor 11.

[0026]

The printing apparatus 1 is provided with interlocking gears 16, 17 rotating in interlock with the pair of supporting shafts 5, 6.

The interlocking gears 16, 17 are fixed to the other ends 5C, 6C of the pair of supporting shafts 5, 6 and are rotated integrally with the supporting shafts 5, 6.

The third transmission gear 15 of the transmission mechanism 12 is meshed with an interlocking gear 17 of the second supporting shaft 6, and the interlocking gear 17 of the second supporting shaft 6 is meshed with an interlocking gear 16 of the first supporting shaft 5.

The rotation device 10 rotates the interlocking gears 16, 17, the second supporting shaft 6 and the first supporting shaft 5 by transmitting a rotation of the motor 11 to the interlocking gear 17 of the second supporting shaft 6 by the third transmission gear 15.

Accordingly, the plate cylinder 3 and the impression cylinder 4 are rotated in interlock with each other within the main body frame 20.

[0027]

The main body frame 20 is a base frame of the printing apparatus 1, and rotatably supports the second supporting shaft 6 (see Figs.3, 6).

Moreover, the main body frame 20 includes a pair of frame parts 21, 22 (a first frame part 21, a second frame part 22) opposed with each other, two openings for exchange 23, 24 (a first opening for exchange 23, a second opening for exchange 24) formed in the first frame part 21, and a housing 25 arranged

in the second opening for exchange 24.

The frame parts 21, 22 are arranged away from each other in the axial directions of the supporting shafts 5, 6.

The plate cylinder sleeve 7 and the impression cylinder sleeve 8 are arranged between the pair of frame parts 21, 22.

[0028]

The openings for exchange 23, 24 are openings for exchange of the plate cylinder sleeve 7 and the impression cylinder sleeve 8, and are formed in the first frame part 21 corresponding to positions of the pair of supporting shafts 5, 6.

Sizes of the openings for exchange 23, 24 are larger than diameters of the plate cylinder sleeve 7 and the impression cylinder sleeve 8, and the plate cylinder sleeve 7 and the impression cylinder sleeve 8 may pass through the openings for exchange 23, 24.

The housing 25 is arranged in the second opening for exchange 24 of the first frame part 21, and is detachably attached in the second opening for exchange 24.

At that time, the housing 25 is inserted into the second opening for exchange 24 from the outside of the main body frame 20 and is attached in the second opening for exchange 24.

The second opening for exchange 24 is closed by attaching the housing 25 in the second opening for exchange 24.

Moreover, the housing 25 is drawn out of the second opening for exchange 24 to the outside of the main body frame 20, and whereby the housing 25 is detached from the second opening for exchange 24.

The second opening for exchange 24 is opened by detaching the housing 25 from the second opening for exchange 24.

[0029]

The second supporting shaft 6 includes a first supporting part 6E located on the one end 6B side, and a second supporting part 6F located on the other end 6C side.

The housing 25 is a supporting member for supporting the first supporting part 6E of the second supporting shaft 6, and is connected to the first supporting part 6E of the second supporting shaft 6, when attached in the second opening for exchange 24.

The main body frame 20 rotatably supports the first supporting part 6E of the second supporting shaft 6 by the housing 25 of the first frame part 21 and rotatably supports the second supporting part 6F of the second supporting shaft 6 by the second frame part 22.

[0030]

When the housing 25 is detached from the second opening for exchange 24, support by the first supporting part 6E of the second supporting shaft 6 is released, and the second supporting shaft 6 is supported only by the second supporting part 6F.

Under the condition, the impression cylinder sleeve 8 or the plate cylinder sleeve 7 can be drawn out of the main body frame 20 through the second opening for exchange 24, and the impression cylinder sleeve 8 or the plate cylinder sleeve 7 can be detached from the second supporting shaft 6.

Moreover, the plate cylinder sleeve 7 or the impression

cylinder sleeve 8 can be inserted into the main body frame 20 through the second opening for exchange 24, and the plate cylinder sleeve 7 or the impression cylinder sleeve 8 can be attached to the second supporting shaft 6.

Accordingly, on the second supporting shaft 6, the impression cylinder sleeve 8 is exchanged with the plate cylinder sleeve 7, or the plate cylinder sleeve 7 is exchanged with the impression cylinder sleeve 8.

[0031]

The main body frame 20 includes two openings 26, 27 (a first opening 26, a second opening 27) (see Figs.4, 5, 7, 8) provided between the pair of frame parts 21, 22 (see Fig.3).

The two openings 26, 27 are openings for attaching the sub frame 30 and the ink supply device 40 and are formed on a side face of the main body frame 20.

Moreover, the two openings 26, 27 are provided on each side of the supporting shafts 5, 6 with respect to the web 2 and opposed with each other across the web 2.

Here, the first opening 26 is a lower opening located on the lower side (the first supporting shaft 5 side) of the web 2, and the second opening 27 is an upper opening located on the upper side (the second supporting shaft 6 side) of the web 2.

[0032]

The sub frame 30 is a cassette attachable to the two openings 26, 27 respectively, and assists the ink supply device 40 in attaching in each of openings 26, 27.

The printing apparatus 1 is provided with a guide member

28 attachable to each of the two openings 26, 27.

The sub frame 30 and the guide member 28 are arranged in an opening 26 or 27 different from each other and detachably attached in the opening 26 or 27.

The guide member 28 is attached in the opening 26 or 27 before the sub frame 30 is attached in the opening 26 or 27 and guides the sub frame 30 to be attached in the opening 26 or 27.

[0033]

The guide member 28 is attached in the opening 26 or 27 on the supporting shaft 5 or 6 side to which the impression cylinder sleeve 8 is attached.

The guide member 28 is formed in a block like shape and closes at least a part of each opening 26 or 27.

The sub frame 30 is attached in the opening 26 or 27 on the supporting shaft 5 or 6 side to which the plate cylinder sleeve 7 is attached.

At that time, the sub frame 30 is inserted into the opening 26 or 27 while being guided by the guide member 28 and arranged in the opening 26 or 27.

[0034]

The guide member 28 is attached in the opening 26 or 27 which is on the impression cylinder 4 side, and the sub frame 30 is attached in the opening 26 or 27 which is on the plate cylinder 3 side.

Accordingly, when printing on the rear face of the web 2 (see Figs.4, 5), the guide member 28 is attached in the second opening 27 on the second supporting shaft 6 side to

which the impression cylinder sleeve 8 is attached.

The sub frame 30 is attached in the first opening 26 on the first supporting shaft 5 side to which the plate cylinder sleeve 7 is attached.

Whereas, when printing on the front face of the web 2 (see Figs.7, 8), the guide member 28 is attached in the first opening 26 on the first supporting shaft 5 side to which the impression cylinder sleeve 8 is attached.

The sub frame 30 is attached in the second opening 27 on the second supporting shaft 6 side to which the plate cylinder sleeve 7 is attached.

[0035]

The ink supply device 40 is a movable cassette type ink unit and is fixed to another sub frame 30 different from the main body frame 20.

Moreover, the ink supply device 40 includes a rotatable anilox roll 41 and an ink doctor chamber device 42 supplying ink to the anilox roll 41.

Along with an exchange of the positions of the plate cylinder 3 and the impression cylinder 4,the ink supply device 40 is moved in alignment with a position of the plate cylinder sleeve 7 attached to the supporting shaft 5 or 6,and is attached in the opening 26 or 27 of the main body frame 20.

The anilox roll 41 is in contact with the plate cylinder sleeve 7 of the plate cylinder 3, and is rotated around a center of rotation 43 in interlock with a rotation of the plate cylinder 3.

The ink supply device 40 supplies ink to the plate

cylinder sleeve 7 by the anilox roll 41.

[0036]

The sub frame 30 and the ink supply device 40 are moved integrally toward each of the two openings 26, 27 of the main body frame 20 and are attached in the opening 26 or 27 which is a destination of moving.

Moreover, along with the exchange of the positions of the plate cylinder 3 and the impression cylinder 4, the sub frame 30 is moved integrally with the ink supply device 40 in alignment with the position of the plate cylinder sleeve 7 attached to the supporting shaft 5 or 6, and is attached in the opening 26 or 27 on the supporting shaft 5 or 6 side to which the plate cylinder sleeve 7 is attached.

The ink supply device 40 is attached in the opening 26 or 27 on the plate cylinder 3 side through the sub frame 30.

The anilox roll 41 is made to contact with the plate cylinder sleeve 7, and the ink supply device 40 supplies ink to the plate cylinder sleeve 7 while the sub frame 30 is attached in the opening 26 or 27.

[0037]

The printing apparatus 1(see Figs.3, 6) is provided with a drive gear 18 fixed to the plate cylinder 3, a driven gear 19 fixed to the anilox roll 41 and a moving device 44 for moving the anilox roll 41.

The drive gear 18 is attached to an end on the second frame part 22 side of the plate cylinder sleeve 7.

When exchanging the plate cylinder sleeve 7 with the impression cylinder sleeve 8, the drive gear 18 is moved

integrally with the plate cylinder sleeve 7 such that the drive gear 18 is fitted to the supporting shaft 5 or 6.

The driven gear 19 is attached to an end on the second frame part 22 side of the anilox roll 41 and is meshed with the drive gear 18.

The drive gear 18 is rotated together with the plate cylinder sleeve 7, whereby the driven gear 19 and the anilox roll 41 are rotated.

[0038]

The moving device 44 includes a pair of moving mechanisms 45A, 45B (a first moving mechanism 45A, a second moving mechanism 45B) provided on a pair of frame members 31, 32 (a first frame member 31, a second frame member 32) of the sub frame 30.

The pair of frame members 31, 32 is arranged on the both sides of the ink supply device 40 in an axial direction of the anilox roll 41 and is attached to the ink supply device 40.

Moreover, the first frame member 31 is attached to the first frame part 21 of the main body frame 20, and the second frame member 32 is attached to the second frame part 22 of the main body frame 20.

[0039]

The pair of moving mechanisms 45A, 45B is connected to ends different from each other (one end on the first frame member 31 side, the other end on the second frame member 32 side) of the anilox roll 41, and moves ends of the anilox roll 41 respectively.

Each of moving mechanisms 45A, 45B includes a movable

member 46 for rotatably supporting the ends of the anilox roll 41, a driving part 47 for moving the movable member 46, and a position adjusting part 48 for adjusting positions of the ends of the anilox roll 41.

In each of moving mechanisms 45A, 45B, the movable member 46 is arranged along the frame member 31 or 32 of the sub frame 30 and is extended from an end of the anilox roll 41 to the driving part 47.

Moreover, the movable member 46 is movably connected to the frame member 31 or 32, and is moved toward or away from the plate cylinder sleeve 7 together with the end of the anilox roll 41.

[0040]

The driving part 47 is a piston-cylinder mechanism, and is connected to the frame member 31 or 32 and the movable member 46.

The driving part 47 moves the end of the anilox roll 41 toward or away from the plate cylinder sleeve 7 by moving the movable member 46.

The moving device 44 moves both ends of the anilox roll 41 away from the plate cylinder sleeve 7 by the pair of moving mechanisms 45A, 45B to separate the anilox roll 41 from the plate cylinder sleeve 7.

Moreover, the moving device 44 moves the both ends of the anilox roll 41 toward the plate cylinder sleeve 7 by the pair of moving mechanisms 45A, 45B to make the anilox roll 41 contact with the plate cylinder sleeve 7.

[0041]

The anilox roll 41 is pressed against the plate cylinder sleeve 7 by the pair of moving mechanisms 45A, 45B of the moving device 44. Under the condition, the both ends of the anilox roll 41 are moved by position adjusting parts 48 of the pair of moving mechanisms 45A, 45B respectively to adjust positions of the both ends of the anilox roll 41.

A position adjusting part 48 includes an adjusting screw 48A extending through a screw hole of the movable member 46, and a handle 48B to rotate the adjusting screw 48A.

The adjusting screw 48A is projected from the movable member 46, whereby a distal end of the adjusting screw 48A is pressed against the frame member 31 or 32.

A length of projection of the adjusting screw 48A is changed by rotating the adjusting screw 48A by the handle 48B.

At the same time, the movable member 46 is moved along the adjusting screw 48A, thus a position of the movable member 46 with respect to the frame member 31 or 32 is shifted.

Accordingly, the movable member 46 and the ends of the anilox roll 41 are moved toward or away from the plate cylinder sleeve 7.

[0042]

By virtue of the position adjusting parts 48 of the pair of moving mechanisms 45A, 45B, the positions of the both ends of the anilox roll 41 are adjusted and a contact pressure between the plate cylinder 3 (the plate cylinder sleeve 7) and the anilox roll 41 is adjusted.

Accordingly, the position adjusting part 48 is also a contact pressure adjusting part.

When the anilox roll 41 is moved away from the plate cylinder sleeve 7 by the position adjusting parts 48, the contact pressure between the plate cylinder 3 and the anilox roll 41 is lowered.

Moreover, when the anilox roll 41 is moved toward the plate cylinder sleeve 7 by the position adjusting parts 48, the contact pressure between the plate cylinder 3 and the anilox roll 41 is raised.

The driven gear 19 of the anilox roll 41 is meshed with the drive gear 18 of the plate cylinder 3 with an appropriate backlash while the contact pressure between the plate cylinder 3 and the anilox roll 41 is adjusted.

[0043]

The turning body 50 holds one of the pair of supporting shafts and is turned together with one supporting shaft.

In the printing apparatus 1 of the present embodiment, one supporting shaft is the first supporting shaft 5, and the other supporting shaft is the second supporting shaft 6.

Accordingly, the turning body 50 holds the first supporting shaft 5 and is turned together with the first supporting shaft 5.

Whereas, the second supporting shaft 6 is held by the main body frame 20, and a position of the second supporting shaft 6 is fixed within the printing apparatus 1.

The first supporting shaft 5 is moved by turning while being in parallel with the second supporting shaft 6.

Moreover, the first supporting shaft 5 is rotatably supported by the turning body 50 and is turned around a center

of turning 51 integrally with the turning body 50.

The first supporting shaft 5 is moved toward or away from the second supporting shaft 6 in accordance with a turning of the turning body 50.

[0044]

The turning body 50 includes a pair of turning parts 52, 53 (a first turning part 52, a second turning part 53), connecting parts 54, 55 (a first connecting part 54, a second connecting part 55) turnably connecting the pair of turning parts 52, 53 to the main body frame 20, one opening for exchange (a third opening for exchange 56) formed in the first turning part 52, and a housing 57 arranged in the third opening for exchange 56.

The pair of turning parts 52, 53 is located on outside the main body frame 20 and is arranged along the frame parts 21, 22 of the main body frame 20, respectively.

Turning parts 52, 53 are, for example, turning arms formed in an arm shape and are connected to the frame parts 21, 22 by the connecting parts 54, 55.

The center of turning 51 of the turning body 50 (see Fig.3) is located at centers of the connecting parts 54, 55, and is located on a straight line parallel with the axial direction of the first supporting shaft 5.

[0045]

The third opening for exchange 56 is an opening for exchange of the plate cylinder sleeve 7 and the impression cylinder sleeve 8, and is formed in the first turning part 52 corresponding to a position of the first supporting shaft 5.

A size of the third opening for exchange 56 is larger than diameters of the plate cylinder sleeve 7 and the impression cylinder sleeve 8, and the plate cylinder sleeve 7 and the impression cylinder sleeve 8 may pass through the third opening for exchange 56.

The housing 57 is arranged in the third opening for exchange 56 of the first turning part 52, and is detachably attached in the third opening for exchange 56.

At that time, the housing 57 is inserted into the third opening for exchange 56 from the outside of the turning body 50, and is attached in the third opening for exchange 56.

The third opening for exchange 56 is closed by attaching the housing 57 in the third opening for exchange 56.

Moreover, the housing 57 is drawn out of the third opening for exchange 56 to the outside of the turning body 50 and is detached from the third opening for exchange 56.

The third opening for exchange 56 is opened by detaching the housing 57 from the third opening for exchange 56.

[0046]

The first supporting shaft 5 includes a first supporting part 5E located on one end 5B side and a second supporting part 5F located on the other end 5C side.

The housing 57 is a supporting member for supporting the first supporting part 5E of the first supporting shaft 5 and is connected to the first supporting part 5E of the first supporting shaft 5, when attached in the third opening for exchange 56.

The turning body 50 rotatably supports the first

supporting part 5E of the first supporting shaft 5 by the housing 57 of the first turning part 52, and rotatably supports the second supporting part 5F of the first supporting shaft 5 by the second turning part 53.

[0047]

The third opening for exchange 56 of the turning body 50 is arranged in alignment with the first opening for exchange 23 of the main body frame 20.

When the housing 57 is detached from the third opening for exchange 56, support by the first supporting part 5E of the first supporting shaft 5 is released, and the first supporting shaft 5 is supported only by the second supporting part 5F.

Under the condition, the plate cylinder sleeve 7 or the impression cylinder sleeve 8 can be drawn out of the main body frame 20 through the first opening for exchange 23 and the third opening for exchange 56, and the plate cylinder sleeve 7 or the impression cylinder sleeve 8 can be detached from the first supporting shaft 5.

Moreover, the impression cylinder sleeve 8 or the plate cylinder sleeve 7 can be inserted into the main body frame 20 through the third opening for exchange 56 and the first opening for exchange 23, and the impression cylinder sleeve 8 or the plate cylinder sleeve 7 can be attached to the first supporting shaft 5.

Accordingly, on the first supporting shaft 5, the plate cylinder sleeve 7 is exchanged with the impression cylinder sleeve 8, or the impression cylinder sleeve 8 is exchanged

with the plate cylinder sleeve 7.

[0048]

When printing on the rear face of the web 2 (see Figs.3, 5), the plate cylinder sleeve 7 is attached to the first supporting shaft 5.

Therefore, the turning body 50 is turned together with the plate cylinder 3 while holding the plate cylinder 3.

Moreover, when the ink supply device 40 has been moved in alignment with the position of the plate cylinder sleeve 7 attached to the first supporting shaft 5 (one supporting shaft), the center of rotation 43 of the anilox roll 41 is matched with the center of turning 51 of the turning body 50.

Under the condition, the driven gear 19 of the anilox roll 41 is meshed with the drive gear 18 of the plate cylinder 3 with an appropriate backlash.

And the anilox roll 41 is in contact with the plate cylinder sleeve 7 of the plate cylinder 3 with an appropriate contact pressure.

In other words, the center of rotation 43 of the anilox roll 41 is matched with the center of turning 51 of the turning body 50, under the condition that the anilox roll 41 of the ink supply device 40 is arranged at a position to supply ink to the plate cylinder sleeve 7.

[0049]

The center of turning 51 of the turning body 50 is located on a radially outer side of an outer peripheral surface of the plate cylinder sleeve 7.

Moreover, the center of rotation 43 of the anilox roll 41

and the center of turning 51 of the turning body 50 are located on the same straight line parallel with the axial direction of the first supporting shaft 5.

Under the condition, the turning body 50 is turned by the turning device 60 and moves the first supporting shaft 5 and the plate cylinder 3 in a turning direction.

The turning device 60 turns the pair of turning parts 52, 53 of the turning body 50 at the same time and integrally turns the pair of turning parts 52, 53 and the first supporting shaft 5.

[0050]

Fig.10 is a schematic view of the turning body 50 shown in Fig.5 in a turned state.

Fig.11 is a sectional view of the turning body 50 and the turning device 60 attached to the main body frame 20.

As shown in Figs.5, 10, 11, the turning device 60 includes a pair of turning mechanisms 61A, 61B (a first turning mechanism 61A, a second turning mechanism 61B) provided on the pair of frame parts 21, 22 of the main body frame 20.

The first turning mechanism 61A turns the first turning part 52 of the turning body 50, and the second turning mechanism 61B turns the second turning part 53 of the turning body 50.

[0051]

Each of turning mechanisms 61A, 61B includes a control member 62 controlling the turning of the turning parts 52, 53 and a driving part 63 driving the control member 62.

The driving part 63 is a piston-cylinder mechanism and is

connected to the frame part 21 or 22 and the control member 62.

The control member 62 includes a shaft member 64 which is rotatably supported by the frame part 21 or 22, a lever 65 fixed to one end of the shaft member 64, and a rotating member 66 fixed to the other end of the shaft member 64.

The driving part 63 and the lever 65 are arranged inside the main body frame 20, and the rotating member 66 is arranged outside the main body frame 20.

[0052]

The driving part 63 is rotatably connected to the lever 65 and rotates the lever 65 around a center of rotation 64A of the shaft member 64 (see Fig.11).

The lever 65 is a rotating arm formed in an arm shape and rotates the shaft member 64 and the rotating member 66 in accordance with rotation.

The rotating member 66 is a tubular member incorporating a cylindrical roller bearing and is rotated around a center (a center of rotation 66A) in a radial direction of the rotating member 66.

The center of rotation 66A of the rotating member 66 is eccentric relative to the center of rotation 64A of the shaft member 64.

Under the condition that an outer peripheral part of the rotating member 66 is in contact with contact surfaces 52A, 53A of the turning parts 52, 53, the rotating member 66 is rotated integrally with the shaft member 64 while being rotated around the center of rotation 66A.

The contact surfaces 52A, 53A of the turning parts 52, 53 are parts of lower edge parts of the turning parts 52, 53.

[0053]

Rotating members 66 are located on lower sides of the contact surfaces 52A, 53A of the turning parts 52, 53 and support the turning parts 52, 53 at the contact surfaces 52A, 53A.

Moreover, under the condition that the center of rotation 66A of the rotating member 66 is eccentric relative to the center of rotation 64A of the shaft member 64, the rotating member 66 in contact with the contact surface 52A or 53A is rotated around the center of rotation 64A of the shaft member 64 while being rotated around the center of rotation 66A of the rotating member 66.

The center of rotation 66A of the rotating member 66 is moved around the center of rotation 64A of the shaft member 64 in accordance with a rotation of the shaft member 64.

At the same time, parts of the rotating members 66 in contact with the contact surfaces 52A, 53A are shifted in a peripheral direction of the rotating members 66.

Accordingly, positions of the contact surfaces 52A, 53A of the turning parts 52, 53 are shifted, and the turning parts 52, 53 are turned.

The turning mechanisms 61A, 61B rotate control members 62 including the rotating members 66 by driving parts 63, and turn the turning parts 52, 53 by the control members 62.

Further, positions of the contact surfaces 52A, 53A in contact with the rotating members 66 are shifted in accordance

with eccentric rotations of the rotating members 66 around centers of rotation 64A of the shaft members 64.

At that time, since the rotating members 66 are rotated around centers of rotation 66A, a friction wear due to friction of the contact surfaces 52A, 53A is suppressed.

[0054]

The turning device 60 turns the pair of turning parts 52, 53 and the turning body 50 together with the first supporting shaft 5 by the pair of turning mechanisms 61A, 61B.

Moreover, the turning device 60 moves the first supporting shaft 5 by the turning of the turning body 50 while the axial directions of the pair of supporting shafts 5, 6 are in parallel.

Accordingly, the first supporting shaft 5 is moved toward or away from the second supporting shaft 6.

In accordance with a movement of the first supporting shaft 5, the plate cylinder 3 is moved relative to the impression cylinder 4.

Specifically, when the first supporting shaft 5 is moved away from the second supporting shaft 6, the plate cylinder 3 (the plate cylinder sleeve 7) is separated from the impression cylinder 4 (the impression cylinder sleeve 8) (see Fig.10), or when the first supporting shaft 5 is moved toward the second supporting shaft 6, the plate cylinder 3 is brought into contact with the impression cylinder 4 (see Fig.5).

[0055]

The contact surfaces 52A, 53A of the turning parts 52, 53 are contact surfaces of the turning body 50 in contact with

the turning device 60 and are located on one side (here, downstream side) in the moving direction F of the web 2 with respect to the first supporting shaft 5.

Whereas, the center of turning 51 of the turning body 50 and connecting parts 54, 55 are located on the other side (here, upstream side) in the moving direction F of the web 2 with respect to the first supporting shaft 5.

The turning device 60 turns the turning body 50 by contacting with a contact surface of the turning body 50 through the control member 62.

The plate cylinder 3 is moved toward or away from the impression cylinder 4 in accordance with the turning of the turning body 50.

[0056]

The plate cylinder sleeve 7 of the plate cylinder 3 is pressed against the impression cylinder sleeve 8 of the impression cylinder 4 by the turning of the turning body 50 (see Figs.5, 11).

Under the condition, the print pressure applied to the web 2 passing through between the plate cylinder 3 and the impression cylinder 4 is adjusted by a print pressure adjusting mechanism 70.

The print pressure adjusting mechanism 70 includes a displacement member 71 for displacing the turning body 50 around the center of turning 51 and an operation mechanism 80 for operating the displacement member 71.

The displacement member 71 includes a shaft part 72, two eccentric parts 73, 74 (a first eccentric part 73, a second

eccentric part 74) provided at both ends of the shaft part 72, and a projected part 75 projected from the first eccentric part 73.

[0057]

The shaft part 72 is bridged across the pair of frame parts 21, 22 of the main body frame 20, and is rotatably supported by the pair of frame parts 21, 22.

The eccentric parts 73, 74, the projected part 75 and the operation mechanism 80 are arranged outside the main body frame 20.

The projected part 75 is projected from the first eccentric part 73 to an opposite side of the shaft part 72 and is formed concentrically with the shaft part 72.

The operation mechanism 80 is attached to the first frame part 21 of the main body frame 20, and is connected to the projected part 75 of the displacement member 71.

[0058]

Fig.12 is a view of the print pressure adjusting mechanism 70 viewed in an arrow X3 direction illustrated in Fig.11.

As shown in the drawing, the operation mechanism 80 of the print pressure adjusting mechanism 70 includes brackets 81 attached to the first frame part 21, an operation shaft 82 rotatably supported by the brackets 81, a worm 83 fixed to the operation shaft 82, a worm wheel 84 fixed to the projected part 75 of the displacement member 71 and a handle 85 attached to the operation shaft 82.

The worm 83 and the worm wheel 84 are meshed with each other.

The operation shaft 82 and the worm 83 are rotated by rotating the handle 85.

The worm wheel 84 is rotated integrally with the displacement member 71 in accordance with a rotation of the worm 83.

[0059]

A rotation of the displacement member 71 is operated by the operation mechanism 80 (see Figs.11, 12), whereby the displacement member 71 is rotated around a center of rotation 72A of the shaft part 72.

The eccentric parts 73, 74 are round-shaped cam parts, and centers 73A, 74A in radial directions of the eccentric parts 73, 74 are eccentric relative to the center of rotation 72A of the shaft part 72.

Distances between the centers 73A, 74A of the eccentric parts 73, 74 and the center of rotation 72A of the shaft part 72 are amounts of eccentricity of the eccentric parts 73, 74 relative to the shaft part 72.

Amounts of eccentricity of the two eccentric parts 73, 74 are equal.

The eccentric parts 73, 74 of the displacement member 71 are rotated by the operation mechanism 80, while outer peripheral parts of the eccentric parts 73, 74 are in contact with receiving parts 52B, 53B of the turning parts 52, 53 (see Figs.5, 11).

The receiving parts 52B, 53B of the turning parts 52, 53 are parts of upper edge parts of the turning parts 52, 53, and are located on upper sides with respect to the contact surfaces

52A, 53A of the turning parts 52, 53.

The receiving parts 52B, 53B are located on lower sides of the eccentric parts 73, 74 and receive the eccentric parts 73, 74.

[0060]

The receiving parts 52B, 53B of the turning parts 52, 53 are pressed against the eccentric parts 73, 74 of the displacement member 71 by the turning device 60.

Under the condition, the eccentric parts 73, 74 are rotated around the center of rotation 72A of the shaft part 72 by rotational operation of the operation mechanism 80 while keeping an eccentricity relative to the shaft part 72.

The centers 73A, 74A of the eccentric parts 73,74 are moved around the center of rotation 72A of the shaft part 72 in accordance with eccentric rotations of the eccentric parts 73, 74.

At the same time, parts of the eccentric parts 73, 74 in contact with the receiving parts 52B, 53B are shifted in peripheral directions of the eccentric parts 73, 74.

Accordingly, positions of the receiving parts 52B, 53B of the turning parts 52, 53 are shifted, then the turning parts 52, 53 and the turning body 50 are turned.

The displacement member 71 displaces the turning body 50 and the turning parts 52, 53 in the turning direction by the eccentric parts 73, 74.

[0061]

The pressure adjusting mechanism 70 displaces the turning body 50 together with the first supporting shaft 5 by the

displacement member 71 while the axial direction of the pair of supporting shafts 5, 6 is in parallel.

Accordingly, the first supporting shaft 5 is displaced toward or away from the second supporting shaft 6.

The plate cylinder 3 is displaced relative to the impression cylinder 4 in accordance with the displacement of the first supporting shaft 5.

The print pressure adjusting mechanism 70 adjusts the print pressure applied to the web 2 by displacing the turning body 50 and the first supporting shaft 5 thereby displacing the plate cylinder 3 toward or away from the impression cylinder 4.

Specifically, the print pressure applied to the web 2 is lowered when the plate cylinder 3 is displaced away from the impression cylinder 4 by the print pressure adjusting mechanism 70.

And the print pressure applied to the web 2 is raised when the plate cylinder 3 is displaced toward the impression cylinder 4 by the print pressure adjusting mechanism 70.

The web 2 passes through between the plate cylinder 3 and the impression cylinder 4 while the print pressure applied to the web 2 is adjusted.

[0062]

When printing on the rear face of the web 2 (see Figs.3, 4, 5), the plate cylinder sleeve 7 is attached to the first supporting shaft 5, and the impression cylinder sleeve 8 is attached to the second supporting shaft 6.

Moreover, the guide member 28 is attached in the second

opening 27 of the main body frame 20.

The ink supply device 40 and the sub frame 30 are moved in alignment with the position of the plate cylinder sleeve 7 and are attached in the first opening 26 of the main body frame 20.

Under the condition, the anilox roll 41 is brought into contact with the plate cylinder sleeve 7 by the moving device 44, and the contact pressure between the plate cylinder 3 and the anilox roll 41 is adjusted by the position adjusting part 48.

Along with this, the driven gear 19 of the anilox roll 41 is meshed with the drive gear 18 of the plate cylinder 3 with an appropriate backlash.

Moreover, the anilox roll 41 is arranged at the position to supply ink to the plate cylinder sleeve 7.

[0063]

The turning body 50 and the plate cylinder 3 are turned by the turning device 60 whereby the plate cylinder 3 is moved relative to the impression cylinder 4.

Moreover, the turning body 50 and the plate cylinder 3 are displaced by the print pressure adjusting mechanism 70 whereby the print pressure applied to the web 2 is adjusted.

When the turning body 50 and the plate cylinder 3 are turned (displaced), the center of rotation 43 of the anilox roll 41 is matched with the center of turning 51 of the turning body 50.

Accordingly, the plate cylinder 3 is moved around the center of rotation 43 of the anilox roll 41 without changing

the distance between a center of rotation of the plate cylinder 3 and the center of rotation 43 of the anilox roll 41.

[0064]

Accordingly, when the plate cylinder 3 is moved relative to the impression cylinder 4, the contact pressure between the plate cylinder 3 and the anilox roll 41 is not changed.

Further, when the print pressure applied to the web 2 is adjusted, the contact pressure between the plate cylinder 3 and the anilox roll 41 is not changed.

In other words, the print pressure applied to the web 2 is adjusted while the contact pressure between the plate cylinder 3 and the anilox roll 41 is constant.

The turning body 50 is arranged outside the main body frame 20, and the anilox roll 41 is arranged inside the main body frame 20.

In this way, in the printing apparatus 1, the turning body 50 and the anilox roll 41 are differently arranged.

Therefore, a structure of the printing apparatus 1 is prevented from being complicated, and the printing apparatus 1 is easily assembled.

The anilox roll 41 is easily arranged such that the centers 43, 51 are matched with each other.

[0065]

When printing on the front face of the web 2 (see Figs.6, 7, 8), the impression cylinder sleeve 8 is attached to the first supporting shaft 5, and the plate cylinder sleeve 7 is attached to the second supporting shaft 6.

The plate cylinder 3 is rotatably supported by the main

body frame 20, and the impression cylinder 4 is rotatably supported by the turning body 50.

The turning body 50 holds the impression cylinder 4 and is turned together with the impression cylinder 4.

Moreover, the guide member 28 is attached in the first opening 26 of the main body frame 20.

The ink supply device 40 and the sub frame 30 are moved in alignment with the position of the plate cylinder sleeve 7 and are attached in the second opening 27 of the main body frame 20.

Under the condition, the anilox roll 41 is brought into contact with the plate cylinder sleeve 7 by the moving device 44, and the contact pressure between the plate cylinder 3 and the anilox roll 41 is adjusted by the position adjusting part 48.

Along with this, the driven gear 19 of the anilox roll 41 is meshed with the drive gear 18 of the plate cylinder 3 with an appropriate backlash.

Moreover, the anilox roll 41 is arranged at the position to supply ink to the plate cylinder sleeve 7.

[0066]

The turning body 50 is turned by the turning device 60 and moves the first supporting shaft 5 and the impression cylinder 4 in the turning direction.

The impression cylinder 4 is moved relative to the plate cylinder 3 in accordance with the movement of the first supporting shaft 5.

The impression cylinder 4 is moved toward or away from

the plate cylinder 3 in accordance with the turning of the turning body 50.

Specifically, when the first supporting shaft 5 is moved away from the second supporting shaft 6, the impression cylinder 4 (the impression cylinder sleeve 8) is separated from the plate cylinder 3 (the plate cylinder sleeve 7).

When the first supporting shaft 5 is moved toward the second supporting shaft 6, the impression cylinder 4 is brought into contact with the plate cylinder 3.

Moreover, the impression cylinder sleeve 8 of the impression cylinder 4 is pressed against the plate cylinder sleeve 7 of the plate cylinder 3 by the turning of the turning body 50.

[0067]

The impression cylinder 4 is displaced relative to the plate cylinder 3 by the print pressure adjusting mechanism 70.

The print pressure adjusting mechanism 70 adjusts the print pressure applied to the web 2 by displacing the turning body 50 and the first supporting shaft 5 thereby displacing the impression cylinder 4 toward or away from the plate cylinder 3.

Specifically, when the impression cylinder 4 is displaced away from the plate cylinder 3 by the print pressure adjusting mechanism 70, the print pressure applied to the web 2 is lowered.

And when the impression cylinder 4 is displaced toward the plate cylinder 3 by the print pressure adjusting mechanism 70, the print pressure applied to the web 2 is raised.

[0068]

The turning body 50 and the impression cylinder 4 are turned by the turning device 60, whereby the impression cylinder 4 is moved.

Moreover, the turning body 50 and the impression cylinder 4 are displaced by the print pressure adjusting mechanism 70 whereby the print pressure applied to the web 2 is adjusted.

When the turning body 50 and the impression cylinder 4 are turned (displaced), positions of the plate cylinder 3 and the anilox roll 41 are not shifted, therefore, when the impression cylinder 4 is moved, the contact pressure between the plate cylinder 3 and the anilox roll 41 is not changed.

Moreover, when the print pressure applied to the web 2 is adjusted, the contact pressure between the plate cylinder 3 and the anilox roll 41 is not changed.

Accordingly, the print pressure applied to the web 2 is adjusted while the contact pressure between the plate cylinder 3 and the anilox roll 41 is constant.

[0069]

As explained above, according to the printing apparatus 1, an adjustment of the print pressure and a movement of the plate cylinder 3 relative to the impression cylinder 4 can be easily performed by a simple mechanism while preventing a change in the contact pressure between the plate cylinder 3 and the anilox roll 41.

When performing the adjustment of the print pressure and the movement of the plate cylinder 3 relative to the impression cylinder 4, it is not even required to adjust the contact

pressure between the plate cylinder 3 and the anilox roll 41.

A load applied to the plate cylinder 3 from the anilox roll 41 is prevented from changing.

As a result, the plate cylinder 3 (plate) can be restrained from damaging.

[0070]

In the printing apparatus 1, the structure of the printing apparatus 1 can be simplified while the number of components can be reduced.

Therefore, a cost of the printing apparatus 1 can be reduced.

Since the sub frame 30 is attached in the openings 26, 27 of the main body frame 20, the ink supply device 40 can be easily arranged in alignment with the position of the plate cylinder sleeve 7.

The sub frame 30 can be smoothly attached in the openings 26, 27 of the main body frame 20 by guiding of the guide member 28.

[0071]

The turning device 60 turns the turning body 50 around the center of turning 51 while being in contact with the contact surface of the turning body 50.

In the moving direction F of the web 2, the contact surface of the turning body 50 is located on one side of the first supporting shaft 5, and the center of turning 51 of the turning body 50 is located on the other side of the first supporting shaft 5.

Therefore, power required to turn the turning body 50 can

be reduced and the turning body 50 can be easily turned by the turning device 60.

[0072]

Furthermore, in the printing apparatus 1 of the present embodiment, the rear face 2A of the web 2 is a lower face of the web 2, and the front face 2B of the web 2 is an upper face of the web 2.

Whereas, the web 2 may be moved in the moving direction F in an inverse state of the rear face 2A and the front face 2B of the web 2.

In this case, the rear face 2A of the web 2 is the upper face of the web 2 and the front face 2B of the web 2 is the lower face of the web 2.

Printing on the front face 2B of the web 2 is performed when the plate cylinder 3 is located on the lower side of the web 2.

And printing on the rear face 2A of the web 2 is performed when the plate cylinder 3 is located on the upper side of the web 2.

[0073]

The first supporting shaft 5 and the second supporting shaft 6 may be replaced.

In this case, the turning body 50 holds the first supporting shaft 5 located on the upper side of the web 2 and turns the first supporting shaft 5.

The second supporting shaft 6 is located on the lower side of the web 2 and is held by the main body frame 20.

[0074]

In the printing apparatus 1 of the present embodiment, the moving direction F of the web 2 is horizontal.

Whereas, the moving direction F of the web 2 may be different direction (e.g. vertical direction, obliquely upward direction, obliquely downward direction).

The present invention is applicable to various printing apparatuses in the same way as mentioned above regardless of the moving direction F of the web 2.

The claims defining the invention are as follows:

1. A printing apparatus capable of switching between front face printing of a web and rear face printing of the web by exchanging positions of a plate cylinder and an impression cylinder relative to the web, comprising:

a pair of supporting shafts opposed with each other across the web,

a plate cylinder sleeve and an impression cylinder sleeve detachably attached to supporting shafts different from each other, the supporting shafts to be attached being changeable,

an ink supply device including an anilox roll and being movable in alignment with a position of the plate cylinder sleeve attached to a supporting shaft, and

a turning body holding one of the pair of supporting shafts and being turned together with one supporting shaft,

wherein a center of rotation of the anilox roll is matched with a center of turning of the turning body, when the ink supply device has been moved in alignment with the position of the plate cylinder sleeve attached to the one supporting shaft.

2. A printing apparatus according to claim 1, further comprising:

a main body frame including two openings provided on each side of the pair of supporting shafts with respect to the web, and

a sub frame moved integrally with the ink supply device in alignment with the position of the plate cylinder sleeve and attached in an opening on a supporting shaft side to which the plate cylinder sleeve is attached.

3. A printing apparatus according to claim 2, further comprising:

a guide member attached in the opening on the supporting shaft side to which the impression cylinder sleeve is attached and guiding the sub frame.

4. A printing apparatus according to claim 1 to 3, further comprising:

a turning device turning the turning body by contacting with a contact surface of the turning body, wherein,

the contact surface of the turning body is located on one side in a moving direction of the web with respect to the one supporting shaft, and

the center of turning of the turning body is located on the other side in the moving direction of the web with respect to the one supporting shaft.

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Fig. 1

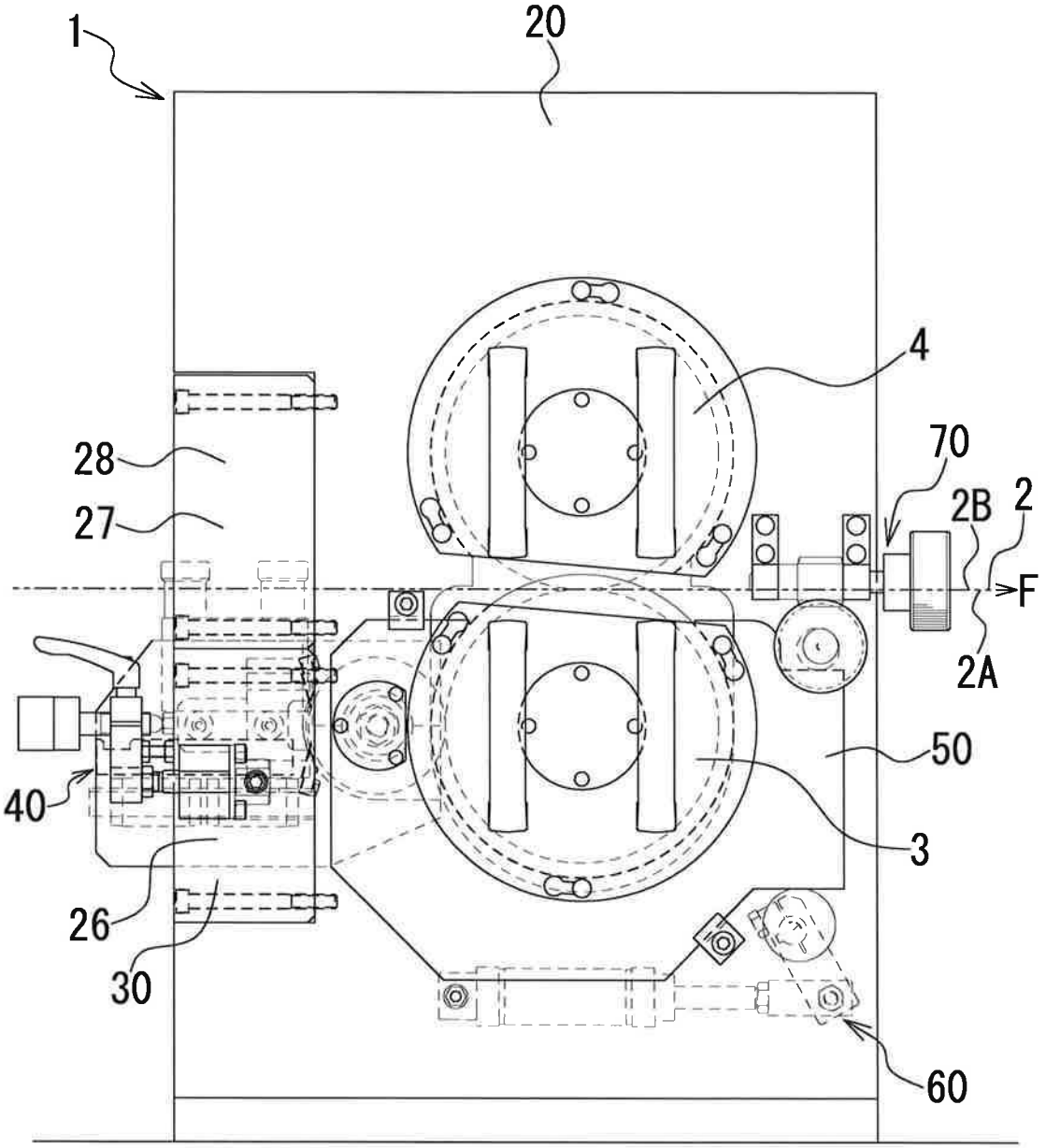

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Fig. 2

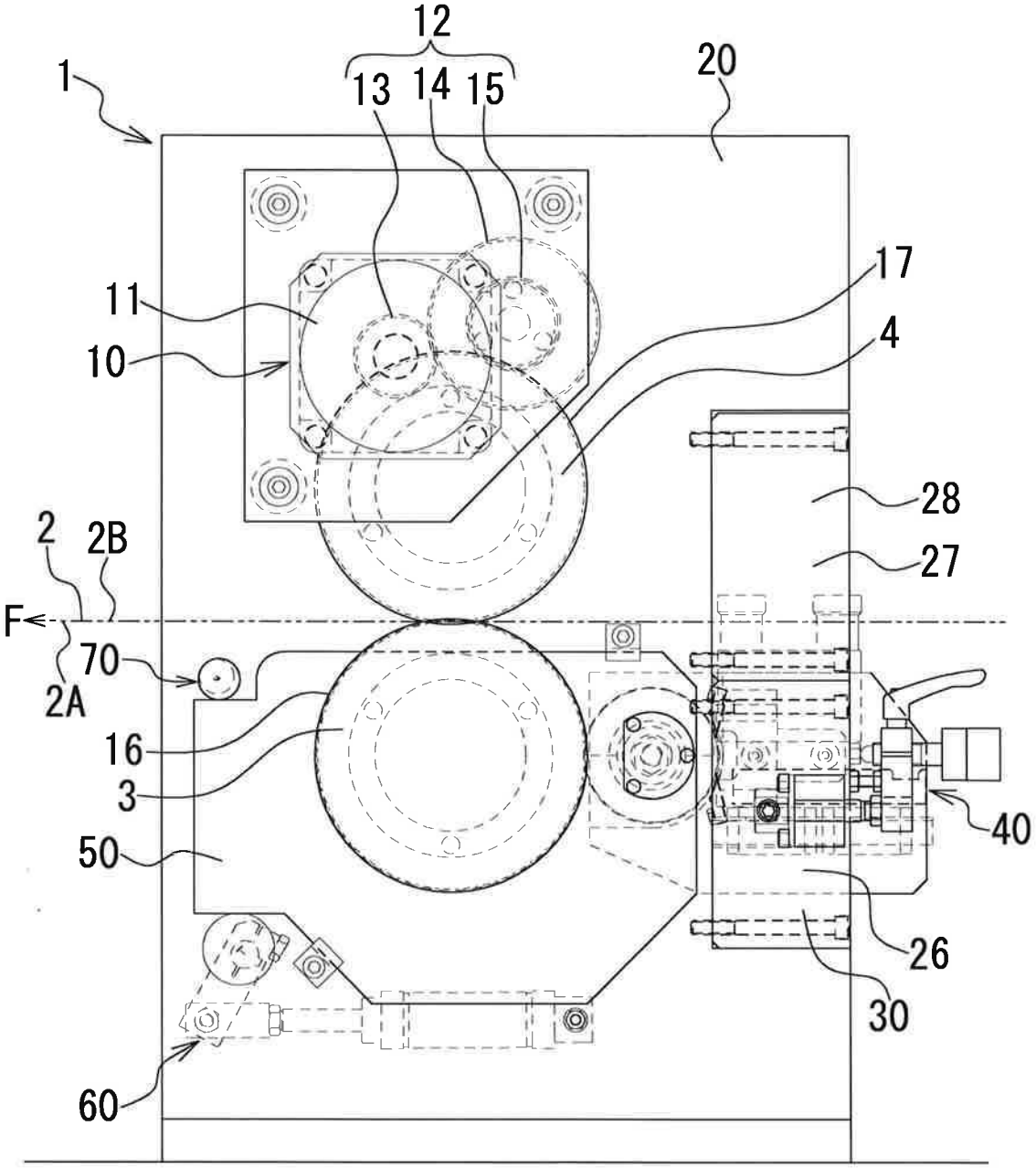

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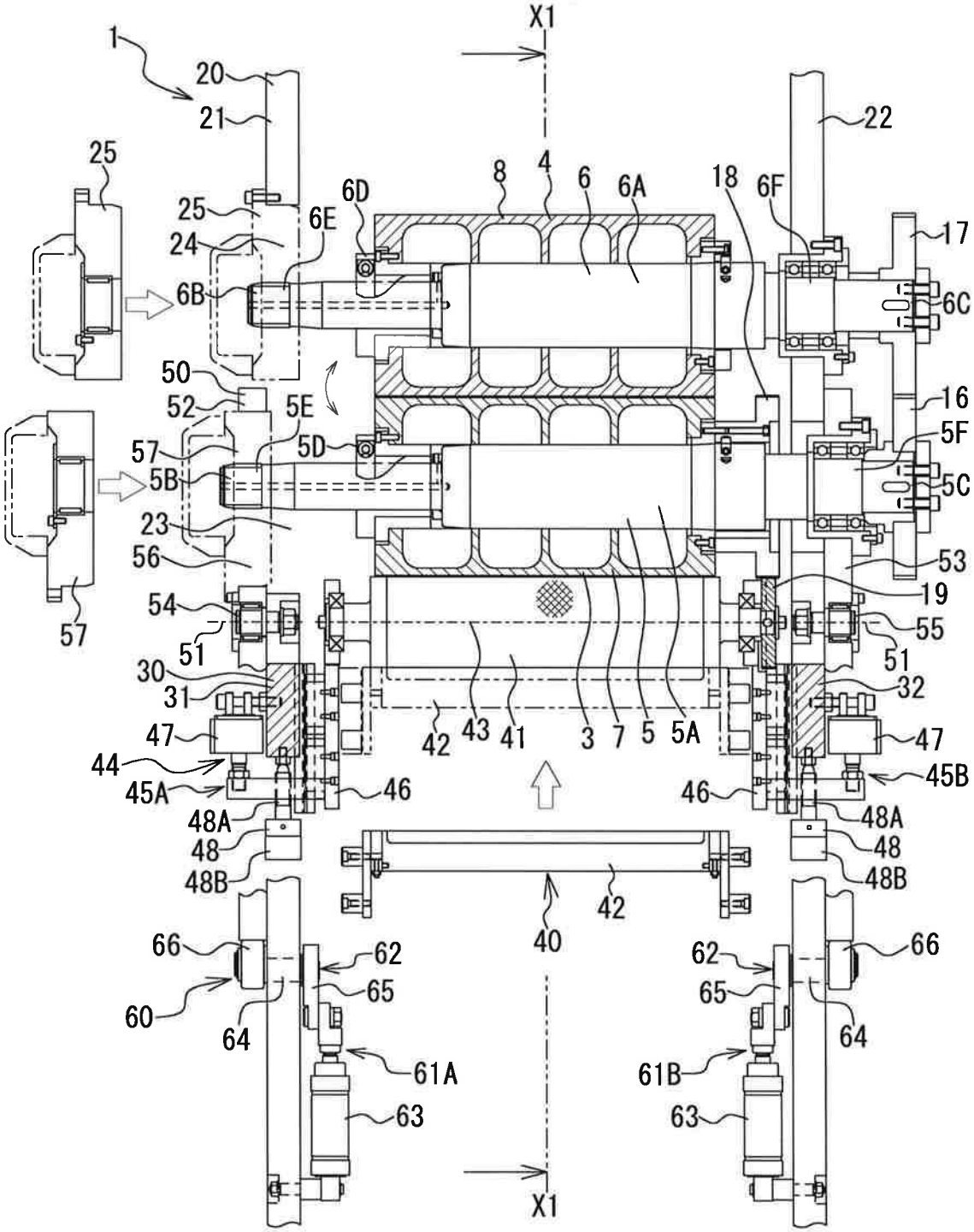
Fig. 3



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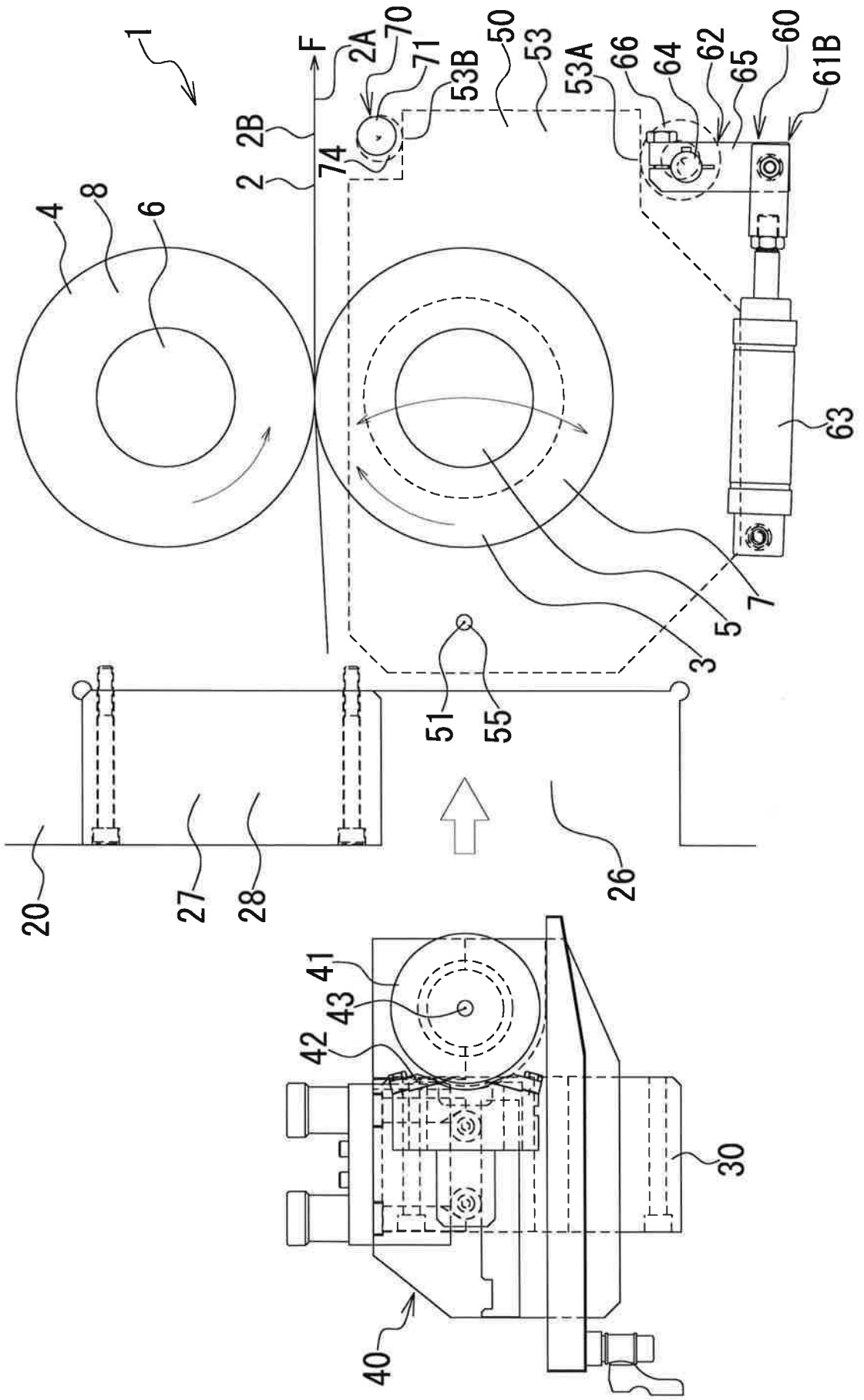
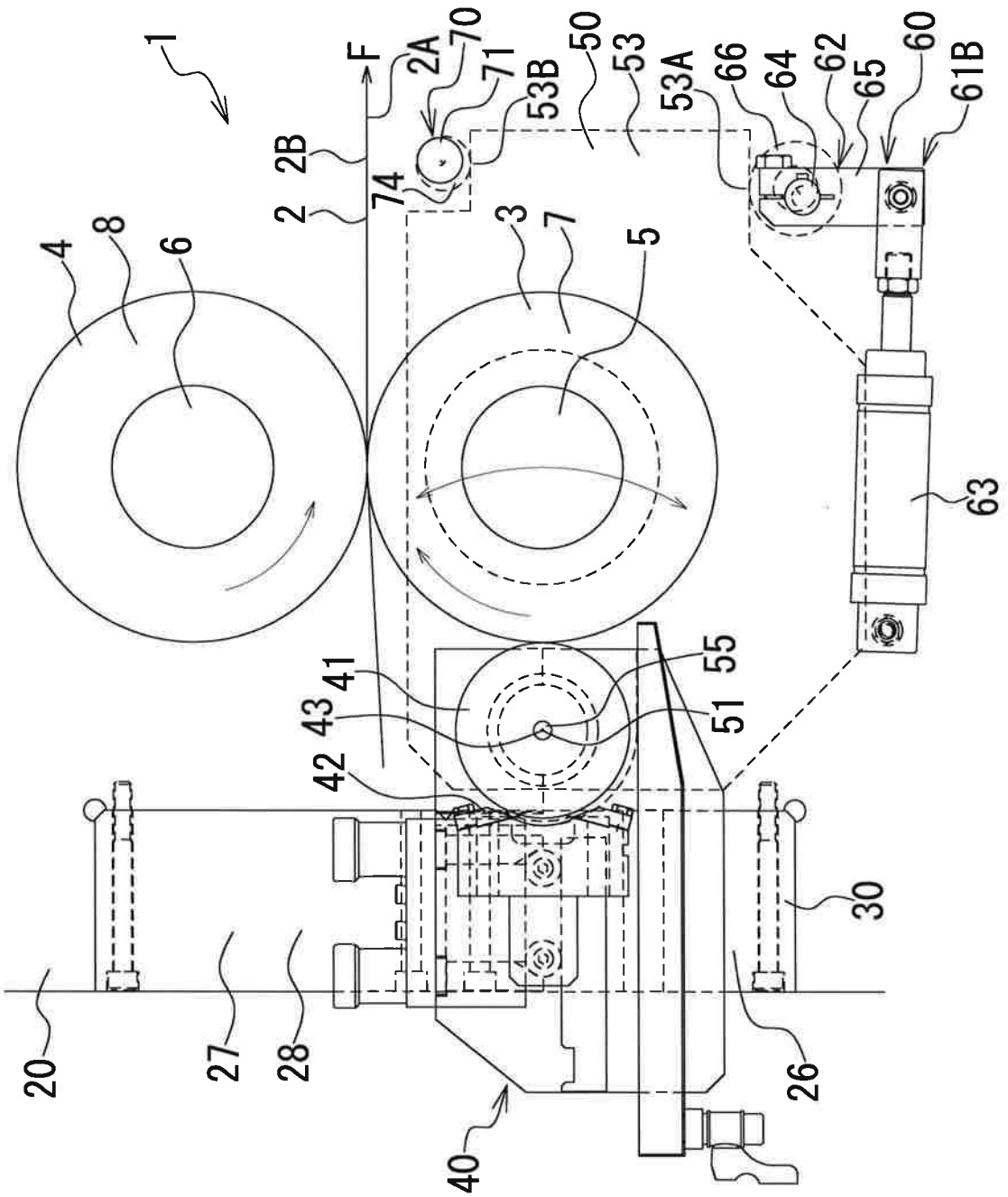


Fig. 4

Fig. 5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71
53B
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66
64
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65
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61B
2B
2
74
4
8
6
3
7
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55
51
30
20
27
28
40
26

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Fig. 6

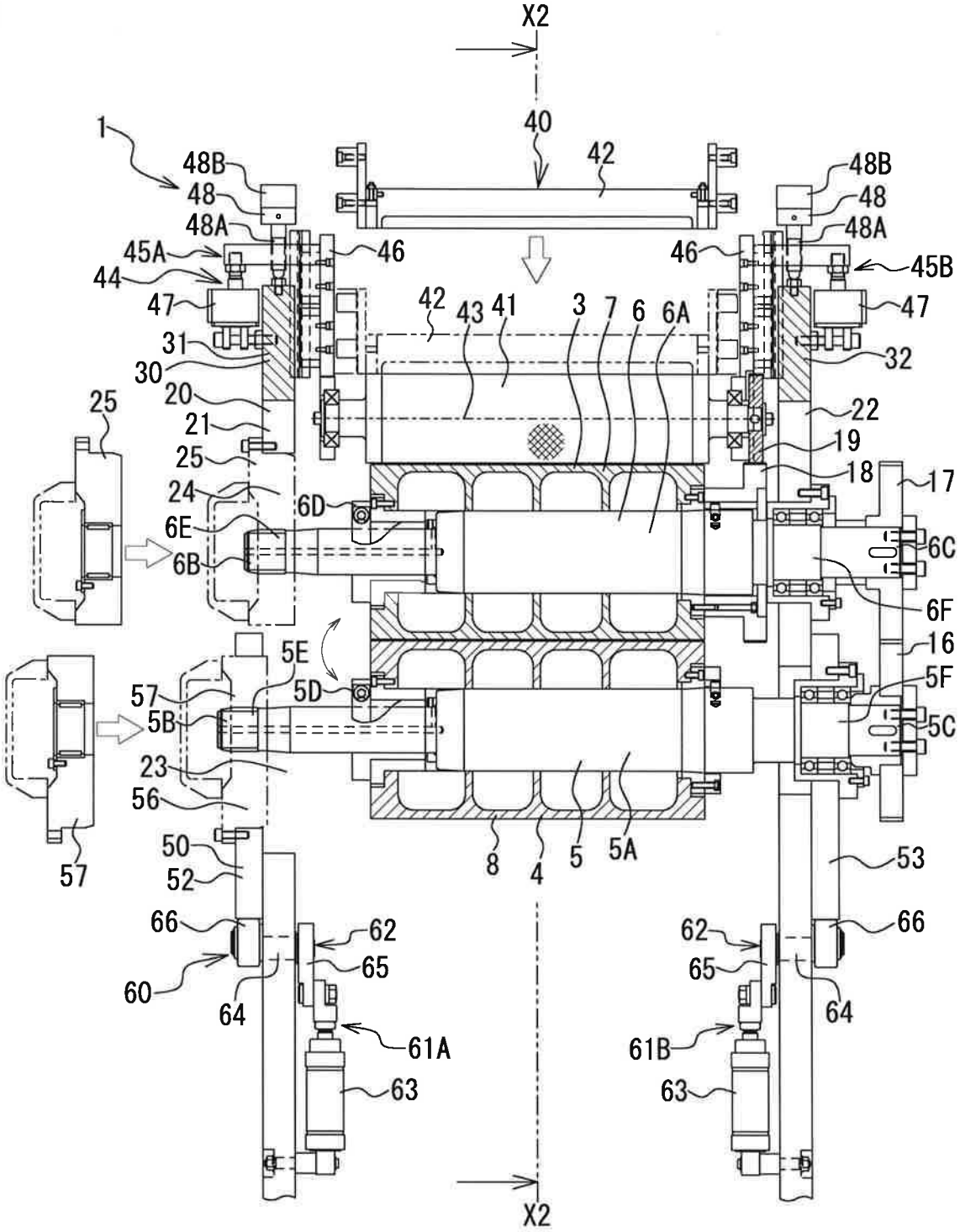

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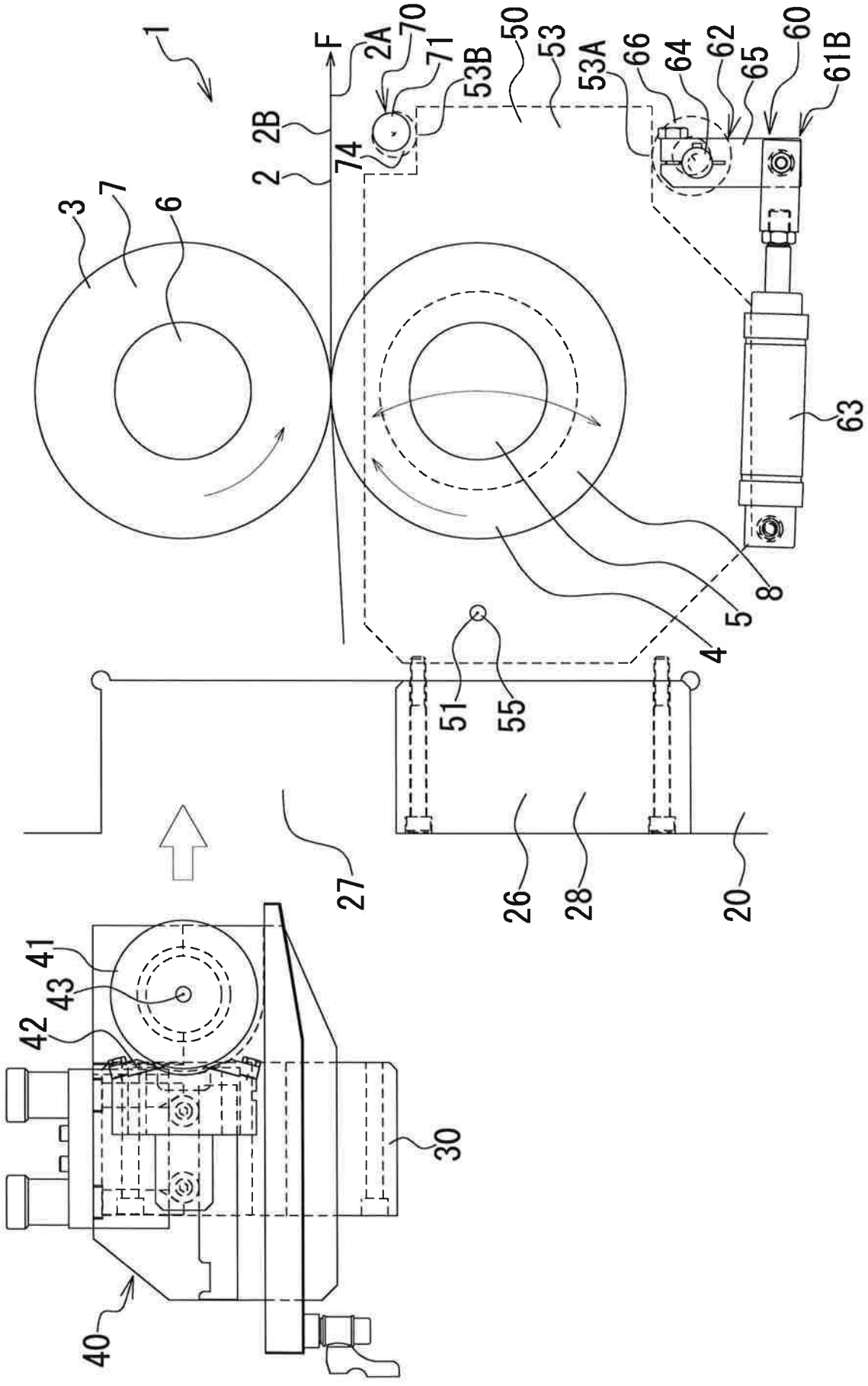
Fig. 7



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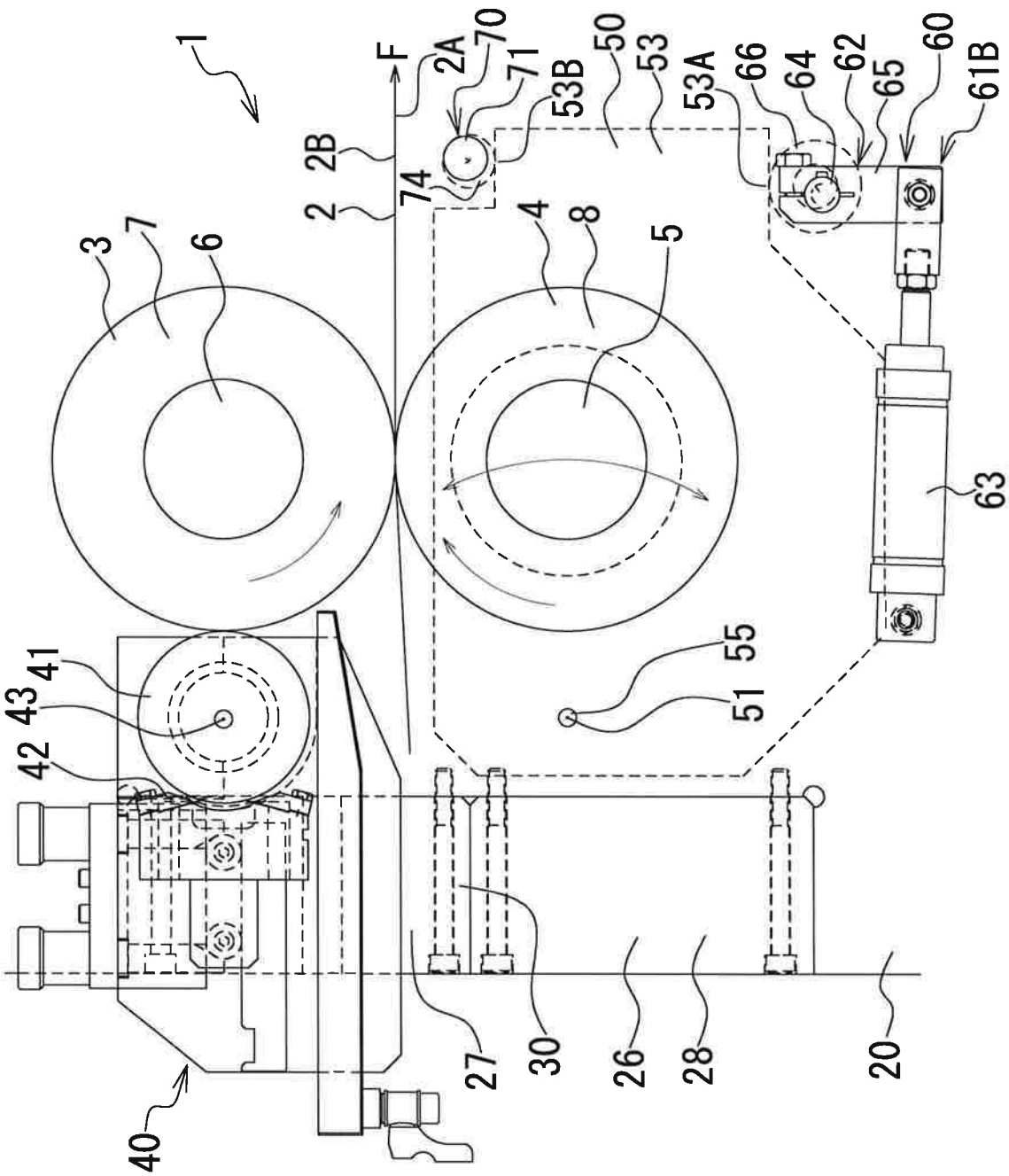

Fig. 8

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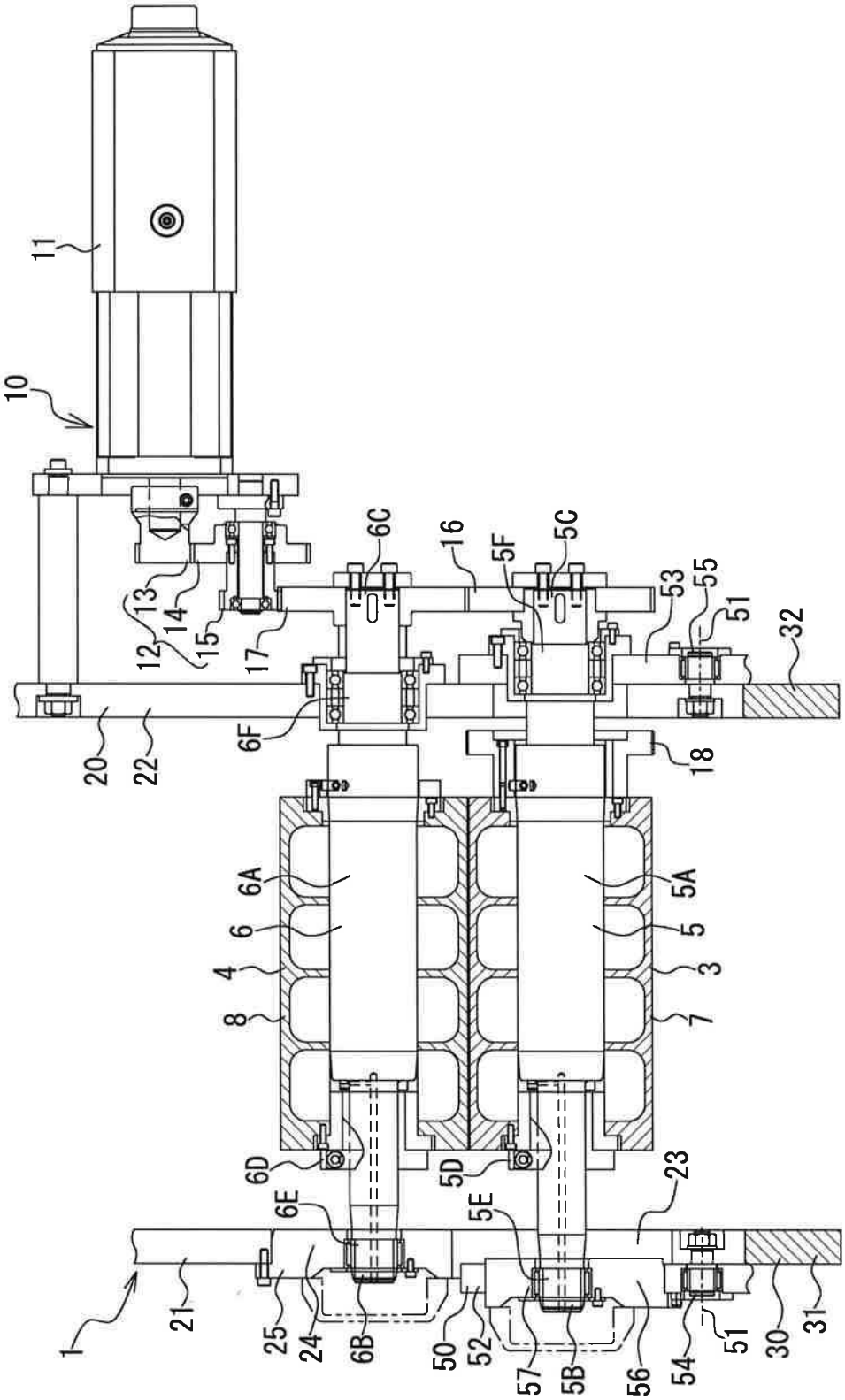
Fig. 9



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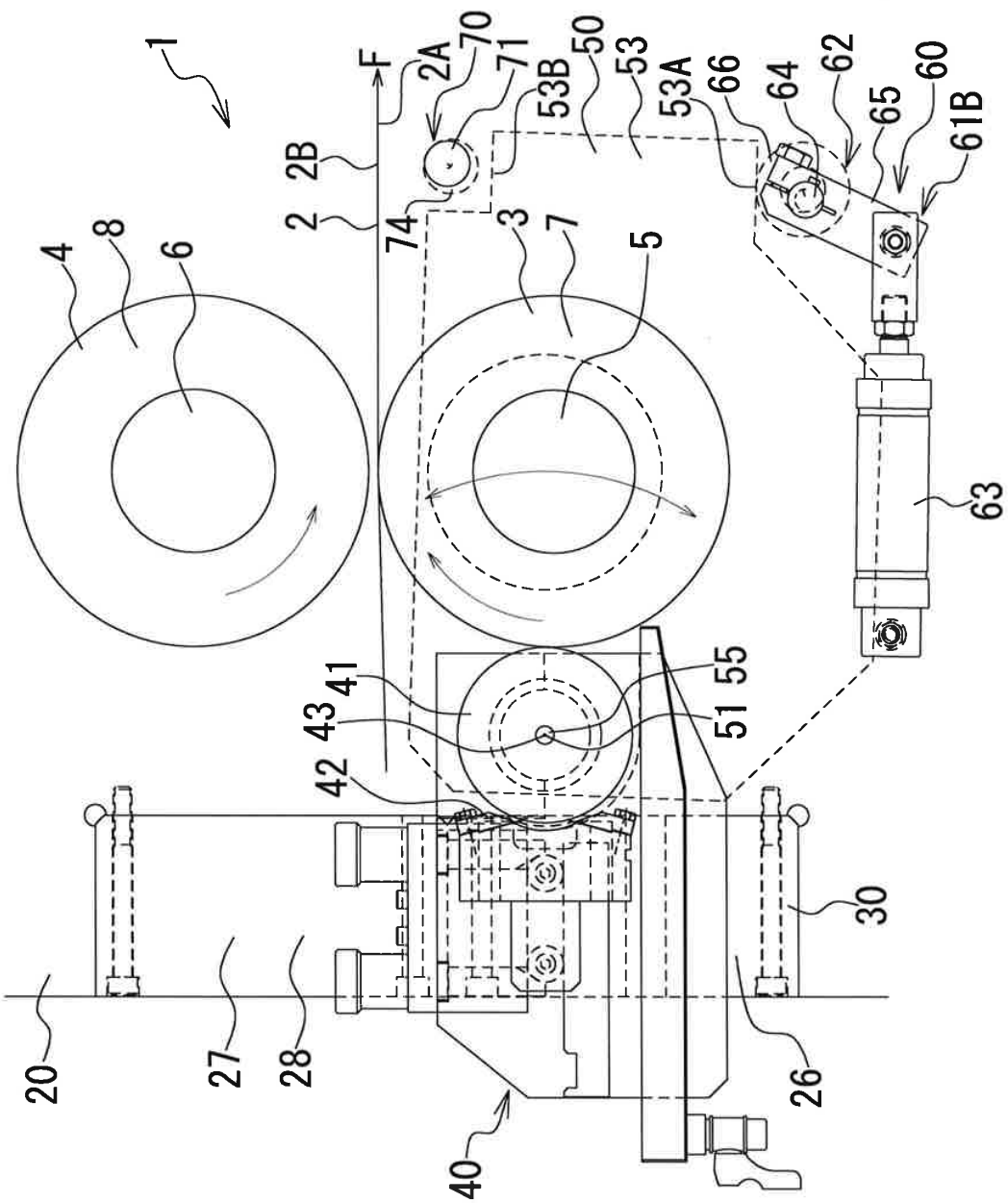

Fig. 10

2018202781 20 Apr 2018

Fig. 11

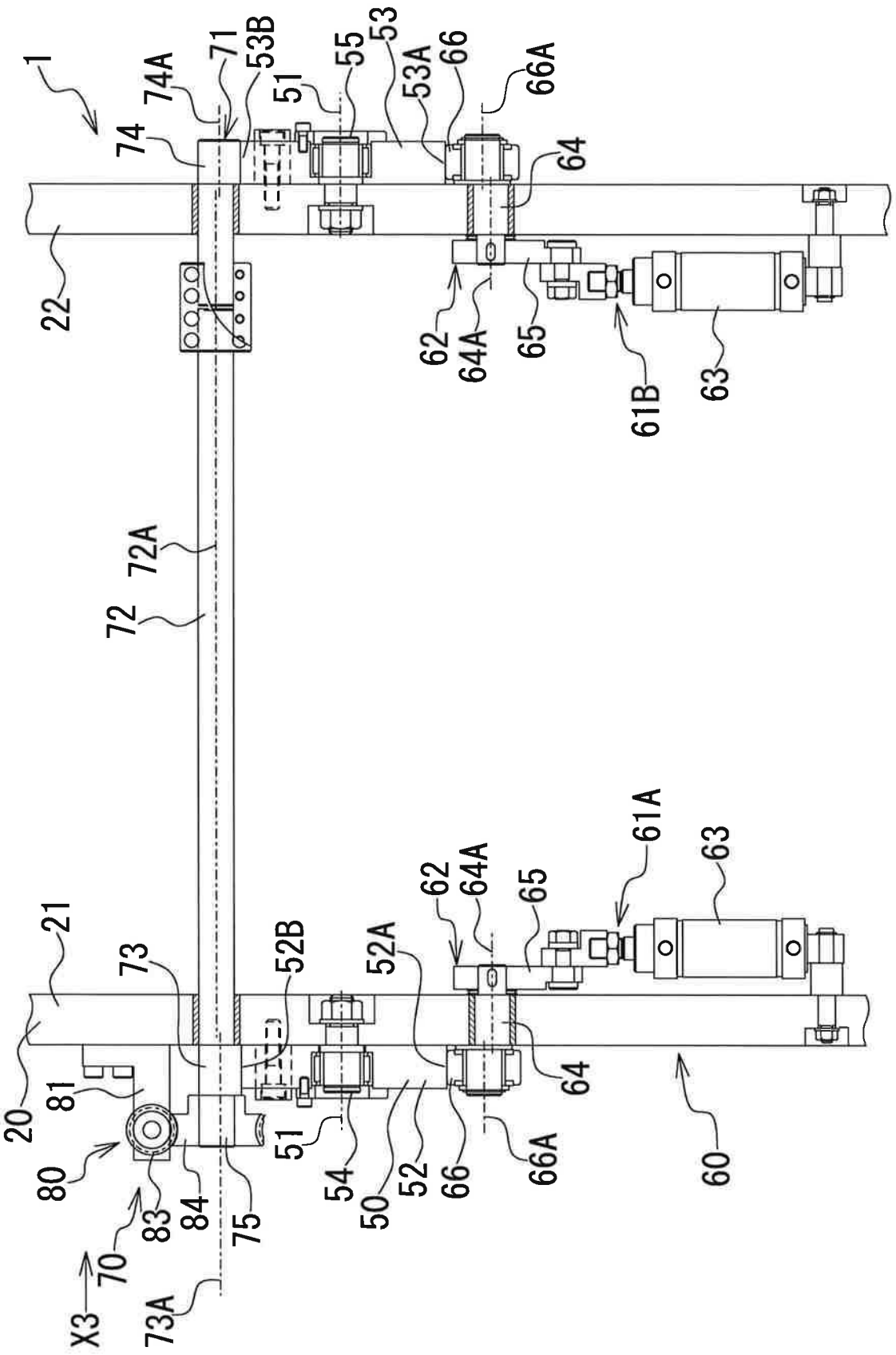

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Fig. 12