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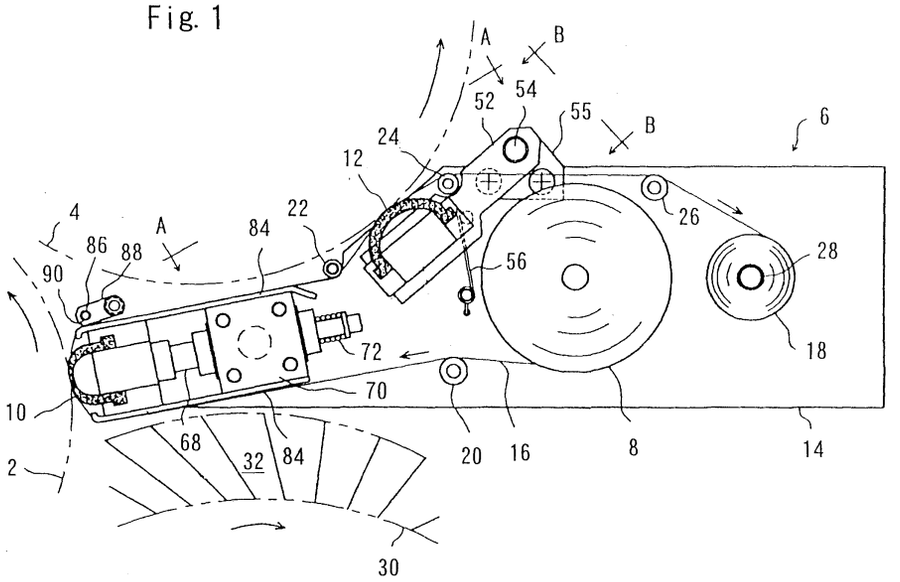
(54) Cylinder cleaning apparatus

(57) There is disclosed an apparatus for cleaning a plurality of cylinders each of which includes an outer surface. The apparatus comprises a cleaning unit (6) including a supply of cleaning fabric (16) installed thereon. The cleaning unit further includes a plurality of pressure pads (10;12) opposed to the outer surfaces of the cylinders respectively, at least one of the pressure pads being incorporated into the cleaning unit for reciprocatingly movement toward and away from the outer surface of the corresponding cylinder. A cleaning fabric is fed to the pressure pads from the supply of cleaning fabric (8). The apparatus further comprises actuating means for moving at least one of the pressure pads relatively to the cleaning unit so that the cleaning fabric is pressed against the outer surface of the corresponding cylinder and then released from being pressed by at least one of the pressure pads to clean the outer surface of the corresponding cylinder.

Fig. 1



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Description

[0001] The invention relates to an apparatus for cleaning a plurality of cylinders with a cleaning fabric in an offset printing press. The cylinders may be an impression cylinder, a blanket cylinder and the like. The apparatus includes a plurality of pressure pads by which the cleaning fabric is pressed against the outer surfaces of the cylinders to clean the outer surfaces of the cylinders.

[0002] There has been proposed an apparatus for cleaning a plurality of cylinders with a cleaning fabric in an offset printing press, as disclosed in Japanese Patent Publication No. 5182 of 1996. The apparatus comprises a cleaning unit which includes a supply of cleaning fabric installed thereon. The cleaning unit further includes a plurality of pressure pads incorporated thereinto and opposed to the outer surfaces of the cylinders respectively. Each of the pressure pads comprises an air pad which can be inflated by air under pressure so that the cleaning fabric is pressed against the outer surface of the cylinder by the air pad to clean the outer surface of the cylinder.

[0003] By the way, the printing press sometimes includes a certain cylinder which is positioned across a restricted space. In the case, in order to clean the outer surface of the cylinder in the apparatus, it is required to insert the pressure pad of the cleaning unit into the restricted space to approach the outer surface of the cylinder. However, the cleaning unit is too large to insert it into the restricted space. The air pad is also too large to insert it into the restricted space. The apparatus is therefore unavailable to clean the outer surface of the cylinder which is positioned across the restricted space.

[0004] It is therefore an object of the invention to provide a new and improved apparatus for cleaning a plurality of cylinders with a cleaning fabric, to thereby overcome the above problems.

[0005] Another object is to provide the apparatus which can clean the outer surface of the cylinder which is positioned across a restricted space.

[0006] According to the invention, there is provided an apparatus for cleaning a plurality of cylinders each of which includes an outer surface. The apparatus comprises a cleaning unit including a supply of means to provide a supply of cleaning fabric when installed thereon. The cleaning unit further includes a plurality of pressure pads opposed to the outer surfaces of the cylinders respectively, at least one of the pressure pads being incorporated into the cleaning unit for reciprocatingly movement toward and away from the outer surface of the corresponding cylinder. A cleaning fabric is fed to the pressure pads from the supply of cleaning fabric. The apparatus further comprises actuating means for moving at least one of the pressure pads relatively to the cleaning unit so that the cleaning fabric is pressed against the outer surface of the corresponding cylinder and then released from being pressed by at least one of the pressure pads to clean the outer surface of the corresponding cylinder.

[0007] The cleaning unit may include a base portion and an elongate portion which extends from the base portion, has a length and terminates at an end portion. The elongate portion and the end portion are thinner than the base portion. The supply of cleaning fabric is installed on the base portion. At least one of the pressure pads is incorporated into the end portion, the actuating means moving at least one of the pressure pads relatively to the end portion.

[0008] The actuating means may comprise first air cylinder means mounted on a carriage. At least one of the pressure pads may be connected to and supported by the first air cylinder means for reciprocating movement toward and away from the outer surface of the corresponding cylinder, the first air cylinder means moving at least one of the pressure pads relatively to the carriage. The carriage may be incorporated into the cleaning unit for reciprocating movement toward and away from the outer surface of the corresponding cylinder. The cleaning unit may further include second air cylinder means incorporated thereinto and connected to the carriage to move the carriage relatively to the cleaning unit.

[0009] In a preferred embodiment, each of the pressure pads is incorporated into the cleaning unit for reciprocatingly movement toward and away from the outer surface of the cylinder. A plurality of the actuating means are connected to the pressure pads respectively for moving the pressure pads relatively to the cleaning unit so that the cleaning fabric is pressed against the outer surfaces of the cylinders and then released from being pressed by the pressure pads to clean the outer surfaces of the cylinders.

[0010] The cleaning unit further includes springs for resiliently urging the pressure pads to move them away from the outer surfaces of the cylinders.

[0011] The cylinders comprise an impression cylinder and a blanket cylinder in a printing press.

[0012] At least one of the pressure pads includes a central portion engaged with the cleaning fabric and opposite edge portions to be mounted, the central portion being thinner than the opposite edge portions.

[0013] At least one of the pressure pad is mounted on one end of a rod which is supported by a support for linearly movement toward and away from the outer surface of the cylinder, the cleaning unit further including side plate means on which the support is mounted.

[0014] At least one of the pressure pads is mounted on an arm which is supported by a shaft for swinging movement thereabout toward and away from the outer surface of the cylinder, the cleaning unit further including side plate means on which the shaft is mounted.

[0015] The cleaning unit further includes means for resiliently urging the pressure pads to move them away from the outer surfaces of the cylinders.

[0016] At least one of the actuating means may comprise first air cylinder means mounted on a carriage. At least one of the pressure pads may be connected to and

supported by the first air cylinder means for reciprocating movement toward and away from the outer surface of the cylinder, the first air cylinder means moving the pressure pad relatively to the carriage. The carriage may be incorporated into the cleaning unit for reciprocating movement toward and away from the outer surface of the cylinder. The cleaning unit may further include second air cylinder means incorporated thereinto and connected to the carriage to move the carriage relatively to the cleaning unit.

[0017] The cylinders comprise a first cylinder which is late contaminated and a second cylinder which is early contaminated. The cleaning fabric is firstly fed to the outer surface of the first cylinder and then fed to the outer surface of the second cylinder from the supply of cleaning fabric.

[0018] The cylinders comprise an impression cylinder and a blanket cylinder, the cleaning fabric being firstly fed to the outer surface of the impression cylinder and then fed to the outer surface of the blanket cylinder.

[0019] The pressure pads may comprise first and second pressure pads cooperating with the cleaning fabric to clean the outer surfaces of the first and second cylinders respectively. The cleaning fabric is consumed by a predetermined length in one programmed cleaning cycle to accomplish the cleaning of the first cylinder. The first and second pressure pads are spaced from each other at a distance which is greater than the predetermined length of the cleaning fabric.

[0020] The cleaning fabric is firstly fed to the outer surface of the first cylinder and then fed to the outer surface of the second cylinder from the supply of cleaning fabric to clean the outer surface of the first cylinder at a first frequency and clean the outer surface of the second cylinder at a second frequency. The first frequency is lower than the second frequency.

[0021] At least one of the actuating means comprises an actuator connected to the pressure pad through a wire and a converting means. The wire transmits a power to the converting means from the actuator. The converting means converts the power to a moving force for moving the pressure pad toward the outer surface of the cylinder.

[0022] The cleaning unit further includes means for changing the length of the wire for adjustment of a press force imparted to the pressure pad by which the cleaning fabric is pressed.

[0023] The actuator is driven in timed relation with the feeding of the cleaning fabric.

[0024] The impression cylinder has gripper means by which a sheet is held, the actuating means for the impression cylinder being driven in timed relation with the feeding of the cleaning fabric and in connection with the rotation of the impression cylinder not to cause interference between the gripper means and the pressure pad.

[0025] The pressure pad is covered by a pair of covers which extend toward the outer surface of the cylinder and terminate at edge portions between which an opening is formed. The pressure pad protrudes out of and retracts into an inner space between the covers through the opening.

[0026] The rod extends through the support, the cleaning unit further including spring means for resiliently urging the rod to move it away from the outer surface of the cylinder.

[0027] The cleaning fabric is released from being pressed when the pressure pad retracts into the inner space between the covers.

[0028] The pressure pad is positioned to be disengaged from the cleaning fabric or not to hinder the feeding of cleaning fabric when the pressure pad retracts into the inner space between the covers.

[0029] The edge portions of the covers are adapted to guide the cleaning fabric to be fed when the pressure pad retracts into the inner space between the covers.

[0030] A pair of guide rollers may be disposed near and spaced from the pressure pad not to hinder the movement of the pressure pad.

[0031] The cleaning fabric may be released from being pressed when the pressure pad retracts into or across a position between the guide rollers.

[0032] The apparatus further comprises adapter plate means extending vertically to the cylinders, the cleaning unit being supported by the adapter plate means for movement toward the cylinders. The apparatus further comprises guide means for guiding the cleaning fabric to be fed to the pressure pads and not to be engaged with the outer surfaces of the cylinders between the pressure pads.

[0033] The guide means comprises guide rollers mounted on press frame means or the adapter plate means which is fixed to the press frame means. The cleaning unit is supported by the adapter plate means for movement toward the cylinders when cleaning and movement away from the cylinders into a standby position when not cleaning. The apparatus further comprises tubular air bar means including a plurality of holes formed therein for blowing air toward the sheet held by the gripper means and advanced toward the blanket cylinder, the blowing of air being started in accordance with the movement of the cleaning unit into the standby position after cleaning.

[0034] The air bar means is mounted on press frame means or the adapter plate means which is fixed to the press frame means.

[0035] The apparatus may further comprise a pair of guide means disposed near the pressure pad on the opposite sides of the pressure pad for guiding the cleaning fabric to be fed between the pressure pad and the cylinder when moving the pressure pad away from the cylinder.

[0036] The apparatus may further comprise means for preventing the pressure pad from moving tangentially to the cylinder by the rotation thereof when cleaning.

[0037] There is also provided an apparatus for cleaning an impression cylinder which includes an outer sur-

face. In the embodiment, a pressure pad is opposed to the outer surface of the impression cylinder. The pressure pad is incorporated into the cleaning unit for reciprocating movement toward and away from the outer surface of the impression cylinder. A cleaning fabric is fed to the pressure pad from the supply of cleaning fabric. The pressure pad includes a central portion engaged with the cleaning fabric and opposite edge portions to be mounted, the central portion being thinner than the opposite edge portions. The cleaning unit further includes spring means for resiliently urging the pressure pad to move it away from the outer surface of the impression cylinder. The actuating means moves the pressure pad toward the outer surface of the impression cylinder against the spring means so that the cleaning fabric is pressed against the outer surface of the impression cylinder by the pressure pad to clean the outer surface of the impression cylinder.

[0038] At least one of the pressure pads may be linearly movable. The apparatus may further comprise a first guide roller interposed between the linearly movable pressure pad and the supply of cleaning fabric for preventing the cleaning fabric from loosening to interfere with another cylinder and the like. The apparatus may further comprise a second guide roller interposed between the linearly movable pressure pad and the adjacent pressure pad for preventing the cleaning fabric from being engaged with the outer surface of the cylinder.

[0039] The first and second guide rollers may be supported by press frame means or adapter plate means which is fixed to the press frame means.

[0040] The first and second guide rollers may be supported for movement in accordance with the movement of the cleaning unit.

[0041] There is also provided an apparatus for cleaning at least one cylinder which includes an outer surface. The apparatus comprise a cleaning unit including a base portion and an elongate portion which extends from the base portion, has a length and terminates at an end portion, the elongate portion and the end portion being thinner than the base portion. The cleaning unit further includes a supply of cleaning fabric installed on the base portion. The cleaning unit further includes at least one pressure pad opposed to the outer surface of the cylinder, the pressure pad being incorporated into the end portion for reciprocating movement toward and away from the outer surface of the cylinder, a cleaning fabric being fed to the pressure pad from the supply of cleaning fabric. The apparatus further comprise actuating means for moving the pressure pad relatively to the end portion so that the cleaning fabric is pressed against the outer surface of the cylinder and then released from being pressed by the pressure pad to clean the outer surface of the cylinder.

[0042] The pressure pad may be incorporated into the end portion for linearly movement longitudinally of the elongate portion.

[0043] The invention will further be described by way of example and with reference to the accompanying drawings, in which:

[0044] Fig. 1 is a schematic view of the apparatus in a preferred embodiment of the invention.

[0045] Fig. 2 is a schematic view of the cleaning unit in Fig. 1 in a standby position when not cleaning.

[0046] Fig. 3 is a side view of the side plate in Fig. 1.

[0047] Fig. 4 is a side view of the adapter plate in Fig. 1.

[0048] Fig. 5 is an explanatory view of the pressure pad for the blanket cylinder seen in a direction of arrows A-A in Fig. 1.

[0049] Fig. 6 is an explanatory view of the pressure pad for the blanket cylinder seen in a direction of arrows B-B in Fig. 1.

[0050] Fig. 7 is an explanatory view of the arm seen in a direction C-C in Fig. 5.

[0051] Fig. 8 is an explanatory view of the pressure pad for the impression cylinder with the cover removed in Fig. 1.

[0052] Fig. 9 is an explanatory view illustrating how to move the pressure pad in Fig. 8.

[0053] Fig. 10 is an explanatory view of the actuating means seen in a direction D-D in Fig. 8.

[0054] Fig. 11 is a schematic view of the pressure pad for impression cylinder retracting in Fig. 1.

[0055] Fig. 12 is a schematic view of the means for adjustment of the press forces imparted to the pressure pads in Fig. 1.

[0056] Fig. 13 is a schematic view of the pressure pad for the impression cylinder in other embodiment.

[0057] Fig. 14 is a schematic view of the pressure pad for impression cylinder in other embodiment.

[0058] Fig. 15 is a side view of the side plate in other embodiment.

[0059] Fig. 16 is a side view of the adapter plate in Fig. 15.

[0060] Fig. 17 is a side view illustrating the moving step of the side plate in Fig. 15.

[0061] Fig. 18 is a side view illustrating the next step to Fig. 17.

[0062] Fig. 19 is a side view illustrating the next step to Fig. 18.

[0063] Fig. 20 is a schematic view illustrating a force acting on the pressure pad when cleaning.

[0064] Fig. 21 is an explanatory view of the stop in Fig. 20.

[0065] Fig. 22 is an explanatory view of the stop seen in a direction of arrows E-E in Fig. 21.

[0066] Fig. 23 is a schematic view of the apparatus in other embodiment.

[0067] Turning now to the drawings, Fig. 1 illustrates an apparatus for cleaning a plurality of cylinders 2 and 4 each of which includes an outer surface. The apparatus comprises a cleaning unit 6 including a supply of cleaning fabric 8 installed thereon. The cleaning unit 6 further includes a plurality of pressure pads 10 and 12

opposed to the outer surfaces of the cylinders 2 and 4 respectively, at least one of the pressure pads being incorporated into the cleaning unit 6 for reciprocating movement toward and away from the outer surface of the corresponding cylinder. In the embodiment, the cylinders comprise an impression cylinder 2 and a blanket cylinder 4 in an offset printing press, the cleaning unit 6 including a pressure pad 10 which is opposed to the outer surface of the impression cylinder 2 and a pressure pad 12 which is opposed to the outer surface of the blanket cylinder 4. Each of the pressure pads 10 and 12 is incorporated into the cleaning unit 6 for reciprocating movement toward and away from the outer surface of the cylinder.

[0068] The cleaning unit 6 further includes side plate means which comprises a pair of side plates 14 spaced from and extending parallel to each other. The supply of cleaning fabric comprises a supply roll 8 including a shaft and extending between the side plates 14, the shaft being mounted on the side plates 14 for rotation. The supply roll 8 may not include the shaft but have an outer surface engaged with a table to be supported. A cleaning fabric 16 is directed to a take-up roll 18 from the supply roll 8 through a guide roller 20, the pressure pad 10, a guide roller 22, the pressure pad 12 and the guide rollers 24 and 26. The take-up roll 18 includes a shaft 28 and extends between the side plates 14, the shaft 28 being mounted on the side plates 14 for rotation. The shaft 28 is intermittently rotated by drive means not shown to take-up the cleaning fabric 16 about the take-up roll 18 so that the cleaning fabric 15 can be intermittently fed for a length to the pressure pads 10 and 12 from the supply roll 8. The cleaning unit 6 may further include brake means not shown for preventing the cleaning fabric 16 from being accidentally fed. The brake means may comprise a brake adapted to be frictionally engaged with the shaft of the supply roll 8 to brake it. The brake means may comprise a brake adapted to be frictionally engaged with the cleaning fabric 16 to brake it. The cleaning unit 6 may further include a coil spring for resiliently urging the shaft of the supply roll 8 so that the shaft is reversely rotated by the coil spring to prevent the cleaning fabric 16 from loosing.

[0069] In the printing press, the impression cylinder 2 is positioned across a restricted space formed between the blanket cylinder 4 and a transfer cylinder 30. The transfer cylinder 30 has gripper means by which a sheet is held, the gripper means being rotated integrally with the transfer cylinder 30 along a track 32 to transfer the sheet to the impression cylinder 2.

[0070] In this connection, the apparatus further comprises actuating means for moving the pressure pad 10 relatively to the cleaning unit 6 so that the cleaning fabric 16 is pressed against the outer surface of the impression cylinder 2 and then released from being pressed by the pressure pad 10 to clean the outer surface of the impression cylinder 2. The apparatus is therefore not required to use an air pad as the pressure pad 10 to clean the outer surface of the impression cylinder 2. In addition, the cleaning unit 6 include a base portion 34 and an elongate portion 36 which extends from the base portion 34, has a length and terminates at an end portion 38, as shown in Fig. 3. The base portion 34 comprises the base portions of the side plates 14, the elongate portion 36 comprising the elongate portions of the side plates 14, the end portion 38 comprising the end portions of the side plates 14. The elongate portion 36 and the end portion 38 are thinner than the base portion 34. The supply roll 8 is installed on the base portion 34. The pressure pad 10 is incorporated into the end portion 38 for linearly movement longitudinally of the elongate portion 36.

[0071] Accordingly, it is feasible to insert the elongate portion 36 and the end portion 38 into the restricted space formed between the blanket cylinder 4 and the transfer cylinder 30 without trouble and without difficulty. Unlike the air pad, the pressure pad 10 can be compact to insert it into the restricted space to approach the outer surface of the impression cylinder 2. The apparatus is therefore available to clean the outer surface of the impression cylinder 2.

[0072] In the embodiment, a plurality of the actuating means are connected to the pressure pads 10 and 12 respectively for moving the pressure pads 10 and 12 relatively to the cleaning unit 6 so that the cleaning fabric 16 is pressed against the outer surfaces of the cylinders 2 and 4 and then released from being pressed by the pressure pads 10 and 12 to clean the outer surfaces of the cylinders 2 and 4. The pressure pad 12 is incorporated between the base portion 34 and the elongated portion 36 of the cleaning unit 6.

[0073] The apparatus further includes adapter plate means which comprises a pair of adapter plates 40 spaced from each other and mounted on press frame means 42, the adapter plates 40 extending parallel to each other and vertically to the cylinders 2 and 3, as shown in Fig. 4 and Fig. 5. The side plates 14 are disposed between and opposed to the adapter plates 40, the side plates 14 including upper and lower rollers 44 mounted thereon for rotation. The adapter plates 40 include upper and lower grooves 46 formed therein, the upper and lower rollers 44 being fitted into the upper and lower grooves 46 for movement therealong. The upper and lower grooves 46 extend toward the cylinders 2 and 4 so that the cleaning unit 6 is supported by the adapter plates 40 for movement toward the cylinders 2 and 4. An operator can therefore move the cleaning unit 6 along the upper and lower grooves 46 between a cleaning position shown in Fig. 1 and a standby or not cleaning position shown in Fig. 2. The apparatus may include drive means such as air cylinders not shown to move the cleaning unit 6 along the upper and lower grooves 46.

[0074] The upper and lower grooves 46 bend in position to have inclined portions 46a and horizontal portions 46b. The inclined portions 46a are intended to move the

cleaning unit 6 therealong between the cleaning position and the standby position. The horizontal portions 46b are intended to move the cleaning unit 6 therealong away from the cylinders 2 and 4 for exchange of the supply roll 8. The cleaning unit 6 can therefore be held horizontally on the adapter plates 40 when the supply roll 8 is removed from the side plates 14 and exchanged for new one. The take-up roll 18 can also be removed from the side plates 14. As to the upper grooves 46, the horizontal portions 46b are opened to notches 48 formed in the adapter plates 40. As to the lower grooves 46, the horizontal portions 46b are communicated with inclined portions 46c which are opened to the notches 48. Accordingly, the upper rollers 44 can be firstly moved to the notches 48 to be disengaged from the upper grooves 46. The lower rollers 44 can be then moved to the notches 48 to be disengaged from the lower grooves 46. The cleaning unit 6 can therefore be removed from the adapter plates 40 for maintenance.

[0075] In addition, in the embodiment, the pressure pad 12 is fixed to a member 50 extending between the side plates 14 and mounted on arms 52. Each of the arms 52 is supported by a shaft 54 for swingingly movement thereabout, the shaft 54 being fixed to a bracket 55 which is mounted on the side plate 14. The cleaning unit 6 further includes means comprising a spring 56 for resiliently urging the pressure pad 12 to move it away from the outer surface of the cylinder 4, as shown in Fig. 6 and Fig. 7. The actuating means comprises an actuator connected to the pressure pad 12 through a wire 58 and a converting means. The wire 58 transmits a power to the converting means from the actuator. The converting means converts the power to a moving force for moving the pressure pad 12 toward the outer surface of the cylinder 4. For example, the converting means comprises a pulley 60 mounted on the side plate 14 for rotation. The arm 52 includes a shoulder 62 formed thereon. The pulley 60 includes an eccentric pin 64 engaged with the shoulder 62 of the arm 52. The wire 58 is connected to the pulley 60 and pulled by the actuator in a direction shown by arrow in Fig. 6. The pulley 60 is therefore rotated integrally with the pin 64 by the wire 58 so that the arm 52 is pushed by the pin 64 to move the member 50 and the pressure pad 12 toward the outer surface of the cylinder 4.

[0076] On the other hand, the pressure pad 10 is fixed to a bar 66 extending between the side plates 14 and mounted on one end of a rod 68, as shown in Fig. 8. The rod 68 extends through a support 70 to be supported by the support 70 for linearly movement toward and away from the outer surface of the cylinder 2. The support 70 extends between the side plates 14 to be mounted on the side plates 14. The cleaning unit 6 further includes means comprising a compression spring 72 for resiliently urging the rod 68, the bar 66 and the pressure pad 10 to move them away from the outer surface of the cylinder 2. In addition, the bar 66 includes followers 74 fixed to the opposite ends of the bar 66. Each of the followers 74 cooperates with the actuating means which comprises an actuator connected to the pressure pad 10 through a wire 76 and a converting means. The wire 76 transmits a power to the converting means from the actuator. The converting means converts the power to a moving force for moving the pressure pad 10 toward the outer surface of the cylinder 2. For example, the converting means comprises a pulley 78 mounted on the side plate 14 for rotation. The follower 74 includes a shoulder 80 formed thereon, as shown in Fig. 10. The pulley 78 includes an eccentric pin 82 engaged with the shoulder 80 of the follower 74. The wire 76 is connected to the pulley 78 and pulled by the actuator in a direction shown by arrow in Fig. 8. The pulley 78 is therefore rotated integrally with the pin 82 by the wire 76 so that the follower 74 is pushed by the pin 82 to move the bar 66 and the pressure pad 10 toward the outer surface of the cylinder 2. The spring 72 then moves the pressure pad 10 away from the outer surface of the cylinder 2, as shown in Fig. 9.

[0077] The actuator is driven in timed relation with the feeding of the cleaning fabric 16.

[0078] Furthermore, the pressure pad 10 is covered by a pair of covers 84. The covers 84 extend toward the outer surface of the cylinder 2 and terminates at edge portions between which an opening is formed. The pressure pad 10 protrudes out of and retracts into an inner space between the covers 84 through the opening, as shown in Fig. 11. The cleaning fabric 16 is released from being pressed when the pressure pad 10 retracts into the inner space between the covers 84. The pressure pad 10 is positioned to be disengaged from the cleaning fabric 16 or not to hinder the feeding of cleaning fabric 16 when the pressure pad 10 retracts into the inner space between the covers 84. The edge portions of the covers 84 are adapted to guide the cleaning fabric 16 to be fed when the pressure pad 10 retracts into the inner space between the covers 84.

[0079] The apparatus further includes guide means for guiding the cleaning fabric 16 to be fed to the pressure pads 10 and 12 and not to be engaged with the outer surfaces of the cylinders 2 and 4 between the pressure pads 10 and 12. The guide means comprises the guide rollers 20, 22 and 24 mounted on the press frame means 42 or the adapter plates 40 which are fixed to the press frame means 42. The guide rollers 20, 22 and 24 may be mounted on the side plates 14. The guide roller 20 is interposed between the pressure pad 10 and the supply roll 8 for preventing the cleaning fabric 16 from loosening to interfere with the transfer cylinder 30 or the like. In the embodiment, the guide roller 20 is mounted on the side plates 14 as shown in Fig. 4 to be supported for movement in accordance with the movement of the cleaning unit 6. The guide roller 20 can be removed from the side plates 14 for setting the cleaning fabric 16 without difficulty. The guide roller 22 is mounted on the adapter plates 40 as shown in Fig. 4 and interposed between the pressure pads 10 and 12 for preventing the

cleaning fabric 16 from being engaged with the outer surface of the blanket cylinder 4. The guide roller 22 may also be supported for movement in accordance with the movement of the cleaning unit 6.

[0080] The impression cylinder 2 has gripper means by which a sheet is held, the sheet being advanced toward the blanket cylinder 4. In this connection, the apparatus further includes tubular air bar means comprising an air bar 86 which is supported at opposite ends by arms 88, spring means resiliently urging the arms 88 counterclockwise in Fig. 1. The air bar 86 includes a plurality of holes 90 formed therein for blowing air toward the sheet held by the gripper means and advanced toward the blanket cylinder 4. In addition, the air bar 86 is engaged with the edge portion of the cover 84, the spring means moving the air bar 86 to a position shown in Fig. 2 from a position shown in Fig. 1 in accordance with the movement of the cleaning unit 6 into the standby position. The blowing of air is also started in accordance with the movement of the cleaning unit 6 into the standby position after cleaning. The air bar 86 is arranged to blow the air toward the sheet in the reverse direction to the advancement of the sheet, as shown in Fig. 2, so as to prevent the trailing edge portion of the sheet from fluttering. The cover 84 then pushes and moves the air bar 86 to the position shown in Fig. 1 in accordance with the movement of the cleaning unit 6 into the cleaning position, the blowing of air being also stopped in accordance with the movement. The side plates 14 may include protrusions to move the air bar 86 in stead of the cover 84. The air bar 86 may be mounted on the press frame means 42 or the adapter plates 40.

[0081] The pressure pad 10 includes a central portion engaged with the cleaning fabric 16 and opposite edge portions to be mounted, the central portion being thinner than the opposite edge portions. This arrangement is convenient to clean the vicinity of the gripper means of the impression cylinder 2. As to the actuating means for moving the pressure pads 10 and 12, the actuating means is driven in timed relation with the feeding of the cleaning fabric 16 and in connection with the rotation of the impression cylinder 2 not to cause interference between the gripper means and the pressure pad 10.

[0082] In the apparatus, the impression cylinder 2 is late contaminated, the blanket cylinder 4 being early contaminated. In this connection, the cleaning fabric 16 is firstly fed to the outer surface of the impression cylinder 2 and then fed to the outer surface of the blanket cylinder 4 from the supply roll 8. In addition, the cleaning fabric 16 is consumed by a predetermined length in one programmed cleaning cycle to accomplish the cleaning of the impression cylinder 2, the pressure pads 10 and 12 being spaced from each other at a distance which is greater than the predetermined length of the cleaning fabric 16. The apparatus is arranged to clean the outer surface of the impression cylinder 10 at a first frequency and clean the outer surface of the blanket cylinder 12 at a second frequency, the first frequency being lower than the second frequency.

[0083] The cleaning unit 6 further includes means for changing the length of the wires 58 and 76 for adjustment of press forces imparted to the pressure pads 10 and 12 by which the cleaning fabric 16 is pressed. In the embodiment, the wires 58 and 76 are inserted into pipes 86 each of which has one end mounted on a fixture 88 and the other end mounted on a curved portion 90 of the side plate 14, as shown in Fig. 12. Each of the wires 58 and 76 is connected to the actuator through an adjustment screw 92, a channel member 94 and a wire 96 so that the adjustment screw 92 can change the length of the wire 58 and 76 for adjustment of the press forces.

[0084] In other embodiment shown in Fig. 13, a pair of guide rollers 98 are disposed near and spaced from the pressure pad 10 not to hinder the movement of the pressure pad 10. The pressure pad 10 protrudes from an inner space formed between the guide rollers 98 so that the cleaning fabric 16 is pressed against the outer surface of the cylinder 2 by the pressure pad 10. The cleaning fabric 16 is released from being pressed when the pressure pad 10 retracts into or across a position between the guide rollers 98. In the embodiment, the guide rollers 98 are disposed near the pressure pad 10 on the opposite sides of the pressure pad 10 for guiding the cleaning fabric 16 to be fed between the pressure pad 10 and the cylinder 2 when moving the pressure pad 10 away from the cylinder 2. The guide rollers 98 are mounted on the side plates 14 for rotation.

[0085] In other embodiment shown in Fig. 14, the pressure pad 10 is mounted on a shaft 100 for swingingly movement thereabout. The actuating means comprises an elongated rod 102 such as a piston rod fitted into an air cylinder. The rod 102 moves the pressure pad 10 clockwise about the shaft 100 so that the pressure pad 10 protrudes from the inner space between the covers 84, the cleaning fabric 16 being pressed against the outer surface of the cylinder 2. The rod 102 then moves the pressure pad 10 counterclockwise about the shaft 100 so that the pressure pad 10 retracts into the inner space between the covers 84, the cleaning fabric 16 being released from being pressed. The rod 102 may be pulled by spring means to move the pressure pad 10 counterclockwise about the shaft 100.

[0086] In other embodiment shown in Fig. 15 and Fig. 16, each of the side plates 14 includes an elongate portion 104 terminating at a inclined edge portion 106, a groove 108 being formed between the elongate portions 36 and 104. Each of the adapter plates 40 includes guide groove 110 formed therein and extending vertically to the inclined portion 46a of the lower groove 46. The guide rollers 20 and 22 are mounted in position of the adapter plate 40 for rotation, the arm 88 of the air bar 86 being also mounted in position on the adapter plate 40 for swingingly movement.

[0087] The guide roller 20 is held in position to be engaged with the cleaning fabric 16 when moving the cleaning unit 6 to the standby position from the cleaning

position, as shown in Fig. 17 and Fig. 18. The guide roller 20 is positioned in the open end of the groove 108 in the standby position of the cleaning unit 6. The arrangement moves the air bar 86 in a direction shown by arrow to blow air in accordance with the movement of the cleaning unit 6. It then moves the guide roller 20 downward along the inclined edge portion 106 and the guide groove 110 when moving the cleaning unit 6 horizontally, as shown in Fig. 18. The arrangement then moves the guide roller 20 to be disengaged from the edge portion 106 and into the bottom of the guide groove 110, as shown in Fig. 19. It can be arranged to change the position of the guide roller 22 in accordance with the movement of the cleaning unit 6.

[0088] In the apparatus, a force F acts on the pressure pad 10 in a direction shown by arrow in Fig. 20 by the rotation of the cylinder 2 when cleaning. The pressure pad 10 is therefore subject to bending stress which is harmful to the cleaning. Under the circumstances, the apparatus may include means comprising a stop 112 for preventing the pressure pad 10 from moving tangentially to the cylinder 2 by the rotation thereof when cleaning, as shown in Fig. 21. The stop 112 is fixed to the adapter plate 40, the stop 112 including a cut surface 114 for guiding the follower 74 when moving the cleaning unit 6 to the cleaning position from the standby position, as shown in Fig. 22.

[0089] In other embodiment shown in Fig. 23, the actuating means comprises first air cylinder means 116 mounted on a carriage 118 for moving the pressure pad 10. The first air cylinder means comprises a plurality of first air cylinders 116 spaced from each other longitudinally of the pressure pad 10. The pressure pad 10 is connected to and supported by the first air cylinders 116 for reciprocatingly movement toward the outer surface of the impression cylinder 2, the first air cylinders 116 moving the pressure pad 10 relatively to the carriage 118 so that the cleaning fabric 16 is pressed against the outer surface of the impression cylinder 2 and then released from being pressed by the pressure pad 10. The carriage 118 is incorporated into the cleaning unit 6 for reciprocatingly movement toward and away from the outer surface of the impression cylinder 2. In the embodiment, the carriage 118 extends between the side plates 14 to be engaged with the side plates 14 for reciprocatingly movement. The cleaning unit 6 further includes second air cylinder means 120 incorporated thereinto, mounted on a bracket 122 and connected to the carriage 118 to move the carriage 118 relatively to the cleaning unit 6. The second air cylinder means also comprises a plurality of second air cylinders 120 spaced from each other longitudinally of the pressure pad 10. The bracket 122 is mounted on the side plates 14. The second air cylinders 120 can move the carriage 118, the first air cylinders 116 and the pressure pad 10 at a distance for setting the cleaning fabric 16 to the take-up roll 18 from the supply roll 8 through the guide roller 20, the pressure pad 10, the guide roller 22 and the pressure pad 12. The covers 84 are mounted on the carriage 118 for movement integrally with the carriage 118. The guide roller 22 is mounted on the adapter plates 40 to be removed therefrom for setting the cleaning fabric 16 without difficulty.

Claims

1. An apparatus for cleaning a plurality of cylinders each of which includes an outer surface, said apparatus comprising:

a cleaning unit including means to provide a supply of cleaning fabric when installed thereon;
said cleaning unit further including a plurality of pressure pads opposed in use to the outer surface of said cylinders respectively, at least one of said pressure pads being incorporated into said cleaning unit for reciprocating movement toward and away from the outer surface of the corresponding cylinder, a cleaning fabric being fed to said pressure pads from said supply of cleaning fabric; and
actuating means for moving said at least one of said pressure pads relatively to said cleaning unit so that said cleaning fabric is pressed against the outer surface of the corresponding cylinder and then released from being pressed by said at least one of said pressure pads to clean the outer surface of the corresponding cylinder.

2. The apparatus as set forth in claim 1 wherein said cleaning unit includes a base portion and an elongated portion which extends from the base portion, has a length and terminates at an end portion, said elongated portion and said end portion being thinner than said base portion, said supply of cleaning fabric being installed on said base portion, said at least one of said pressure pads being incorporated into said end portion, said actuating means moving said. at least one of said pressure pads relatively to said end portion.

3. The apparatus as set forth in claim 2 wherein said actuating means comprises first air cylinder means mounted on a carriage, said at least one of said pressure pads being connected to and supported by said first air cylinder means for reciprocatingly movement toward and away from the outer surface of the corresponding cylinder, said first air cylinder means moving said at least one of said pressure pads relatively to said carriage, said carriage being incorporated into said cleaning unit for reciprocating movement toward and away from the outer surface of the corresponding cylinder, said cleaning unit fur-

ther including second air cylinder means incorporated thereinto and connected to said carriage to move said carriage relatively to said cleaning unit.

4. The apparatus as set forth in claim 1 or 2 wherein each of said pressure pads is incorporated into said cleaning unit for reciprocating movement toward and away from the outer surface of said cylinder, a plurality of said actuating means being connected to said pressure pads respectively for moving said pressure pads relatively to said cleaning unit so that said cleaning fabric is pressed against the outer surfaces of said cylinders and then released from being pressed by said pressure pads to clean the outer surfaces of said cylinders.

5. The apparatus as set forth in claim 4 wherein said cleaning unit further includes springs for resiliently urging said pressure pads to move them away from the outer surfaces of said cylinders.

6. The apparatus as set forth in claim 4 wherein said cylinders comprise an impression cylinder and a blanket cylinder in a printing press.

7. The apparatus as set forth in claim 4 wherein at least one of said pressure pads includes a central portion engaged with said cleaning fabric and opposite edge portions to be mounted, said central portion being thinner than said opposite edge portions.

8. The apparatus as set forth in claim 4 wherein at least one of said pressure pad is mounted on one end of a rod which is supported by a support for linearly movement toward and away from the outer surface of said cylinder, said cleaning unit further including side plate means on which said support is mounted.

9. The apparatus as set forth in claim 4 wherein at least one of said pressure pads is mounted on an arm which is supported by a shaft for swingingly movement thereabout toward and away from the outer surface of said cylinder, said cleaning unit further including side plate means on which said shaft is mounted.

10. The apparatus as set forth in claim 8 wherein said cleaning unit further includes means for resiliently urging said pressure pads to move them away from the outer surfaces of said cylinders.

11. The apparatus as set forth in claim 4 wherein at least one of said actuating means comprises first air cylinder means mounted on a carriage, at least one of said pressure pads being connected to and supported by said first air cylinder means for reciprocatingly movement toward and away from the outer surface of said cylinder, said first air cylinder means moving said pressure pad relatively to said carriage, said carriage being incorporated into said cleaning unit for reciprocatingly movement toward and away from the outer surface of said cylinder, said cleaning unit further including second air cylinder means incorporated thereinto and connected to said carriage to move said carriage relatively to said cleaning unit.

12. The apparatus as set forth in claim 4 wherein said cylinders comprise a first cylinder which is late contaminated and a second cylinder which is early contaminated, said cleaning fabric being firstly fed to the outer surface of said first cylinder and then fed to the outer surface of said second cylinder from said supply of cleaning fabric.

13. The apparatus as set forth in claim 4 wherein said cylinders comprise an impression cylinder and a blanket cylinder, said cleaning fabric being firstly fed to the outer surface of said impression cylinder and then fed to the outer surface of said blanket cylinder.

14. The apparatus as set forth in claim 4 wherein said cylinders comprise first and second cylinders, said cleaning fabric being firstly fed to the outer surface of said first cylinder and then fed to the outer surface of said second cylinder from said supply of cleaning fabric, said pressure pads comprising first and second pressure pads cooperating with said cleaning fabric to clean the outer surfaces of said first and second cylinders respectively, said cleaning fabric being consumed by a predetermined length in one programmed cleaning cycle to accomplish the cleaning of said first cylinder, said first and second pressure pads being spaced from each other at a distance which is greater than said predetermined length of said cleaning fabric.

15. The apparatus as set forth in claim 4 wherein said cylinders comprise first and second cylinders, said cleaning fabric being firstly fed to the outer surface of said first cylinder and then fed to the outer surface of said second cylinder from said supply of cleaning fabric to clean the outer surface of said first cylinder at a first frequency and clean the outer surface of said second cylinder at a second frequency, said first frequency being lower than said second frequency.

16. The apparatus as set forth in claim 4 wherein at least one of said actuating means comprises an actuator connected to said pressure pad through a wire and a converting means, said wire transmitting a power to said converting means from said actuator, said converting means converting the power to

a moving force for moving said pressure pad toward the outer surface of said cylinder.

17. The apparatus as set forth in claim 16 wherein said cleaning unit further includes means for changing the length of said wire for adjustment of a press force imparted to said pressure pad by which said cleaning fabric is pressed.

18. The apparatus as set forth in claim 16 wherein said actuator is driven in timed relation with the feeding of said cleaning fabric.

19. The apparatus as set forth in claim 13 wherein said impression cylinder has gripper means by which a sheet is held, said actuating means for said impression cylinder being driven in timed relation with the feeding of said cleaning fabric and in connection with the rotation of said impression cylinder not to cause interference between said gripper means and said pressure pad.

20. The apparatus as set forth in claim 4 wherein at least one of said pressure pads is mounted on one end of a rod which is supported by a support for linearly movement toward and away from the outer surface of said cylinder, said cleaning unit further including side plate means on which said support is mounted, said pressure pad being covered by a pair of covers which extend toward the outer surface of said cylinder and terminate at edge portions between which an opening is formed, said pressure pad protruding out of and retracting into an inner space between said covers through said opening.

21. The apparatus as set forth in claim 20 wherein said rod extends through said support, said cleaning unit further including spring means for resiliently urging said rod to move it away from the outer surface of said cylinder.

22. The apparatus as set forth in claim 20 wherein said cleaning fabric is released from being pressed when said pressure pad retracts into said inner space between said covers.

23. The apparatus as set forth in claim 20 wherein said pressure pad is positioned to be disengaged from said cleaning fabric or not to hinder the feeding of cleaning fabric when said pressure pad retracts into said inner space between said covers.

24. The apparatus as set forth in claim 20 wherein said edge portions of said covers are adapted to guide said cleaning fabric to be fed when said pressure pad retracts into said inner space between said covers.

25. The apparatus as set forth in claim 4 wherein at least one of said pressure pads is mounted on one end of a rod which is supported by a support for linearly movement toward and away from the outer surface of said cylinder, said cleaning unit further including side plate means on which said support is mounted, a pair of guide rollers being disposed near and spaced from said pressure pad not to hinder the movement of said pressure pad, said rod extending through said support, said cleaning unit further including spring means for resiliently urging said rod to move it away from the outer surface of said cylinder.

26. The apparatus as set forth in claim 25 wherein said cleaning fabric is released from being pressed when said pressure pad retracts into or across a position between said guide rollers.

27. An apparatus for cleaning a plurality of cylinders each of which includes an outer surface, said apparatus comprising:

a cleaning unit including a supply of cleaning fabric installed thereon;

said cleaning unit further including a plurality of pressure pads opposed to the outer surfaces of said cylinders respectively, said pressure pads being incorporated into said cleaning unit for reciprocatingly movement toward and away from the outer surfaces of said cylinders, a cleaning fabric being fed to said pressure pads from said supply of cleaning fabric;

a plurality of actuating means connected to said pressure pads respectively for moving said pressure pads relatively to said cleaning unit so that said cleaning fabric is pressed against the outer surfaces of said cylinders and then released from being pressed by said pressure pads to clean the outer surfaces of said cylinders;

adapter plate means extending vertically to said cylinders, said cleaning unit being supported by said adapter plate means for movement toward said cylinders; and

guide means for guiding said cleaning fabric to be fed to said pressure pads and not to be engaged with the outer surfaces of said cylinders between said pressure pads.

28. The apparatus as set forth in claim 27 wherein said guide means comprises guide rollers mounted on press frame means or said adapter plate means which is fixed to the press frame means.

29. An apparatus for cleaning a plurality of cylinders each of which includes an outer surface, one of said cylinders comprising an impression cylinder having

gripper means by which a sheet is held, said apparatus comprising:

a cleaning unit including a supply of cleaning fabric installed thereon;
said cleaning unit further including a plurality of pressure pads opposed to the outer surfaces of said cylinders respectively, said pressure pads being incorporated into said cleaning unit for reciprocatingly movement toward and away from the outer surfaces of said cylinders, a cleaning fabric being fed to said pressure pads from said supply of cleaning fabric;
said cleaning unit further including spring means for resiliently urging said pressure pads to move them away from the outer surface of said cylinder;
a plurality of actuating means connected to said pressure pads respectively to move them toward the outer surfaces of said cylinders against said spring means so that said cleaning fabric is pressed against the outer surfaces of said cylinder by said pressure pads to clean the outer surfaces of said cylinders;
adapter plate means extending vertically to said cylinders, said cleaning unit being supported by said adapter plate means for movement toward said cylinders when cleaning and movement away from said cylinders into a standby position when not cleaning; and
tubular air bar means including a plurality of holes formed therein for blowing air toward said sheet held by said gripper means and advanced toward a blanket cylinder, the blowing of air being started in accordance with the movement of said cleaning unit into said standby position after cleaning.

30. The apparatus as set forth in claim 29 wherein said air bar means is mounted on press frame means or said adapter plate means which is fixed to the press frame means.

31. An apparatus for cleaning at least one cylinder which includes an outer surface, said apparatus comprising:

a cleaning unit including a supply of cleaning fabric installed thereon;
said cleaning unit further including at least one pressure pad opposed to the outer surface of said cylinder, said pressure pad being incorporated into said cleaning unit for reciprocatingly movement toward and away from the outer surface of said cylinder, a cleaning fabric being fed to said pressure pad from said supply of cleaning fabric;
actuating means for moving said pressure pad relatively to said cleaning unit so that said cleaning fabric is pressed against the outer surface of said cylinder and then released from being pressed by said pressure pad to clean the outer surface of said cylinder; and
a pair of guide means disposed near said pressure pad on the opposite sides of said pressure pad for guiding said cleaning fabric to be fed between said pressure pad and said cylinder when moving said pressure pad away from said cylinder.

32. The apparatus as set forth in claim 31 wherein said pressure pad is mounted on one end of a rod which supported by a support for linearly movement toward the outer surface of said cylinder, said cleaning unit further including side plate means on which said support is mounted.

33. The apparatus as set forth in any one of claims 8, 20, 25 and 32 further comprising means for preventing said pressure pad from moving tangentially to said cylinder by the rotation thereof when cleaning.

34. The apparatus as set forth in claim 31 wherein said cleaning unit further includes means for resiliently urging said pressure pad to move it away from said cylinder.

35. The apparatus as set forth in any one of claims 32 to 34 wherein said actuating means comprises an actuator connected to said pressure pad through a wire and a converting means, said wire transmitting a power to said converting means from said actuator, said converting means converting the power to a moving force for moving said pressure pad toward the outer surface of said cylinder.

36. The apparatus as set forth in claim 35 wherein said cleaning unit further including means for changing the length of said wire for adjustment of a press force imparted to said pressure pad by which said cleaning fabric is pressed.

37. The apparatus as set forth in claim 35 wherein said actuator is driven in timed relation with the feeding of said cleaning fabric.

38. An apparatus for cleaning an impression cylinder which includes an outer surface, said apparatus comprising:

a cleaning unit including a supply of cleaning fabric installed thereon;
said cleaning unit further including a pressure pad opposed to the outer surface of said impression cylinder, said pressure pad being incorporated into said cleaning unit for recipro-

catingly movement toward and away from the outer surface of said impression cylinder, a cleaning fabric being fed to said pressure pad from said supply of cleaning fabric, said pressure pad including a central portion engaged with said cleaning fabric and opposite edge portions to be mounted, said central portion being thinner than said opposite edge portions;
said cleaning unit further including spring means for resiliently urging said pressure pad to move it away from the outer surface of said impression cylinder; and
actuating means for moving said pressure pad toward the outer surface of said impression cylinder against said spring means so that said cleaning fabric is pressed against the outer surface of said impression cylinder by said pressure pad to clean the outer surface of said impression cylinder.

39. An apparatus for cleaning a plurality of cylinders each of which includes an outer surface, said apparatus comprising:

a cleaning unit including a supply of cleaning fabric installed thereon;
said cleaning unit further including a plurality of pressure pads opposed to the outer surfaces of said cylinders respectively, said pressure pads being incorporated into said cleaning unit for reciprocatingly movement toward and away from the outer surfaces of said cylinders, a cleaning fabric being fed to said pressure pads from said supply of cleaning fabric;
a plurality of actuating means connected to said pressure pads respectively for moving said pressure pads relatively to said cleaning unit so that said cleaning fabric is pressed against the outer surfaces of said cylinders and then released from being pressed by said pressure pads to clean the outer surfaces of said cylinders;
at least one of said pressure pads being linearly movable;
a first guide roller interposed between said linearly movable pressure pad and said supply of cleaning fabric for preventing said cleaning fabric from loosening to interfere with another cylinder and the like; and
a second guide roller interposed between said linearly movable pressure pad and the adjacent pressure pad for preventing said cleaning fabric from being engaged with the outer surface of said cylinder.

40. The apparatus as set forth in claim 39 wherein said first and second guide rollers are supported by press frame means or adapter plate means which is fixed to the press frame means.

41. The apparatus as set forth in claim 40 wherein said first and second guide rollers are supported for movement in accordance with the movement of said cleaning unit.

42. An apparatus for cleaning at least one cylinder which includes an outer surface, said apparatus comprising:

a cleaning unit including a base portion and an elongated portion which extends from the base portion, has a length and terminates at an end portion, said elongated portion and said end portion being thinner than said base portion;
said cleaning unit further including a supply of cleaning fabric installed on said base portion;
said cleaning unit further including at least one pressure pad opposed to the outer surface of said cylinder, said pressure pad being incorporated into said end portion for reciprocatingly movement toward and away from the outer surface of said cylinder, a cleaning fabric being fed to said pressure pad from said supply of cleaning fabric; and
actuating means for moving said pressure pad relatively to said end portion so that said cleaning fabric is pressed against the outer surface of said cylinder and then released from being pressed by said pressure pad to clean the outer surface of said cylinder.

43. The apparatus as set forth in claim 42 wherein said pressure pad being incorporated into said end portion for linearly movement longitudinally of said elongated portion.

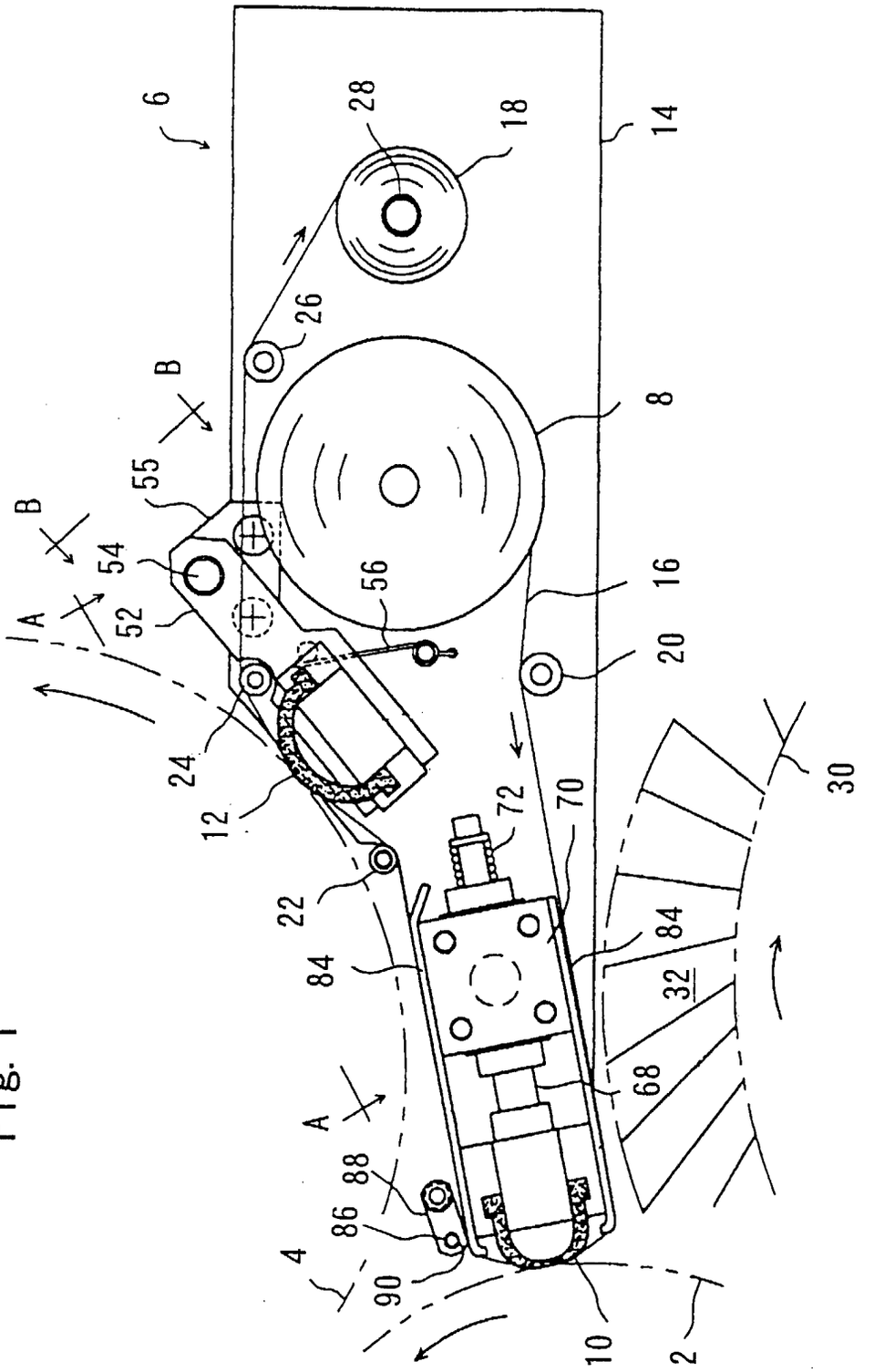
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Fig. 1

Fig. 2

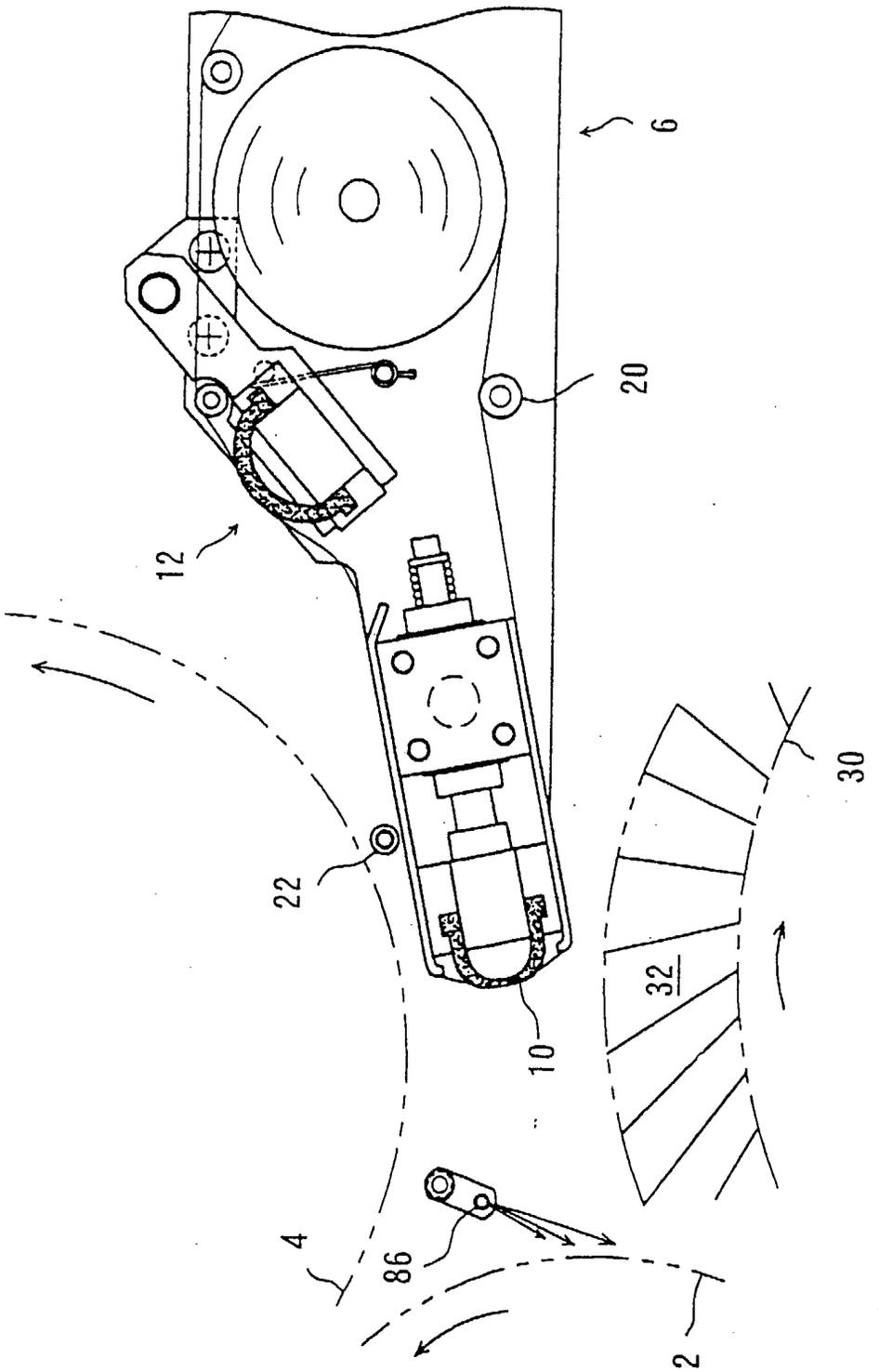

Fig. 3

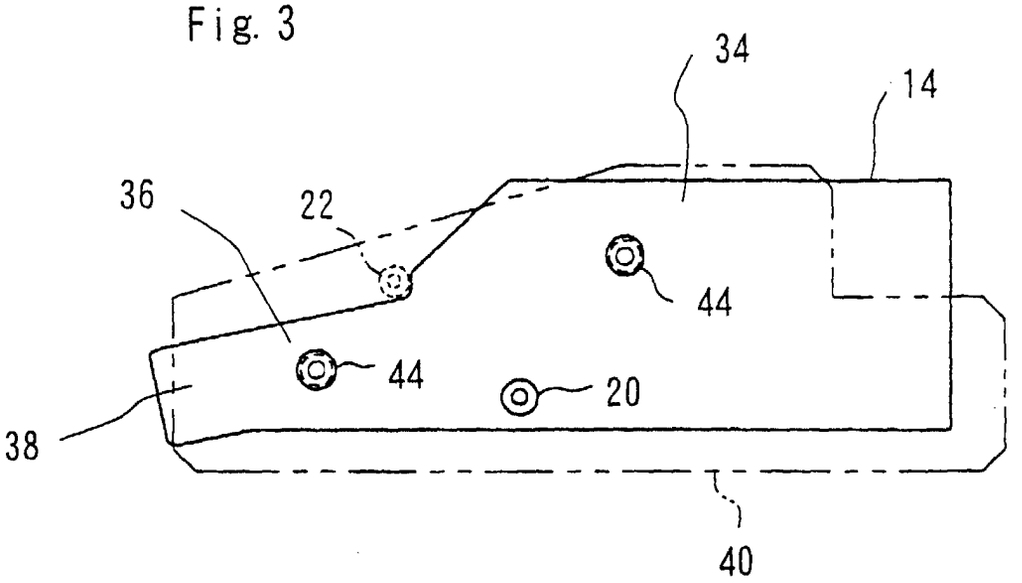
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Fig. 4

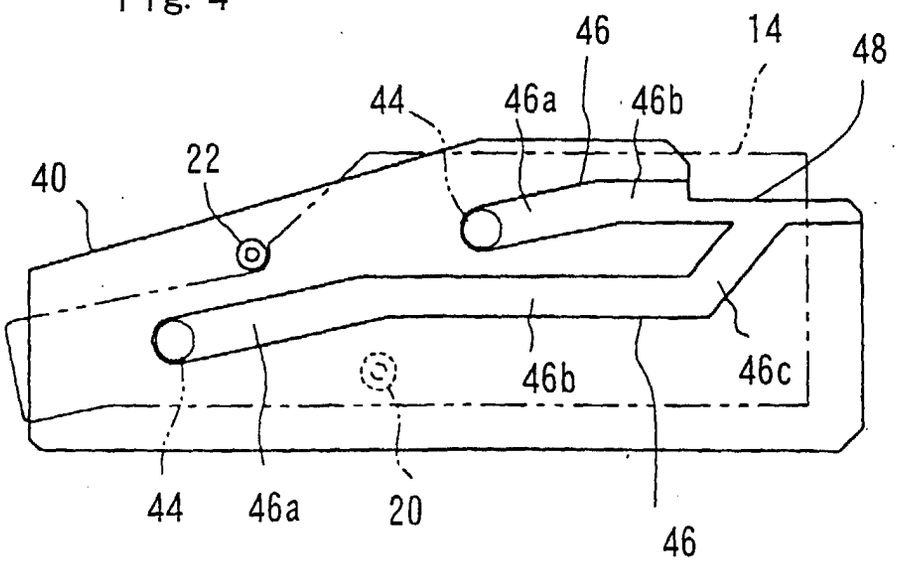
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Fig. 5

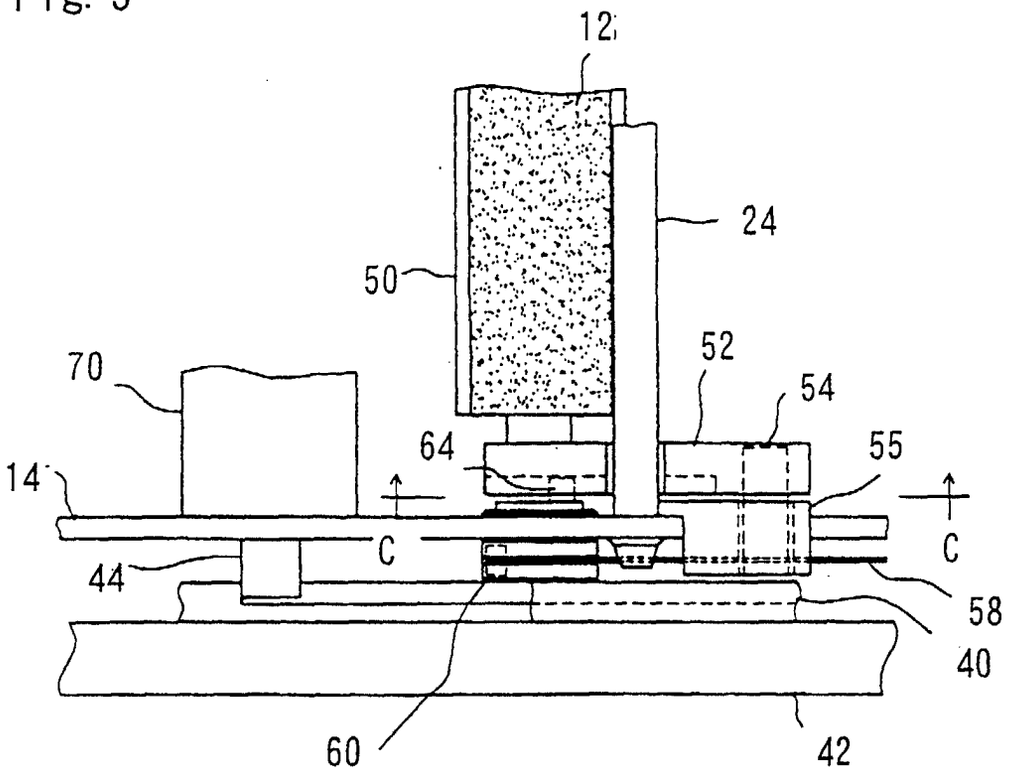

Fig. 6

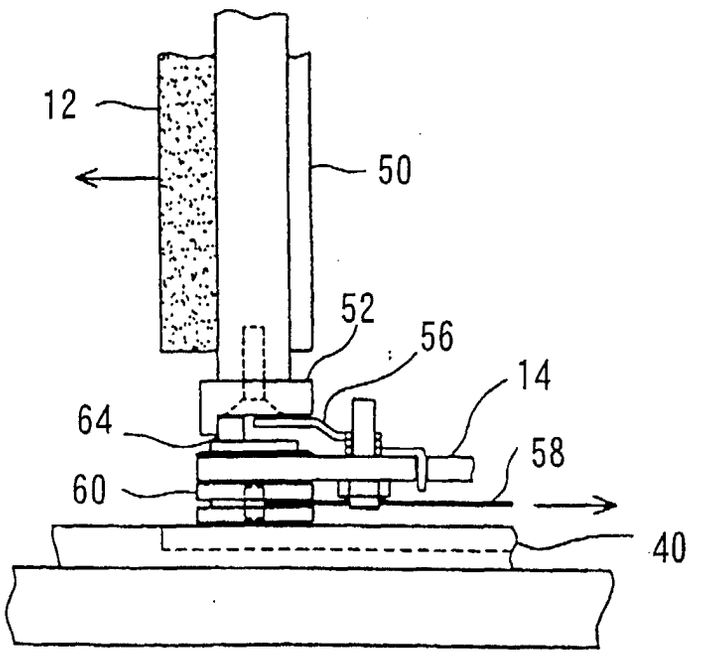

Fig. 7

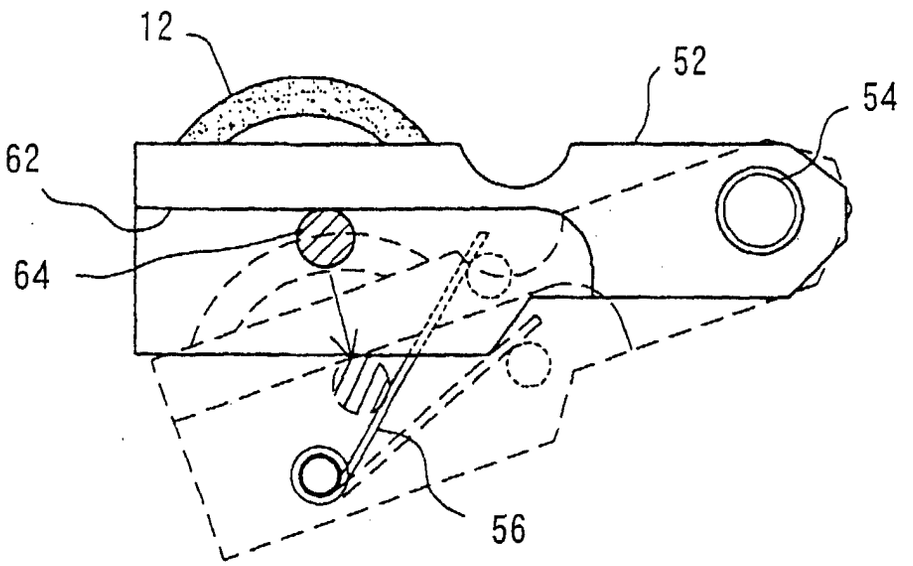

Fig. 8

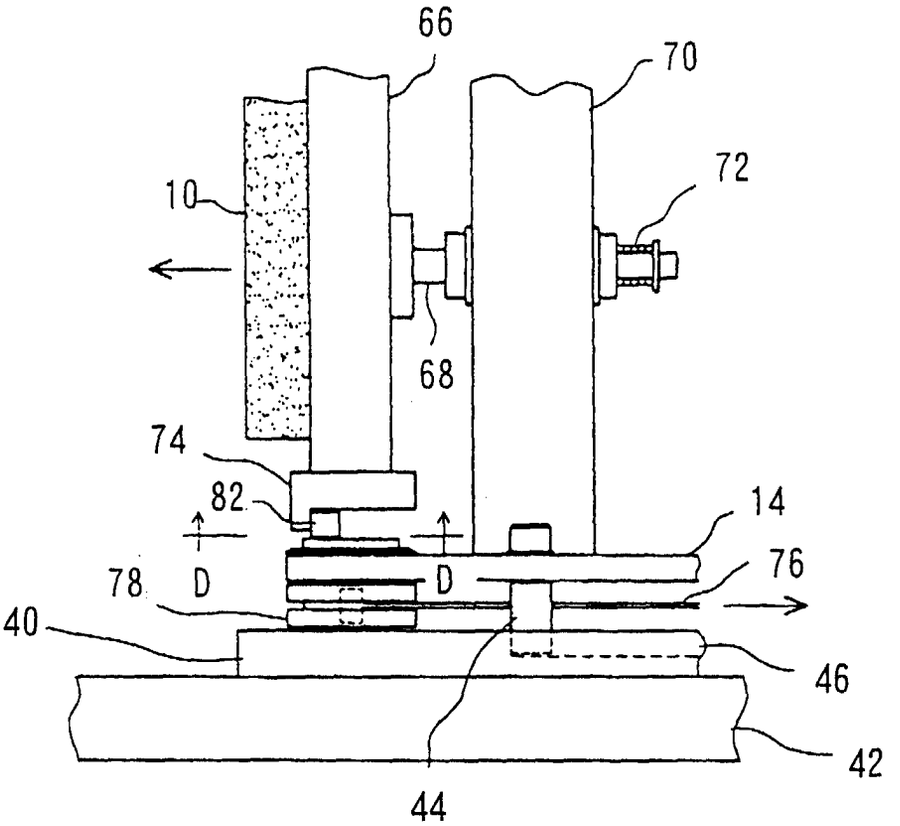

Fig. 9

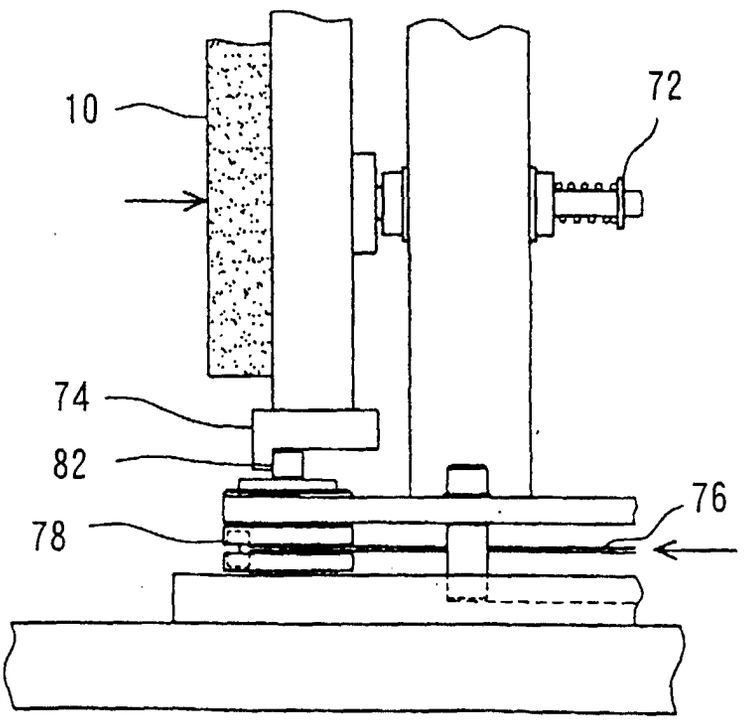

Fig. 10

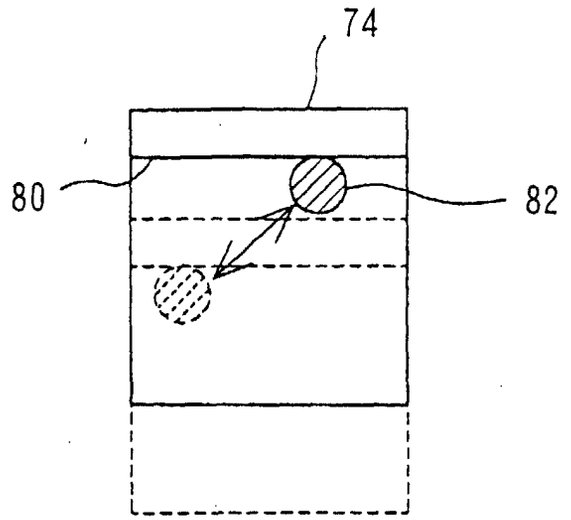

Fig. 11

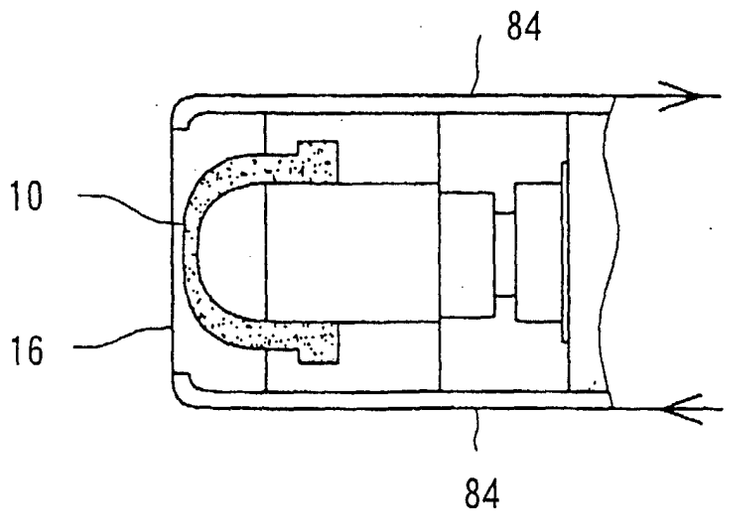

Fig. 12

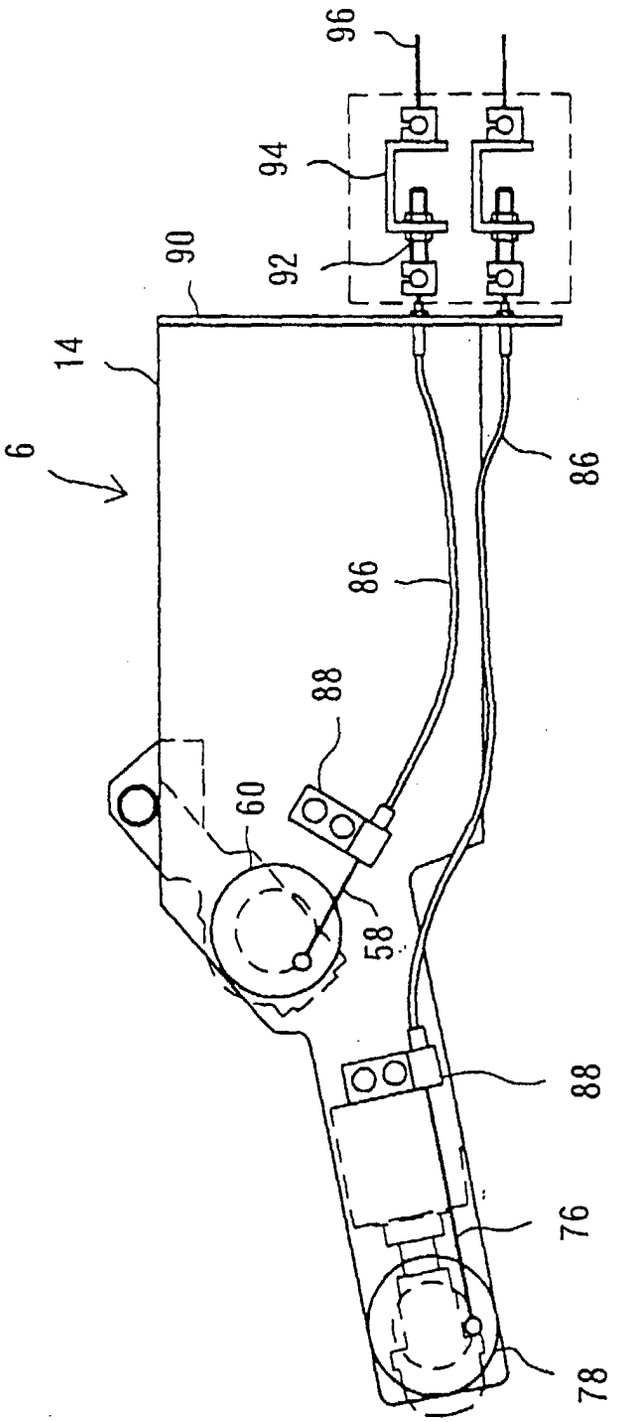

Fig. 13

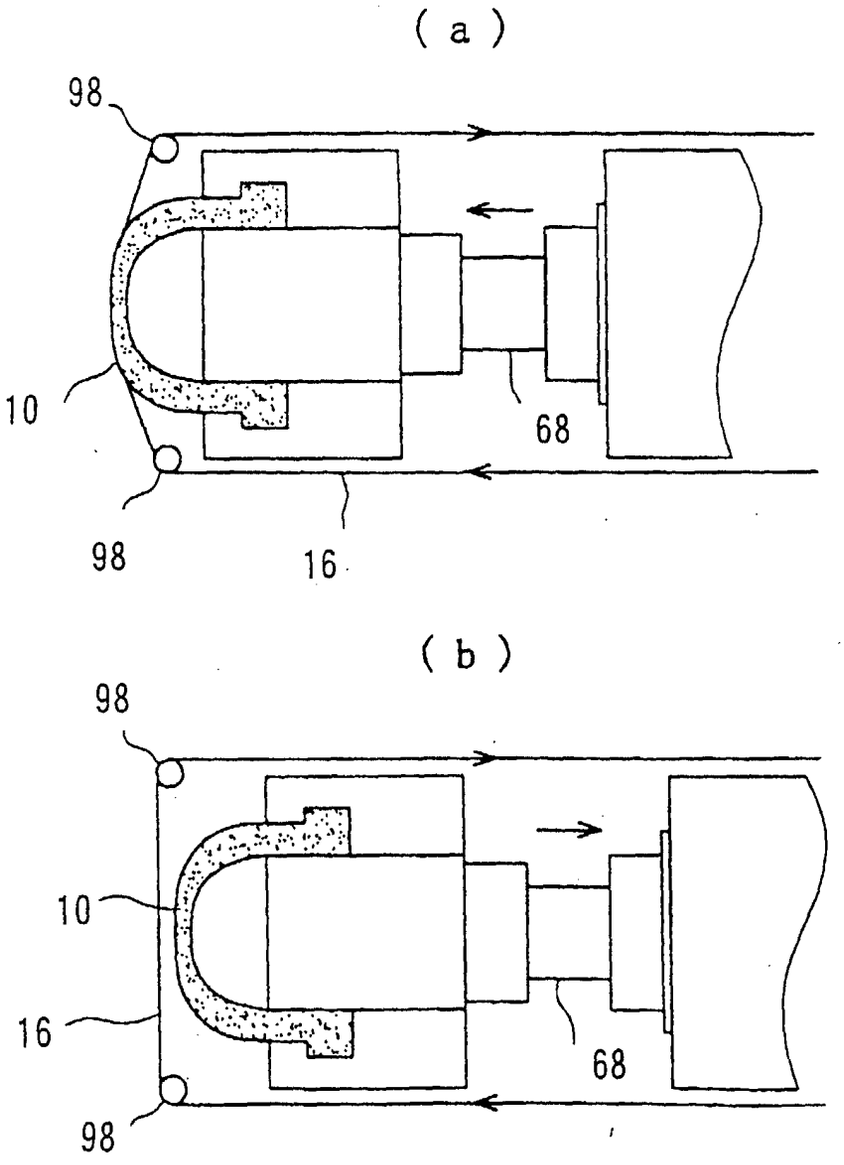

Fig. 14

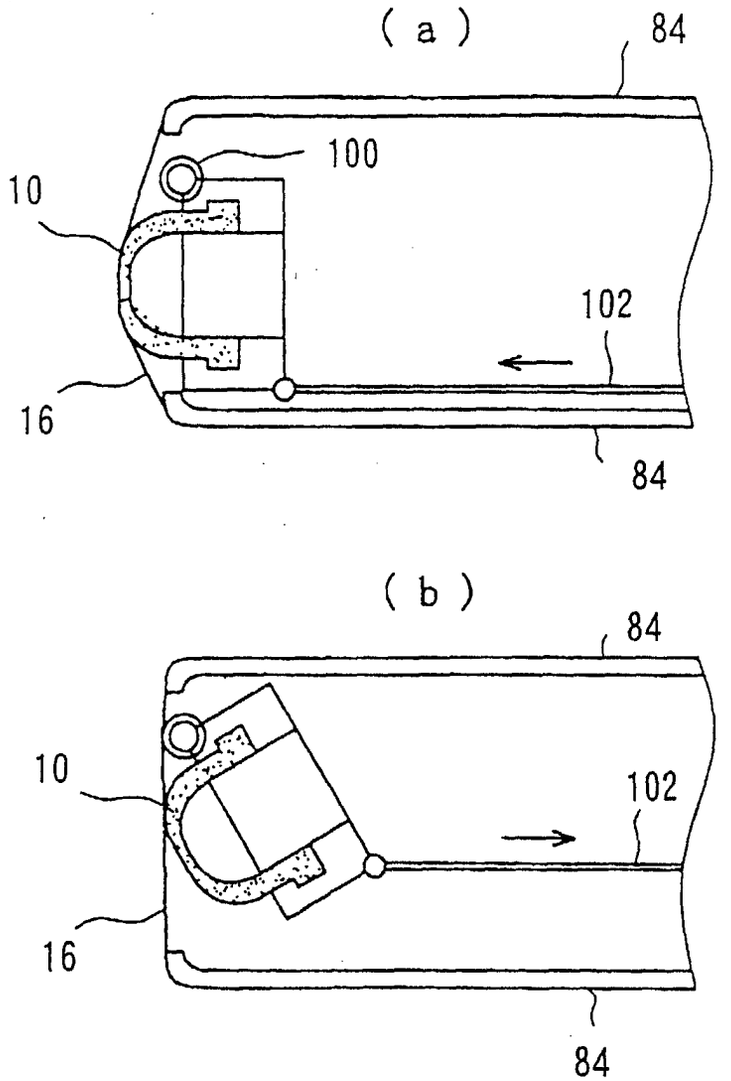

Fig. 15

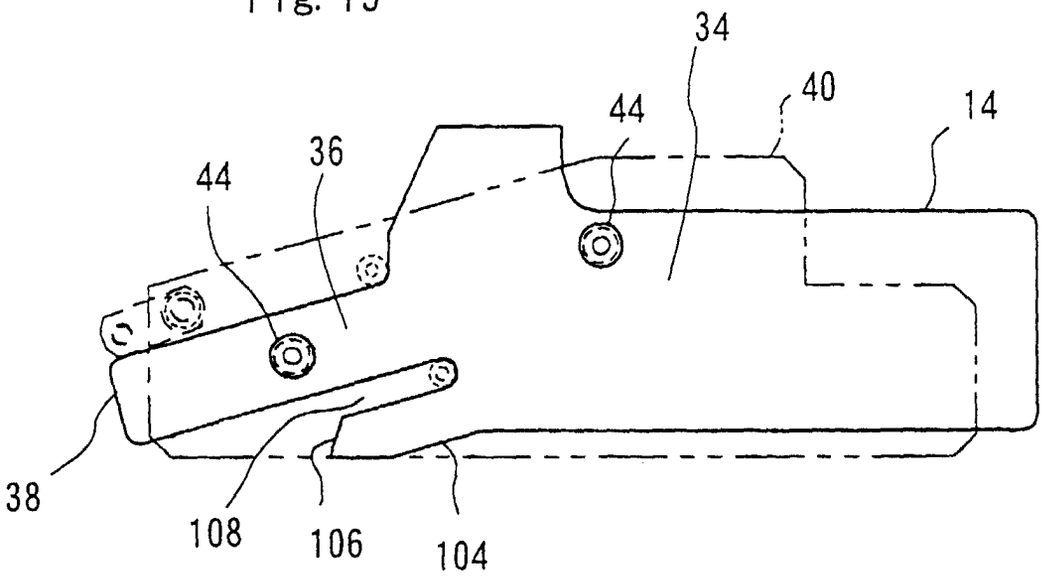
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Fig. 16

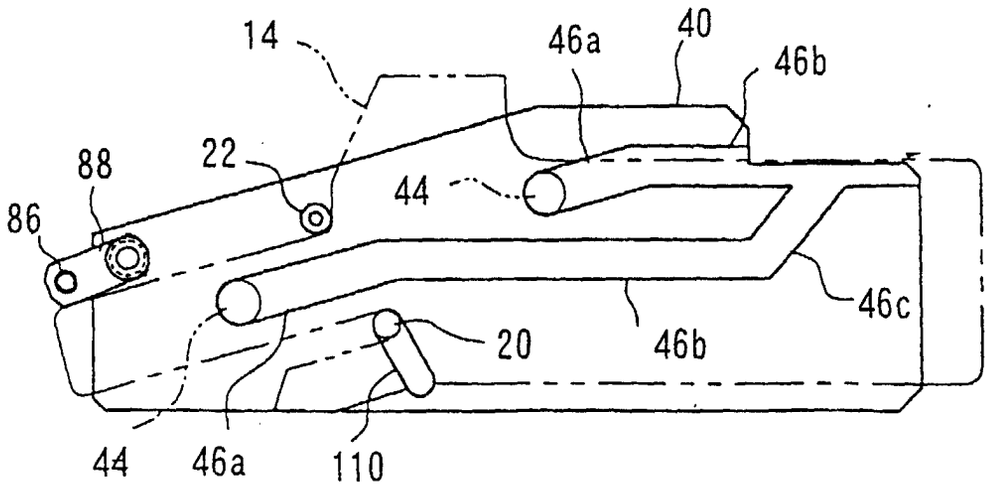
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Fig. 17

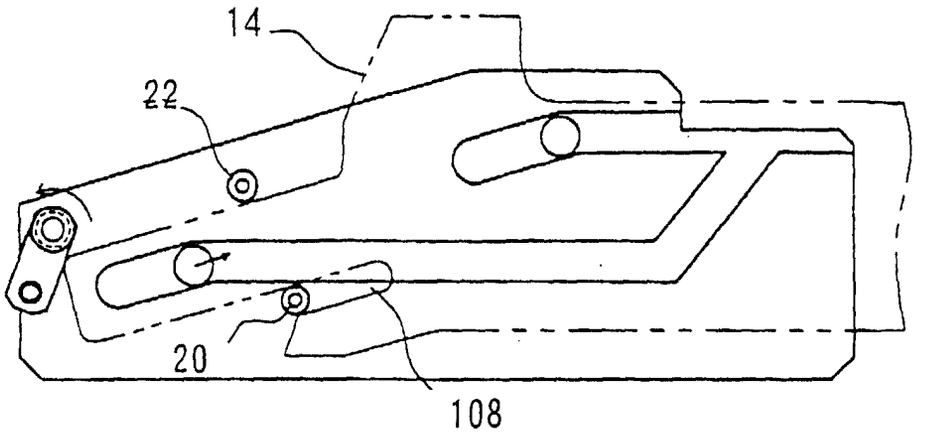


Fig. 18

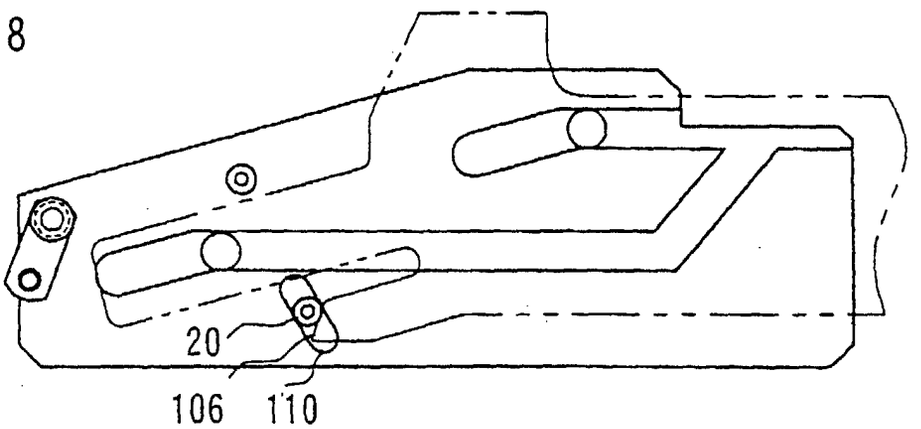


Fig. 19

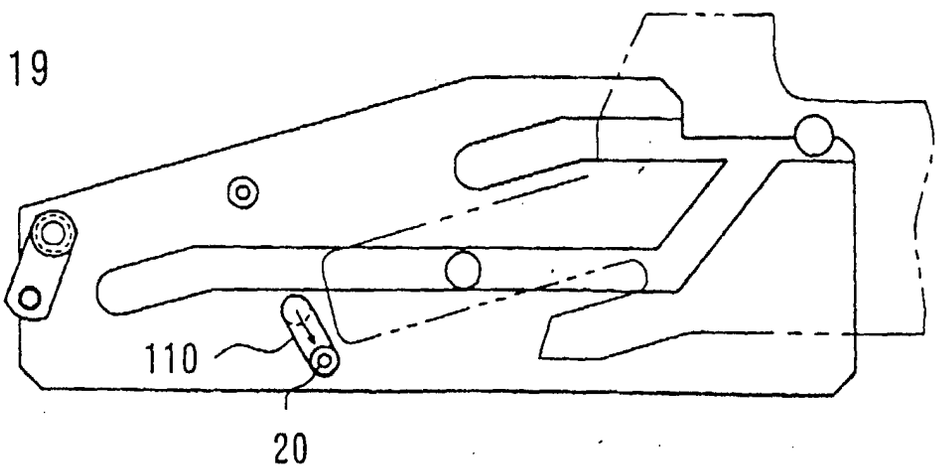


Fig. 20

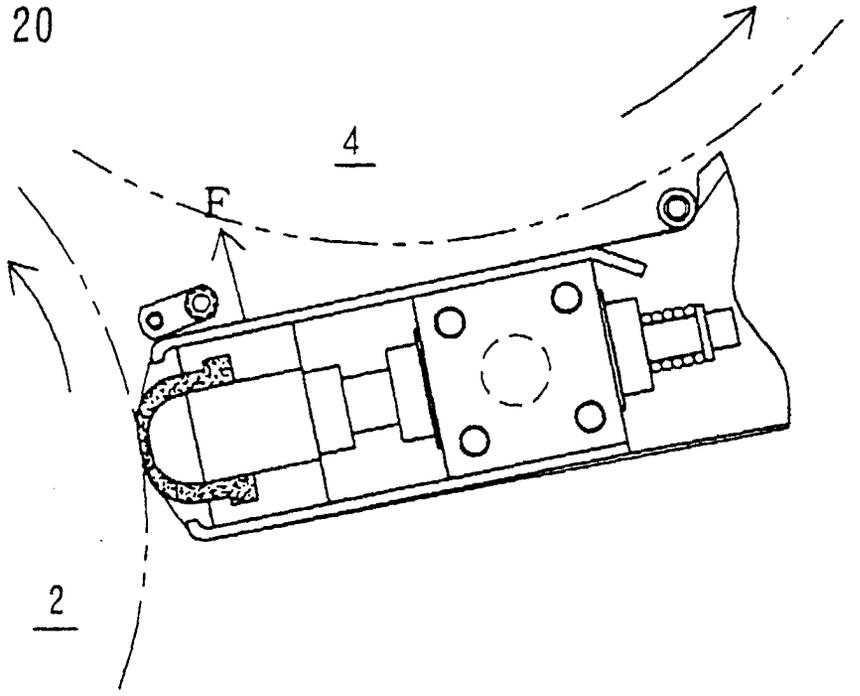


Fig. 21

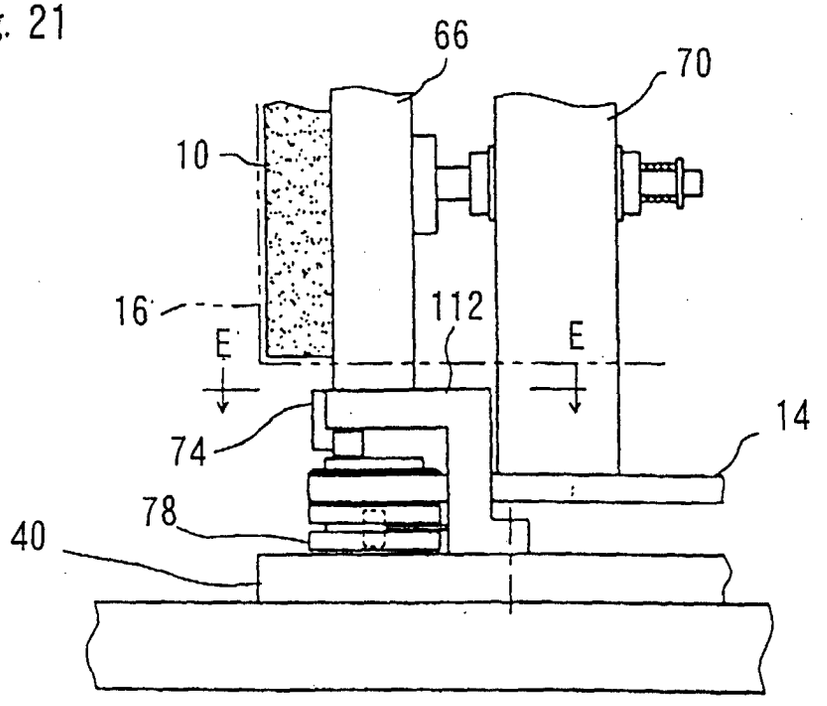


Fig. 22

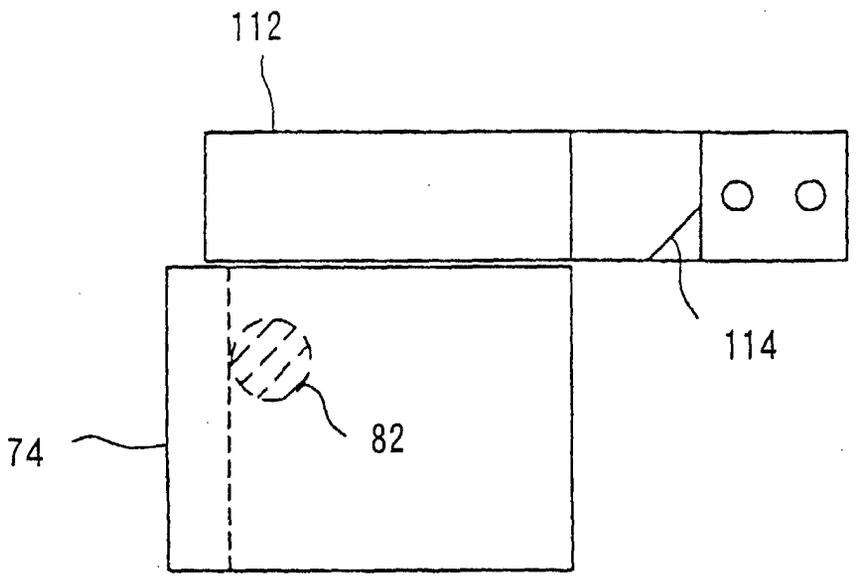
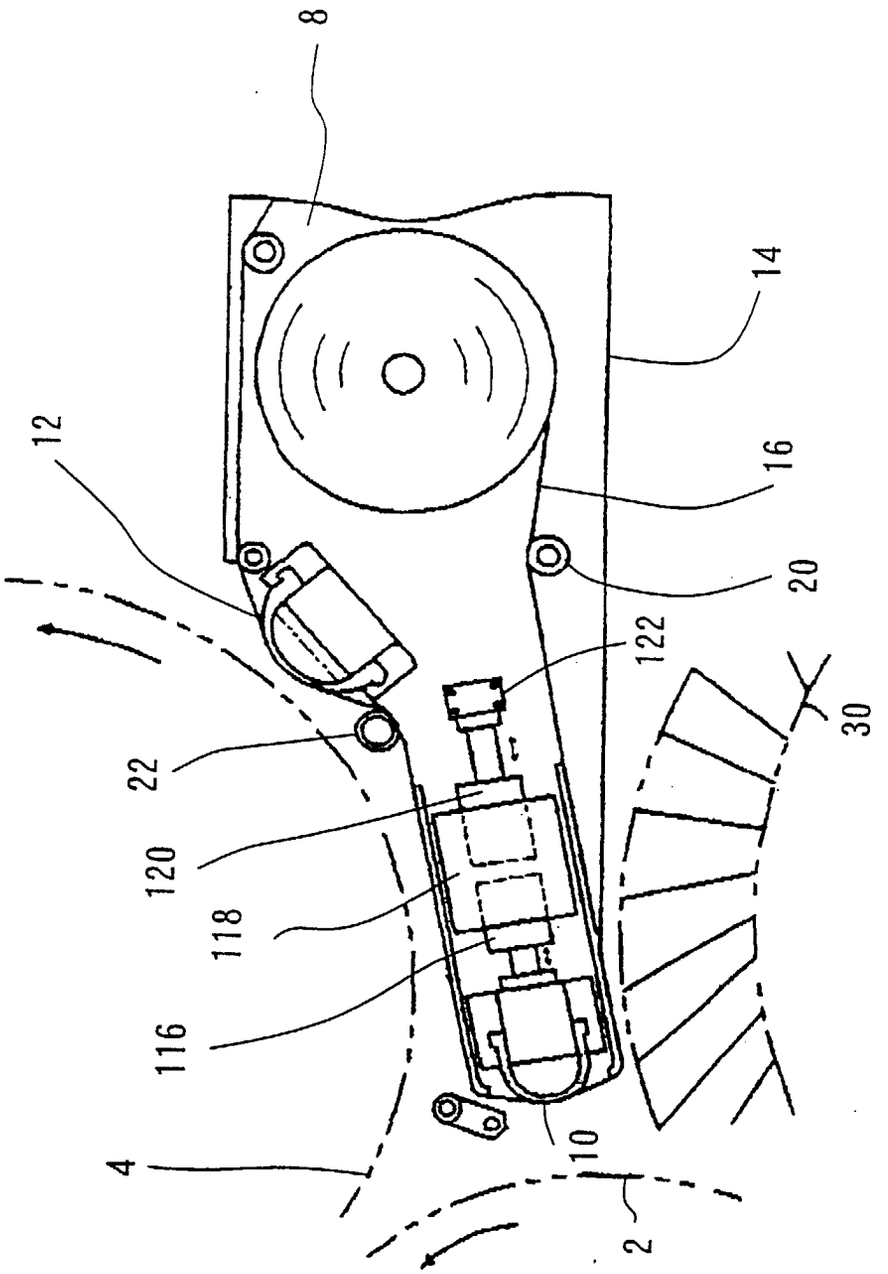


Fig. 23



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 30 8637

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 4 981 078 A (HOLL ROLAND ET AL) 1 January 1991 (1991-01-01) * the whole document *	1,27,29, 31,38, 39,42	B41F35/00 B41F35/06

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B41F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 February 2000	Madsen, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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P : intermediate document

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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 30 8637

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