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

(11) EP 1 285 753 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.02.2003 Bulletin 2003/09

(51) Int Cl.[7]: **B41F 13/44**, B41F 13/20, B41F 5/24

(21) Application number: **02009120.3**

(22) Date of filing: **24.04.2002**

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

(30) Priority: **07.08.2001 IT MI20011737**

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(54) Printing station, particularly for a flexographic printing press

(57) A printing station is described, particularly for a flexographic printing press, comprising an anilox roller (2) able to transfer a veil of ink (6) onto a plate cylinder (3) able to perform printing on a web material (W) which is fed between said roller and a backing roller (4). The three rollers (2, 3, 4) have parallel axes, the anilox roller (2) and the backing roller (4) have the same diameter and are both in contact with the plate cylinder (3), the second roller (3) by interposition of the web. The diameter of the plate cylinder (3) varies according to the print format. The plate cylinder (3) is supported with its mandrel (33) by two sides supports (20) open at the top, resting on respective pair of adjustment cams (30) and attracted against the respective side panels (12, 13) of the press by magnets housed in recesses (24) provided in said side panels (12, 13). Each support (20) has on the bottom a pin (25) housing in a respective hole (26) of a wedge (27) constrained to the respective side panel (12, 13) of the press.

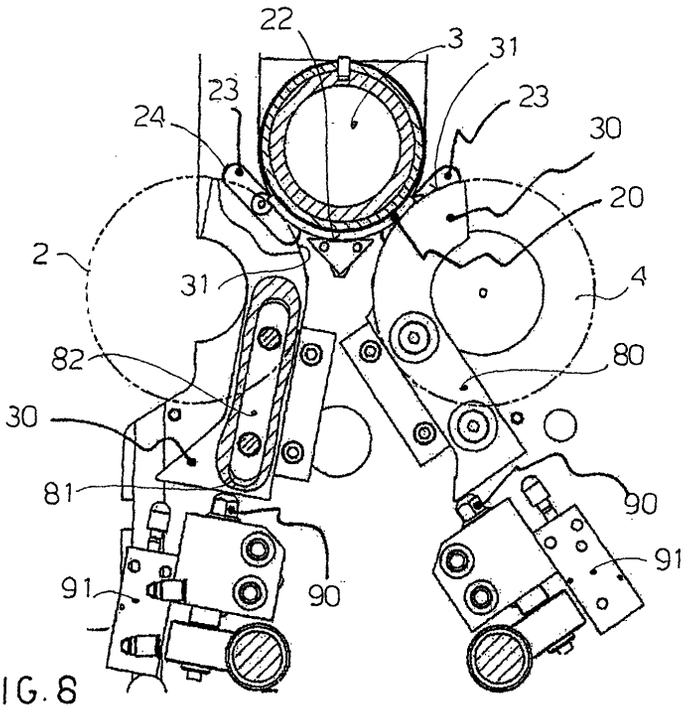

FIG. 8

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Description

[0001] The present invention refers to a printing station, particularly for a flexographic printing press.

[0002] As is known, a flexographic printing press comprises a plurality of printing stations, arranged in succession, through which the web material for printing, which can be paper, cardboard, self-adhesive paper, plastic or composite laminated web, is fed.

[0003] Each printing station serves to apply a colour to the web material and essentially comprises three rollers between which the web material (hereinunder also called paper for brevity's sake) on which the colour has to be transferred is fed.

[0004] Said three rollers comprise in particular an inking roller or anilox roller, which collects ink from a rubber coated roller, which dips into a special basin and transfers it to a plate cylinder, which in turn applies it to the paper that is fed between said plate cylinder and a backing roller.

[0005] The constructional details of the various rollers of a printing station are not further described, in that they are to be considered per se known, and in any case do not form the specific subject matter of the invention.

[0006] The three above mentioned rollers have their axes parallel to each other and generally horizontal, with the anilox roller and the backing roller normally of the same diameter and with their axes disposed on a horizontal plane, whereas the plate cylinder is disposed above the first two and in mutual contact with each of them, except for the interposition of the web of paper between the plate cylinder and the backing roller.

[0007] In a printing station the backing roller forms part of the fixed structure of the press, in that it does not require replacements or changes in position, whereas the anilox roller and the plate cylinder are subject to frequent replacement or modification.

[0008] In particular, in the majority of currently existing printing stations, replacement of the plate cylinder is required at each change of format, that is, when a change in the length of the outer surface of the cylinder, and thus a change in diameter, is required.

[0009] At each change of pattern, which does not require a change in the diameter of the printing roller, but only replacement of the plate cylinder with the new pattern, the plate cylinder must be removed and the plate must be replaced off the press in any case, it not being possible to perform said operation with the plate roller mounted on the press.

[0010] It is obvious that this brings considerable drawbacks from a practical point of view, also imposing considerable machine stoppages.

[0011] During operation of the press the contact pressure between the three rollers, that is the pressure between the plate cylinder and the anilox roller must be suitably adjusted to regulate the transfer of ink between the two, and above all the printing pressure between the plate cylinder and the backing roller, between which the paper passes, according to the print format and the particular thickness of the material to be printed.

[0012] These adjustments are made by varying the centre distance between the rollers.

[0013] In particular, once the printing station has been placed in the working position, the position of the plate cylinder is adjusted by acting on its axis to bring it closer to or further away from the axis of the backing roller in particular.

[0014] This operation proves rather laborious and must be done each time the print format or print pattern is changed, requiring a considerable amount of time.

[0015] US 4878427 proposes a solution in which discs having the same outside diameter as the plate roller are fitted at the supported ends of said roller. Said discs come to rest on respective pairs of cams having a curved profile that reproduces the circular profile of the anilox rollers and backing rollers. Each of said cams with a curved profile has one pivoted end and at the other end receives the thrust of an adjustment screw which tends to make it rotate in one direction or the other around said pivoted end, raising or lowering the plate roller that rests on an intermediate point of the cam itself.

[0016] Such a solution simplifies in part the adjustment of the plate cylinder position, but does not overcome the drawbacks related to the need to remove the plate cylinder from the press at each change of production, and to subsequent remounting thereof.

[0017] The object of the invention is to overcome the drawbacks of the printing stations of the prior art, and to make said printing stations extremely versatile.

[0018] In particular, an object of the invention is to allow the format and print pattern on the plate cylinder to be changed on the press, without the need to have to remove the entire cylinder from the press.

[0019] Another object of the invention is to provide a system for adjusting the printing pressure that is extremely simple, precise and rapid.

[0020] Another object of the invention is to provide a printing station in which the plate cylinder is not constrained to the mechanical transmissions that normally drive it.

[0021] These objects are achieve by the printing station according to the invention which has the characteristics listed in appended independent claim 1. Advantageous embodiments of the invention are described in the dependent claims.

[0022] Essentially, the printing station according to the invention provides a pair of supports for the plate cylinder mandrel that can be movably fixed to the side panels of the press frame. Said supports are advantageously in the form of sectors of disc with a central hole, so as to be open at the top, where they have a circular profile with a radius corresponding to the radius of the plate cylinder mandrel or in any case of the supported part of the plate cylinder. The bottom profile of said disc sector supports, on the other hand, is an arc of a circle with a radius corresponding to the radius of the plate

cylinder.

[0023] The supports in the form of a sector of a disc with a hole are of different sizes according to the print format and are interchangeable with one another. They are advantageously fixed to the side panels of the press by means of respective magnets which prevent any shifting thereof and by means of a centring and safety pin at the bottom.

[0024] Each support in the form of sector of a circle with a central hole rests on a pair of adjustment cams that have a curved outer profile with the same radius as the anilox roller and the backing roller.

[0025] According to one embodiment, said cams are rocking levers pivoted at an intermediate point between the point of contact of said levers with the respective disc sector supports and the point of application of the adjustment force. The arm of the lever where the adjustment force acts is advantageously longer than arm of the lever that transfers said force to the plate cylinder, thus allowing fine adjustment of the printing pressure.

[0026] According to another embodiment, the adjustment cams have a rectilinear sliding movement, being provided with a groove, which acts as a guide for a corresponding tongue fixed to a side panel of the press. An appropriate orientation of sliding of the cams allows almost constant pressure adjustment, between the minimum format and the maximum format, also as the set pressure varies.

[0027] To allow interventions on the plate cylinder on the press, the mandrel of the latter is mounted directly on the driving motor and relative reduction gear, and moves therewith, eliminating the normal coupling joints. In this manner, when the print pattern and/or format must be changed, the entire motor-reduction gear-mandrel assembly is raised, remaining accessible from the operator side of the press, where the side panel of the press is conveniently made lower than that of the drive side. In this position, a compressed air inlet hole provided on the plate cylinder is positioned in correspondence with a delivery nozzle, which allows the printing sleeve to be extracted and replaced with another of a different diameter and/or with a different printing plate.

[0028] The entire motor-reduction gear-mandrel assembly is mounted to tilt around a pivot, so as to allow pressure to be applied to the plate cylinder and the printing pressure to be adjusted by means of the above mentioned adjustment cams and perfect adaptation of the mandrel axis to the real working axis passing through the centre of the open cams.

[0029] Further characteristics of the invention will be made clearer by the detailed description that follows, referring to purely exemplary and therefore non-limiting embodiments thereof, illustrated in the appended drawings, in which:

Figure 1 is a diagrammatic side view of a printing station, particularly for a flexographic printing press;

Figure 2 is an axonometric view of a printing station according to the invention, shown assembled on the relative frame and with parts removed, taken from the left-hand operator side;

Figure 3 is a view of the assembly of Figure 2, taken from the left-hand drive side;

Figures 4 and 5 are views similar to those of Figures 2 and 3, respectively, with the plate cylinder in the raised position;

Figure 6 is a vertical median section taken along the axis of the mandrel of the plate cylinder, substantially in the direction of the arrows VI-VI of Figure 2;

Figure 7 is an enlargement of the detail enclosed in the circle A in Figure 6, in the position in which the pressurized air inlet hole in the plate cylinder is connected to the corresponding delivery nozzle;

Figures 8 and 9 are partially sectional side elevation views, taken on the inside of a side panel of the press, showing in particular fixing of a disc sector support, respectively for a small print format and for a large print format. Also shown in these figures are the linearly sliding adjustment cams for said support;

Figures 10 and 11 are axonometric diagrammatic views showing the supported ends of a plate cylinder for a small print format, respectively on the drive side and on the operator side of the press, with adjustment carried out by means of linearly sliding cams, as shown in Figures 8 and 9;

Figures 12 and 13 are axonometric views of the supported ends of a plate cylinder for a large print format, taken from opposite angles, wherein the adjustment cams are of the rocking type.

[0030] In the appended figures, reference numeral 1 denotes in a general manner the printing station, particularly for a flexographic printing press, according to the invention.

[0031] As can be seen better from the diagrammatic view of Figure 1, the printing station 1 comprises an inking roller or anilox roller 2, a plate cylinder 3, which in the figure is shown in two different sizes, for a small print format and a larger print format, and a backing roller 4.

[0032] The three rollers 2, 3 and 4 have parallel and substantially horizontal axes. The anilox roller 2 and the backing roller 4 have substantially the same diameter, whereas the diameter of the plate cylinder 3, as seen, varies according to the print format.

[0033] The web material W, henceforth simply called paper, on which printing must be performed, is fed between the plate cylinder 3 and the backing roller 4.

[0034] To complete briefly the description of the printing station 1 of Figure 1, it must be specified that a rubber-coated roller 5 partially immersed in a bath of ink 6 contained in a basin 7 cooperates with the anilox roller 2. The rubber-coated roller 5 transfers a thin layer of ink by contact to the anilox roller 2 which receives the ink in microcavities 8 provided on the surface thereof and shown diagrammatically in Figure 1. The excess ink on the anilox roller 2 is removed by means of a doctor blade 9.

[0035] The anilox roller 2 transfers the ink to a print plate 10 mounted on the outer surface of the plate cylinder 3, which reproduces the print pattern and transfers the print onto the paper W, which is fed between the plate cylinder and the backing roller 4.

[0036] In Figure 1 the arrows indicate the directions of rotation of the various rollers and the direction of feed of the paper.

[0037] In a flexographic printing press, a plurality of printing stations 1 are generally provided, each able to transfer a particular colour onto the paper W.

[0038] Depending upon the characteristics and the thickness of the paper W to be printed, as well as the print format, that is of the size of the print plate 10, the printing pressure, that is the contact pressure between the plate cylinder 3 and the backing roller 4, as well as the contact pressure between the plate cylinder 3 and the anilox roller 2 must be varied.

[0039] Furthermore, each time the print format or pattern is to be changed, it is necessary to intervene appropriately on the plate cylinder 3.

[0040] The invention addresses these problems.

[0041] Making particular reference now to Figures 2 to 5, it can be seen that the printing station 1 is supported by a machine frame 11 comprising a pair of side panels or shoulders 12, 13, joined by a plurality of stiffening bars 14. The sides 12 and 13 will henceforth be called drive side and operator side, to indicate respectively the side of the press where the drive members are disposed and the side where the operator normally works.

[0042] As can be seen in the appended figures, side panel 13 on the operator side is lower than the side panel on the drive side 12, so that it is possible to intervene on the plate cylinder 3 on the press, once it has been raised from its working position, as will be better described hereunder.

[0043] To allow easy interventions on the plate cylinder 3 on the press and to allow easy adjustment of the printing pressure exerted thereby, according to an important characteristic of the invention the plate cylinder is supported at the two ends by special supports 20 (see in particular Figures 8 to 13).

[0044] In particular, the supports 20 are perfectly identical to each other and are disposed facing each other on the inside of each side panel 12, 13 of the press.

[0045] They are interchangeable and their size varies according to the print format, that is, according to the size of the plate cylinder they must support.

[0046] In the appended figures, two different types of support 20 are shown, one for small print formats (Figures 8, 10, 11) and one for large print formats (Figures 9, 12, 13).

[0047] Each support 20 advantageously consists of a sector of disc with a hole in the centre so as to form at the top a concave seat 21 with a circular profile to house a shaft-mandrel or in any case supported parts of the plate cylinder 3.

[0048] The bottom profile 22 of the disc sector-shaped support 20 also is circular and has a radius equal to the radius of the plate cylinder 3, complete with the print plate 10.

[0049] Each support 20 rests with its bottom circular profile 22 on a respective pair of print pressure adjustment cams 30. More precisely, the supports rest in a punctiform manner on corresponding circular profiles 31 with a radius corresponding to the radius of the anilox roller 2 and of the backing roller 4.

[0050] Operation of the cams 30 will be described further on.

[0051] Returning to the disc sector support 20, this is attracted against the respective side panel 12 or 13 of the press by a pair of permanent magnets 23, housed in respective recesses 24, formed in the corresponding side panel 12, 13.

[0052] In this manner the position of alignment between the axis of the pairs of supports 20 and the axis of the plate cylinder is ensured, before the plate cylinder comes to rest and press on the supports 20. In other words, the pairs of magnets 23, attracting the respective support 20 against the corresponding side 12, 13 of the press, prevent the axis of the support from being disposed crooked, in any direction in space, with respect to the axis of the plate cylinder.

[0053] Also provided at the bottom of each support 20 is a substantially vertical pin 25, which inserts in a hole 26 (see in particular Figure 12), provided in a wedge 27 fixed to the corresponding side panel of the press. The pins 25 are safety elements, which ensure that an accidental contact of any body against the supports, for example of the print sleeve during loading on the plate cylinder, does not cause the support to lose its position, or even fall.

[0054] The fact of having the supports 20 open at the top allows the plate cylinder 3 to be raised from the working position in which it rests on the supports, to a raised position of detachment (Figures 4 and 5), where it is possible to intervene on the plate cylinder, always leaving the disc sector supports 20 in the same position, resting on the adjustment cams 30.

[0055] In this manner, if there is no change of format in the plate cylinder 3, it is possible to remove and replace the print sleeve 32 with the print plate 10 without having to remove the supports 20. If, on the other hand, it is necessary to change the print format, the supports 20 will also be replaced. The operation of replacing the sleeves 32 of the plate cylinder 3 will be described fur-

ther on.

[0056] As can be seen in the figures, the mandrel 33 of the plate cylinder 3 has supported parts 34, 35, respectively on the drive side and on the operator side of the press, of exactly the same diameter, so as to house in the circular seats 21 of the identical disc sector supports 20 provided on the inside of the two side panels of the press.

[0057] In particular, the supported part 34 on the drive side is a cylindrical portion inside which the axis of the mandrel 33 passes, whilst the supported part 35 on the operator side is a round cover, in which the end of the mandrel 33 houses by means of a roller bearing 36.

[0058] The round cover 35, which is obviously pressed against the support 20 during operation, as will be better described later, is mounted on the end of the mandrel 33 so as to allow axial adjustment of the latter, without rubbing. For this purpose, besides the above mentioned roller bearing 36, a further bearing 37 (Figure 6) which is constrained to a pin 38 coaxial with the mandrel 33 is provided in the round cover 35.

[0059] Said pin 38 is retained by two helicoidal springs 39, contrasting with each other, which keep the pin 38/round cover 35 in a central axial position. The axial movements of the mandrel 33 do not cause shifting of the round cover 35 during the working phase, because, as already mentioned, the printing pressure is discharged onto the round cover 35.

[0060] Only during the resting phase, that is with the mandrel 33 raised from the supports 20, the contrasting springs 39 bring the pin 38/round cover 35 back to the central axial position.

[0061] The operation of replacement of the print sleeves on the plate cylinder 3 will now be described in more detail. As already mentioned, said operation is allowed by the fact that the side panel on the operator side 13 is lower than the side panel on the drive side 12, and in the latter a wide vertical slot 40 is provided in which the mandrel of the plate cylinder 3 can vertically slide to be raised and lowered.

[0062] To allow movement of the mandrel 33 and increase the stiffness of the system, according to the invention, any mechanical joint for transmission of the drive to said shaft has been eliminated.

[0063] In fact, as can be seen in particular from Figures 6, 9-13, a brushless motor 41 is fixed directly to a reduction gear 42, which in turn is screwed directly into an end flange 43 (Figure 6), carried by the mandrel 33 of the plate cylinder 3.

[0064] This particular assembly allows elimination of said coupling joints, increasing the stiffness and angular precision of the motor/mandrel system.

[0065] The print plate mandrel 33 is supported on the drive side by two roller bearings 45, which in any case allow the above axial movement of the mandrel. Said movement is obtained by means of the action of a motor 46, which drives an axial adjustment screw 47. The motor 46 is fixed to a support 48 integral with the reduction gear 42. The nut screw 44 into which adjustment screw 47 screws is constrained to a support 49 connected to the screwstock assembly (cylindrical supported part 34).

[0066] In this manner, rotation of the adjustment screw 47 in the fixed nut screw 44 causes axial movement of the entire motor 41 - reduction gear 42 - mandrel 33 assembly, which, as can be seen, can slide axially in the round end cover 35.

[0067] Pressure is applied to the mandrel of the plate cylinder 3 by means of a pneumatic system. The actual printing pressure is discharged onto the adjustment cams 30 by means of the disc sector supports 20.

[0068] A pneumatic printing pressure system 71 is provided on the operator side which acts, by means of a split lever 72 directly on the round cover 35, resting on the relative support 20.

[0069] In the change of work position, the pneumatic cylinder 71 is at the end of its stroke, with the rod extended, the lever 72 is in an almost vertical position, such as to free the front space occupied by maximum size of the print sleeve 32, thus allowing sliding of any size of sleeve along the axis of the mandrel 33 (Figures 4 and 5).

[0070] In the operating condition, the lever 72 is lowered until it reaches the working position, determined by the round cover 35 which houses in the open circular recess 21 in the circular sector support 20, in turn resting on the adjustment cams 30.

[0071] Splitting of the lever 72 allows the end of the lever to be adapted to the various positions assumed by all the print formats, minimum, maximum and intermediate.

[0072] On the drive side the pressure system consists of a pneumatic cylinder 73 which acts on said rocking type support 49 which connects said nut screw 44 to the bearing assembly of the mandrel 33 of the plate cylinder 3.

[0073] The working position, that is, with the mandrel 33 under pressure, is determined by stopping of the supported cylindrical part 34 against the corresponding disc sector support 20. Said position obviously varies according to the print format, and therefore to the size of the print plate.

[0074] The position of movement of the print sleeves 32, assembly and removal and new sleeves, is the same for all print formats, and is determined by the end of stroke position of the drive side pressure cylinder 73, which besides the function of applying pressure to the print plate mandrel 33, also performs the function of raising said mandrel.

[0075] In the condition of movement of the print sleeves, the operator side pressure cylinder releases the pressure and sends the lever 72 upward, freeing the sleeve loading area.

[0076] The drive side pressure cylinder 73 releases the pressure and pushes the entire print plate mandrel 33 upward into the work changing position.

[0077] In the meantime, the brushless motor 41 in axis with the mandrel 33 has determined the correct angular position of said mandrel, which allows coupling of a radial hole 64 thereof with a nozzle 62 for delivering compressed air into said mandrel (see in particular Figure 7).

[0078] Said compressed air forms an air cushion between the mandrel 33 and the print sleeve 32, which can therefore be removed easily in the axial direction, and replaced with a new sleeve.

[0079] After replacement of the print sleeve and possible replacement of the disc sector supports 20, in the case of the print format also having been changed, the print plate mandrel 33 is brought into the lowered working position and pressure is applied on both sides thereof.

[0080] The drive side pressure cylinder 73 acts on the rocking support 49, which is pivoted around the body of the nut screw 44 and is rigidly connected to a substantially vertical linear guide 77, disposed on the outside of the side panel 12 on the drive side.

[0081] The linear guide 77 allows a stroke along the whole working range between the minimum print plate format (at the bottom) and the sleeve changing position (at the top). The rocking system with a double pivot, around the body of the nut screw 44 and at the point of coupling 78 to the stem of the cylinder 73, allows the mandrel 33 to follow the micromovements due to the print adjustments between the anilox roller 2/plate cylinder 3 and between the backing roller 4/plate cylinder 3.

[0082] These microadjustments correspond to changes in the centre distance between the three print rollers, these changes in size being absorbed by the rocking movement of the mandrel 33, hinged to the body of the nut screw 44 on a rigid support 76 constrained to said vertical linear guide 77.

[0083] The system for adjustment of the print pressure, performed by means of the pairs of cams 30, will now be described.

[0084] Initially reference will be made in particular to Figures 8 to 11, which illustrate an embodiment of linearly sliding cams.

[0085] The cams 30 have a working profile 31 with a radius equal to the radius of the anilox roller 2 and backing roller 4, and have a rectilinear portion 80, provided with a slot-shaped groove 81, which acts as a guide for a tongue 82 fixed to the corresponding side panel of the press (Figures 8 and 9). The restraint thus obtained allows the cams 30 to move in a rectilinear movement.

[0086] An adjustable abutment block 83, placed against the outer rectilinear profile 80 of each cam 30, allows the cam clarence to be taken up and a better precision of operation to be achieved.

[0087] To carry out an adjustment of the printing pressure, a respective adjustment screw 90 is operated and rectilinearly drives the corresponding cam 30 which acts accordingly on the disc sector support 20.

[0088] The rectilinear movement is advantageously perpendicular to the line joining the points of contact of the minimum format ant the maximum format.

[0089] This arrangement allows an almost constant pressure adjustment between the minimum format and the maximum format, also as the set pressure varies.

[0090] This allows a considerable saving of time when the format is changed, through maintenance of the previous pressures. The time saved is multiplied by the number of printing stations of which the press is made up.

[0091] As can be seen in the figures, associated with each adjustment assembly is a small cylinder 91, whose rod 92, in an extended position, acts against the respective cam 30, which tends slightly to raise the support 20, causing detachment of the plate cylinder 30 from the material to be printed W.

[0092] With reference to Figures 12 and 13 another embodiment of the adjustment cams 30 acting on the supports 20 will now be described.

In this case the cams 30 are pivoted on a respective pivot 86, placed between the point of contact of the cam 30 with the support 20 and the point of application of the force by means of the adjustment screw 92.

[0093] As shown in the drawings, the lever arm a which goes from the pivot 86 to the point of application of the adjustment force is advantageously considerably longer than the lever arm b which goes from the pivot 86 to the point of contact of the cam with the disc sector support 20, the arms a and b being substantially at right angles to each other.

[0094] In this manner, the adjustment screw 90 placed on the long arm of the lever allows fine adjustment of the cam profile 30, the radius of which corresponds to that of the anilox roller and the backing roller.

[0095] The adjustment cams 30 according to the invention, in the two embodiments previously described and illustrated in Figures 8-11 and 12-13, respectively, can advantageously also be used as plate cylinders 3 having supported parts of their outer diameter resting directly on said cams 30.

[0096] The advantages of the printing station particularly for flexographic printing presses according to the invention, with respect to printing stations of the prior art, are evident from the foregoing description.

[0097] It is clear, however, that the invention is not limited to the particular embodiments described and illustrated in the appended drawings, but numerous modifications of detail within the reach of a person skilled in the art can be made thereto and are all to be considered as coming within the scope of the invention, as defined in the appended claims.

Claims

1. A printing station, particularly for a flexographic printing press, comprising an anilox roller (2) able to transfer a veil of ink (6) onto a plate cylinder (3) able to perform printing on a web material (W) fed

between said roller and a backing roller (4), the rollers (2, 3, 4) having parallel axes, the anilox roller (2) and the backing roller (4) having substantially the same diameter and both being in contact with the plate cylinder (3) whilst the diameter of the plate cylinder (3) varies according to the print format, **characterized in that** a mandrel (33) of the plate cylinder (3) is supported at the two sides by respective supports (20) open at the top, lying against the inside of the side panels (12, 13) of the press, respectively on the drive side and the operator side, and each resting on a respective pair of adjustment cams (30).

2. A printing station according to claim 1, **characterized in that** said supports (20) are sectors of disc with a central hole, so as to form at the top a seat with a circular profile (21) with a radius corresponding to the radius of the supported parts (34, 35) of the mandrel (33) of the plate cylinder (3), and at the bottom a circular profile (22) with a radius corresponding to the outer radius of the plate cylinder (3).

3. A printing station according to claim 1 or 2, **characterized in that** said supports (20) have at the bottom a pivot (25) that is housed in a hole (26) provided in a wedge (27) fixed to the corresponding side (12, 13) of the press.

4. A printing station according to any one of the preceding claims, **characterized in that** said supports (20) are attracted against the respective side panels (12, 13) by magnets (23) housed in seats (24) formed in said side panels (12, 13).

5. A printing station according to any one of the preceding claims, **characterized in that** said supports (20) are interchangeable and are of variable size according to the print format.

6. A printing station according to any one of the preceding claims, **characterized in that** said plate cylinder (3) is movable mounted from a lowered working position to a raised position for replacement of the print sleeves (32) fitted on the mandrel (33) thereof, said side panel (13) on the operator side being made lower, to allow axial removal of the print sleeve (32) when the plate cylinder (3) is in the raised position, whilst the side frame (12) on the drive side has a vertical slot (40) inside which said mandrel (33) can slide to be raised and lowered.

7. A printing station according to claim 6, **characterized in that** said plate cylinder (3) is moved by means of a pressure cylinder (73) acting upon a rocking support (49) pivoted to a support (76) rigidly connected to a linear guide (77), which allows a stroke along the entire working range between the minimum format of the plate cylinder (3) and the sleeve changing position (33).

8. A printing station according to any one of the preceding claims, **characterized in that** said mandrel (33) of the plate cylinder (3) is driven in rotation by a brushless motor (41) mounted integrally thereto, with a reduction gear (42) interposed, the entire motor (41) - reduction gear (42) - plate cylinder (3) assembly thus being raised and lowered by means of said pressure cylinder (73).

9. A printing station according to any one of claims 6 to 8, **characterized in that** provided in said mandrel (33) is a compressed air inlet hole that can brought into register with a nozzle for delivery of the air, when said mandrel is in the raised position, to facilitate removal of the print sleeves (32).

10. A printing station according to any one of the preceding claims, **characterized in that** also provided is a motor (46) able to cause axial movements of the mandrel (33), together with its drive motor (41) and the reduction gear (42), through a screw (47) - nut screw (44) driver, the motor (46) with the screw (47) being made integral with the reduction gear (42), whilst the nut screw (44) is fixed axially.

11. A printing station according to claim 10, **characterized in that** the free end of the mandrel (33) houses in a round cover (35), on the operator side, on which a pneumatic print pressure system (71) acts by means of a split lever (72), to give the set print pressure during operation.

12. A printing station according to claim 11, **characterized in that** a roller bearing (36) centred on the mandrel (33) is rigidly fixed in said round cover (35), a further bearing (37) being provided constrained to a pivot/pin (38) coaxial with the mandrel (33), and retained by two helicoidal springs (39), contrasting with each other, which keep the pin (38)/round cover (35) in an axial central position.

13. A printing station according to any one of the preceding claims, **characterized in that** said cams (30) for adjustment of the print pressure have a portion of circular profile (31) essentially of the same diameter as the anilox roller (2) and the backing roller (4).

14. A printing station according to claim 13, **characterized in that** said adjustment cams (30) are linearly sliding and have for this purpose a respective rectilinear portion (80) provided with a slot-shaped groove (81) which acts as a guide for a tongue (82) fixed to the corresponding side panel (12, 13) of the press.

15. A printing station according to claim 14, **characterized in that** the linear sliding of said cam (30) is perpendicular to the line joining the points of contact of the minimum and maximum print formats of said plate cylinder (3).

16. A printing station according to claim 14 or 15, **characterized in that** the linear movement of said cams (30) is obtained by means of respective adjustment screws (90) acting at the free end of the cams, opposite the point of contact with the support (20).

17. A printing station according to claim 13, **characterized in that** said cams (30) are levers pivoted on a respective pivot (86) placed between the point of application of the adjustment force (90) and the point of contact of the cam (30) with said support (20).

18. A printing station according to claim 17, **characterized in that** the lever arm a which goes from the point of application of the force of the adjustment screw (90) to the fulcrum (86) is considerably longer than the lever arm b which goes from said fulcrum (86) to the point of contact of the cam (30) with the support (20).

19. A printing station according to claim 18, **characterized in that** said lever arms a and b are substantially at right angles to each other.

20. A printing station according to any one of claims 16 to 19, **characterized in that** coupled to said adjustment screw (90) is a cylinder (91) which acts with its rod (92) against the respective cam (30) to cause raising of said support (20) and thus detachment of the plate cylinder (3) from the web material (W).

21. A print assembly, particularly for flexographic printing presses, comprising an anilox roller (2) able to transfer a veil of ink (6) onto a plate cylinder (3), able to perform printing on a web material (W) fed between said plate cylinder (3) and a backing roller (4), the rollers (2, 3, 4) having parallel axes, the anilox roller (2) and backing roller (4) having substantially the same diameter and both being in contact with the plate cylinder (3), whilst the diameter of the print cylinder (3) varies according to the print format, wherein said plate cylinder (3) has on two sides supported parts having the same outside diameter as the plate cylinder, and resting on respective adjustment cams (30) having a portion with a curved profile with the same radius as the anilox roller (2) and the backing roller (4), **characterized in that** said cams (30) are linearly sliding and have a respective rectilinear portion (80) provided with a slot-shaped groove (81) which acts as a guide for a tongue (82) fixed to the corresponding side panel (12, 13) of the press.

22. A printing station according to claim 21, **characterized in that** said linear sliding of the adjustment cams (30) is perpendicular to the line joining the points of contact of the minimum and maximum print formats.

23. A printing station particularly for a flexographic printing press, comprising an anilox roller (2) able to transfer a veil of ink (6) to a plate cylinder (3), able to perform printing on a web material (W) fed between said plate cylinder (3) and a backing roller (4), the rollers (2, 3, 4) having parallel axes, the anilox roller (2) and the backing roller (4) having essentially the same diameter and both being in contact with the plate cylinder (3), whilst the diameter of the plate cylinder (3) varies according to the print format, wherein said plate cylinder (3) has on the two sides supported parts having the same outside diameter as the plate cylinder, and resting on respective adjustment cams (30) having a portion with a curved profile of the same radius as the anilox roller (2) and the backing roller (4), **characterized in that** said cams (30) are levers pivoted on a respective pivot (86) placed between the point of application of the adjustment force (90) and the point of contact of the cam (30) with said support (20).

24. A printing station according to claim 23, **characterized in that** the lever arm a that goes from the point of application of the force of the adjustment screw (90) to the fulcrum (86) is considerably longer than the lever arm b which goes from said fulcrum (86) to the point of contact of the cam (30) with the support (20), and said lever arms a and b are substantially at right angles to each other.

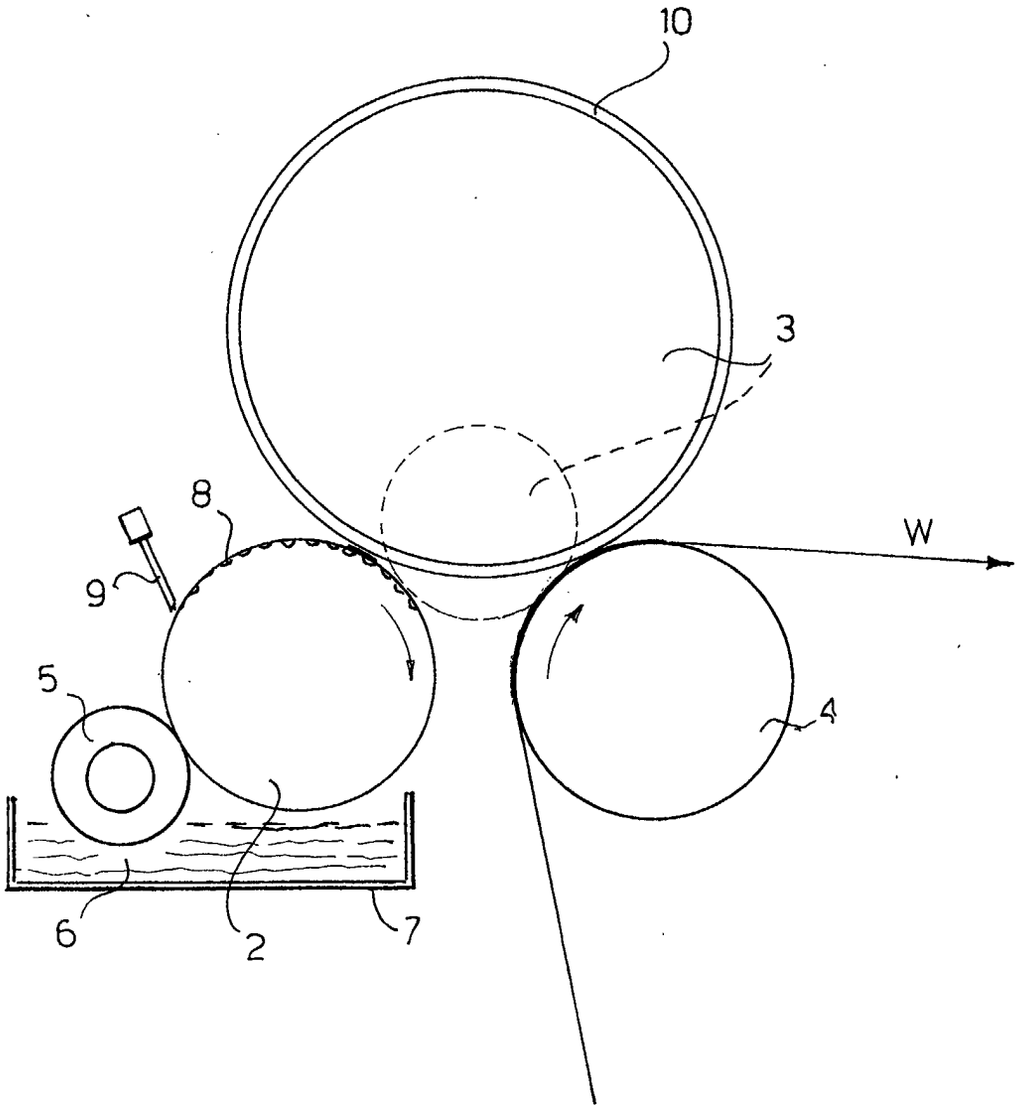

FIG. 1

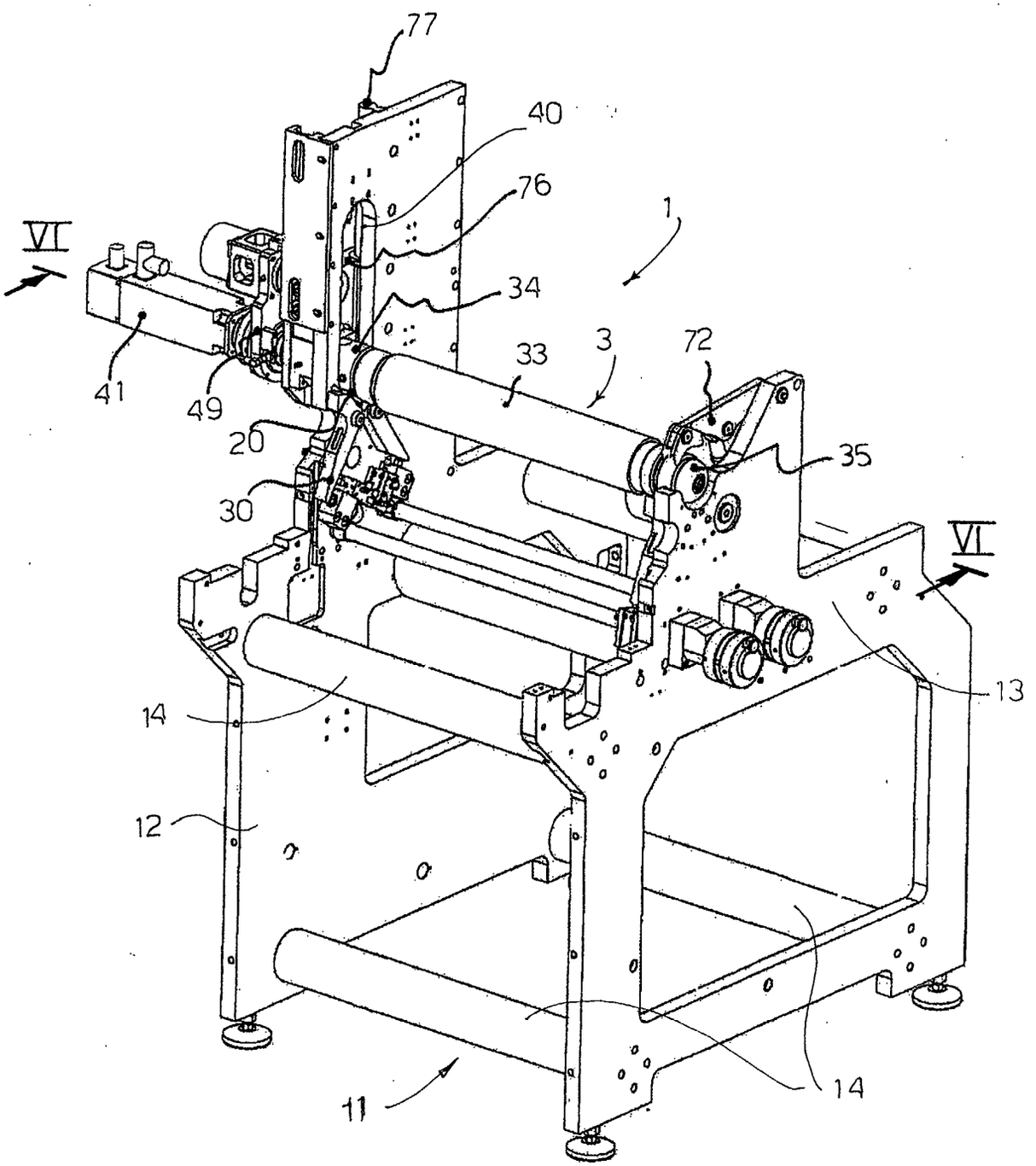

FIG. 2

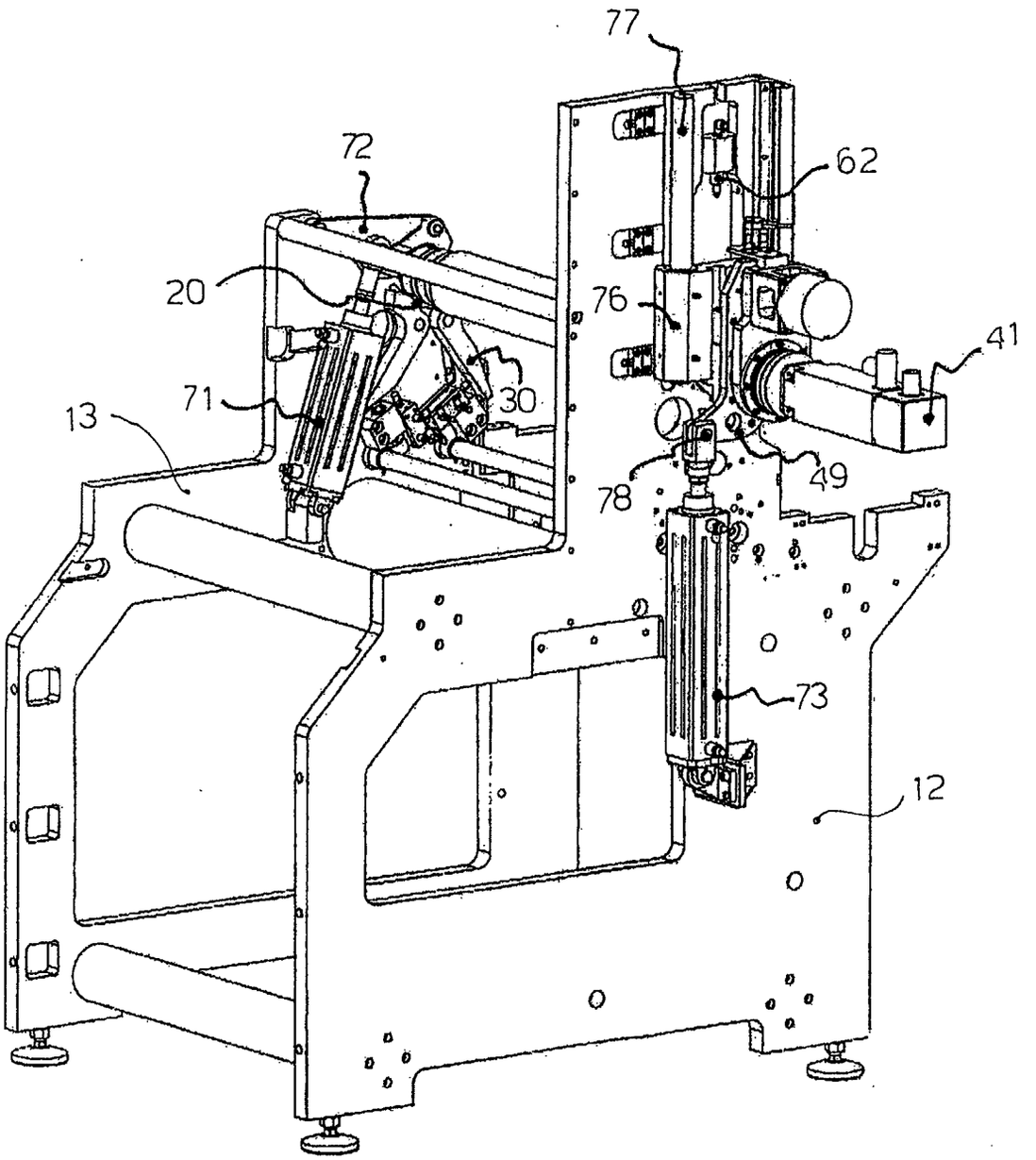

FIG. 3

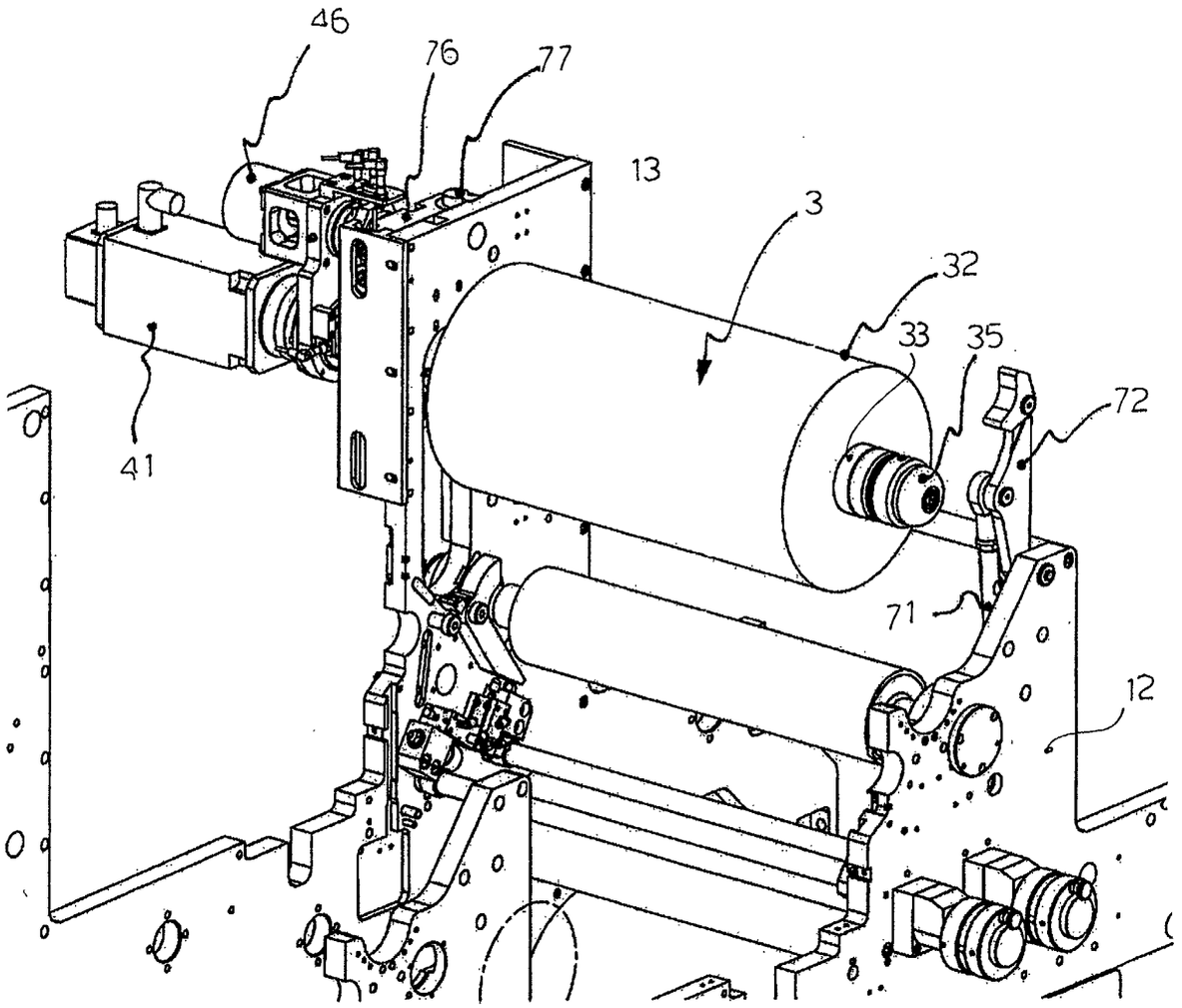

FIG. 4

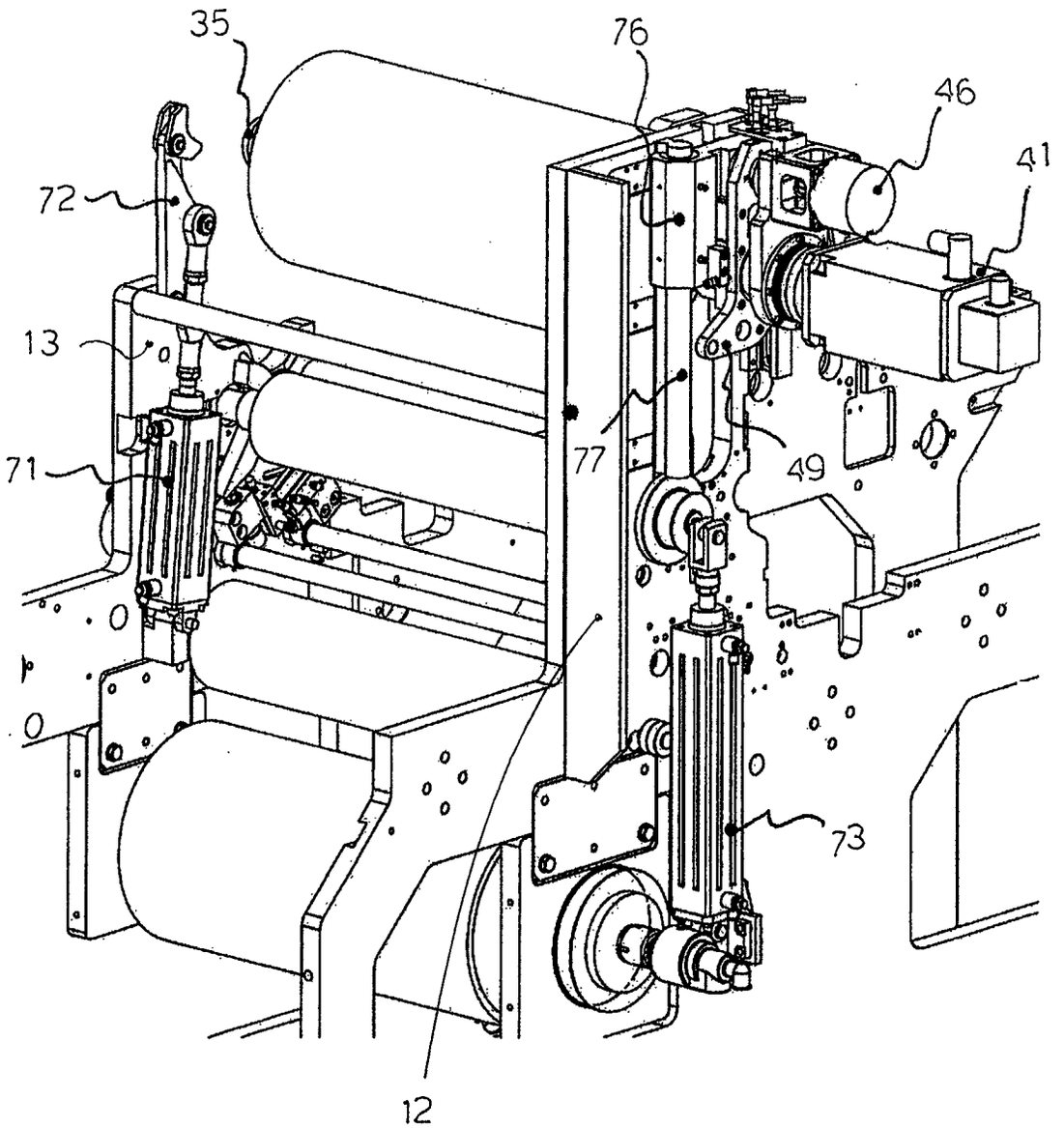

FIG.5

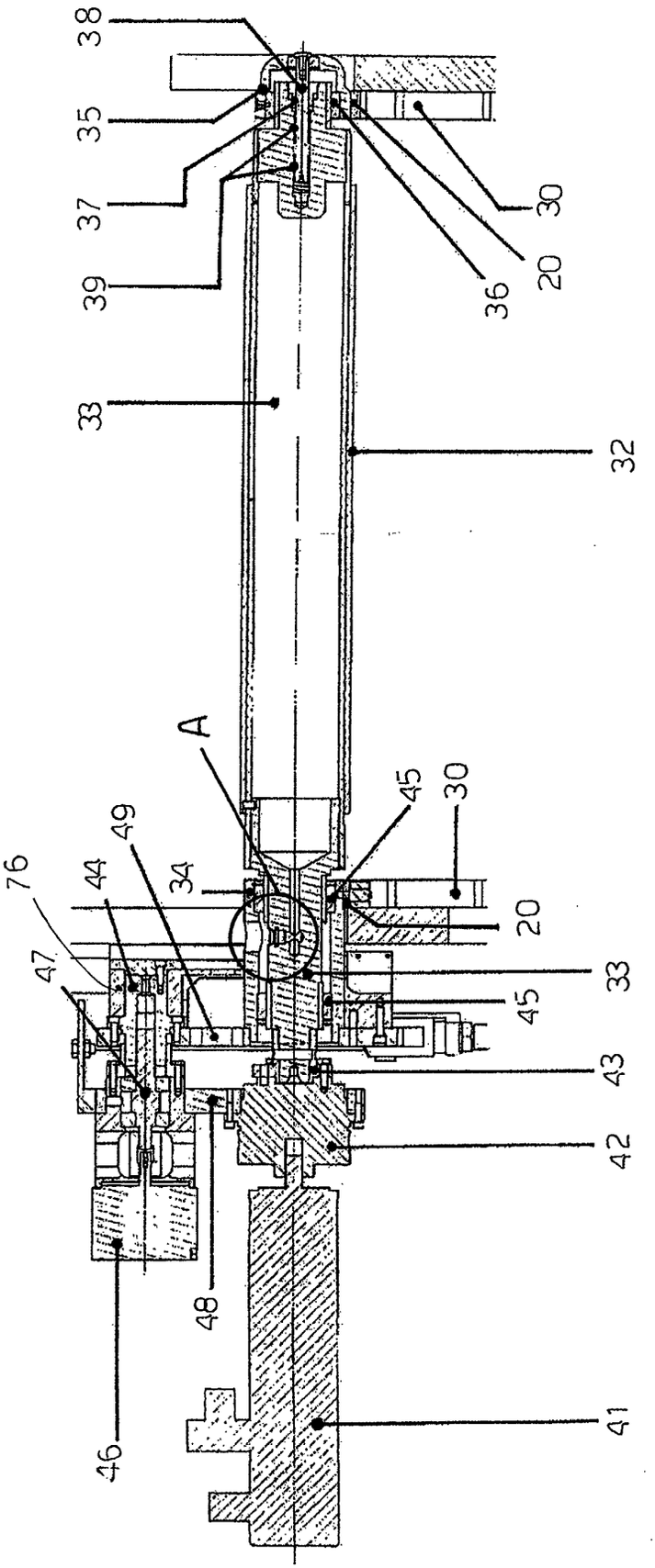

FIG. 6

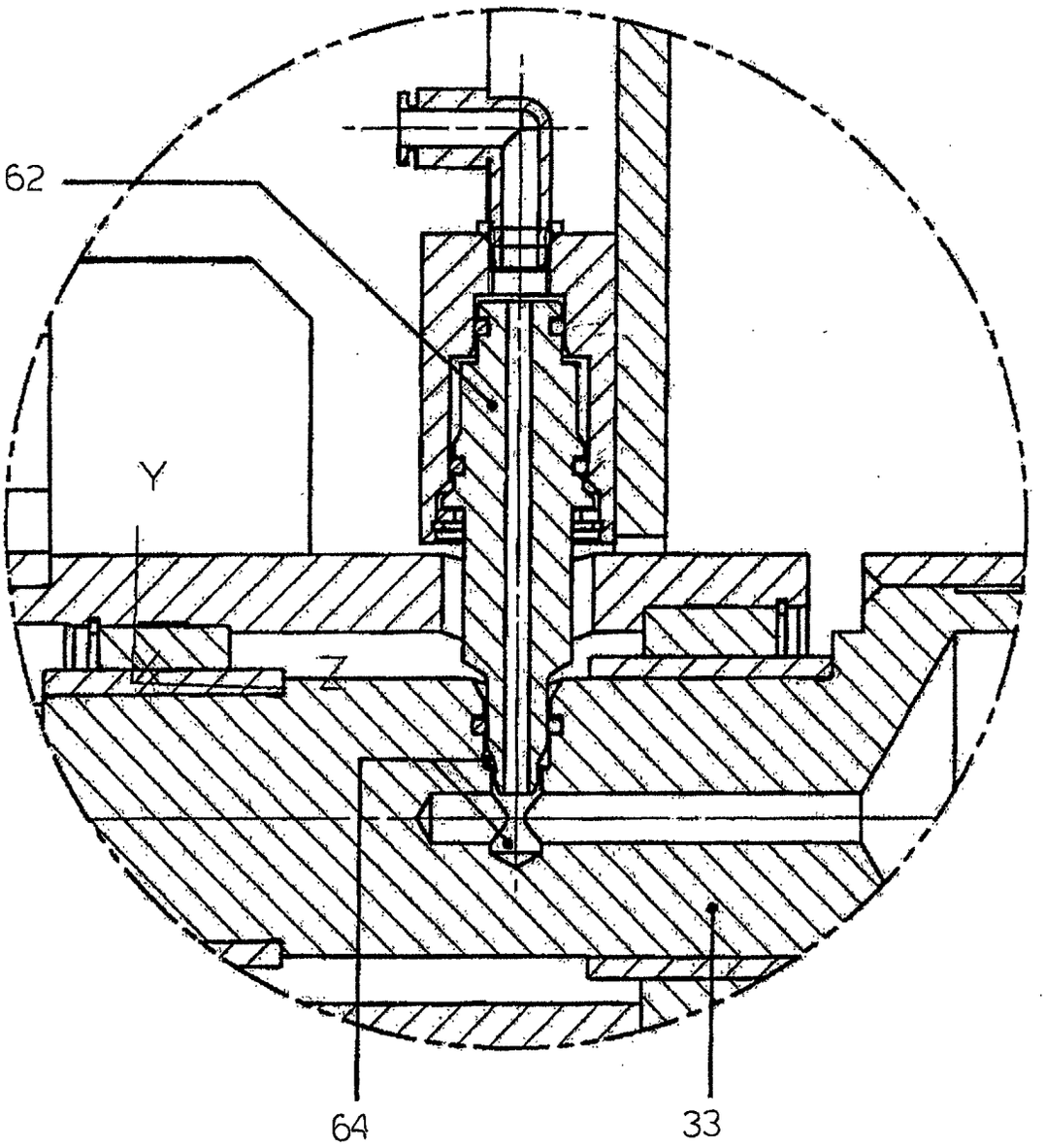

FIG. 7

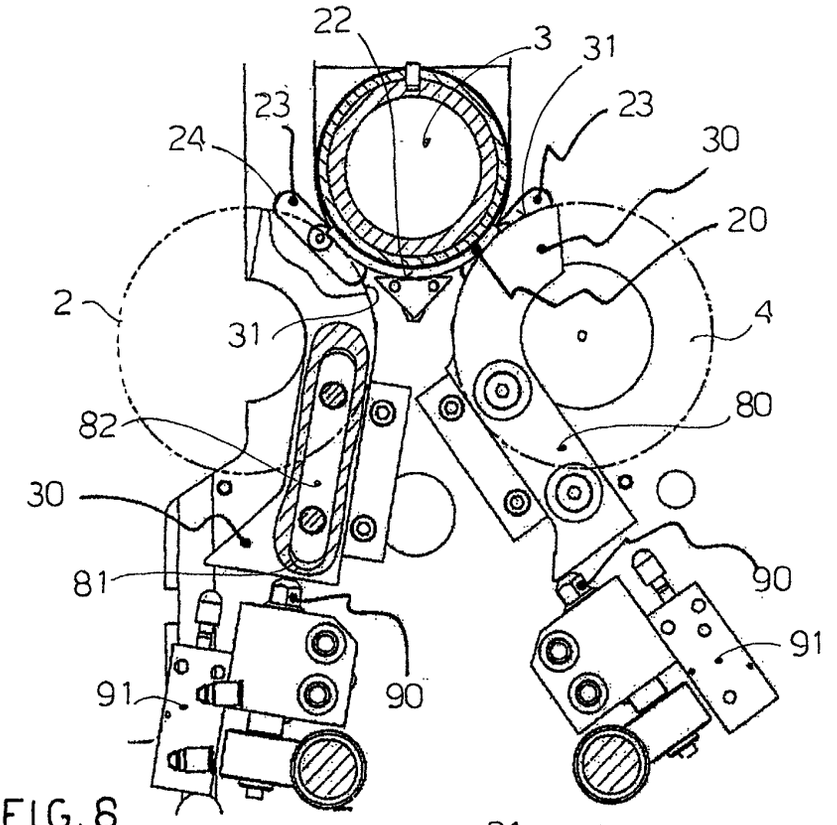
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FIG. 6

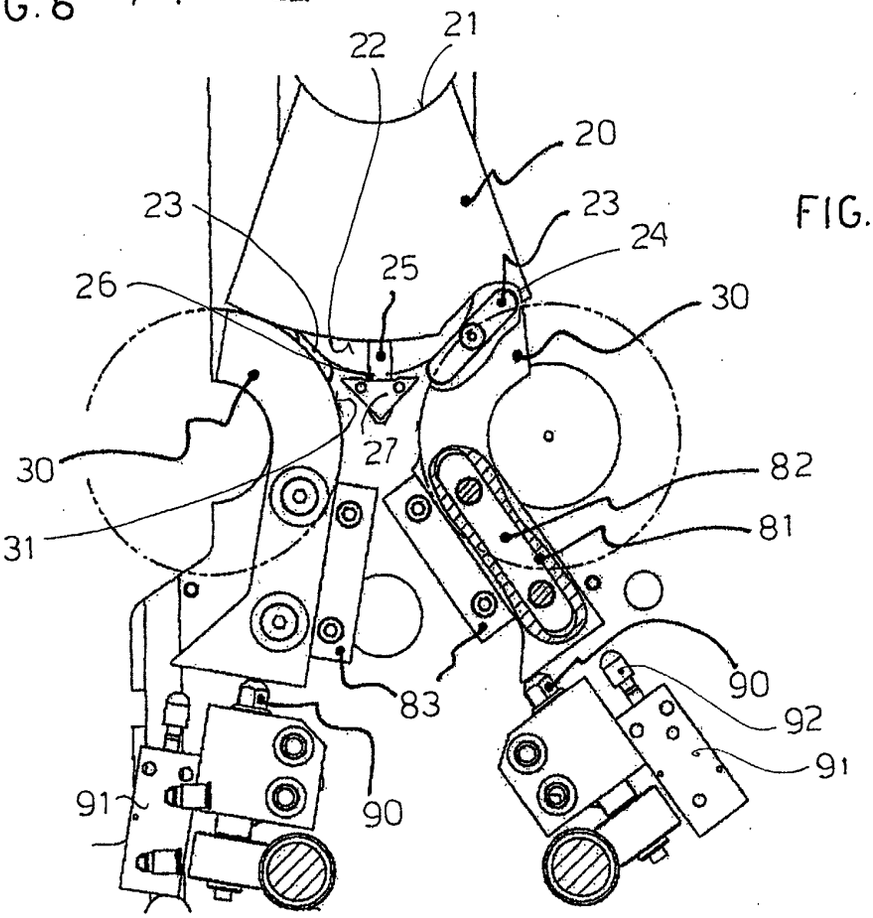
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FIG. 9

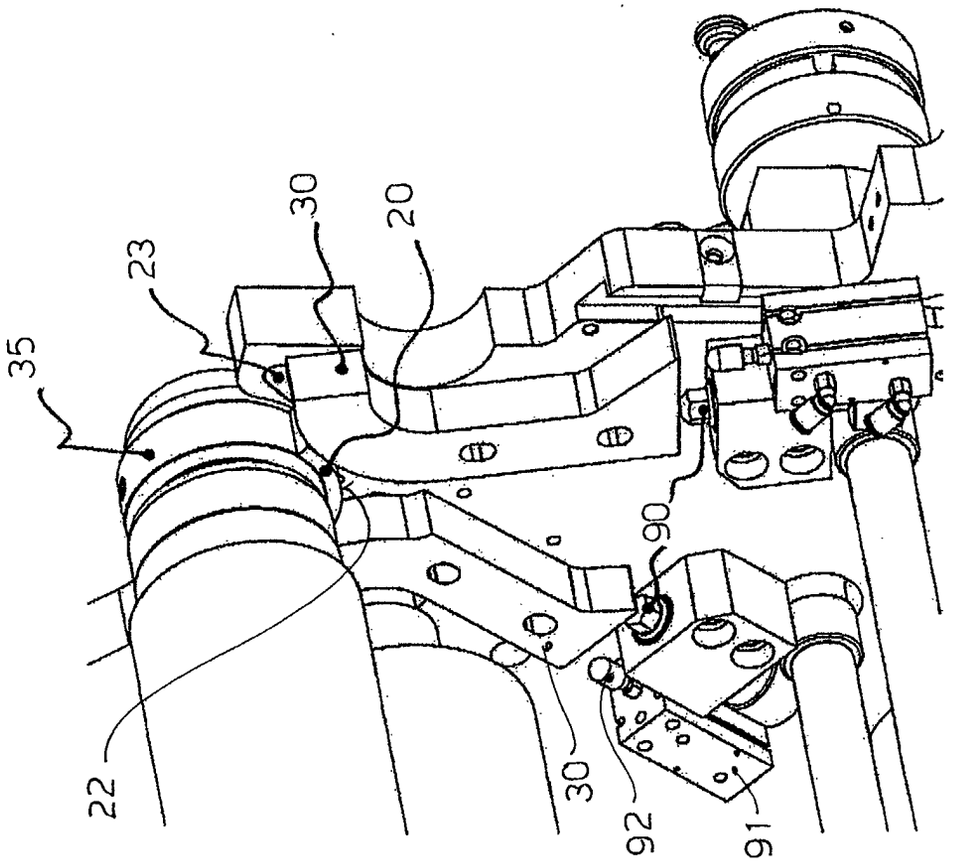

FIG. 11

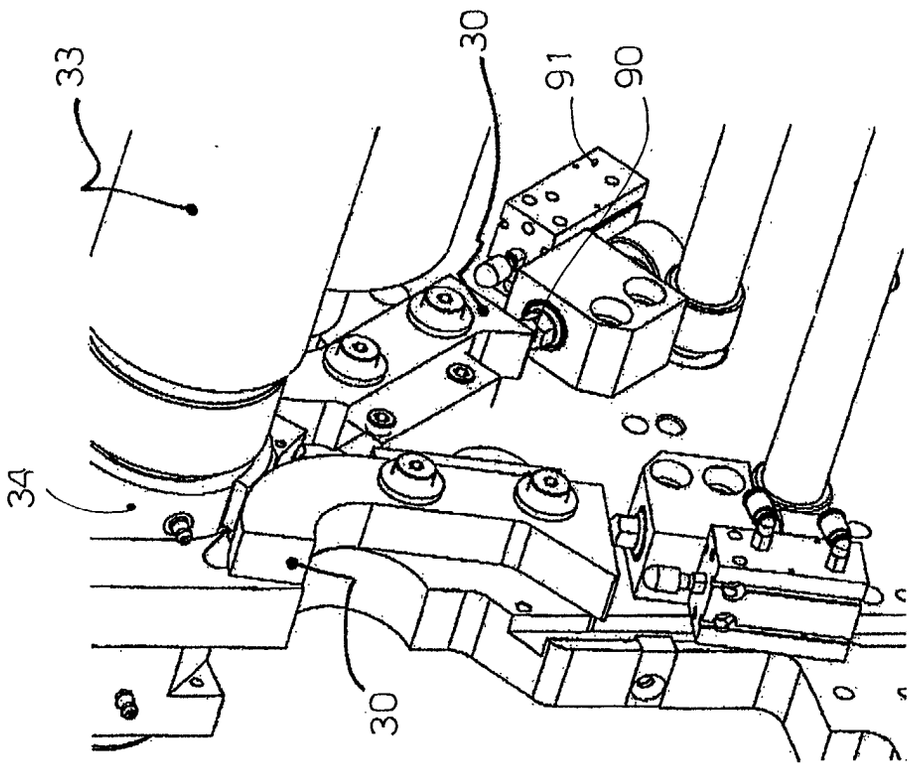

FIG. 10

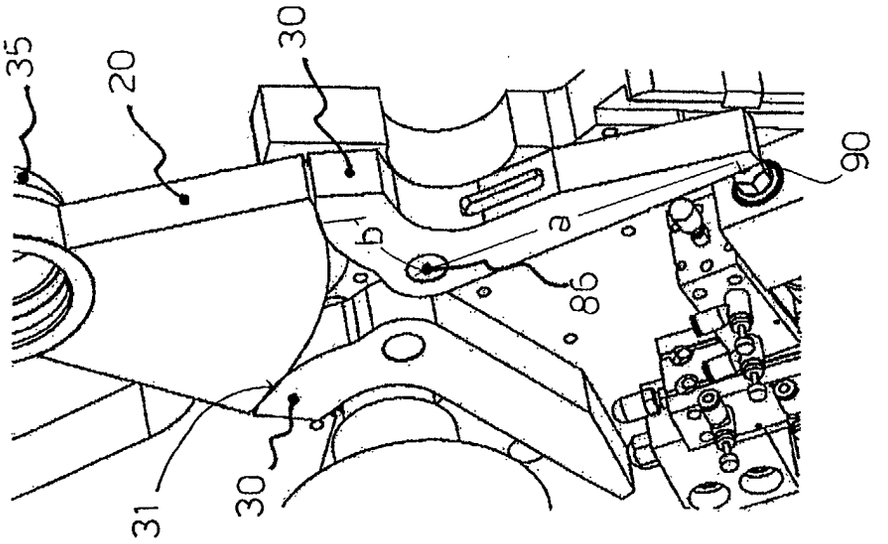

FIG. 13

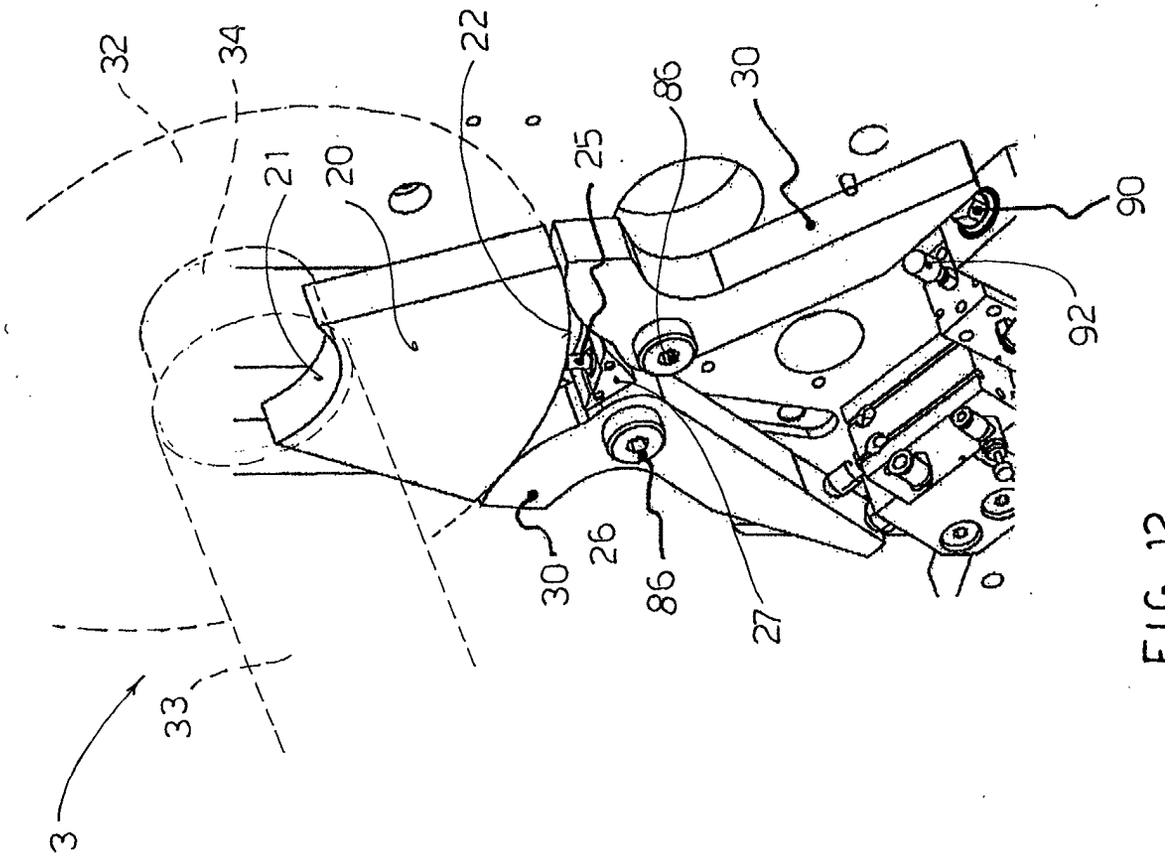

FIG. 12

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 00 9120

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 2 982 204 A (WILLIAM A. ROEHM) 30 June 1959 (1959-06-30) * the whole document *	1,21,23	B41F13/44 B41F13/20 B41F5/24
A	FR 2 342 160 A (JEAN-PIERRE NAVARRE) 23 September 1977 (1977-09-23) * the whole document *	1,21,23	

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	14 October 2002	Loncke, J

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 00 9120

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14-10-2002

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2982204 A	02-05-1961	NONE	
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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82