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

(11) Publication number: **0 032 954**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **07.11.84**

(51) Int. Cl.³: **C 25 D 17/06**, C 25 D 7/04

(21) Application number: **80901041.6**

(22) Date of filing: **04.06.80**

(86) International application number:
PCT/JP80/00123

(87) International publication number:
WO 80/02702 11.12.80 Gazette 80/28

(54) **A Cassette-Type Automatic Hollow Roller Mounting And Demounting Apparatus.**

(30) Priority: **09.06.79 JP 71853/79**

(43) Date of publication of application:
05.08.81 Bulletin 81/31

(45) Publication of the grant of the patent:
07.11.84 Bulletin 84/45

(84) Designated Contracting States:
CH DE FR GB LI LU NL SE

(56) References cited:
DE-A-2 722 857
JP-B-47 042 020
JP-Y-40 021 302
US-A-3 244 613
US-A-3 462 357

(73) Proprietor: **THINK LABORATORY CO., LTD.**
610-1, Toyofuta-aza-umebayashi
Kashiwa-shi Chiba-ken 277 (JP)

(72) Inventor: **SAITO, Susumu**
Room 510 1-30, Toyoshikidai 2-chome
Kashiwa-shi Chiba-ken 277 (JP)

(74) Representative: **Thomson, Paul Anthony et al**
Potts, Kerr & Co. 15, Hamilton Square
Birkenhead Merseyside L41 6BR (GB)

EP 0 032 954 B1

Courier Press, Leamington Spa, England.

Description

The present invention relates to an apparatus for plating printing rollers and more particularly to plating of photo-gravure rollers.

In order to provide homogeneous plating of a gravure roller, at least a part of the roller surface must be immersed in a plating solution and the roller must be rotated with precision at a specified constant rate. In addition, in order to carry out the plating in a short time period, it is desirable to immerse the whole body of the roller in the plating solution. Consequently, because the gravure roller is hollow in shape, some action must be taken to prevent the plating solution from leaking to the inside of the roller.

In conventional plating apparatus for gravure plate making, action is taken as follows: a spindle is inserted through the hollow gravure roller; both ends of the roller are supported with a pair of ring-shaped charge-supporters provided on the spindle; ring shaped leak-proof caps are provided on the spindle to cover both of the charger-supporters and seal the ends of the roller; and the completed set-up is firstly mounted on a pretreatment apparatus, then on a plating apparatus, and finally on an after-treatment apparatus. However, in such a procedure, manual mounting is indispensable, and complete automatization has been hindered. Also, in such a process a great amount of man power is required and work efficiency is low.

In addition, in another conventional example, the European gravure plate maker is equipped with an apparatus to automatically mount the gravure roller onto the pretreatment apparatus, plating apparatus, and after-treatment apparatus or to dismount the roller from each of them respectively as well as to rotate the roller. However, such a structure has certain disadvantages as is described below. Firstly, the cost is high because an automatic mounting apparatus is required for each pretreatment, plating and after-treatment apparatus. In addition, the mounting must be done on each apparatus and therefore the time required for the process increases. In addition, since there are required a great number of mountings and dismountings of the roller, the chance of a leak into the inside of the roller is increased. Furthermore, because the roller is directly lifted onto and off of each one of the apparatuses, there is a substantial possibility that the roller surface will be scratched and to avoid such scratching the rollers must be handled carefully and with a soft material such as a cloth.

Examples of known automatic hollow roller mounting and demounting devices are disclosed in U.S. Patent Nos. 3,244,613 and 3,462,357.

Accordingly, it is the general object of the present invention to provide an apparatus wherein the printing roller can be mounted automatically and exactly, to provide an apparatus wherein the roller can be carried easily, quickly, and safely to a plurality of specified processing apparatuses without manually handling the roller, to provide an apparatus wherein each of the processing apparatuses is not required to have a mounting aparatus, to provide an apparatus for plating a roller wherein the cost is reduced, and in keeping with the principles of the present invention, the above-mentioned features and objects of the present invention are accomplished by a unique plating apparatus for plating only the outer circumferential surface of a hollow roller.

It is an object of the present invention to at least minimise the disadvantages referred to above.

According to the present invention there is provided an apparatus for automatically mounting and demounting a cassette-type hollow roller, comprising a lifting frame, a pair of rotary spindles facing each other and rotatably secured to said lifting frame, at least one of said spindles being axially movable, a pair of electrically conductive support members provided on free ends of said pair of spindles and capable of supporting both ends of said hollow roller between the pair of spindles, and a pair of leak-proof caps which are annularly formed on the outer sides of said electrically conductive support members and which come into contact with the end surfaces of said hollow roller to prevent a plating liquid from infiltrating into the interior of the hollow roller, characterised in that one of said spindles that is axially movable is rotatably supported by a piston of an air cylinder device that is provided on said lifting frame; said pair of leak-proof caps are slidably provided on the outer side of said corresponding spindles to form air cylinder chambers relative to the spindles, and are movable from the outer side of said spindles toward the outer side of said electrically conductive support members to come into contact with the end surfaces of said hollow roller as said air cylinder chambers are served with compressed air; provision is made of a spindle drive means which is provided substantially on said lifting frame and which is adapted to drive the spindle in the axial direction and provision is made of a leak-proof cap drive means which is adapted to drive said pair of leak-proof caps to come into contact with the end surfaces of said hollow roller; said spindle drive means consisting of said air cylinder device, and a compressed air storage tank which is provided on said lifting frame and which supplies compressed air to said air cylinder device, and said leak-proof cap drive means consisting of said air cylinder chambers and said compressed air storage tank.

The present invention will be further illustrated by way of example, with reference to the accompanying drawings in which:—

Fig. 1 is a sectional view of a mounting apparatus and a plating apparatus in accordance with the present invention; and

Fig. 2 is a schematic view of a plating process line utilizing the plating apparatus in accordance with the teachings of the present invention.

The plating line of a photogravure roller makeup device will be explained with reference to the drawings. Fig. 1 is a mounting apparatus represented by the symbol X and a copper plating apparatus represented by a symbol Y. The mounting apparatus X and the copper plating apparatus Y, operate together to perform the required function.

Firstly, an explanation will be given of the construction and operation of the copper plating apparatus Y. The apparatus Y includes a pair of left and right frames 2A and 2B which are provided with guide plates 1 at their upper ends in order to mount the apparatus X in the specified position. A plating tank 3 is provided between the frames 2A and 2B and leakage collector tanks 4A and 4B are provided on either side of the tank 3. Any plating solution in the collector tanks 4A and 4B which has leaked from plating tank 3 is sent back to the plating tank 3 through a circulator 5 composed of circulation pipes 5A and 5B, circulation pump 5C and circulation pipe 5D. Notches 7 are provided on top of four side panels 6A, 6B, 6C and 6D, which constitute the above-described tanks 3, 4A and 4B, so that the apparatus X can be mounted thereon by fitting into the notches 7. In addition, leak prevention plates 8A, 8B, 8C and 8D are provided. The lower ends of leak prevention plates 8A to 8D are pivoted and can close in order to prevent the plating solution from leaking from the tank 3. However, the upper portions of the leak prevention plates 8A to 8D can be split in two. A motor 10 is installed on an accessory board 9 attached to the right frame 2B. The motor 10 is designed to drive an appropriate chain drive which is not shown in the drawings. A drip trap 11 is provided under the process tank 3.

In the following paragraphs the mounting apparatus X will be explained. The mounting apparatus X includes left and right vertical frames 12A and 12B which face each other and which cooperate with the left and right frames 2A and 2B of the apparatus Y. The frames 12A and 12B are designed to be placed on top of the frames 2A and 2B and are installed at both ends of high pressure tank 13. The high pressure tank 13 also serves as the transverse frame member. As a whole, all of these components form a hoasting frame. The pressure in the high pressure tank 13 can be detected by means of a pressure gauge, not shown. Also, the tank 13 can regularly supply high pressure air through an air inlet attached to it, again not shown in the drawings. Furthermore, suspension metal fittings 14A and 14B are provided on upper sides of both ends of the tank 13.

Vertical frame 12A and air cylinder unit 15 are provided at the lower end of the left of the tank 13. Vertical frame 12B and cylinder bearing box 16 are provided at the lower end of the right of the tank 13. The air cylinder unit 15 is designed to conduct pressurized air in the high pressure tank 13 into the outlet side of the cylinder chamber 15A through pipe 17, switching valve 18, and pipe 19 to push piston 15B, made of insulated material towards the right frame 12B. Also, the air cylinder unit 15 is so designed that by switching the switching valve 18 from (a) to (b), the pressurized air in the high pressure tank 13 is led to retreating side cylinder chamber 15C through pipe 20 and the piston 15B is pulled back. The piston 15B is made cylindrical. The bearing box 16, spindles 21A and 21B are rotatably coupled to the piston 15B, and the pair of spindles 21A and 21B face each other. Electrically conductive support members 22A and 22B are fastened to respective ends of the spindles 21A and 21B. These support members 22A and 22B have a tapered cylindrical shape so as to be capable of anchoring printing roller R.

Leak-proof caps 23A and 23B are fitted at the outside of the spindles 21A and 21B, in a manner as to be able to slide. Ring-shaped packings 24A and 24B are provided at the end surfaces of the leak-proof caps 23A and 23B. In order to enable a pair of left and right leak-proof caps 23A and 23B to approach each other by respectively moving their positions, cylinder chambers 25A and 25B are provided between a notched portion of an inner surface of the leak-proof caps and a notched portion of the spindles 21A and 21B, respectively. Into the left cylinder chamber 25A, highly pressurized air from the high pressure tank 13 is provided via pipe 26, switching valve 27, pipe 28A, flexible pipe 29 installed on the cylinder 15A, rotary joint 39A, and air inlet 31 provided in the spindle 21A. Also, into the right cylinder chamber 25B, the highly pressurized air is provided via pipe 28, rotary joint 30B, and air inlet 31B provided in the spindle 21B. Springs 32A and 32B are inserted between the respective leak-proof caps 23A and 23B, and the small diameter portions of the spindles 21A and 21B, and by switching the switching valve 27 from (c) to (d), the respective leak-proof caps are carried back to their original position by the springs 32A and 32B. Hand guard shaped drainboards 33A and 33B are installed at the outside of the respective leak-proof caps 23A and 23B in such a position that they are provided between the side panels 6A and 6B and 6C and 6D, respectively, Bellows-shaped cylinders 34A and 34B are respectively provided between the leak-proof cap 23A and the vertical frame 12A and between the leak-proof caps 23B and the vertical frame 12B. Current feeding to the support members 22A and 22B is accomplished by feeding the current to bearing portions of the respective spindles 21A and 21B. In addition a sprocket 35 is provided at the base of the right spindle 21B.

In operation, to mount the roller R in the apparatus X, one must first place the roller R on

a supporting roller for mounting, not shown in the drawings. Then, after placing the apparatus X on the roller R, the tapered hole at the right end of the roller R is fitted over the tapered cylinder of the charger-supporter 22B on the right side by moving the roller R towards the right. Next, switch the lever of the switching valve 18 from (b) to (a). By doing so the piston 15A is pushed out and the support member 22A at the end of the left spindle 21A fits into the tapered hole at the left end of the roller R. Thereafter, when the lever of the switching valve is shifted from (b) to (c), high pressure air in the high pressure tank 13 flows into the left and right cylinder chambers 25A and 25B and the left and right leak-proof caps 23A and 23B support the ends of the roller R as well as preventing the leakage of the plating solution to the inside of the roller R.

To remove the roller R, it only required that the switching valve 27 be returned to the (d) position and then the switching valve 18 returns to the (b) position. The above-described mounting and dismounting of the roller R by the apparatus X is carried on a specified mounting or dismounting board and the roller is mounted onto the apparatus Y after being held by the apparatus X. Upon mounting the apparatus X with the roller R onto the apparatus Y, the four leak prevention plates 8A, 8B, 8C and 8D are split in two, respectively, by the action of the springs which are not shown in the drawings and are closed when the leak-proof caps 23A and 23B are dropped into a setting position. Also, by merely mounting the apparatus X on the apparatus Y, the sprocket 35 of the apparatus X is linked to a chain drive gear (not shown) of the apparatus Y and the right spindle 21B is caused to rotate by the motor 10. Then, when the motor 10 and circulation pump 5C of the apparatus Y are started to operate automatically or manually, the roller R held at both ends with the right and left spindles 21A and 21B is immersed, while rotating, in the plating solution in the plating tank 3 to be copper-plated.

Referring now to Fig. 2, a method is shown therein for plating the roller in a copper plating process line utilizing the mounting apparatus X described above. The roller R is mounted on two supporting rollers 37 provided on a mounting board 36 and the apparatus X is fitted to the roller R_1 as is described above. Then, the apparatus X, which holds the roller R, is held by an automatic carrier 38 which is controlled by a computer and carried to the stop board 39 to be stored. Next, the rollers R_2 assembled with the apparatus X and placed on the stop board 39 are carried to the pretreatment apparatus 40 by the carrier 38, after being divided into two groups of rollers and mounted on the apparatus 40. Then, the rollers are nickel plated and are subjected to treatment. When the pretreatment is completed, the rollers R_3 assembled with the apparatus X are carried by the carrier of conveyor 38 to a double copper plating apparatus 41 and 42 wherein both of the rollers are mounted on the double copper plating apparatus 41 and 42 and copper plated. Next, the rollers R_4 assembled with the apparatus X are carried separately to, and are mounted on, the after-treatment apparatus 43. When after-treatment is finished, the rollers R_5 assembled with the apparatus X are carried by the carrier 38 to the stop board 44 and mounted thereon. Finally, the rollers are carried to buffing machine 45 to be buffed and when the buffing is finished, the rollers are removed from the apparatus X.

It should be apparent that the process described above is in terms of copper plating. If chromium plating is utilized, buffing is not done. It should be apparent that the construction of the above-described apparatus could be varied without departing from the scope of the present invention. In particular, in the apparatus X the means to move the spindle in the axial direction is not limited to an air cylinder unit and various other methods such as a motor with pinion and rack, hydraulic motor and screw, and the combination of an air cylinder unit and linking device could be utilized. Furthermore, it is not necessary that the driving devices be provided on the apparatus X and could be provided on the apparatus Y. To the present invention it is only essential that the spindle be mounted in the mounting apparatus or cassette so that the spindle can move in the axial direction and so that the spindle can be driven by one of the above-described driving methods. Also, it is not necessary that the drive source for rotating the spindle be provided on the apparatus X and other driving means for rotating the spindle than those specifically described above could be utilized.

It should be apparent to those skilled in the art that the above described embodiment is merely illustrative of but one of the many possible specific embodiments which represent the applications and principles of the present invention. Numerous and various other arrangements can be readily devised by those skilled in the art without departing from the scope of the invention.

The plating method for the periphery of a hollow roller and the automatic removal system for the cassette-type hollow roller according to the present invention may be adapted to all plating lines adapted for copper or chrome plating only on the periphery of the hollow roller and convenient especially for plating treatment of photogravure rollers.

Claim

An apparatus for automatically mounting and demounting a cassette-type hollow roller, comprising a lifting frame, a pair of rotary spindles facing each other and rotatably secured to said lifting frame, at least one of said spindles being axially movable, a pair of electrically con-

ductive support members provided on free ends of said pair of spindles and capable of supporting both ends of said hollow roller between the pair of spindles, and a pair of leak-proof caps which are annularly formed on the outer sides of said electrically conductive support members and which come into contact with the end surfaces of said hollow roller to prevent a plating liquid from infiltrating into the interior of the hollow roller; characterized in that one of said spindles (21A) that is axially movable is rotatably supported by a piston (15B) of an air cylinder device (15) that is provided on said lifting frame; said pair of leak-proof caps (23A, 23B) are slidably provided on the outer side of said corresponding spindles (21A, 21B) to form air cylinder chambers (25A, 25B) relative to the spindles, and are movable from the outer side of said spindles (21A, 21B) toward the outer side of said electrically conductive support members (22A, 22B) to come into contact with the end surfaces of said hollow roller (R) as said air cylinder chambers (25A, 25B) are served with compressed air; provision is made of a spindle drive means which is provided substantially on said lifting frame and which is adapted to drive the spindle (21A) in the axial direction and provision is made of a leak-proof cap drive means which is adapted to drive said pair of leak-proof caps (23A, 23B) to come into contact with the end surfaces of said hollow roller (R); said spindle drive means consisting of said air cylinder device (15) and a compressed air storage tank (13) which is provided on said lifting frame and which supplies compressed air to said air cylinder device (15), and said leak-proof cap drive means consisting of said air cylinder chambers (25A, 25B) and said compressed air storage tank (13).

Revendication

Appareil pour monter et démonter automatiquement un rouleau creux du type cassette, comprenant un châssis de levage, une paire d'arbres rotatifs se faisant face et assemblés rotativement audit châssis, au moins un desdits arbres étant déplaceable axialement, une paire d'éléments-support électriquement conducteurs prévus aux extrémités libres de ladite paire d'arbres et susceptibles de supporter les deux extrémités dudit rouleau creux entre la paire d'arbres, et une paire de chapeaux étanches formés annulairement sur les côtés extérieurs desdits éléments-support électriquement conducteurs et venant en contact avec les surfaces d'extrémité dudit rouleau creux pour prévenir l'infiltration d'un liquide de placage à l'intérieur du rouleau creux, caractérisé en ce qu'un desdits arbres (21A) qui est déplaceable axialement, est supporté rotativement par un piston (15B) d'un dispositif de cylindre à air (15) prévu sur ledit châssis de levage; les chapeaux étanches (23A, 23B) de ladite paire sont prévus de manière coulissante sur la côté extérieur desdits arbres correspondant (21A, 21B) pour former des chambres de cylindre à air (25A, 25B) relativement aux arbres et peuvent être déplacés du côté extérieur desdits arbres (21A, 21B) en direction du côté extérieur desdits éléments-support électriquement conducteurs (22A, 22B) pour venir en contact avec les surfaces terminales dudit rouleau creux (R) lorsque lesdites chambres de cylindre à air (25A, 25B) reçoivent de l'air comprimé; des moyens d'entraînement d'arbres sont prévus substantiellement sur ledit châssis de levage et sont susceptibles d'entraîner l'arbre (21A) dans la direction axiale et il est prévu des moyens d'entraînement de chapeaux étanches susceptibles d'entraîner ladite paire de chapeaux étanches (23A, 23B) pour venir en contact avec les surfaces d'extrémité dudit rouleau creux (R); lesdits moyens d'entraînement d'arbre consistant en ledit dispositif de cylindre à air (15) et en un réservoir d'emmagasinage d'air comprimé (13) prévu sur ledit châssis de levage et qui délivre de l'air comprimé audit dispositif de cylindre à air (15) et lesdits moyens d'entraînement de chapeaux étanches consistant en lesdites chambres de cylindre à air (25A, 25B) et en ledit réservoir d'emagasinage d'air comprimé (13).

Patentanspruch

Vorrichtung zum automatischen Montieren und Demontieren einer hohlen Kassetten-Druckwalze, mit einem Hubrahmen, einem Paar gegenüberliegender, drehbar im Hubrahmen gelagerter Spindeln, von welchen mindestens die eine axial verschiebbar ist, einem Paar elektrisch lietender Stützorgane an den freien Enden des Paares von Spindeln, die dazu geeignet sind, beide Enden der hohlen Walze zwischen dem Paar von Spindeln zu halten, und mit einem Paar von ringförmigen, dichtenden Hülsen an den Aussenseiten der elektrisch leitenden Stützorgane, welche sich gegen die Stirnflächen der hohlen Walze anlegen, um Galvanisierflüssigkeit am Eindringen ins Innere der hohlen Walze zu hindern; dadurch gekennzeichnet, dass eine der Spindeln (21A) die axial verschiebbar ist, drehbar von einem Kolben (15B) eines am genannten Hubgestell angebrachten Druckluftzylinders (15) getragen wird; dass die dichtenden Hülsen (23A, 23B) gleitend an der Aussenseite der zugeordneten Spindeln (21A, 21B) angebracht sind, um Luftzylinderkammern (25A, 25B) in Bezug auf die Spindeln zu bilden und an der Aussenseite der Spindeln (21A, 21B) gegen die Aussenseite der genannten elektrisch leitenden Stützorgane (22A, 22B) beweglich sind, um mit den Stirnflächen der hohlen Walze (R) in Berührung zu gelangen, wenn die Luftzylinderkammern (25A, 25B) mit Druckluft beschickt werden; dass Spindelantriebsmittel vorgesehen sind, die im wesentlichen auf dem Hubrahmen angeordnet und die dazu geeignet sind, die Spindel (21A) in axialer Richtung anzutreiben, und dass Mittel zum An-

trieb der dichtenden Hülsen vorgesehen sind, die dazu geeignet sind, das genannte Paar von dichtenden Hülsen (23A, 23B) gegen die Stirnflächen der hohlen Walze (R) anzulegen; dass die Spindelantriebsmittel aus dem genannten Druckluftzylinder (15) und einem Druckluftbehälter (13), welcher auf dem Hubrahmen angeordnet ist, und welcher dem Druckluftzylinder (15) zuführt, bestehen, und dass die Mittel zum Antrieb der dichtenden Hülsen aus den genannten Luftzylinderkammern (25A, 25B) und dem Druckluftbehälter (13) bestehen.

FIG. 1

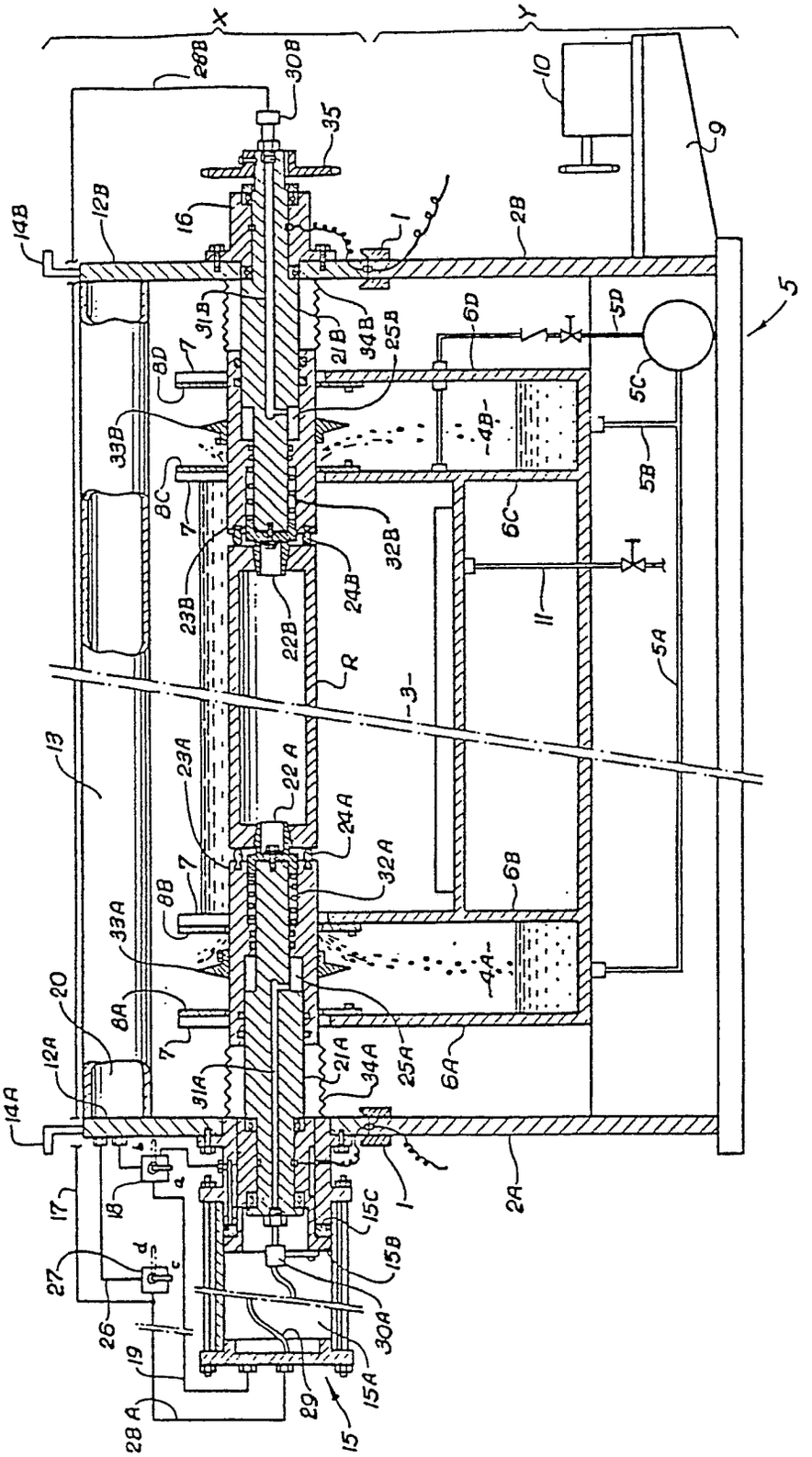
X
Y
26B
30B
35
10
9
14B
12B
16
1
2B
5
31B
34B
25B
21B
6D
5D
8D
7
5C
4B
33B
8C
5B
6C
32B
24B
23B
22B
R
3
11
5A
13
23A
22A
24A
32A
6B
8B
33A
4A
20
8A
12A
21A
34A
25A
6A
14A
31A
2A
17
18
15C
27
15B
26
19
30A
28A
29
15A
15

FIG. 2