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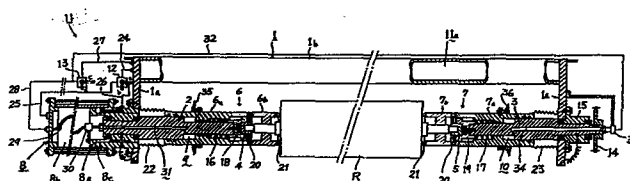
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54 **Apparatus for automatically mounting and demounting cassette-type rollers having a shaft.**

57 The invention is concerned with an apparatus for automatically mounting and demounting cassette-type rollers, having a shaft, which is suited for plating peripheral surfaces of the roller, and particularly for plating peripheral surfaces of a photogravure roller, with copper or chromium. Apparatus which horizontally chucks both ends of a photogravure roller and which also spins the roller, could be adapted to the cassette-type hollow rollers, but could not be adapted to the cassette-type rollers having a shaft. According to the apparatus of the present invention, the electrically conductive support members (4, 5) are replaceable and are selected depending upon the type of roller to be treated, and the leak-proof caps are made up of movable caps (6a, 7a) that slide on the outer sides of the spindles (2, 3) and replaceable exchange caps (6b, 7b) which are located between end surfaces of the roller and the movable caps (6a, 7b). By suitably selecting and replacing the electrically conductive support members (4, 5) and exchange caps (6b, 7b), the apparatus can be adapted to different types of rollers having a shaft. That is, the roller (R) having a shaft is placed on a mounting/demounting plate, electrically conductive support members (4, 5) are fitted to the shaft portions, exchange caps (6b, 7b) are fitted to the support members (4, 5) and the apparatus is placed on the roller to chuck it by spindles (2, 3). When the roller R having a shaft of a different type is to be treated, other suitable support members (4, 5) and exchange caps (6b, 7b) are used.



APPARATUS FOR AUTOMATICALLY MOUNTING AND DEMOUNTING CASSETTE-TYPE
ROLLERS HAVING A SHAFT

The present invention relates to an apparatus for automatically mounting and demounting cassette-type rollers, having a shaft that can be adapted to a facility for processing the outer surfaces of rollers, to plate outer surfaces of rollers, to effect pre-treatment or after-treatment for plating, or to effect buffing. More specifically, the present invention relates to an improved apparatus for automatically mounting and demounting cassette-type rollers, having a shaft which is separate from a line facility having a plurality of required processing devices or from conveyer means suspended from the ceiling of the line, but which is suspended from the conveyer means, and which is conveyed to required processing devices in the line facility, such that the roller with both ends being chucked can be subjected to the required processings in the processing devices.

We have conducted a study in the field of photoengraving art related to photogravure rollers in order to realise a photogravure robot. We have developed an apparatus for automatically mounting and demounting cassette-type hollow rollers, which is separate from a line facility that has a plurality of required processing devices or from conveyer means hanged from the ceiling of the line, but which holds the rollers at both ends permitting them to rotate and permitting the flow of electric current, and which also seals the portions where the rollers are held. Using the thus developed apparatus, we have developed a method of plating outer peripheral surfaces of the rollers, by holding the rollers in the form of a cassette that can be conveyed, conveying the cassette to a required device by conveyer means, subjecting the roller to a predetermined processing by rotating it in the device, conveying the roller to any other processing device to subject it to another processing in the same manner as mentioned above, and finally disassembling the cassette.

Such apparatus forms the subject of our European Published Application No. 0032954A. Such application claims 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.

Fig. 1 is a sectional view of the above-mentioned

apparatus for automatically mounting and demounting cassette-type hollow rollers.

The apparatus X for automatically mounting and demounting cassette-type hollow rollers comprises a lifting frame 1, a pair of rotary spindles 2, 3, facing each other at both ends of the lifting frame 1, a pair of electrically conductive support members 4, 5 which are provided on free ends of said pair of spindles 2, 3, which support the hollow roller R between the spindles, and which permit flow of electric current, a pair of leak-proof caps 6, 7 which are annularly formed on the outer sides of the electrically conductive support members 4, 5, and which come into contact with the end surfaces of the hollow roller to prevent a processing liquid from infiltrating into the interior of the hollow roller, an air cylinder device 8 which is mounted on the lifting frame 1 to move the spindles 2, 3 at least in the axial direction, air cylinder chambers 9, 10 which are formed between the spindles and the leak-proof caps, and which drive the leak-proof caps 6, 7 toward the end surface of the roller being powered by the compressed air, and a compressed air supply means 11 which has a compressed air tank 11a and which supplies compressed air to the air cylinder unit 8 and to the air cylinder chambers 9, 10.

The lifting frame 1 is formed of a pair of vertical frames 1a, 1a which are provided at both ends of the frame and face each other, and which are placed on processing devices of the line facility, and a coupling frame 1b for coupling the pair of vertical frames. The coupling frame is formed of a cylindrical member, and has a compressed air supply port to also serve as the compressed air tank 11a. The spindle 3 on the right side of Fig. 1 is equipped with a sprocket 14.

The operation will be described below briefly.

The apparatus X for automatically mounting and demounting

cassette-type hollow rollers, is placed on a roller R that is to be treated and that is placed on a roller mounting/demounting plate, not shown. The roller is moved to the right so that a tapered hole at the right end of the roller is fitted over the
5 electrically conductive support member 5 located on the right.

The lever of a switching valve 12 is moved from position (b) to position (a), to supply compressed air in the compressed air tank 11a into a cylinder chamber in the bottom of the air
10 cylinder device 8, whereby a piston 8a is pushed out, and the electrically conductive support member 4 at the end of the left spindle 2 is fitted to a tapered hole formed in the left end of the roller R.

15 Then, the lever of a switching valve 13 is moved from position (d) to position (c), to supply compressed air in the compressed air tank 11a to the right and left air cylinder chambers 10, 9, whereby the right and left leak-proof caps 7, 6 are brought into contact with the end surfaces of the roller R to
20 prevent the processing liquid from entering.

Thus, the roller R is chucked. The roller in the form of a cassette is then placed on the right and left frames 41, 40 of a predetermined processing device Y in the line facility as
25 shown in Fig. 2.

Then, four leak-prevention plates 42a, 42b, 42c, 42d, each being split in two toward the right and left, operate to close the leak-proof caps 6, 7 to prevent the leakage of liquid.
30 Further, the sprocket 14 engages with a chain of a chain transmission device or with a gear of a gear device, which is not shown, so that the right spindle 3 is driven by a motor 43.

Then, if the motor 43 and a circulation pump 44 in the
35 processing device Y are energised, the roller R, supported by the right and left spindles 3, 2, spins and is immersed in the

processing liquid in a processing vessel S, so that a predetermined processing is effected (plating, pre-treatment or after-treatment). When electroplating is to be effected, an electric current is supplied to the roller R via the right and left
5 spindles and the electrically conductive support members 4, 5.

The roller R is then conveyed to another processing device in the line facility and is subjected to a predetermined processing.
10

To take out the roller R after all treatments have been completed, the apparatus for automatically mounting and demounting cassette-type hollow rollers is conveyed to the mounting/demounting plate by a conveyer, not shown, but which is suspended from the
15 ceiling of the line. The switching valve 13 is then returned to initial position (d) to release the compressed air in the air cylinder chambers 9, 10 into the atmosphere, whereby the leak-proof caps 6, 7 are separated from the end surfaces of the roller.

The switching valve 12 is then returned to initial position (b), the compressed air in the compressed air tank 11a is supplied into the cylinder chamber on the head side of the air cylinder device 8, to retract the piston 8a. The left electrically conductive support member 4 is then separated away from the
20 roller R.
25

If pushed leftwards by hand in Fig. 2, the roller R can be taken out.

The above-mentioned apparatus for automatically mounting and demounting cassette-type rollers, can only be used with hollow rollers. Therefore, modification of the apparatus is required so that it can also be used with rollers having a shaft.
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In order to adapt the apparatus to rollers having a shaft, it would be possible to use electrically conductive support members
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4, 5 formed in a cylindrical shape, and to use leak-proof caps
6, 7 of an elongated form to increase the stroke. However,
photoengraving rollers have a variety of lengths in the roller
surface, a variety of roller diameters, and various sizes,
5 lengths and shapes in the shaft portion. Accordingly, the above-
mentioned proposal is not sufficient to cope with different sizes
and lengths of the shaft portion.

The present invention was devised in view of the above-
10 mentioned respects, and provides an apparatus for automatically
mounting and demounting cassette-type rollers, having a shaft in
which the electrically conductive support members are replaceable,
depending upon the types of the rollers to be processed, the
leak-proof caps are made up of movable caps which slide on the
15 outer side of the spindles and replaceable exchange caps which
are fitted to the outer periphery of shafts of the roller, and
which are pressed onto the movable caps to press the end surfaces
of the roller, wherein the electrically conductive support members
and the exchange caps are suitably selected so as to be adapted
20 to the roller having a shaft of any size, length or shape.

The present invention provides an apparatus for automatic-
ally mounting and demounting cassette-type rollers, having a shaft,
comprising:

- 25 a lifting frame;
- a pair of rotary spindles facing each other and rotatably
secured to said lifting frame;
- a pair of electrically conductive support members which
are provided at the free ends of said pair of spindles to support
30 a roller that is to be treated between the spindles;
- a pair of leak-proof caps which are annularly formed on
the outer sides of the electrically conductive support members,
and which come into contact with the end surfaces of the roller
to prevent a processing liquid from infiltrating into the side
35 of the electrically conductive support members;
- an air cylinder device which is mounted on the lifting

frame and which moves at least one of said spindles in the axial direction;

air cylinder chambers which are formed between said spindles and said leak-proof caps, and which drive, by compressed air, the leak-proof caps so as they come into contact with the end surfaces of said roller, and

compressed air supply means including a compressed air tank for supplying compressed air to said air cylinder device and to said air cylinder chambers;

characterised in that said electrically conductive support members are replaceable and are selected depending upon the type of roller, and possess shaft-engaging portions which engage with and support the shaft portion of said roller, and spindle-engaging portions which are engaged with and supported by said spindles; and

said leak-proof caps comprise movable caps fitted to the outer sides of said spindles and moved by compressed air supplied to said air cylinder chambers, and replaceable exchange caps which are selected depending upon the type of roller, and maintain airtightness around the periphery of said spindles between the movable caps and the end surfaces of the roller when the roller is to be chucked.

The lifting frame may be formed of a pair of vertical side frames that are provided at both ends facing each other and that are placed on a line facility, and a coupling frame which also serves as a compressed air tank for the compressed air supply means, and which couples said pair of vertical side frames as a unitary structure.

Two compressed air tanks may be provided, one for the air cylinder device and the other for the air cylinder chambers.

The electrically conductive support members are selected depending upon the type of roller to be treated and are fitted to the shaft portion of the roller. The electrically conductive

support members have spindle-engaging portions that will engage with the spindles, viz.: the spindle-engaging portions are secured to the spindles by bolts, or are screwed into the spindles, or are coupled with the spindles through a spline, or
5 are simply fitted to the spindles.

The electrically conductive support members further have shaft-engaging portions that engage with the shaft portion of the roller. The shaft-engaging portions are engaged with the
10 shaft portion of the roller and are then engaged with the spindles. Alternatively, the shaft-engaging portions engage with the shaft portion of the roller after the spindle-engaging portions have engaged with the spindles.

15' The electrically conductive support members should be mounted so as to be engaged with further support members which are provided at the ends of the spindles.

The leak-proof caps comprise movable caps and replaceable
20 exchange caps. The outer surfaces of the caps should be made of electrically nonconductive material. Further, the caps should be made of a heat-resistant plastics material and be of a cylindrical shape, and should have a sealing member at the ends adjacent the end surface of the roller.

25 The replaceable exchange caps should have shaft-engaging portions so that they are supported in a stable manner by the shaft portion of the roller to be treated, or should have additional engaging portions so as to be supported by the
30 movable caps.

The replaceable exchange caps having additional engaging portions are so mounted as to be added to the movable caps. Alternatively, the replaceable exchange caps are engaged with
35 the shaft portion of the roller when they have shaft-engaging portions.

The end surfaces of the movable caps and the replaceable exchange caps are brought into contact with each other so as to maintain the interior thereof in an air-tight manner. Alternatively, the interior is maintained in an air-tight manner by the tapered fitting, or by using a seal packing. No limitation, however, is imposed on the method of maintaining the caps air-tight.

Usually, a single replaceable exchange cap will suffice. However, in case the roller to be treated has a long shaft portion, or the shaft has a distinctly stepped portion, a single replaceable exchange cap may not be sufficient so as to be mounted in a stable manner on the periphery of the shaft. Alternatively, when the inner surface of the replaceable exchange cap is stepped, and requires an increased machining cost, two or more replaceable exchange caps may be provided.

When two or more replaceable exchange caps are used, each cap should be butted in series in the axial direction to maintain the interior air-tight.

The replaceable exchange cap should have a cylindrical shape which can be mounted in a stable manner on the outer periphery of the roller to be treated, and should be butted to the movable cap to accomplish sealing.

In the accompanying drawings:

Fig. 1 is a sectional front view of an apparatus for automatically mounting and demounting cassette-type hollow rollers, as described and claimed in our European Published Application No. 0032954A;

Fig. 2 is a sectional front view illustrating the state where a predetermined processing is effected by placing the apparatus of Fig. 1 for automatically mounting and demounting

cassette-type hollow rollers on a required processing device; and

Fig. 3 is a sectional front view of an apparatus for automatically mounting and demounting cassette-type rollers having a shaft in accordance with an embodiment of the present invention.

As illustrated in Fig. 3, the apparatus for automatically mounting and demounting cassette-type rollers having a shaft comprises a pair of spindles 2, 3 facing each other and provided at each end of a gate-shaped lifting frame 1, electrically conductive support members 4, 5 which are selectively replaceable, located at the ends of the spindles 2, 3 depending upon the type of roller, leak-proof caps 6, 7 located around the outer periphery of the spindles and electrically conductive support members, the leak-proof caps 6, 7 being composed of movable caps 6a, 7a and replaceable exchange caps 6b, 7b, and compressed air supply means 11 with a compressed air tank 11a. The compressed air is supplied to the air cylinder device 8 and to the air cylinder chambers 9, 10 to drive the spindle 2 in the axial direction. Further, the movable caps 6a, 7a are moved towards the direction of the end surface of the roller to press the exchange caps 6b, 7b which are fitted to the shaft portion of the roller R that is to be treated. Thus, the interior of the caps is maintained air-tight, and the roller is chucked at both ends.

The lifting frame 1 comprises a pair of vertical side frames 1a, 1a that face each other at each end and that are placed on a required processing device in the line facility, and a coupling frame 1b which couples the pair of side frames together. The coupling frame 1b comprises a cylindrical member and has a compressed air supply port, not shown, to also work as a compressed air tank 11a.

The pair of spindles 2, 3 are made of an electrically conductive material, provided on the pair of side frames 1a, 1a,

facing each other in a horizontal line, and slide relative to power-feed brushes which are provided on the side of the line facility to be served with electric power. The spindle 2 on the left side in the drawing is rotatably supported by the cylindrical piston 8a made of an electrically nonconductive material in the air cylinder device 8 which is secured at the lower end of the side frame 1a of the lifting frame 1 on the left side in the drawing. Therefore, the spindle 2 is allowed to spin and to move in the axial direction. The spindle 3 on the right side of the drawing is supported by a cylindrical bearing box 15 which is provided at the lower end of the side frame 1a on the right side. When the spindle 3 is to be placed on the line facility, the sprocket 14 provided at one end engages with a drive device, not shown, of the line facility, so that the spindle 3 is rotated.

The air cylinder chamber 9 is formed between a stepped portion of the spindle 2 and a stepped portion in the inner surface of the leak-proof cap 6. Further, the air cylinder chamber 10 is formed between a stepped portion of the spindle 3 and a stepped portion in the inner surface of the leak-proof cap 7. The leak-proof caps 6, 7 are brought into contact with the end surfaces of the roller by compressed air which is supplied into the air cylinder chambers 9, 10. The pressure in the compressed air tank 11a is detected by a pressure gauge, not shown. Springs 16, 17 are fitted between the leak-proof caps 6, 7 and the corresponding small-diameter portions of the spindles 2, 3 to return the leak-proof caps 6, 7.

The pair of electrically conductive support members 4, 5 are made of an electrically conductive material, and are fitted to the support members provided at the ends of the spindles 2, 3 in the axial direction, and work to support the roller therebetween and to enable electric current to flow. According to this embodiment, the electrically conductive support members 4, 5 are selected and replaceable depending upon the size of the shaft

portion of the roller R. The support members 4, 5 are engaged with the spindles 2, 3 when the roller is to be chucked, and are fitted to the shaft portion of the roller R prior to chucking the roller.

5

Support members 18, 19 are attached to the ends of the spindles 2, 3 to support the electrically conductive support members 4, 5.

10 The pair of leak-proof caps 6, 7 consist of movable caps 6a, 7a and replaceable exchange caps 6b, 7b.

The movable caps 6a, 7a are slidably fitted to the outer periphery of the spindles 2, 3 so as to be driven by compressed
15 air which is supplied into the air cylinder chambers 9, 10, and have a ring-like sealing member 20 made of rubber at the ends close to the roller to produce sealing function.

The replaceable exchange caps 6b, 7b are annular parts
20 which are separate from the movable caps 6a, 7a, and are selectively replaced depending upon the type of roller R that is to be treated.

The replaceable exchange caps 6b, 7b further assume a
25 cylindrical shape and are stably fitted to the shaft portion of the roller R that is to be treated.

The replaceable exchange caps 6b, 7b have a ring-like
sealing member 21 made of rubber at the ends close to the
30 roller to produce sealing function.

When compressed air is supplied to the air cylinder chambers 9, 10, the end surfaces of the replaceable exchange caps 6b, 7b are pressed by the movable caps 6a, 7a which move
35 outwardly of the electrically conductive support members 4, 5. Therefore, the replaceable exchange caps 6b, 7b come into

contact with end surfaces of the roller to maintain a sealed condition; i.e., the processing liquid is prevented from entering into the side of the support members 4, 5 during the processing step.

5

Bellows cylinders 22, 23 are provided between the leak-proof caps 6, 7 and the side frames 1a, 1a to cover the spindles 2, 3.

10

The compressed air supply means 11 works to supply compressed air stored in the compressed air tank 11a to the air cylinder device 8 and to the air cylinder chambers 9, 10.

15

When the lever of switching valve 12 is in position (a), compressed air in the compressed air tank 11 is introduced into the cylinder chamber 8b in the bottom of the air cylinder device 8 via switching valve 12 and pipe 25.

20

When the lever of switching valve 12 is in position (b), compressed air is introduced into the cylinder chamber 8c in the head portion of the air cylinder device 8 via pipe 26, whereby the cylinder chamber 8b in the bottom portion communicates with a port of the switching valve 12 on the atmospheric side.

25

Further, when the lever of switching valve 13 is located in position (c), compressed air is introduced into the left air cylinder chamber 9 via pipe 27, switching valve 13, pipe 28, flexible pipe 29 which runs through the air cylinder device 8, rotary joint pipe 30, and air-feed hole 31 formed in the spindle 2, and is further introduced into the right air cylinder chamber 10 via pipe 32, rotary joint pipe 33 and air-feed hole 34 formed in the spindle 3.

30

35

When the lever of switching valve 13 is in position (d), the air cylinder chambers 9, 10 are communicated with a port of the switching valve 13 on the atmospheric side.

By manipulating the switching valve 12, the air cylinder device 8 can be driven to extend or retract the piston 8a. By manipulating the switching valve 13, furthermore, the leak-proof caps 6, 7 can be actuated.

5

Flange-like drain boards 35, 36 are provided at positions corresponding to an over-flow vessel of the line facility on the outer side of the leak-proof caps 6, 7.

10 The operation will be described below:

 The apparatus X for automatically mounting and demounting cassette-type rollers having a shaft is placed on the roller R that is to be treated and that is placed on the roller mounting/
15 demounting plate, not shown, to chuck the roller. Here, however, the replaceable exchange caps 6b, 7b and the electrically conductive support members 4, 5 are fitted to the shaft portion of the roller R in advance. The support members 4, 5 should be selected so as to have an inner surface that fits on the shaft
20 portion of the roller R.

 Thereafter, the apparatus X for automatically mounting and demounting cassette-type rollers having a shaft is placed on the roller R that is to be treated and that is placed on the roller
25 mounting/demounting plate, not shown. The roller is then moved to the right in the drawing. The electrically conductive support members 4, 5 fitted to the shaft portion at the right end of the roller are then fitted to support members at the ends of the spindles 2, 3. Thus, one end of the roller is engaged.

30

 The lever of switching valve 12 is then shifted from position (b) to position (a) to introduce compressed air in the compressed air tank 11a into the cylinder chamber in the bottom of the air cylinder device 8 via pipe 24, switching valve 12 and
35 pipe 25, to push out the piston 8a. The support member 18 at the end of the spindle 2 then engages with the support member 4

fitted to the end of the shaft portion on the left of the roller.
Thus, both ends of the roller are chucked.

The roller R to be treated is sandwiched in the axial
5 direction by the support members 4, 5. Therefore, a heavy
current is allowed to flow into the roller.

Thereafter, if the lever of switching valve 13 is shifted
from position (d) to position (c), compressed air in the compressed
10 air tank 11a flows into the right and left air cylinder chambers
10, 9, whereby the right and left movable caps 7a, 6a are urged
to move toward the end surfaces of the roller R overcoming the
force of the springs 16, 17. Sealing members 20 of the movable
caps 6a, 7a push the replaceable exchange caps 6b, 7b fitted to
15 the shaft portions of the roller R. Further, sealing members 21
of the replaceable exchange caps 6b, 7b are pressed onto the end
surfaces of the roller R that is to be treated. Namely, the
processing liquid is prevented from entering into the replaceable
exchange caps 6b, 7b, the roller is chucked, and the cassette
20 operation is completed.

Thereafter, the cassette is conveyed by a conveyer means,
not shown, suspended from the ceiling of the line to a processing
device in the line facility to perform a required processing.
25

To remove the roller R after all of the processing steps
have been completed, the apparatus X for automatically mounting
and demounting cassette-type rollers having a shaft is placed on
the mounting/demounting plate, and the lever of switching valve
30 13 is returned to position (d). Compressed air in the air
cylinder chambers 9, 10 then escapes into the open air through
the switching valve 13, and the movable caps 6a, 7a separate
away from the replaceable exchange caps 6b, 7b and return to the
initial positions being urged by the springs 16, 17.

35

Then, if the lever of switching valve 12 is returned to

position (b), compressed air in the compressed air tank 11a is supplied into the cylinder chamber 8c in the head portion of the air cylinder device 8 and, at the same time, the compressed air in the cylinder chamber 8b in the bottom portion is allowed to
5 escape into the atmosphere through the switching valve 12. Accordingly, the piston 8a retracts, and the spindle 2 separates away from the support member 4.

10 If the roller R is pushed by hand toward the left in the drawing, the spindle 3 separates away from the support member 5, whereby the roller is freed. The apparatus X for automatically mounting and demounting cassette-type rollers having a shaft is then suspended, and the electrically conductive support
15 members 4, 5 and replaceable exchange caps 6b, 7b are removed from the shaft portions of the roller R.

When a roller having a shaft of a different type is to be treated, the support members 4, 5 and replaceable exchange caps 6b, 7b are selected to suit the roller.
20

Alternatively, the support members 4, 5 may not be fitted to shaft portions at both ends of the roller, but may be fitted to the support members provided at the ends of the spindles 2, 3.

25 According to the apparatus for automatically mounting and demounting cassette-type rollers having a shaft of the present invention as explained in the foregoing, at least one of the pair of spindles facing each other and provided at both ends of the lifting frame is moved in the axial direction by the air cylinder
30 device which is driven by the compressed air supply means which has a compressed air tank. Further, the electrically conductive support members provided at the ends of the spindles can be selected and replaced depending upon the type of roller. The leak-proof caps fitted to the circumference of the spindles and the
35 electrically conductive support members to maintain the interior thereof air-tight, are made up of movable caps and replaceable

exchange caps. The movable caps form air cylinder chambers relative to the spindles and, hence, move toward the end surfaces of the roller when compressed air is introduced into the air cylinder chambers from the compressed air tank. Further, the
5 replaceable exchange caps can be selected and replaced depending upon the type of roller.

According to the present invention, therefore, the apparatus described for use with hollow rollers can be improved
10 so as to be adapted to rollers having a shaft in addition to the rollers of the sleeve type. Further, the improvement does not restrict the apparatus to be adapted to rollers of one type only, but permits the apparatus to be adapted to rollers of any type having shafts of different sizes and lengths.

15

That is, if the electrically conductive support members and replaceable exchange caps are prepared to suit for rollers of all types, they can be replaced depending upon the type of roller, i.e., the apparatus can be adapted to rollers having any
20 lengths or having shafts of any shapes. Further, electrically conductive support members and replaceable exchange caps can be easily replaced.

25

CLAIM

An apparatus for automatically mounting and demounting cassette-type rollers, having a shaft, comprising:

a lifting frame;

5

a pair of rotary spindles facing each other and rotatably secured to said lifting frame;

10 a pair of electrically conductive support members which are provided at the free ends of the spindles to support a roller that is to be treated between the spindles;

15 a pair of leak-proof caps which are annularly formed on the outer sides of the electrically conductive support members, and which come into contact with the end surfaces of the roller to prevent the processing liquid from entering into the side of the electrically conductive support members;

20 an air cylinder device which is mounted on the lifting frame and which moves at least one of said spindles in the axial direction;

25 air cylinder chambers which are formed between said spindles and said leak-proof caps, and which drive, by compressed air, the leak-proof caps so as they come into contact with the end surfaces of said roller; and

30 compressed air supply means including a compressed air tank to supply compressed air to said air cylinder device and to said air cylinder chambers;

characterised in that said electrically conductive support members (4,5) are replaceable and are selected depending upon the type of roller (R), and possess shaft-engaging portions which

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engage with and support the shaft portion of said roller, and spindle-engaging portions which are engaged with and supported by said spindles(2,3); and

5 said leak-proof caps comprise movable caps (6a, 7a) fitted to the outer sides of said spindles (2,3) and moved by compressed air supplied to said air cylinder chambers (9,10), and replaceable
exchange caps (6b, 7b) which are selected depending upon the type
of roller, and that maintain air-tightness around the periphery
10 of said spindles (2,3) between the movable caps (6a, 7a) and the end surfaces of the roller (R) when the roller is to be chucked.

15

FIG. 1

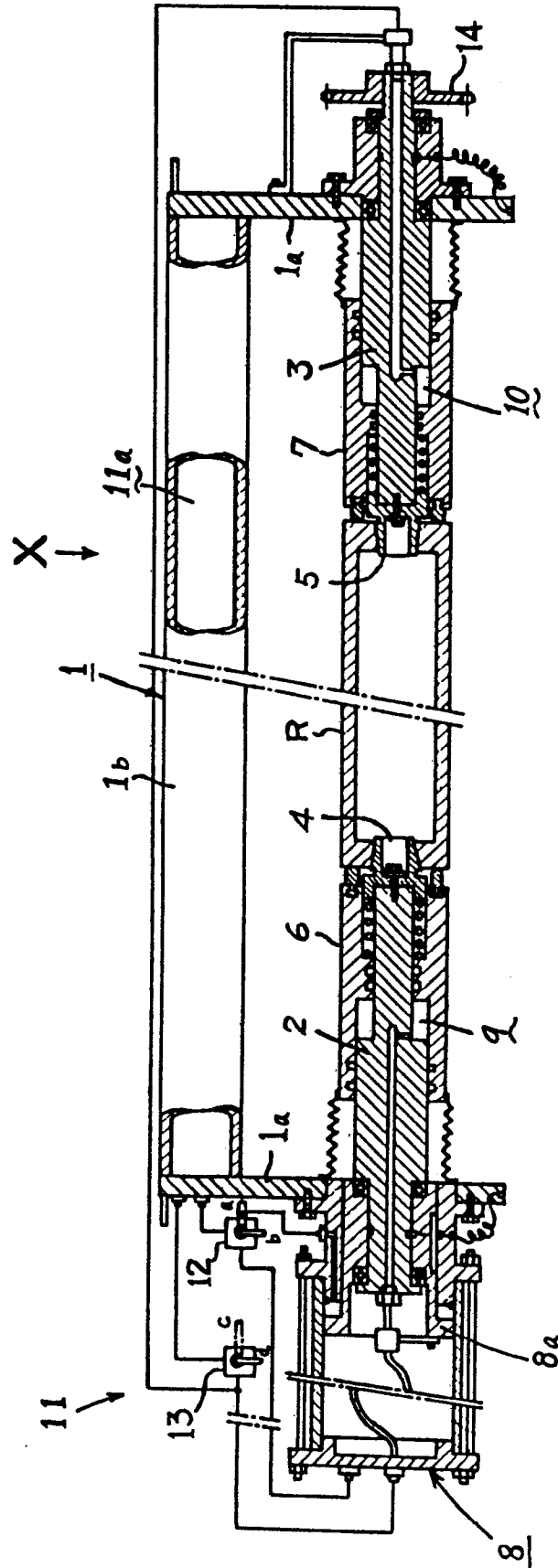


FIG. 2

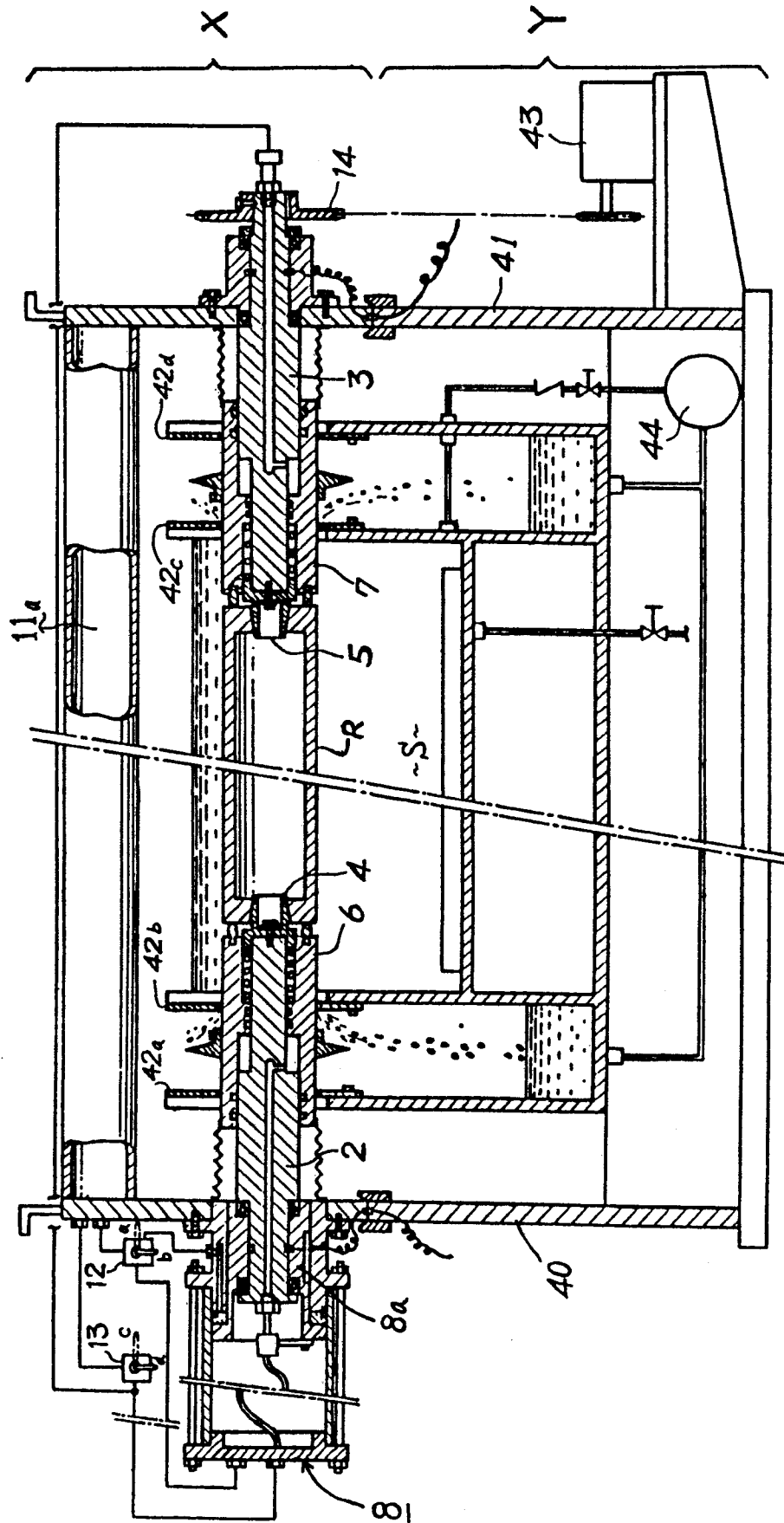
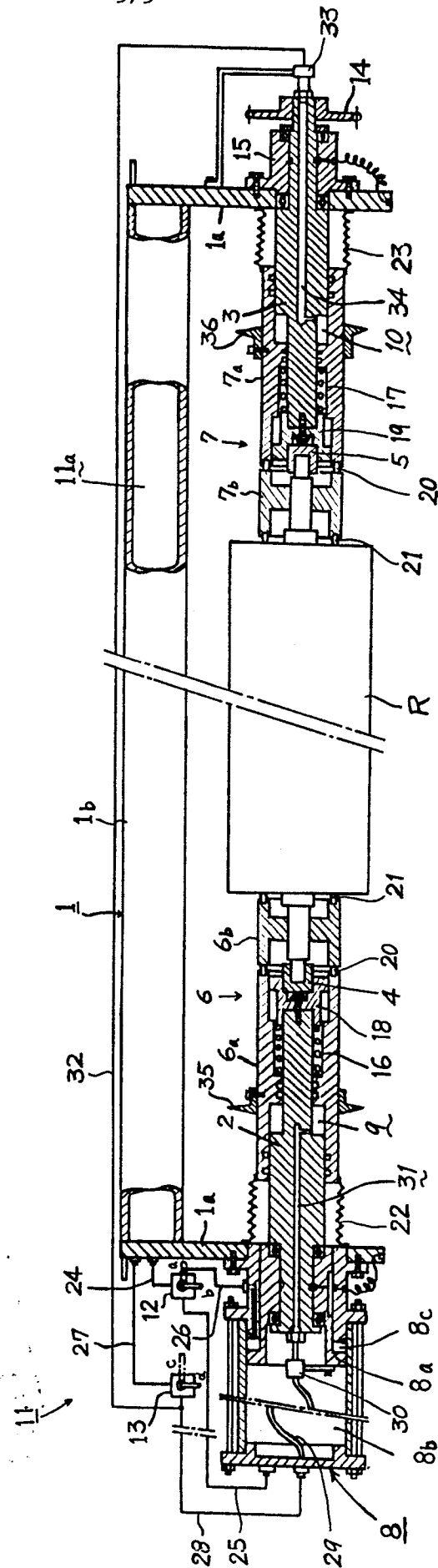


FIG. 3





European Patent
Office

EUROPEAN SEARCH REPORT

0128657

Application number

EP 84 30 3011

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. 3)
A, D	US-A-4 340 450 (SAITO)		C 25 D 7/04
A	--- US-A-4 317 706 (SAITO)		
A	--- US-A-3 462 357 (KARLQUIST) * Column 4, lines 50-51 *		
A	--- US-A-3 616 447 (HAYFORD) * Column 3, lines 11-14, 41-45 *		
A	--- US-A-3 664 944 (BUCKLEY) * Column 5, lines 9-12, 40-42, 51-57 * -----		TECHNICAL FIELDS SEARCHED (Int. Cl. 3) C 25 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29-08-1984	Examiner NGUYEN THE NGHIEP
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 O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention 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	