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(54) **Combined apparatus for laser image transfer printing and lithographic cold stamping**

(57) A combined apparatus for laser image transfer printing and lithographic cold stamping according to the present invention is provided to solve the problems in the prior art that the substrate wobbles when getting in contact with the lower roller and smooth leaving therefrom can be difficult, and that the printing assembly has many parts and therefore a complex structure. The combined apparatus of the invention comprises a frame and mounted thereon a printing assembly, a laminating assembly, a laminated film receiving and releasing assembly, a substrate discharging assembly, a product receiving assembly, a plurality of conveying/holding means and a UV irradiator, wherein the laminating assembly consists of an upper roller and a lower roller, it is characterized in that, said lower roller has sandwich cavities provided inwardly of its arc outer surface, the cavities extend axially and are circumferentially divided into a plurality of air suction or blowing cavities, each of which opens at least on one side and has air holes opened to the arc outer surface of the lower roller, and a covering is provided on the frame to cover the openings of the air suction or blowing cavities, which covering has air suction and blowing orifices each facing the corresponding openings of the air suction or blowing cavities, and that the printing assembly comprises an impression roller, a rubber roller, a plate roller, an anilox roller, and ink supply and homogenizing components.

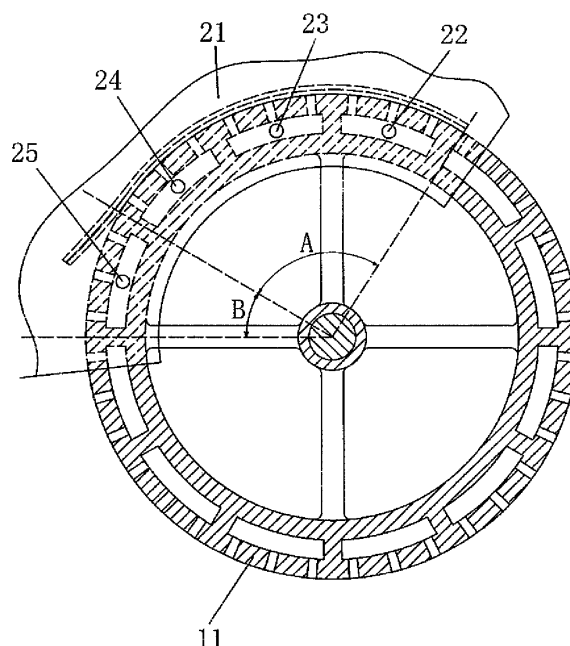


FIG. 3

Description**Technical Field**

5 **[0001]** The present invention relates to a printing apparatus and in particular to an apparatus that can be used both for laser image transfer printing from a laser film to a substrate or a printing medium and for transfer printing of cold stamping metal foil to the substrate by lithography.

Background Art

10 **[0002]** Presently the widely used apparatus for laser image transfer printing and that for lithographic cold stamping are serving as separate production facilities, although their workflows and most of their assemblies are similar or the same. For printing factories, this will give rise to the problems such as high total costs, large occupation in working space and low usage of the apparatus when two such apparatuses need to be bought at the same time.

15 **[0003]** Therefore, in the applicant's prior Chinese Application No. 200720047388.6, there has been disclosed a combined apparatus for laser image transfer printing/lithographic cold stamping, comprising a frame and mounted thereon a printing assembly, a laminating assembly, a laminated film receiving and releasing assembly, a substrate discharging assembly, a product receiving assembly, a plurality of conveying/holding means and a UV irradiator, wherein the printing assembly consists of a flexographic printing unit, a lithographic printing unit, conveying/holding means and on-off systems, the conveying/holding means being arranged between the flexographic printing unit and the lithographic printing unit, and the on-off systems being disposed on the flexographic printing unit and the lithographic printing unit. When a laser image transfer printing process is needed, the flexographic printing unit is utilized to apply ultraviolet-curing varnish onto the selected portions or entire of the surface of a substrate and meanwhile the lithographic printing unit is separated by the on-off systems to be in non-operating state; a prepared laser film is received and released by the laminated film receiving and releasing assembly, thus the apparatus as a whole effects the laser image transfer printing. Alternatively, when a lithographic cold stamping process is needed, the lithographic printing unit is utilized to apply ultraviolet-curing adhesives onto the selected portions or entire of the surface of a substrate and meanwhile the flexographic printing unit is separated by the on-off system to be in non-operating state; an electrochemical foil attached film is received and released by the laminated film receiving and releasing assembly, thereby the apparatus as a whole effects the lithographic cold-stamping for a single printing stock.

20 **[0004]** Since said laminating assembly comprises an upper roller and a lower roller that cooperate with one another, and no special holding means or structure for the substrate is provided on the lower roller, the substrate tends to wobble when getting in contact with the lower roller, therefore resulting in inaccurate lamination or low lamination quality. Additionally, no special separating device or structure for the substrate is provided on the lower roller, thus there is a great likelihood that the substrate cannot leave the lower roller smoothly. Moreover, the aforementioned printing assembly comprises a separate flexographic printing unit, a separate lithographic printing unit and conveying/holding means provided between the flexographic unit and the lithographic unit, thus such an arrangement brings about the drawbacks of too many parts, complex structure as well as the relatively high total cost.

Summary of the Invention

40 **[0005]** Therefore, the main object of the present invention is to overcome the shortcomings of the combined laser image transfer printing/lithographic cold stamping apparatus disclosed in the applicant's prior application. The said shortcomings lie in that, in the case where no special holding means or structure for the substrate is provided on the lower roller, the wobbling of the substrate occurring when in contact with the lower roller easily cause inaccurate lamination or lamination quality problems, and also, smooth separation of the substrate from the lower roller can be problematic because no special separating device or structure for the substrate is provided on the lower roller. According to the invention, these aforesaid shortcomings can be overcome by providing an improved apparatus for laser image transfer printing and lithographic cold stamping.

50 **[0006]** An additional object of the present invention is to overcome the drawbacks such as too many parts, complex structure and high total cost existing in the combined laser image transfer printing/lithographic cold stamping apparatus disclosed in the applicant's prior application. This object can also be achieved by providing an improved apparatus for laser image transfer printing and lithographic cold stamping according to the invention.

55 **[0007]** Regarding the above-mentioned main object, the present invention is to provide a combined apparatus for laser image transfer printing and lithographic cold stamping, comprising a frame and mounted thereon a printing assembly, a laminating assembly, a laminated film receiving and releasing assembly, a substrate discharging assembly, a product receiving mechanism, a plurality of conveying/holding means and a UV irradiator, wherein the substrate discharging assembly, the printing assembly, the laminating assembly and the product receiving assembly are arranged in order

from the fore to the aft with conveying/holding means provided between each two adjacent assemblies, and the laminated film receiving and releasing assembly is located close to the laminating assembly, the UV irradiator is arranged behind the point of pressing operation of the laminating assembly comprising an upper roller and a lower roller that are rotatably cooperated on the frame, it is characterized in that, said lower roller has sandwich cavities extending axially and provided inwardly of the arc outer surface, the cavities are circumferentially divided into a plurality of air suction or blowing cavities, each of which has at least one side opening and air holes opened to the arc outer surface of the lower roller, and a covering is provided on the frame to cover the openings of the air suction or blowing cavities, which covering has air suction and blowing orifices each facing the corresponding openings of the air suction or blowing cavities.

[0008] Regarding the additional object, the present invention aims to improve the structure/construction of the printing assembly on the basis of the above mentioned. The newly structured printing assembly comprises an impression roller, a rubber roller cooperating with the impression roller, a plate roller cooperating with the rubber roller, an anilox roller cooperating with said rubber roller through a guide on the frame, and ink supply and homogenizing components with which the plate roller and the anilox roller each cooperate correspondingly.

[0009] Herein the term "fore" or "aft" will be referred in terms of the operating sequence.

[0010] In addition, the number of the above mentioned air suction or blowing cavities facing each air suction or blowing orifice may be one or more.

[0011] The covering on the frame provides a sealing for side openings of the air suction or blowing cavities and also a support for the air suction and blowing orifices, and remains immovable in use when the air suction or blowing cavities rotate with the lower roller. When the clearance between the covering and the air suction or blowing cavities becomes small to a certain degree, a predetermined seal degree can be provided for openings of the air suction or blowing cavities. The above cavities covered by the covering of the frame may be part of or all of the air suction or blowing cavities.

[0012] Generally, the plate roller and the anilox roller may cooperate with the rubber roller in such a manner that, in the mode of laser image transfer printing, the plate roller separates from the rubber roller and the anilox roller is brought in contact with the rubber roller, and alternatively in the mode of lithographic cold stamping, the anilox roller separates from the rubber roller and the plate roller is made in contact with the rubber roller. The separation or contact between the plate roller and the rubber roller can be realized by removing or placing a lithographic plate and an interleaver, while the separation or contact between the anilox roller and the rubber roller can be achieved by sliding the anilox roller along a guide on the frame. Here when the rubber roller is in contact with the plate roller or anilox roller, it refers to working mode, and when the rubber roller separates from the plate roller or anilox roller, it refers to nonworking mode. Generally, said plate roller and anilox roller each cooperate with a separate ink supply and homogenizing component.

[0013] The said conveying/holding means serves to carry a single substrate or product and to hold it thereon during the carrying process. The conveying/holding means can be in the form of an assembly comprising a belt conveyor and a pinch roller, a gripping jaw, a gripping belt or a negative pressure suction slot which cooperate with the belt conveyor, and can also be structured as an assembly comprising a carrying roller and a pinch roller, a gripping jaw or gripping belt which cooperate with the carrying roller.

[0014] Additionally, a monitoring and conveying control means comprising a monitor disposed within the operational route of the laminated film from the laminated film receiving and releasing assembly and a conveying controller arranged on the corresponding conveying/holding means that can be generally positioned between the laminating assembly and the printing assembly, can be provided to avoid quality problems caused by pressing the portions of laminated film which have defects on the electrochemical foil onto the substrate. Said monitor may be formed as a photoelectric sensor or the like and the conveying controller may include a servomotor and so on.

[0015] The above described laminated film receiving and releasing assembly generally comprises a plurality of guide rollers and two receiving and releasing rollers. Here the receiving and releasing rollers can be long rollers or constructed by a plurality of short rollers connected in series along a roller axis. Each pair of the short rollers in the receiving and releasing rollers of the series type is used for receiving and releasing a roll of narrow breadth laminated film. For a narrow-breadth substrate or substrate-laminated area, the use of narrow breadth film will increase the usage of the laminated films and reduce the production cost.

[0016] Moreover, a film applicator, which may work in any suitable manner such as print coating, spraying or daubing and so on, can be provided between the laminating assembly and the product receiving assembly, specially for transfer printing of cold stamping foil by lithography. Since in the lithographic cold stamping, a small amount of metallic powder, which may be caused by the metal foil, is attached on the product released from the laminating assembly, it may do harm to the subsequent inking printing procedure, however, with the help of a thin layer of film applied by the film applicator onto the substrate, the above disadvantageous effects can be eliminated.

[0017] As described above, the lower roller has sandwich cavities provided inwardly of the arc surface thereof. These cavities extend axially and are circumferentially divided into a plurality of air suction or blowing cavities, each of which has at least one side openings and air holes opened into the arc outer surface of the lower roller, and the covering is provided on the frame to cover the openings of the air suction or blowing cavities and has air suction and blowing orifices each facing the corresponding openings of air suction or blowing cavities, by doing so, when the lower roller is in operation,

the substrate becomes suctioned tightly onto the surface of the lower roller with the effect of the negative pressure through the air holes such that inaccurate lamination or quality concerned problems caused by the wobbling of the substrate can be avoided, and upon the completion of the laminating process of the lower roller, the substrate is pushed outwardly by air blowing through said air holes so as to ensure that the substrate can leave the lower roller smoothly. Further, less parts, simple structure and low total cost of the whole apparatus can be achieved with a newly structured printing assembly comprising an impression roller, a rubber roller cooperating with the impression roller, a plate roller cooperating with the rubber roller, an anilox roller cooperating with said rubber roller through a guide on the frame, and ink supply and homogenizing components with which the plate roller and the anilox roller each cooperate correspondingly. When a laser image transfer printing process is performed, the rubber roller is made in contact with the anilox roller and meanwhile separates from the plate roller by removing from the latter the lithographic plate and interleaver; and the laminated film receiving and releasing assembly is used to receive and release a prepared laser film, thus the apparatus as a whole acts as a device for laser image transfer printing. While in a lithographic cold-stamping process, the rubber roller is made in contact with the plate roller and separates from the anilox roller, and the laminated film receiving and releasing assembly is utilized to receive and release a film attached with electrochemical foil, thus the apparatus as a whole acts as a device for lithographic cold stamping for a single printing stock.

[0018] In one aspect of the present invention, air suction and blowing structures are provided on the lower roller so that the substrate can be prevented from wobbling by tight suction or can leave the lower roller smoothly by outward push through air blowing. In a second aspect of the present invention, a rubber roller and an impression roller are matched as shared components for the flexographic printing and the lithographic printing so that two separate printing units are combined integrally, and thus the whole apparatus is simplified in structure.

Brief Description of the Drawings

[0019] Further explanation of the present invention is made in the following detailed description in combination with the embodiments with reference to the accompanying drawings, wherein:

Figure 1 shows schematically a cross-section of an embodiment of the present invention;

Figure 2 shows schematically a sectional view of the lower roller in Figure 1 in an enlarged manner;

Figure 3 is a schematic view showing the cooperation of the lower roller in Figure 2 with the covering on the frame;

Figure 4 schematically shows an operation mode different from Figure 1.

Detailed Description of the Present Invention

[0020] Now referring to Figure 1 to Figure 4, a combined apparatus for laser image transfer printing and lithographic cold stamping according to the present invention comprises a frame 1 and mounted thereon a printing assembly 2, a laminating assembly 3, a laminated film receiving and releasing assembly 4, a substrate discharging assembly 5, a product receiving assembly 6, a plurality of conveying/holding means 7 and a UV irradiator 8, wherein the substrate discharging assembly 5, the printing assembly 2, the laminating assembly 3 and the product receiving assembly 6 are orderly arranged from the fore to the aft in terms of the operating sequence with conveying/holding means 7, 9, 10 provided between each two adjacent assemblies, the laminated film withdrawal assembly 4 being positioned above the laminating assembly 3, the UV radiator 8 being arranged behind the point of pressing operation of the laminating assembly 3 comprising an upper roller 3 and a lower roller 11 that are rotatably cooperated on the frame 1, it is characterized in that, said lower roller 11 has sandwich cavities 12 provided inwardly of its arc outer surface. The cavities extend axially and are circumferentially divided into a plurality of air suction or blowing cavities 13, 14, 15, 16, each of which opens on one side and has air holes 17, 18, 19, 20 opened to the arc outer surface of the lower roller 11, and a covering 21 is provided on the frame to cover openings of the air suction or blowing cavities 13, 14, 15, 16, air suction orifices 22, 23, 24 and an air blowing orifice 25 are provided on the covering with each facing the corresponding openings of said air suction or blowing cavities 13, 14, 15 or 16.

[0021] Said printing assembly 2 comprises an impression roller 26, a rubber roller 27 cooperating with the impression roller 26, a plate roller 28 cooperating with the rubber roller 27, an anilox roller 29 cooperating with said rubber roller 27 through a guide 30 on the frame 1, and ink supply and homogenizing components (not shown, reference can be made to the specific structure of the well known ink supply and homogenizing components generally used in printing machines) with which the plate roller 28 and the anilox roller 29 each cooperate correspondingly.

[0022] In addition, a lithographic plate and an interleaver 31 are provided on the plate roller 28. The laminated film receiving and releasing assembly is made up of guide rollers 34, 35 and two receiving and releasing rollers 32, 33. Said

conveying/holding means 7 comprises a belt conveyor 36, a pinch roller 37 and a carrying roller 38 which cooperate with the belt conveyor, while the conveying/holding means 9 or 10 comprises a belt conveyor(s) 39 and 40 or 42 and a negative pressure suction slot 41 or 43. The present combined apparatus is also provided with a monitoring and conveying control means 44, 45 comprising a monitor 44 arranged within the operational route of a laminated film 46 released from the laminated film receiving and releasing assembly 4 and a conveying controller 45 cooperating on a drive shaft of the belt conveyor 39 of the conveying/holding means 9. Besides, said anilox roller 29 may also have a chambered doctor blade.

[0023] When this combined apparatus operates in the mode as shown in Figure 1, the rubber roller 27 separates from the anilox roller 29 and is made in contact with the plate roller 28 by attaching a lithographic plate and an interleaver 31 onto the latter, then the apparatus as a whole can effect the lithographic cold stamping for a single printing stock. In operation, the single substrate released from the substrate discharging assembly is passed via the conveying/holding means 7, and enters into the space between the impression roller 26 and the rubber roller 27, then is printed with ultraviolet-curing adhesives and carried via the conveying/holding means 9 into the laminating assembly 3. In section A of Figure 2, said substrate 47 is suctioned tightly to the surface of the lower roller 11, while the upper roller 3 presses an electrochemical-foil-attached laminated film 46 released from the laminated film receiving and releasing assembly 4 onto the substrate 47 on the lower roller. When leaving the laminating assembly, the substrate 47 is pushed outward in section B by blowing airflow from the lower roller 11 and conveyed forward together with the electrochemical-foil-attached laminated film 46 via the conveying/holding means 10. When the pressed substrate passes by the UV irradiator 8, curing occurs to the electrochemical metal foil on the laminated film 46 and the ultraviolet-curing adhesives on the substrate. As the cured substrate travels further, the laminated film 46 will separate from the electrochemical foil cured thereon. Thus, the substrate with cured electrochemical foil, namely the product, is produced and then received by the product receiving assembly 6. This above-described process is monitored and controlled by the monitoring and conveying control means 44, 45 so that quality problems caused by pressing the portions of laminated film which have defects on the electrochemical foil onto the substrate can be avoided.

[0024] Alternatively, when this combined apparatus operates in the mode as shown in Figure 4, the rubber roller 27 separates from the plate roller 28 by removing the lithographic plate and the interleaver 31, and is made in contact with the anilox roller 29, thus the apparatus as a whole serves for laser image transfer printing. In this operation mode, a single substrate released from the substrate discharging assembly is passed via the conveying/holding means 7, and enters into the space between the impression roller 26 and the rubber roller 27, then is printed with ultraviolet-curing varnish and passed by the conveying/holding means 9 into the laminating assembly 3 where said substrate 47 is suctioned tightly in section A to the surface of the lower roller 11 and meanwhile the upper roller 3 presses onto the substrate 47 a prepared laser-image laminated film 46 released from the laminated film receiving and releasing assembly 4, and when leaving the laminating assembly 3, the substrate 47 is pushed outward in section B by airflow from the lower roller 11 and conveyed forward together with the prepared laser image laminated film 46 via the conveying/holding means 10. When the laminated substrate passes by the UV irradiator 8, curing occurs to the ultraviolet-curing varnish on the substrate, and as the cured substrate travels further, the laminated film 46 will separate from the substrate. Thus, the substrate impressed with laser image becomes a final product, which is then collected by the product receiving assembly 6.

References in the figures

[0025]

1	Frame
2	Printing assembly
3	Laminating assembly (same reference with the upper roller)
4	Laminated film receiving and releasing assembly
5	Substrate discharging assembly
6	Product receiving assembly
7	Conveying/holding means
8	UV irradiator
9	Conveying/holding means
10	Conveying/holding means
11	Lower roller
12	Sandwich cavity
13, 14, 15 and 16	air suction or blowing cavities
17, 18, 19 and 20	Air holes
21	Covering
22, 23 and 24	air suction orifices

25	Air blowing orifice
26	Impression roller
27	Rubber roller
28	Plate roller
5 29	Anilox roller
30	Guide
31	Lithographic plate and interleaver
32 and 33	receiving and releasing rollers
34 and 35	Guide rollers
10 36	Belt conveyor
37	Pinch roller
38	Carrying roller
39 and 40	Conveyor belt
15 41	Negative pressure suction slot
42	Belt Conveyor
43	Negative pressure suction slot
44 and 45	Monitoring and conveying control means (wherein 44 is a monitor and 45 is a conveying controller)
46	Laminated film
20 47	Substrate

Claims

- 25 1. A combined apparatus for laser image transfer printing and lithographic cold stamping, comprising:
- a frame; and mounted thereon
- a printing assembly, a laminating assembly, a laminated film receiving and
- 30 releasing assembly, a substrate discharging assembly, a product receiving assembly, a plurality of conveying/
- holding means and a UV irradiator;
- wherein, the substrate discharging assembly, the printing assembly, the laminating assembly and the product receiving assembly are arranged in order from the fore to the aft with a conveying/holding means provided between
- 35 each two adjacent assemblies, the laminated film receiving and releasing assembly being located in the vicinity of the laminating assembly and the UV irradiator being arranged behind the point of pressing operation of the laminating assembly comprising an upper roller and a lower roller that are rotatably cooperated on the frame,
- characterized in that**, said lower roller has sandwich cavities provided inwardly of its arc outer surface, the cavities extend axially and are circumferentially divided into a plurality of air suction or blowing cavities, each of which opens
- 40 at least on one side and has air holes opened to the arc outer surface of the lower roller, and a covering is provided on the frame to cover the openings of the air suction or blowing cavities, which covering has air suction and blowing orifices each facing the corresponding openings of the air suction or blowing cavities.
2. Combined apparatus for laser image transfer printing and lithographic cold stamping according to claim 1, **characterized in that**, said printing assembly comprises an impression roller, a rubber roller, a plate roller, an anilox roller
- 45 and ink supply and homogenizing components, and that the rubber roller cooperates with the impression roller, the plate roller cooperates with the rubber roller, the anilox roller cooperates with said rubber roller through a guide on the frame, and the plate roller and the anilox roller each cooperate with their corresponding ink supply and homogenizing components.
3. Combined apparatus for laser image transfer printing and lithographic cold stamping according to claim 1 or 2, **characterized in that**, the number of the air suction or blowing cavities facing each air suction or blowing orifice is
- 50 one or more.
4. Combined apparatus for laser image transfer printing and lithographic cold stamping according to claim 1 or 2, **characterized in that**, said plate roller and the anilox roller cooperate with said rubber roller in such a manner that,
- 55 the rubber roller separates from the plate roller and remains in contact with the anilox roller, or the rubber roller separates from the anilox roller and remains in contact with the plate roller.

5. Combined apparatus for laser image transfer printing and lithographic coldstamping according to claim 1 or 2, **characterized in that**, said conveying/holding means can be in the form of an assembly comprising a belt conveyor and a pinch roller, a gripping jaw, a gripping belt or a negative pressure suction slot which cooperate with the belt conveyor, or the form of an assembly comprising a carrying roller and a pinch roller, a gripping jaw or gripping belt which cooperate with the carrying roller.
6. Combined apparatus for laser image transfer printing and lithographic cold stamping according to claim 1 or 2, **characterized in that**, the apparatus is further provided with a monitoring and conveying control means comprising a monitor disposed within the operational route of the laminated film from the laminated film receiving and releasing assembly and a conveying controller arranged on the corresponding conveying/holding means.
7. Combined apparatus for laser image transfer printing and lithographic cold stamping according to claim 6, **characterized in that**, said conveying controller is arranged on the conveying/holding means provided between the laminating assembly and the printing assembly.
8. Combined apparatus for laser image transfer printing and lithographic cold stamping according to claim 1 or 2, **characterized in that**, said laminated film receiving and releasing assembly comprises two receiving and releasing rollers and a plurality of guide rollers, the receiving and releasing roller can be a long roller or constructed by a plurality of short rollers connected in series along a roller axis, each pair of the short rollers receives and releases a roll of narrow breadth laminated film.

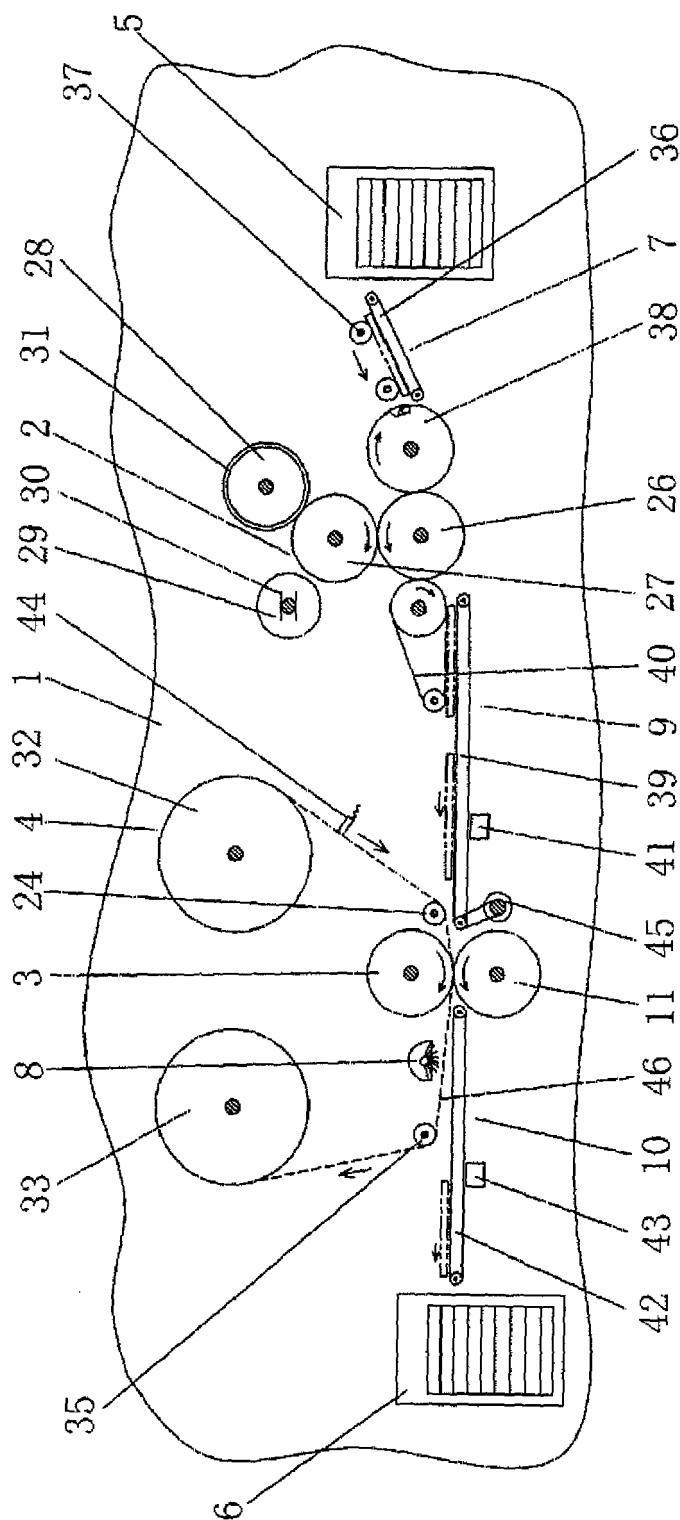
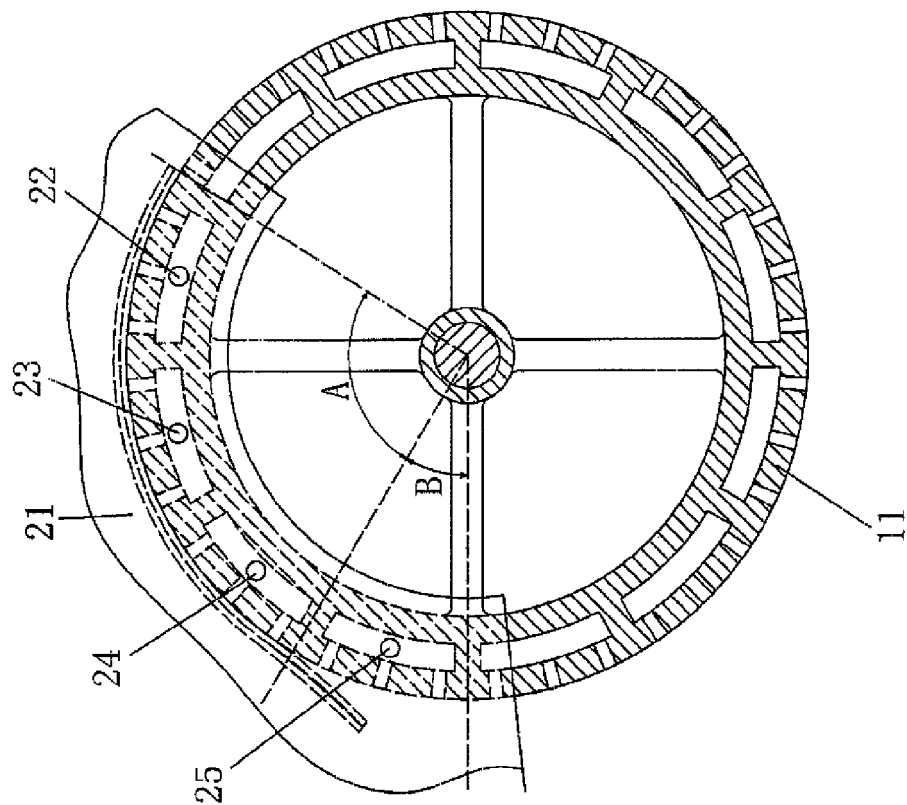
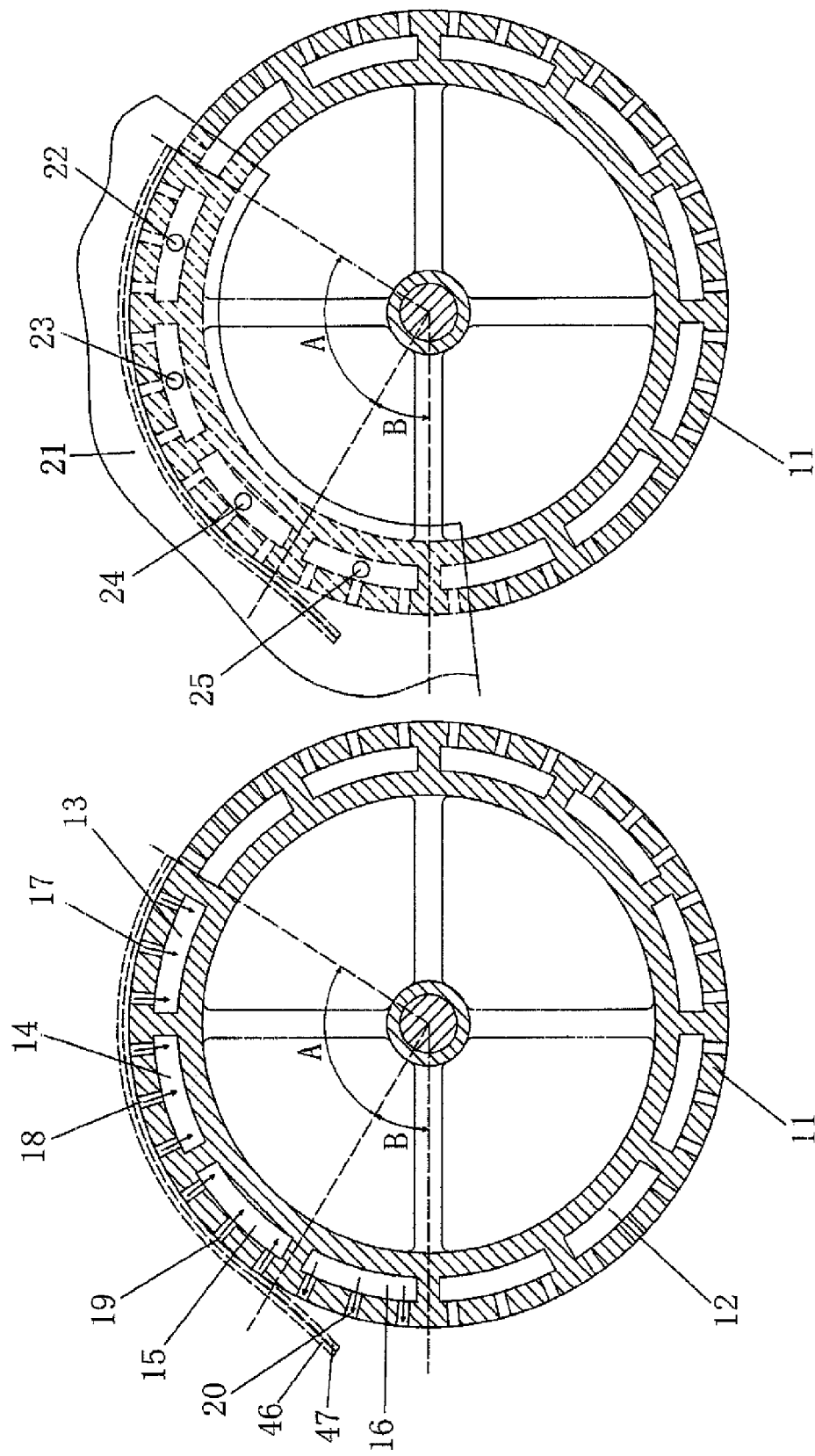


FIG.1



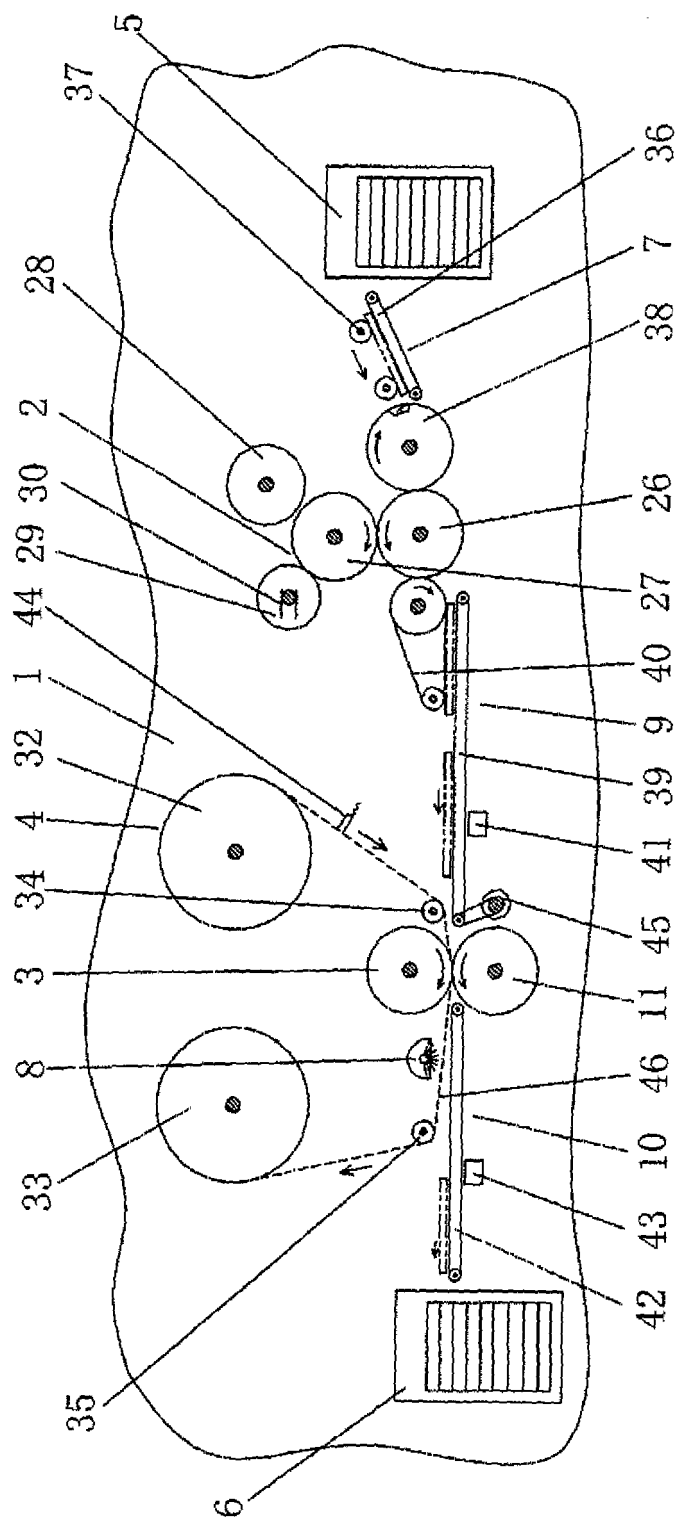


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
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<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 07 11 4579

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