

(19)



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(11)

EP 0 897 811 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.02.1999 Bulletin 1999/08

(51) Int. Cl.⁶: B41N 3/04

(21) Application number: 98115279.6

(22) Date of filing: 13.08.1998

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

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(30) Priority: 15.08.1997 JP 220356/97

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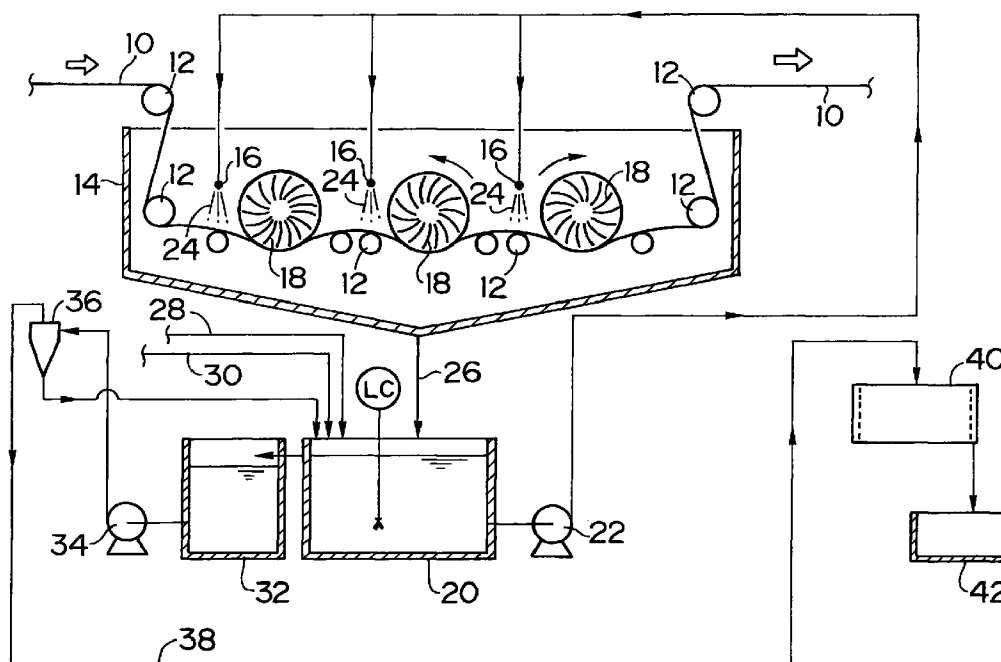
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(54) Surface treatment method and apparatus for support of lithographic plate and grinding apparatus for graining brush

(57) In a surface treatment apparatus for a support (10) of a lithographic plate, a graining brush (18) rubs the surface of the support (10) with abrasive slurry (24) to thereby form grains on the surface of the support (10). Angles (θ) of tips of bristles (18A) in the graining brush (18) greatly influence the quality and depth of the grains. Before a new graining brush (18) is used for the

first time, the acute angles (θ) of the tips of the bristles (18A) in the new graining brush (18) are adjusted between about 20° and about 80°. Thereby, it is possible to satisfactorily perform the surface treatment from the first time the new graining brush (18) is used.

F I G. 1



EP 0 897 811 A1

Description**BACKGROUND OF THE INVENTION****Field of the Invention**

[0001] The present invention relates generally to method and apparatus for treating the surface of a support of a lithographic plate and an apparatus for grinding the tips of bristles in a graining brush that roughens the surface of the support, and more particularly to an improvement of the graining brush for an aluminium support of the lithographic plate.

Description of Related Art

[0002] The aluminium plate has widely been used as the support of the lithographic plate or a photosensitive printing plate. The surface of the aluminium support is grained in order to improve the adherence between of a sensitive layer and the aluminium support and to provide non-image parts on the plate with the capacity to retain moisture.

[0003] A brush graining method is now widely used as the surface treatment method for graining the surface of the aluminium support. In the brush graining method, a graining brush, which is made of such as nylon, rubs the surface of the aluminium support with abrasive slurry, which contains abrasive particles of such as pumice or pumicite, aluminium hydroxide, or alumina, which have new Mohs' scale of 2 or more. According to the brush graining method, it is possible to sequentially obtain the support that has a good printing performance, and the equipment costs can be relatively low.

[0004] In the brush graining method, however, the surface of the aluminium support is sectionally roughened too deeply, or few grains are formed on the surface for some time from the first time a new graining brush is used. The aluminium support, on which the grains are not satisfactorily formed, has the inferior surface quality and stains during printing, and hence, the aluminium support is scrapped as an inferior good. For this reason, the yield is deteriorated, and the productivity is lowered.

SUMMARY OF THE INVENTION

[0005] The present invention has been developed in view of the above-described circumstances, and has as its object the provision of a surface treatment method and apparatus for a support of a lithographic plate that is able to satisfactorily perform the surface treatment from the first time a new graining brush is used, thus manufacturing the support that has the excellent surface quality and printing performance.

[0006] To achieve the above-mentioned object, the present invention is directed to a surface treatment method for a support of a lithographic plate in which a brush rubs a surface of the support with abrasive slurry to thereby rough the surface of the support, characterized in that: acute angles of tips of bristles in the brush are previously adjusted between about 20° and about 80°.

[0007] To achieve the above-mentioned object, the present invention is directed to a surface treatment apparatus for a support of a lithographic plate that rubs a surface of the support with abrasive slurry by means of a brush to thereby rough the surface of the support, characterized in that: acute angles of tips of bristles in the brush are adjusted between about 20° and about 80°.

[0008] The present invention has been developed based on a knowledge that angles of the tips of the bristles in the graining brush greatly influence the quality and depth of grains that are formed on the surface of the support of the lithographic plate when the graining brush rubs the surface of the support with the abrasive slurry. According to the present invention, the acute angles of the tips of the bristles in the graining brush are adjusted between 20° and 80°, and thereby, the surface treatment is satisfactorily performed from the first time the new graining brush is used.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The nature of this invention, as well as other objects and advantages thereof, will be explained in the following with reference to the accompanying drawings, in which like reference characters designate the same or similar parts throughout the figures and wherein:

Fig. 1 is a view illustrating the flow of aluminium web in a surface treatment apparatus according to the present invention;

Figs. 2(A), 2(B) and 2(C) are views of assistance in explaining the state of the tip of a bristle in a graining brush;

Fig. 3 is a perspective view illustrating a grinding apparatus for the graining brush according to the present invention;

Fig. 4 is a side view illustrating the grinding apparatus in Fig. 3; and

Fig. 5 is a view of assistance in explaining an abrasive tool provided in the grinding apparatus.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

5 [0010] This invention will be described further in detail by way of example with reference to the accompanying drawings.

[0011] Fig. 1 is a view illustrating the overall flow of aluminium web, to be supports of lithographic plates, in a surface treatment apparatus according to the present invention.

10 [0012] Aluminium web 10 is transported on pass rollers 12 to a graining vessel 14. Pairs of a nozzle 16 and a graining brush 18 are arranged along a transporting route of the web 10. Abrasive slurry 24 is supplied from a circulatory tank 20 to the nozzles 16 via a circulatory pump 22. The abrasive slurry 24 is poured onto the surface of the web 10 at the upstream sides of the graining brushes 18. The graining brushes 18 rub the surface of the web 10 to which the abrasive slurry 24 adheres, so that the surface of the web 10 can be treated. Thus, the grains are formed on the surface of the web 10, and the surface of the web 10 can be rough.

15 [0013] The abrasive slurry 24 that has fallen into the graining vessel 14 from the web 10 returns to the circulatory tank 20 via a return line 26. The spent abrasive slurry 24, in which abrasive particles have become smaller, loses in ability to treat the surface of the web 10. To solve this problem, new abrasive particles are supplied to the circulatory tank 20 from an abrasive particle supply line 28, and water is supplied to the circulatory tank 20 from a water supply line 30. Then, the abrasive slurry 24 partially flows into an overflow tank 32. The abrasive slurry 24 in the overflow tank 32 is transferred to a cyclone 36 via a cyclone pump 34, and the abrasive particles are classified by diameter. The abrasive slurry including larger abrasive particles is returned to the circulatory tank 20, and the abrasive slurry including smaller abrasive particles is discharged from the apparatus via a discharge line 38. A centrifugal separator 40 solid-liquid separates the discharged abrasive slurry. The smaller abrasive particles are collected in a treatment tank 42, and then they are thrown away.

25 [0014] In the surface treatment apparatus, which is constructed in the above-mentioned manner, angles of the tips of bristles 18A (see Figs. 2(A)-2(C)) in the graining brush 18 greatly influence the quality and depth of the grains formed on the web 10. Specifically, if an acute angle θ of the tip of the bristle 18A in the graining brush 18 is more than about 80° as shown in Fig. 2(A), the tip of the bristle 18A is too flat and rubs too hard the abrasive particles in the abrasive slurry 24 onto the surface of the web 10. Then, the surface of the web 10 has too deep grains sectionally. To the contrary, if the acute angle θ of the tip of the bristle 18A in the graining brush 18 is less than about 20° as shown in Fig. 2(B), the tip of the bristle 18A is too sharp and has no ability to rub the abrasive particles in the abrasive slurry 24 onto the surface of the web 10. Then, the surface of the web 10 has too shallow grains, and the life of the graining brush 18 is short because the bristles 18A break easily.

30 [0015] In views of the formation of the grains and the life of the graining brush 18, the acute angles θ of the tips of the bristles 18A in the graining brush 18 are preferably between about 20° and about 80° as shown in Fig. 2(C). The angles of the tips of the bristles 18A in a new graining brush 18 are diverse. Accordingly, before the new graining brush 18 is used, it is necessary to adjust the acute angles of the tips of the bristles 18A in the new graining brush 18 between about 20° and about 80°. Moreover, as the graining brush 18 is used, a number of bristles 18A in the graining brush 18 are folded or broken. Hence, in the case of the graining brush 18 that has been used for a predetermined period of time, it is necessary to regularly adjust the acute angles of the tips of the bristles 18A in the graining brush 18 between about 20° and about 80°.

[0016] Fig. 3 is a perspective view illustrating the graining brush 18 and a grinding apparatus 44 that grinds the tips of the bristles 18A in the graining brush 18 at angles of 20°-80°. Fig. 4 is a side view of Fig. 3.

35 [0017] As shown in Figs. 3 and 4, the graining brush 18 is constructed in such a manner that one end of a rotary shaft 48 of a roller 46 connects to a motor 50, which is rotatable both forward and backward, and the other end of the rotary shaft 48 is supported by a bearing (not shown). A number of bristles 18A are provided on the periphery of the roller 46. The bristles 18A may be directly secured to the roller 46, but it is more convenient if the bristles 18A are planted on a number of channels provided on a cylindrical drum 54 and the drum 54 is detachably attached on the roller 46.

40 [0018] On the other hand, the grinding apparatus 44 comprises a grinding plate 56 and a movement part 58 that presses the grinding plate 56 against the graining brush 18.

45 [0019] The grinding plate 56 is formed in such a way that the width thereof is substantially equal to that of the graining brush 18 and that the length thereof is substantially equal to the diameter of the graining brush 18. The grinding plate 56 has a surface that faces the graining brush 18 and that is curved along the periphery of the graining brush 18. An abrasive tool 60 such as a piece of abrasive paper or a whetstone (as shown in Fig. 5) is attached on the surface of the grinding plate 56 that faces the graining brush 18.

50 [0020] The movement part 58 is constructed in such a manner that a column 64 stands on a base frame 62, and a feed screw 66 engages with the column 64. One end of the feed screw 66 connects to a bearing 68 that is fixed to the back of the graining plate 56. The other end of the feed screw 66 connects to a rotary handle 70 that rotates the feed

screw 66. A rail 72 is arranged on the base frame 62 toward the graining brush 18. The bottom end of the graining plate 56 is slidably supported on the rail 72 via a linear bearing 74. The rotation of the handle 70 moves the grinding plate 56 toward the rotating graining brush 18. Pressing the abrasive tool 60, which is attached on the grinding plate 56, against the graining brush 18 grinds the tips of the bristles 18A in the brush 18.

[0021] Changing the amount of pressing the grinding plate 56 and the pressed state of the brush 18 and the abrasive tool 60 allows the angles of the tips of the bristles 18A to change freely. Specifically, if the grinding plate 56 is pressed little, only the tips of the bristles 18A are ground in a state that the bristles 18A are substantially vertical with respect to the abrasive tool 60. Thus, ground surfaces 18B are short, and the angles θ of the tips of the bristles 18A are large as shown in Fig. 2(A). If the grinding plate 56 is pressed very much, the bristles 18A are ground in a state that the bristles 18A are substantially horizontal with respect to the abrasive tool 60. Thus, the ground surfaces 18B are long, and the angles θ of the tips of the bristles 18A are small as shown in Fig. 2(B). Adjusting the amount of pressing the grinding plate 56 makes the acute angles of the tips of the bristles 18A in the brush 18 between 20° and 80°.

[0022] The grinding apparatus 44 may be arranged independently of the surface treatment apparatus, but it is more convenient if pairs of the grinding apparatus 44 and the graining brush 18 are incorporated into the surface treatment apparatus in Fig. 1.

EXAMPLE

[0023] In an embodiment according to the present invention, the grinding apparatus 44 grinds a new graining brush 18 to make the acute angles of the tips of the bristles 18A in the new graining brush 18 at about 30°. In a control example, the grinding apparatus 44 does not grind a new graining brush 18 before using it.

[0024] Then, the new graining brushes 18 of the embodiment and the control example are tested in the surface treatment apparatus in Fig. 1. On the test, the aluminium web 10, which is 800mm wide, is transported by 20,000m at a speed of 30m/min through the surface treatment apparatus, and the surface treatment state of the web 10 is evaluated. The surface treatment state is evaluated in surface roughness, surface quality, printing performance and type ratio of the web 10. TABLE 1 shows the results.

TABLE 1

		Treated length of web [m]				
		10	100	1000	10000	20000
Embodiment	Surface roughness [μm]	0.38	0.38	0.38	0.38	0.38
	Surface quality	mat	mat	mat	mat	mat
	Printing performance (printing durability)	95	98	100	100	100
	Type ratio (stains)	fair	good	good	good	good
Comparative Example	Surface roughness [μm]	0.30	0.34	0.38	0.38	0.38
	Surface quality	lustered	lustered	mat	mat	mat
	Printing performance (printing durability)	90	95	100	100	100
	Type ratio (stains)	poor	fair	good	good	good

[0025] As shown in TABLE 1, in the comparative example, if the web is only treated by less than 100m, the surface roughness, the surface quality and the type ratio are not satisfactory in the surface treatment. In other words, the grains cannot be formed satisfactorily on the web when the new graining brush is used for the first time.

[0026] In the embodiment wherein the tips of the bristles in the graining brush are ground at about 30°, the surface roughness, the surface quality, the printing performance, and the type ratio are satisfactory after the web is treated by 10m. Thereby, inferior products can be decreased drastically, and thus, the productivity can be improved.

[0027] As set forth hereinabove, according to the surface treatment method and apparatus for the support of the lithographic plate and the graining brush grinding apparatus of the present invention, it is possible to satisfactorily perform the surface treatment from the first time the new graining brush is used. Thus, it is possible to manufacture stably the support of the lithographic plate that has the excellent surface quality and stains during printing.

[0028] Accordingly, the inferior products can be decreased drastically, and the productivity can be improved.

[0029] It should be understood, however, that there is no intention to limit the invention to the specific forms disclosed, but on the contrary, the invention is to cover all modifications, alternate constructions and equivalents falling within the spirit and scope of the invention as expressed in the appended claims.

Claims

1. A surface treatment method for a support (10) of a lithographic plate in which a brush (18) rubs a surface of the support (10) with abrasive slurry (24) to thereby rough the surface of the support (10), characterized in that:
acute angles (θ) of tips of bristles (18A) in the brush (18) are previously adjusted between 20° and 80°.
2. The surface treatment method as defined in claim 1, wherein the tips of the bristles (18A) are rubbed against an abrasive tool (60) to thereby adjust the angles (θ) of the tips of the bristles (18A).
3. A surface treatment apparatus for a support (10) of a lithographic plate that rubs a surface of the support (10) with abrasive slurry (24) by means of a brush (18) to thereby rough the surface of the support (10), characterized in that:
acute angles (θ) of tips of bristles (18A) in the brush (18) are adjusted between 20° and 80°.
4. The surface treatment apparatus as defined in claim 3, wherein the tips of the bristles (18A) are rubbed against an abrasive tool (60) in a pressed state to thereby grind the tips of the bristles (18A), and the pressed state is changed to adjust the angles (θ) of the tips of the bristles (18A).
5. The surface treatment apparatus as defined in claim 3 or 4, wherein the brush (18) comprises a body (54) being fixed on one of a roller (46) and a plate, the body (54) having a number of channels, the bristles (18A) being planted in the channels.
6. The surface treatment apparatus as defined in claim 3 or 4, wherein the brush (18) comprises a bundle of the bristles (18A) directly fixed on one of a roller (46) and a plate.
7. A brush grinding apparatus characterized in that:
tips of bristles (18A) of a cylindrical rotary brush (18) are rubbed against an abrasive tool (60) in a pressed state to thereby grind the tips of the bristles (18A), and the pressed state is changed to adjust angles (θ) of the tips of the bristles (18A).

FIG. 1

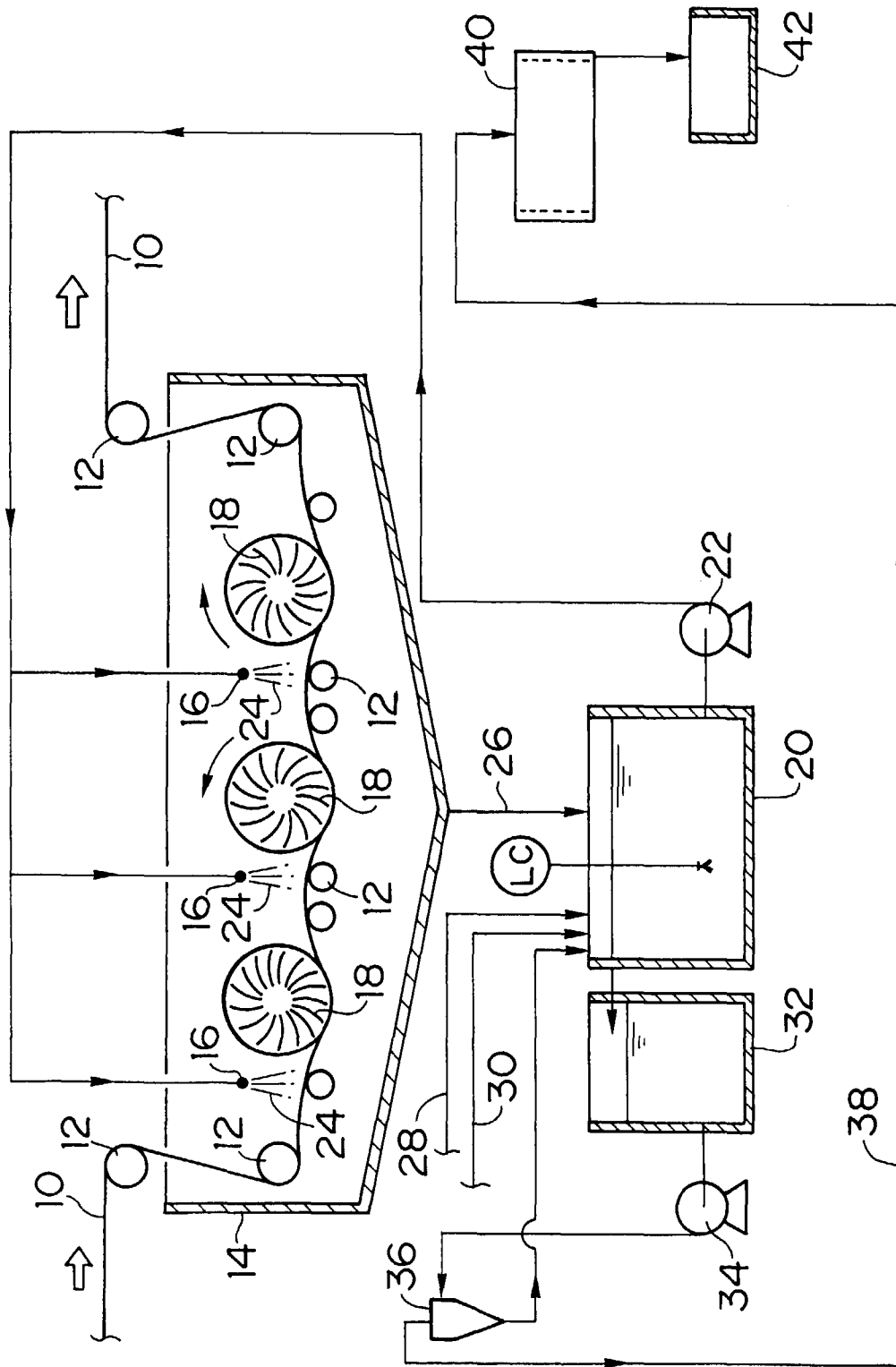


FIG. 2(A)

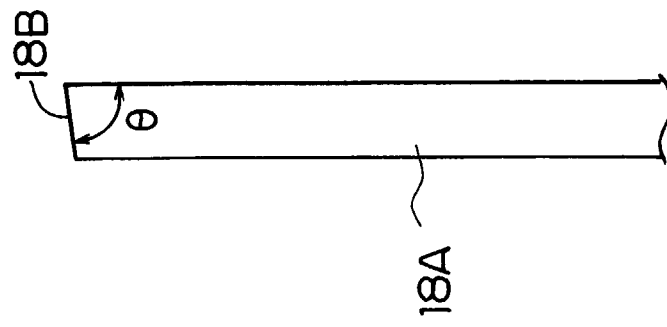


FIG. 2(B)

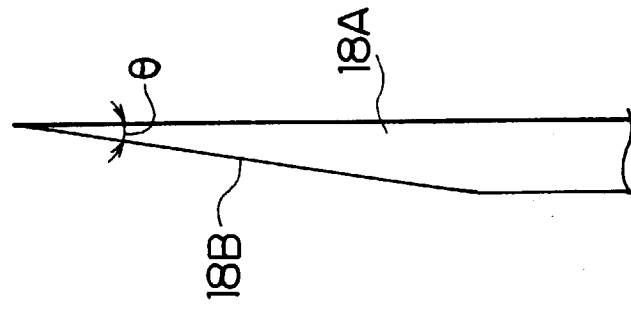


FIG. 2(C)

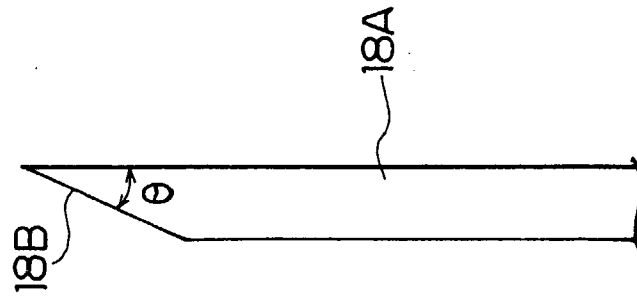


FIG. 3

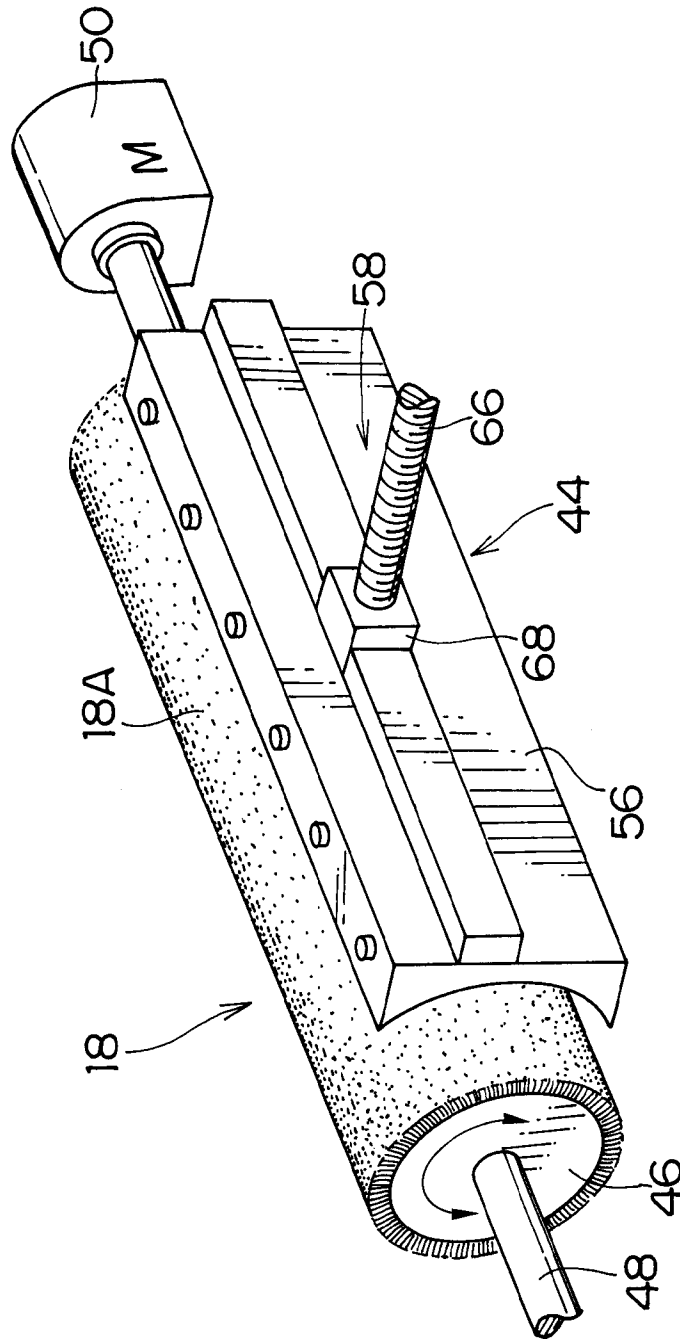
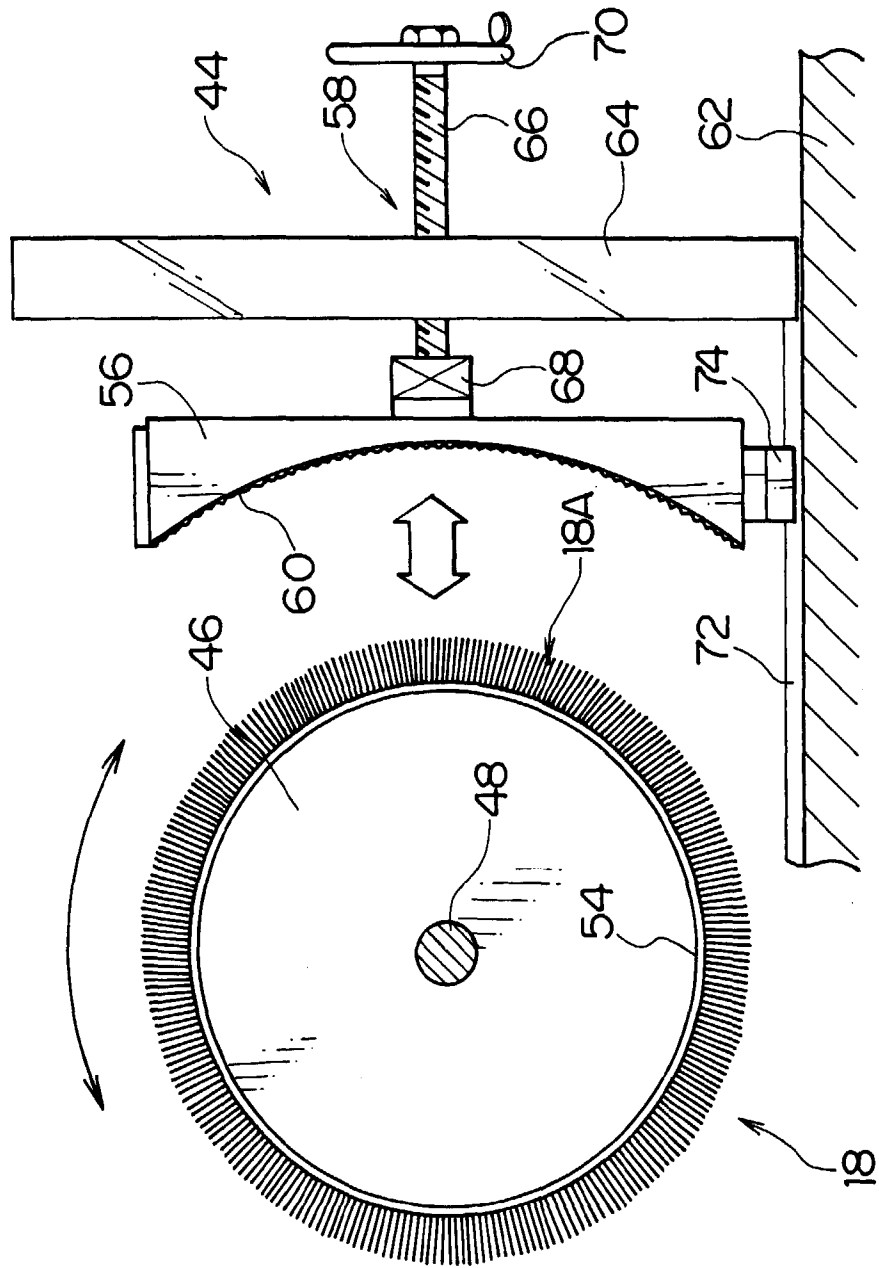
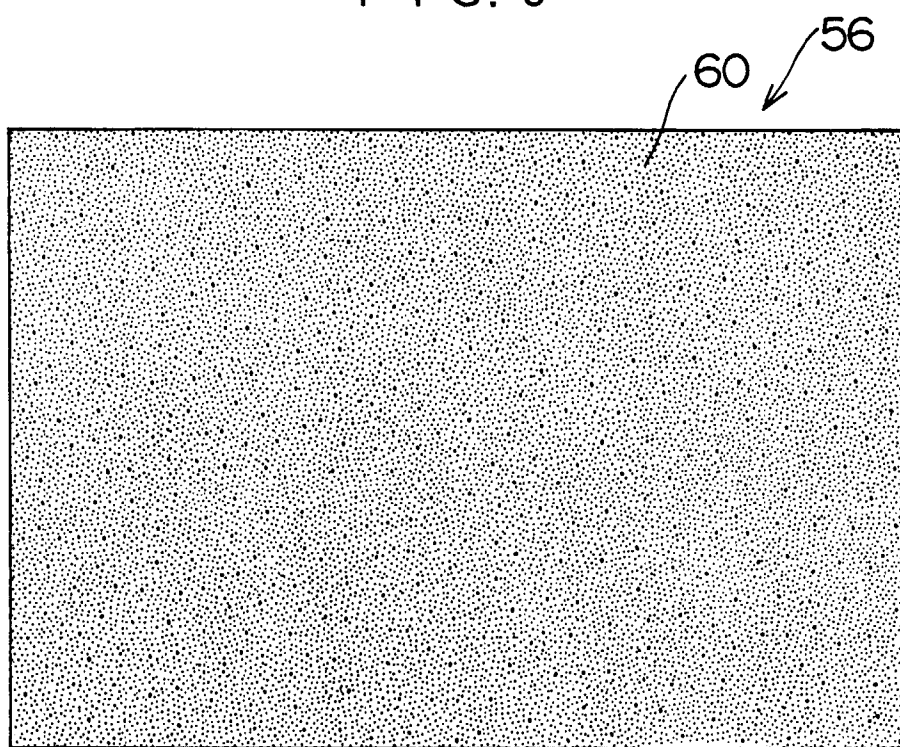


FIG. 4



F I G. 5





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EUROPEAN SEARCH REPORT

Application Number
EP 98 11 5279

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.6)
A	US 5 564 789 A (GERSPACHER HELMUT) 15 October 1996 * the whole document * -----	1-7	B41N3/04
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B41N A46D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17 November 1998	Examiner Martins Lopes, L
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