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

(11) EP 0 936 305 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.08.1999 Bulletin 1999/33

(51) Int Cl.[6]: **D21F 1/48**

(21) Application number: **99660007.8**

(22) Date of filing: **19.01.1999**

(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

(30) Priority: **16.02.1998 FI 980349**

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(54) Method and apparatus for regulating the clearance angle of a paper machine's foil

(57) The present invention refers to a method for regulating the clearance angle of paper machine foil and an apparatus used therefor. Characteristic of the regulating method of the clearance angle of a foil according to the invention is that the regulation is performed only from one side of the paper machine.

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Description

[0001] The present invention refers to a method for regulating the clearance angle of paper machine foil and an apparatus used therefor. A foil is the dewatering unit of paper machine's wire section. The dewatering properties and working up the pulp can be efficiently affected by regulating the clearance angle of foil.

[0002] Generally known to prior art there is a method for regulating the angle of foil, in which the foil has been fastened from its both ends to the body of the paper machine with screws. For re-regulation of the angle the screws must be loosened.

[0003] Generally known to prior art there is also a method in which there are mounting supports in both ends of the foil, having arched surfaces on which the foil can be rotated. The foil is locked to the regulated position with screws.

[0004] The third alternative known is a method in which, like in the previous method there are mounting supports on which the foil has been fastened with fulcrum pins. The angle is regulated manually with a threaded spindle or bolt from both ends of the foil individually.

[0005] The previously described methods have though several disadvantages. Regulation with screws is slow and almost impossible to perform while the machine is running, because the wire rotates almost touching the regulating apparatus, so regulating is dangerous and difficult. In order to perform the regulation the paper machine must usually be stopped. Because there is an individual regulating apparatus in both ends of the foil, it is difficult to measure and regulate the angle on different sides of the machine exactly the same.

[0006] In the present invention these disadvantages have been abolished and quick and accurate regulation is achieved. The desired clearance angle can be observed in the gauge right away. Performing the regulation is possible while the machine is running and the effect of the regulation can be seen immediately. This way it is possible to find the best clearance angle quickly. Performing the regulation while the machine is running, without an interruption in production, will bring considerable cost savings. In addition, extra wastewater emissions resulting from tuning of the machine are avoided.

[0007] Characteristic of the regulating method of the clearance angle of foil according to the invention is that regulating of the clearance angle of the foil is only performed from one side of the paper machine, preferably from only one substantially steplessly functioning regulating element. The apparatuses situated on different sides of the machine have, as an example, been synchronized with a connecting shaft; thus the regulations on different sides of the machine are equal. The clearance angle of the foil can be regulated while the paper machine is running.

[0008] The regulating apparatus is equipped with eccentric levers in order to abolish clearance and damp vibration. The apparatus is equipped with an articulated shaft and in addition with support screws and bolts to strengthen the structure. The centre of the articulated shaft is situated on the same vertical level with the point of the ceramic wearing piece and in height direction as close as possible to the point of the ceramic wearing piece. The actuator of the lifting appliance is a screw hoist or similar.

[0009] One of the embodiments of the invention is explained more closely in the following by referring to the attached drawings, in which

fig. 1A presents the foil seen from the front and fig. 1B from the side,

figures 2A and 2B present the regulating apparatus of the angle seen from the front, and

figures 3A and 3B present the regulating apparatus of the angle seen from the side.

[0010] The operating switches 2 and the angle indicating gauge 3 of the foil 9, situated on the operative side 1 of the regulating apparatus have been presented in figures IA and 1B. The drive motor 5 is situated on the appliance side 4 of the regulating apparatus. The shaft 6 connects the apparatuses situated on different sides of the machine. The foil 9 has been fastened to the body of the paper machine 7 with mounting screws 8.

[0011] The regulating apparatus of the angle, whose hinge support 11 is fastened to the body of the paper machine with screws 12, has been presented in figures 2A, 2B, 3A and 3B. Mounting plates 14 have been welded or otherwise attached to the ends of the foil 9, on which the articulated shaft 15 and a lug 17 that transmits the movement of the screw hoist 16 have been attached. The hinge support 11 has elongated holes 18, which allow the rotational motion of the support screws 19 fastened to the mounting plates 14, during regulation of the foil 9. The clearance between the bolt 20 and the plate 21 attached to the hinge support 11 is regulated from the bolts 20 on the support screws 19. The eccentric lever 22 revolves in relation to the shaft 23 operated by the cylinder 24. Reference number 25 indicates the cover bellow of the screw hoist. The centre of the articulated shaft 15 is situated as close as possible to the ceramic wearing piece 26 and on the same vertical level with its point.

[0012] Angle regulation of the foil 9 is operated with operating switches 2, from which the clockwise and counter-clockwise rotary movement of the motor is operated. During the rotational motion of the motor 5 the cylinder 24 pulls the eccentric lever 22 loose from the end plate 14 allowing the rotational motion. When the motor 5 stops, the cylinder 24 turns the eccentric lever 22 back to the locked position removing the clearances and thus preventing vibration of the foil 9. Position angle of the foil 9, preferably being between 0..-3 degrees, can

be observed in the angle indicating gauge 3.

[0013] Motor can, instead of the fixed motor shown in the drawing, also be a removable hand tool, for example an air-driven or electrical screw wrench or a hand crank. Actuator of the rotational motion of the foil can be a screw hoist, whose stroke is preferably approx. 20 mm. Screw hoists or similar have been synchronized by interlocking them with a connecting shaft or similar.

[0014] Some of the embodiments of the invention have been presented in the explanation. The invention does not, however, restrict to apply only to these special cases, but different features of the invention can be modified without leaving the scope of the invention.

Claims

1. A method for regulating the clearance angle of foil, characterized in that the regulation of the clearance angle of foil (9) is performed only from one side of the paper machine.

2. A method according to claim 1, **characterized** in that the regulation of the clearance angle of foil (9) is performed only from one side of the paper machine with one single substantially steplessly functioning regulating element.

3. A method according to claim 1 or 2, **characterized** in that the apparatuses on different sides of the machine have been sychronized, whereas the regulations on different sides of the machine are equal.

4. A method according to any of the above claims **characterized** in that the apparatuses on different sides of the machine have been synchronized with a connecting shaft (6), whereas the regulations on different sides of the machine are equal.

5. A method according to any of the above claims, **characterized** in that the clearance angle of the foil (9) can be regulated while the paper machine is running.

6. A regulating element to be used in a method according to any of the above claims.

7. A regulating element according to claim 6, **characterized** in that the actuator (5) is a motor.

8. A regulating element according to claim 6, **characterized** in that the actuator (5) is a hand tool.

9. A regulating apparatus according to claim 6, **characterized** in that the actuator (5) is a hand crank.

10. A regulating apparatus according to any of the claims 6-9, **characterized** in that the apparatus is equipped with eccentric levers (22) in order to remove clearances and damp vibration.

11. A regulating apparatus according to any of the claims 6-10, **characterized** in that the apparatus is equipped with an articulated shaft (15) and in addition with support screws (19) and bolts (20) in order to strengthen the structure.

12. An apparatus according to any of the claims 6 - 11, **characterized** in that the centre of the articulated shaft (15) is situated on the same vertical level with the point of the ceramic wearing piece (26) and in height direction as close as possible to the point of the ceramic wearing piece (26).

13. A regulating apparatus according to any of the claims 6-12, **characterized** in that the actuator of the lifting appliance is a screw hoist (16).

14. A regulating apparatus according to any of the claims 6-13, **characterized** in that the clearance angle of the foil (9) can be regulated while the paper machine is running.

FIGURE 1B

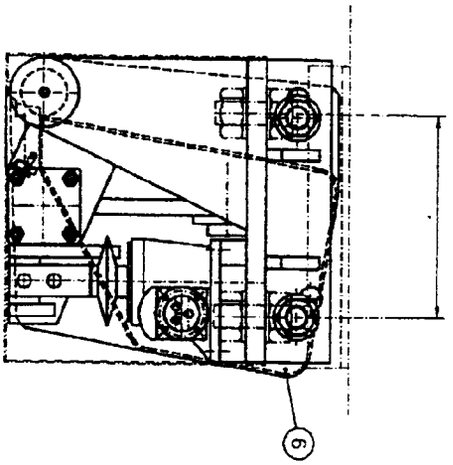


FIGURE 1A

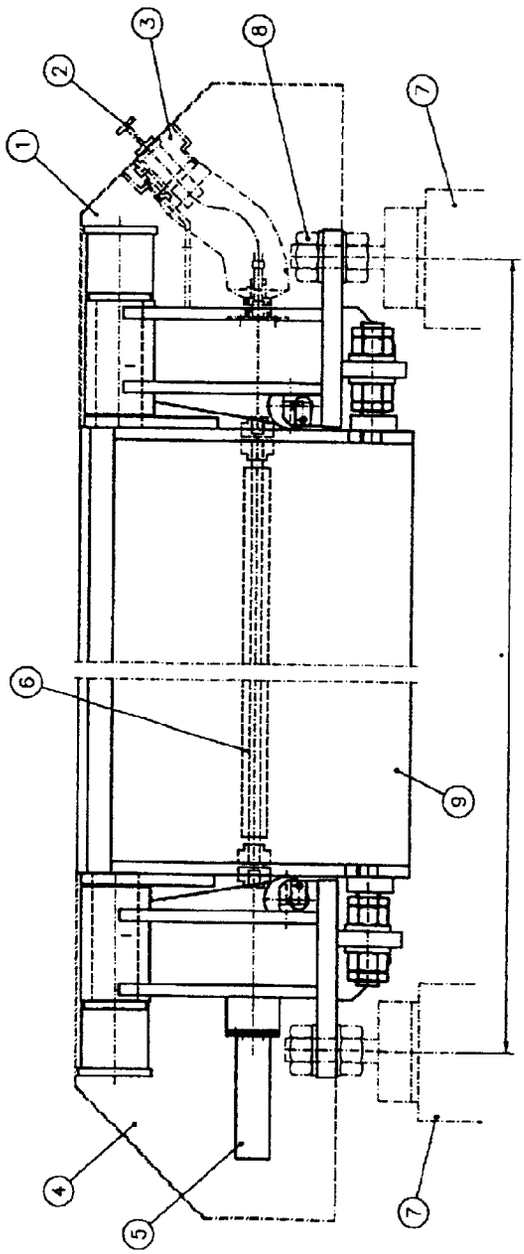


FIGURE 2A

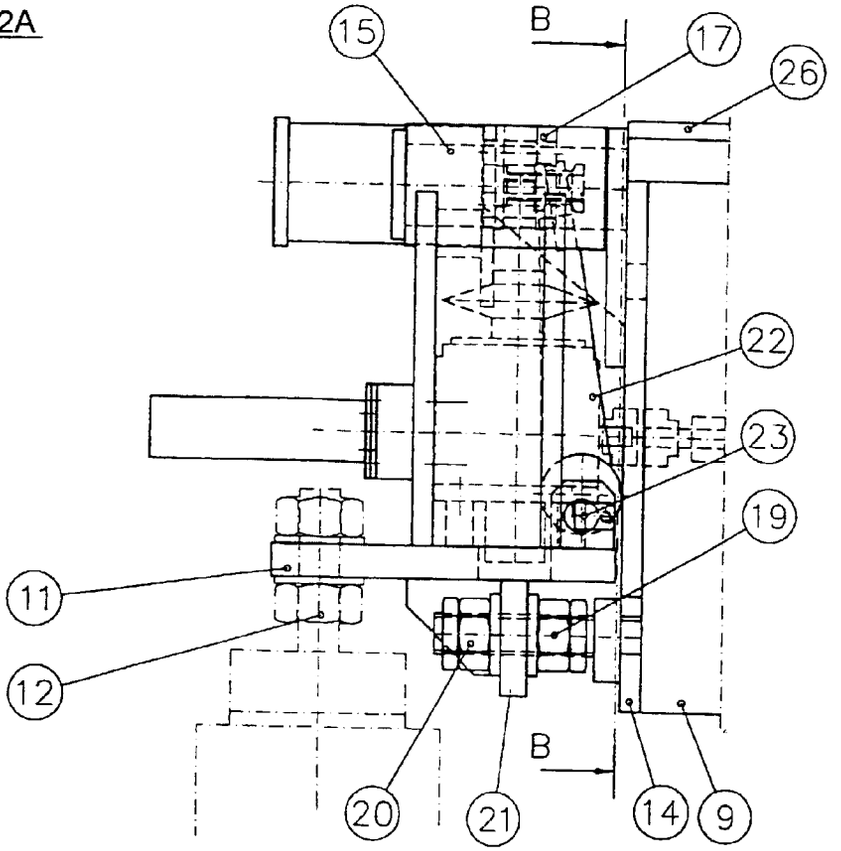
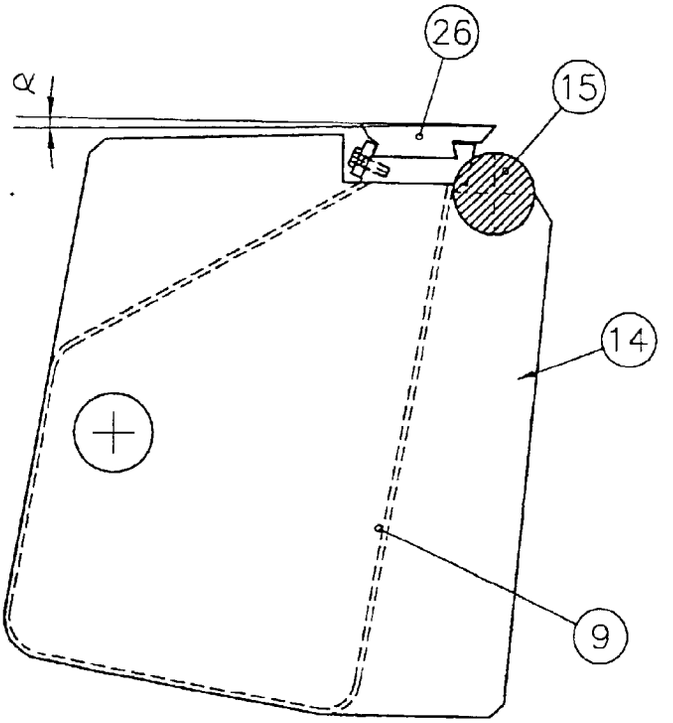


FIGURE 2B



B–B

FIGURE 3A

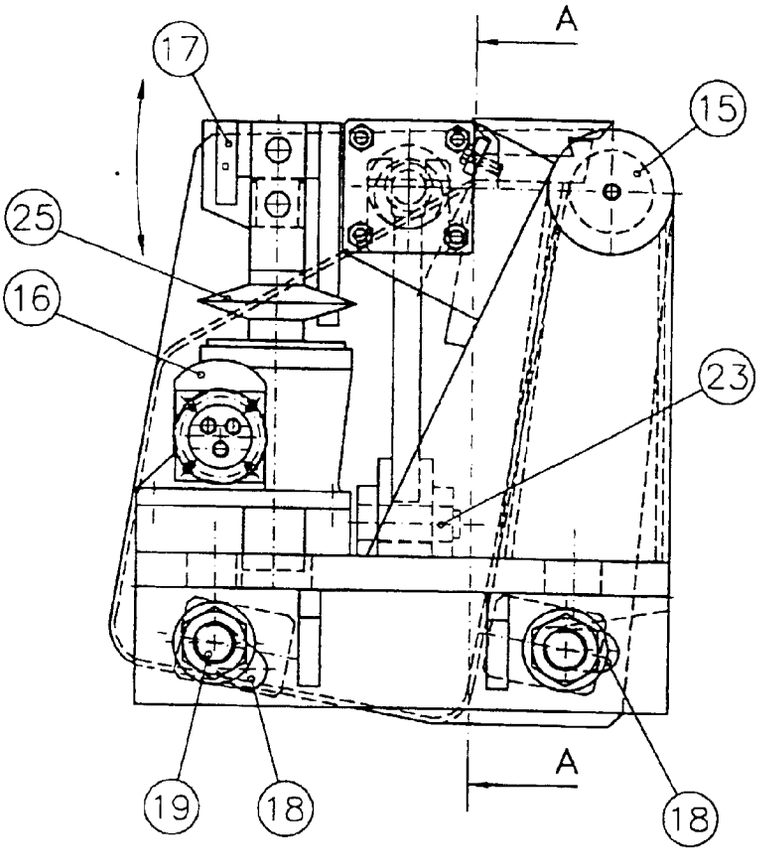
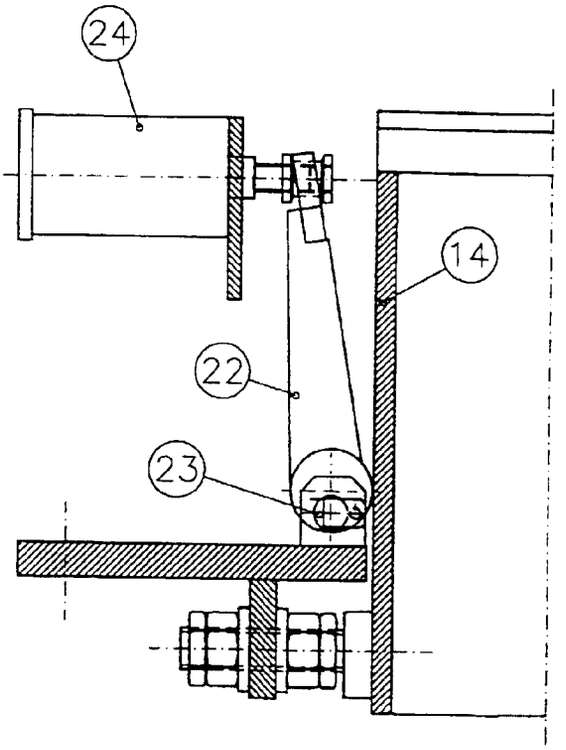


FIGURE 3B



A–A