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(54) **A METHOD AND APPARATUS FOR CUTTING THE EDGE OF A MOVING PAPER WEB**

VERFAHREN UND VORRICHTUNG ZUM SCHNEIDEN DES RANDBEREICHS EINER
BEWEGENDEN PAPIERBAHN

PROCEDE ET APPAREIL DE DECOUPAGE DU BORD D'UNE BANDE DE PAPIER EN
DEFILEMENT

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Description

[0001] The invention relates to edge cutting of paper web in accordance with the preamble of patent claims 1 and 5.

[0002] Previously known from Finnish patent 12457 is edge cutting by a water jet. From the Finnish publications 83106 and 88417 diagonal cutting of paper web is known, i.e. in the first place longitudinal cut off by means of a water jet (see also WO-A-94 05473).

[0003] The construction as per patent 12457 can be applied when the paper web speed is slow and cutting carried out close to the wet end. Then the forces generated by cutting hardly have any impact on the web forward travel. Instead, cutting of dry paper has turned out to be difficult by growing web speeds. Especially, on coating the paper, the edge arrives at cutting only after coating, whereat the uneven edge margin with the coating border is removed. After coating, due to cutting, the advancing web is equal in quality up to the edge. It has been established that a high-speed water jet produces in the edge of a fast moving web braking powers preventing the use of a water jet cutter. The web proceeds undeterminately and the possibility of breaks in the line grows.

[0004] With a method and an apparatus according to this invention the above introduced problem has been settled and the invention is characterized in what is presented in patent claims 1 and 5.

[0005] Advantages of the present invention can be considered that it is possible to generate enough counterforces in the web edge in order to compensate the inconvenient forces on the web by the water jet. Cutting can be carried out in dried and even in coated paper web moving even faster than 20 m/s. The cutted edge can be easily after-treated, since after cutting the position of edge is stable on utilizing the method and apparatus as per this invention are utilized.

[0006] In the following the invention is disclosed with reference to the enclosed drawing.

Fig. 1 is a diagonal view of the apparatus.

Fig. 2 is a side view of the apparatus.

Fig. 3 is a cutting top.

[0007] In figure 1 the paper web moves from the right to the left and a strip 2 is cut off from its edge. For cutting a high-speed water jet is used, the nozzle portion 3 of which is very close, appr. at 1 mm distance from web 1. The cut off strip 2 is steered to a channel 11, into which an air flow to transport the edge strip is produced, which secures conveyance of strip out from channel. At the channel 11 mouth (not shown) is a control device with a photocell observing faulty motions of strip 2, for instance its getting conveyed along with web 1, whereat different functions go off, e.g. air blasts, striving to steer strip 2 into channel 11 and, in case it does not work, finally nozzle 3 is pulled aside and cutting of edge strip swithed

off. Conveyance of strip 2 along with web 1 causes an immediate line break possibility and efforts must be made to prevent such a possibility by means of safety devices.

[0008] Cutting water is conveyed to nozzle 3 along piping 6. The whole apparatus rests on a bearer 7 and the cutting line is adjusted moving the bearer sideways.

[0009] Along pipe 5 the air jet is guided to the cutting spot, whereat cutting dust and coating peeling off the paper and coating dust are conveyed to channel 11 and into the channel by suction. On the cutting line an after-treatment device is installed consisting of after-treatment pieces 9 and 10 installed on both sides of the web at the edge. In pieces 9,10 there are sharp edges directed against the arriving web to sweep off portions that swell too much from the web surface. Further, about from the middle of these pieces air is blasted into the space between the pieces and the web in order to prevent full gliding contact. The direction of the air blast into the space between a piece and the web is turned mildly out off the web, whereby the blast residue goes to channel 11. Along pipe 8 compressed air is brought to the apparatus. The lower piece 10 is fixed to cutting top 4, the upper piece 9 attached to the apparatus. The after-treatment equipment is resiliently attached to beam 7 (not shown) so that the apparatus is freely suspended by piece 9 above the web almost without any friction on an air cushion formed beneath piece 9. The web edge is dried by means of an infrared radiator 12, by means of which possible water jet moisture is lessened.

[0010] Figure 2 shows a side view of the complete apparatus with a sectional view of a part of channel 11. Web 1 travels above cutting top 4 almost touching this cutting top 4. Cutting and after-treatment take place above the channel 11 orifice.

[0011] Figure 3 shows the cutting table, which is a top level 4 and most significant for the water jet cutting to work well, and most appropriately placed under the web at the cutting point. Water penetrating web 1 is conveyed out through a hole 14. The lower after-treatment piece 10 is placed in hole 18. On the cutting top underside surface there is a L-formed channel 13 into which compressed air is conveyed. From channel 13 compressed air has access to flow out from the underside of lath 16 and along furrows 17 diagonally with respect to the web forward travel. The furrows 17 are separated from one another by ridges 15. When compressed air in furrows 17 flows faster than the web and since it can be discharged into a larger space, i.e. to the outside, negative pressure is generated in the furrows pulling web 1 toward cutting top 4. The simultaneous direction sideways and forward chosen for the furrows produces forces of proper direction into the web compensating the forces generated by the water jet, due to which the web travel would otherwise be disturbed.

[0012] The compensation forces formed by cutting top 4 are necessary for the web to endure continuous water jet cutting, without trouble, at usually applied

speeds. The after-treatment equipment as per embodiments shown in figures 1 and 2 is imperative for reliable cutting operation and its necessity depends on the web quality. When cutting dried paper web this equipment is needed for dusting and for cleaning the coating material and the web edge. Particles hovering in the air may not even begin to accumulate on the surface of the cutting equipment, since they could before long reach into contact with the web and cause interruption in web travel. Dusts and water mist must therefore be blasted or sucked off the cutting point if one wants to secure a reliable long-run function.

[0013] Cutting top 4 is shown from the web underside only, it can be located on both sides of the web. Most advantageously the cutting top is made of strong material or coated with such material. After-treatment devices 9,10,12 may be needed either on one side only or on both sides of the web.

Claims

1. A method for longitudinal cut off of the edge (2) of moving paper web or similar coated web (1), where cutting is carried out by a water jet through the web and the web is supported at least from one side in the cutting point, **characterized in that** the web is supported by a cutting top (4) installed into contact with the web (1) and forcible blast is directed into the space between the web and the cutting top in order to generate forces in the web cutting top direction for pulling the web forward and toward the edge for compensating the cutting forces.
2. A method according to patent claim 1 **characterized in that** air is blasted by a speed higher than the web (1) speed.
3. A method according to patent claim 1 **characterized in that** the blast is steered by means of guides (15) in cutting top (4) surface.
4. A method according to any of the above patent claims 1 - 3 **characterized in that** removal of the edge strip (2) is facilitated by a blast generated in discharge channel (11) and faster than the strip (2) travel speed.
5. An apparatus for cut off of the edge of moving paper web or similar coated web (1), where cutting is carried out by a water jet through the web using a water jet nozzle (3) arranged at the cutting point (14) close to the web surface and where the web is supported at least from one side of the cutting point vicinity, **characterized in that** the apparatus has as supporting means a cutting top (4) in line with the web and installed into contact with the web, a blast channel system (13) for conveying air into the space be-

tween the cutting top (4) and the web, and guides 15 on the cutting top (4) surface to steer the blast in the web direction diagonally towards the web edge to compensate the cutting forces.

6. An apparatus according to patent claim 5 **characterized in that** it has a suction duct (11) for removal of the cut off strip.
7. An apparatus according to patent claim 6 or 7 **characterized in that** the most part of cutting top (4) is after the cutting point (14) in line with the web.

Patentansprüche

1. Eine Methode zum waagerechten Abschneiden der Kante (2) einer beweglichen Papierbahn oder ähnlichen beschichteten Bahn (1), wo das Abschneiden mit einem Wasserstrahl durch die Bahn geschieht und die Bahn wenigstens von einer Seite des Schnitts gestützt wird, **gekennzeichnet dadurch, dass** die Bahn von einer, in Kontakt mit Bahn (1) liegende Abschneidefläche (4) gestützt, und starkes Blasen in den Raum zwischen der Bahn und der Abschneidefläche gerichtet wird, wobei Kräfte in Schneiderichtung der Bahn erzeugt werden, um die Bahn vorwärts und gegen die Kante zu ziehen und die schneidende Kräfte zu kompensieren.
2. Eine Methode gemäß Patentanspruch 1 **gekennzeichnet dadurch, dass** Luft mit höherer Geschwindigkeit als die der Papierbahn (1) geblasen wird.
3. Eine Methode gemäß Patentanspruch 1 **gekennzeichnet dadurch, dass** das Blasen mit Führungen (15) auf der Abschneidefläche (4) gesteuert wird.
4. Eine Methode gemäß einer der obigen Patentansprüchen 1 - 3 **gekennzeichnet dadurch, dass** das Entfernen des Kantenstreifens (2) mit Blasen, erzeugt in Abführungskanal (11), erleichtert wird.
5. Eine Einrichtung zum Abschneiden der Kante einer beweglichen Papierbahn oder einer ähnlichen beschichteten Bahn (1), wo das Abschneiden mit einem Wasserstrahl durch die Bahn mit einer Wasserstrahldüse (3) am Schnitt (14), nahe der Bahnfläche geschieht, und wo die Bahn in der Umgebung des Schnitts wenigstens von einer Seite gestützt wird, **gekennzeichnet dadurch, dass** die Einrichtung als Stützmittel eine Abschneidefläche (4) in Kontakt und auf gleicher Linie mit der Bahn (1) hat, sowie Luftblasekanäle (13) um Luft in den Raum zwischen der Abschneidefläche (4) und der Bahn

zu fördern, und Führungen (15) auf der Abschneidefläche (4) zur Steuerung des Luftstroms diagonal gegen die Bahnkante um die schneidenden Kräfte zu kompensieren.

6. Eine Einrichtung gemäß Patentanspruch 5 **gekennzeichnet dadurch, dass** sie einen Saugkanal (11) zur Entfernung des abgeschnittenen Streifens hat.
7. Eine Einrichtung gemäß Patentanspruch 6 oder 7 **gekennzeichnet dadurch, dass** der größte Teil der Abschneidefläche (4) nach dem Schnitt auf gleicher Linie mit der Bahn ist

Revendications

1. Une méthode pour découper longitudinalement le bord (2) d'une bande de papier ou d'autre matériau similaire (1) en mouvement, la découpe étant effectuée au moyen d'un jet d'eau à travers la bande et celle-ci étant soutenue de l'autre côté au moins au point de découpe, **caractérisée en ce que** la bande est soutenue au moyen d'un niveau de découpe (4) installé en contact avec la bande (1) et **en ce qu'un** vent de soufflage fort est dirigé dans l'espace entre la bande et le niveau de découpe dans le but de générer des forces parallèles au niveau de découpe, qui tirent la bande en avant et vers le bord pour compenser les forces de découpe.
2. Une méthode selon la revendication 1, **caractérisée en ce que** l'air est soufflé à une vitesse supérieure à celle de la bande (1).
3. Une méthode selon la revendication 1, **caractérisée en ce que** l'air soufflé est dirigé au moyen de guides (15) situés sur la surface du niveau de découpe (4).
4. Une méthode selon l'une quelconque des revendications 1 à 3 citées ci-dessus, **caractérisée en ce que** le retrait du ruban découpé (2) est favorisé par un courant d'air qui est produit dans le canal de décharge (11) et dont la vitesse est supérieure à la vitesse de déplacement du ruban découpé (2).
5. Un appareil pour découper le bord d'une bande de papier ou d'autre matériau similaire (1), dans lequel la découpe est effectuée au moyen d'un jet d'eau à travers la bande en utilisant une buse à jet d'eau (3) aménagée au point de découpe (14) près de la surface de la bande et dans lequel la bande est soutenue de l'un côté au moins aux alentours du point de découpe, **caractérisé en ce que** l'appareil possède un moyen de soutien, soit un niveau de découpe (4), qui est en ligne avec la bande et qui est installé

en contact avec la bande, un système de canaux de soufflage (13) pour envoyer l'air dans l'espace entre le niveau de découpe (4) et la bande, ainsi que des guides (15) situés sur le niveau de découpe (4) permettant de diriger le souffle diagonalement vers le bord de la bande afin de compenser les forces de découpe.

6. Un appareil selon la revendication 5, **caractérisé en ce qu'il** possède un canal d'aspiration (11) permettant le retrait du ruban découpé.
7. Un appareil selon l'une quelconque des revendications 6 à 7, **caractérisé en ce que**, pour la plus grande partie, le niveau de découpe (4) est situé après le point de découpe (14), en ligne avec la bande.

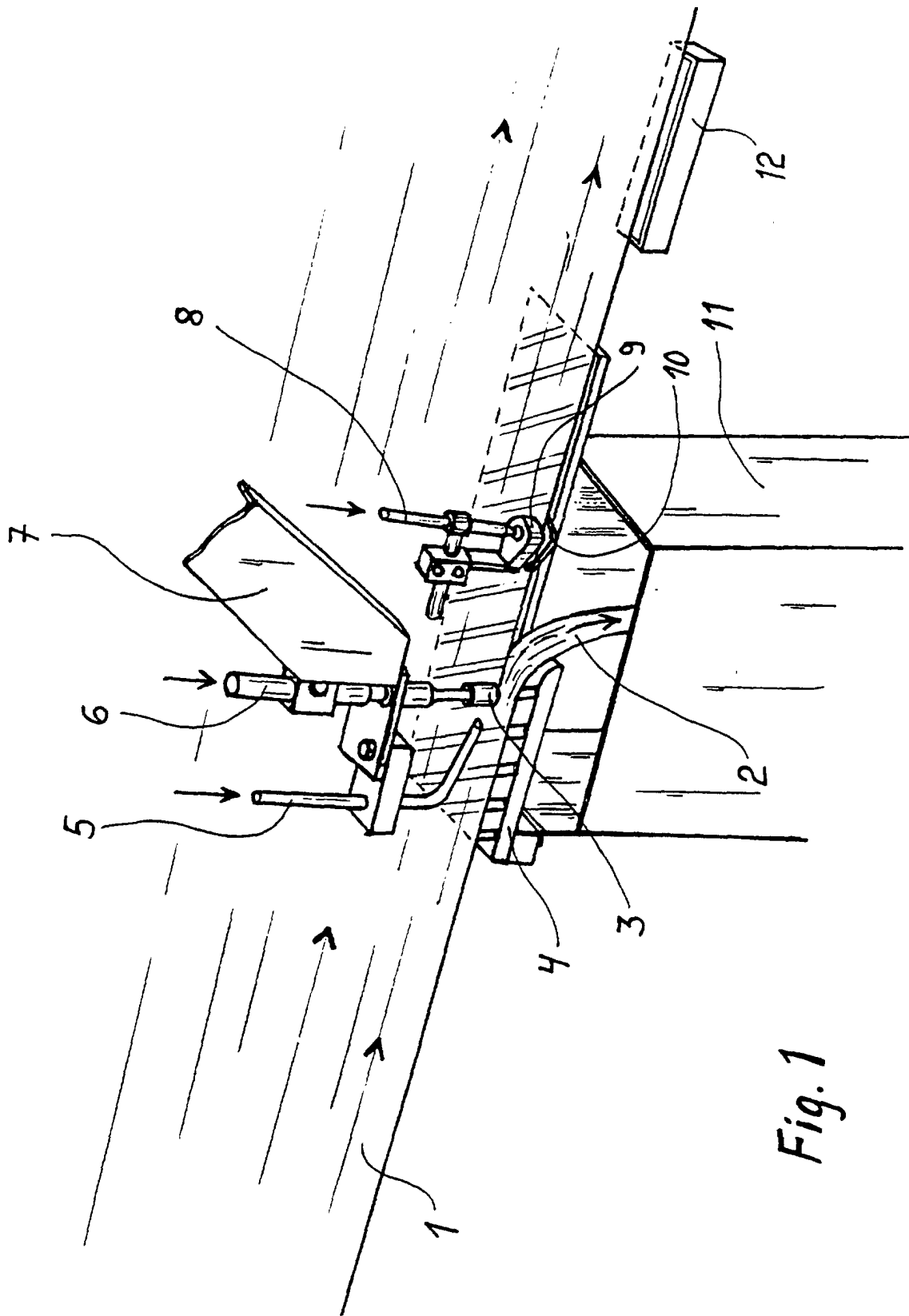


Fig. 1

