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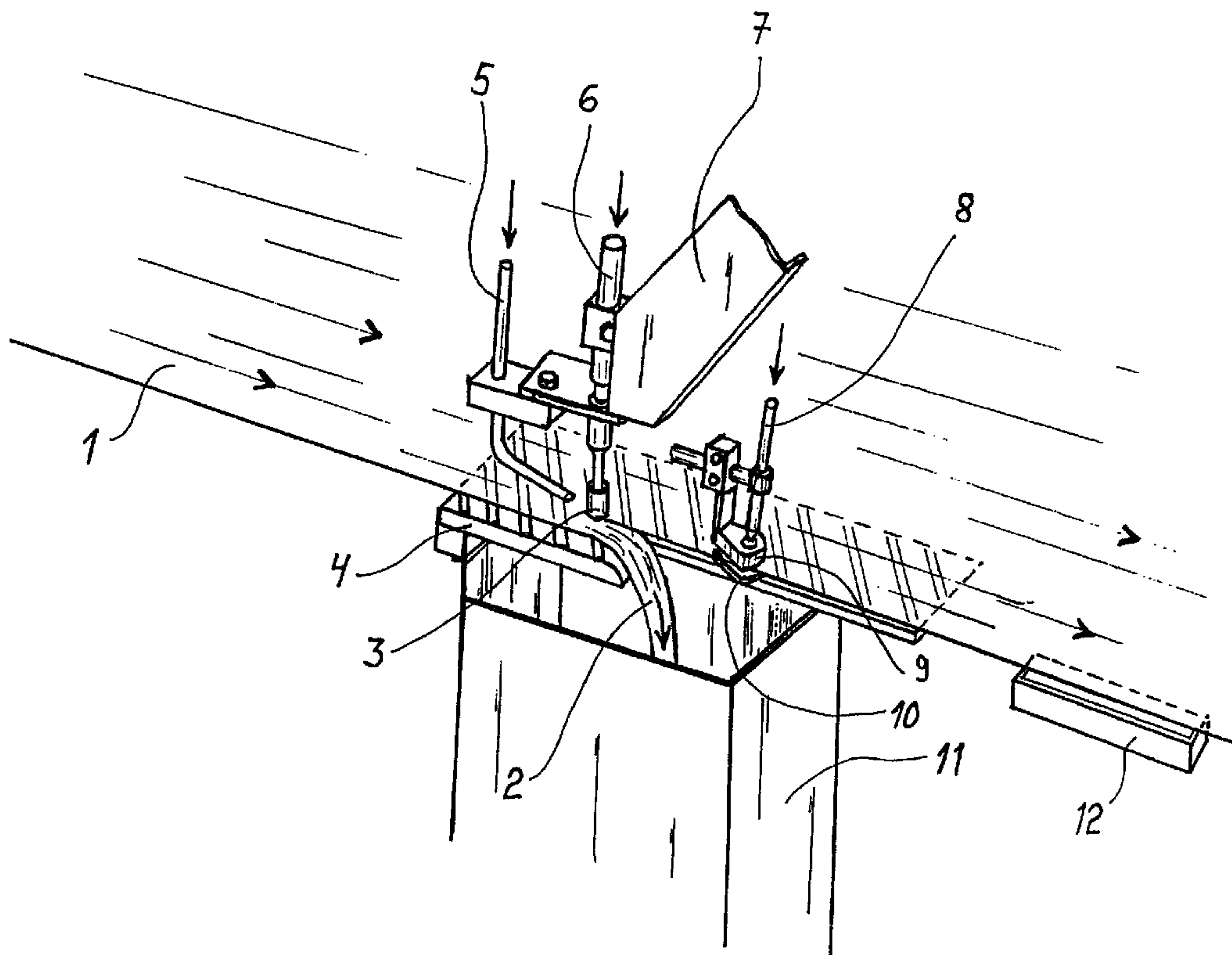
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(54) Title: A METHOD AND APPARATUS FOR CUTTING THE EDGE OF A MOVING PAPER WEB



(57) Abrégé/Abstract:

A method for longitudinal cutoff of edge (2) of moving paper web (1), where cutting is carried out by a water jet through the web. In the cutting point (14), vicinity forces are generated in the web (1) in the direction of the web cutting top in order to pull the web forward and towards the edge.

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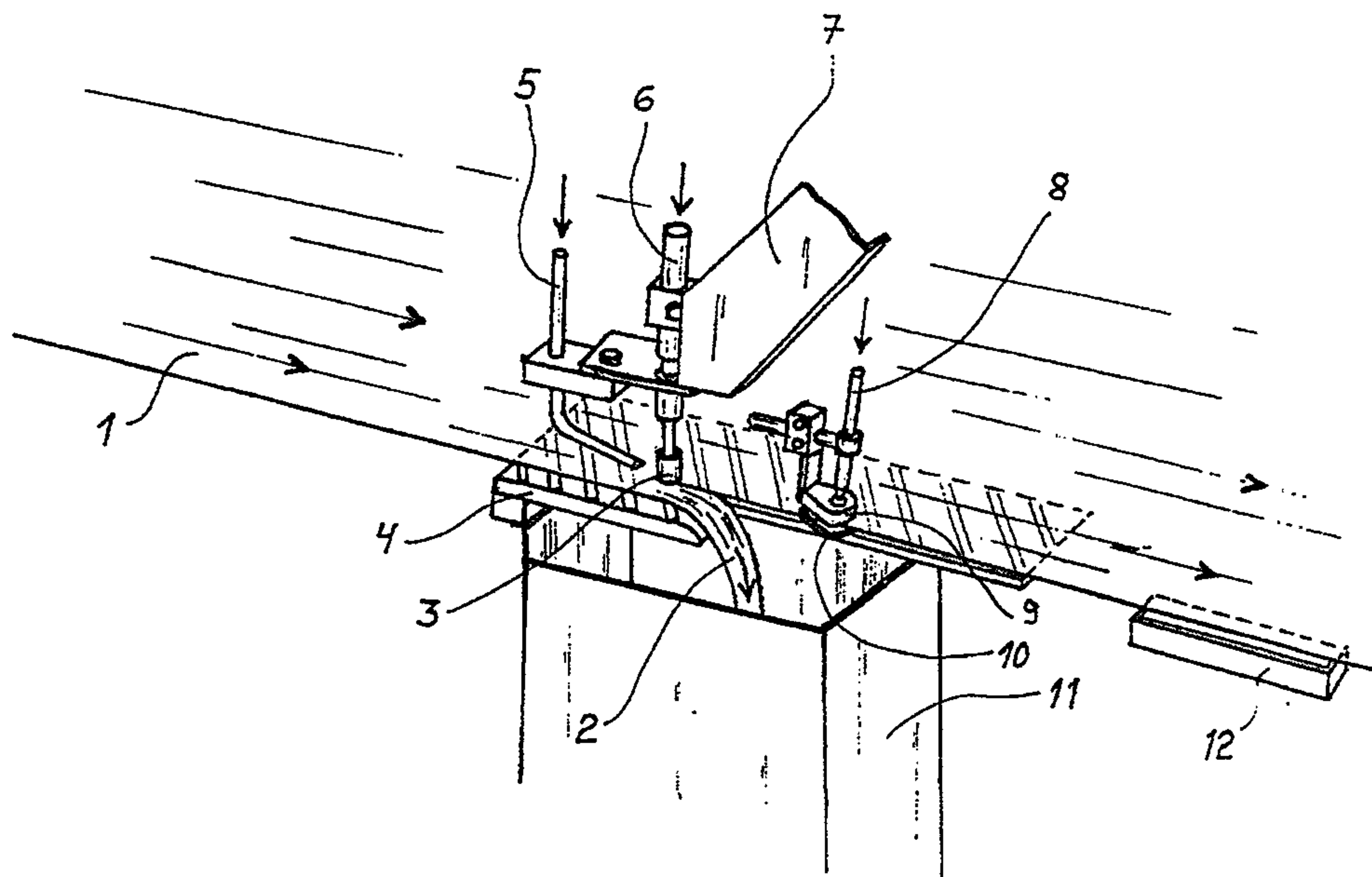
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(57) Abstract

A method for longitudinal cutoff of edge (2) of moving paper web (1), where cutting is carried out by a water jet through the web. In the cutting point (14), vicinity forces are generated in the web (1) in the direction of the web cutting top in order to pull the web forward and towards the edge.

A METHOD AND APPARATUS FOR CUTTING THE EDGE OF A
MOVING PAPER WEB

This invention relates to edge cutting of a paper web using a water jet.

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.

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.

With a method and an apparatus according to this invention the above introduced problem has been settled.

In accordance with the invention, a method for longitudinally cutting off an edge of the moving paper web or similar coated web where the cutting is carried out by a water jet through the web when the web is supported at at least one side at a cutting point, characterized in that the web is supported by a cutting top which is installed into contact with the web and negative pressure is caused in a space between the web

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and the cutting top in order to generate forces in the web direction to pull the web forward and toward the edge for compensating in a rearwardly directed forces generated by the water jet.

In accordance with the invention, an apparatus to cut off an edge of a moving paper web or similar coated web where cutting is carried out by a water jet through a web using a water jet nozzle arranged at a cutting point close to the web surface and where the web is supported from at least one side of the cutting point vicinity is characterized in that the apparatus has a supporting means, a cutting top in line with the web and installed into contact with the web, a blast channel for conveying air or causing negative pressure in a space between the cutting top and the web and guides on the cutting top surface to steer the blast or forces in the web direction diagonally towards the web edge to compensate for rearwardly directed forces generated by the water jet.

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.

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.

In figure 1 the paper web moves from the left to the right 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 switched 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.

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.

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

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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.

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.

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.

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.

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 an edge (2) of a forwardly 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 from at least one side at a cutting point, characterized in that the web is supported by a cutting top installed into contact with the web and negative pressure is caused in a space between the web and the cutting top in order to generate forces in the web direction to pull the web forward and toward the edge for compensating rearwardly directed forces generated by the water jet.
2. A method according to claim 1 characterized in that air is blasted by a speed higher than the web (1) speed.
3. A method according to claim 1 characterized in that the blast is steered by means of guides (15) in the cutting top (4) surface.
4. A method according to any one of claims 1 – 3 characterized in that removal of an edge strip (2) is facilitated by a blast generated in discharge channel (11) and faster than the edge strip (2) travel speed.
5. An apparatus for cut off of an edge of a 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 a cutting point (14) close to the web surface and where the web is supported from at least one side of the cutting point vicinity, characterized in that the apparatus has as supporting means, a cutting (4) top in line with the web and installed into contact with the web, a blast channel system (13) for conveying air or causing negative pressure in a space between the cutting top (4) and the web, and guides (15) on the cutting top (4) surface to steer the blast or forces in the web direction diagonally towards the web edge to compensate for rearwarding directed forces generated by the water jet.

6. An apparatus according to claim 5 characterized in that it has a suction duct (11) for removal of the cut off strip.

7. An apparatus according to claim 6 characterized in that more than 50% of the length of the cutting top (4) is located forward of the cutting point (14) in line with the web.

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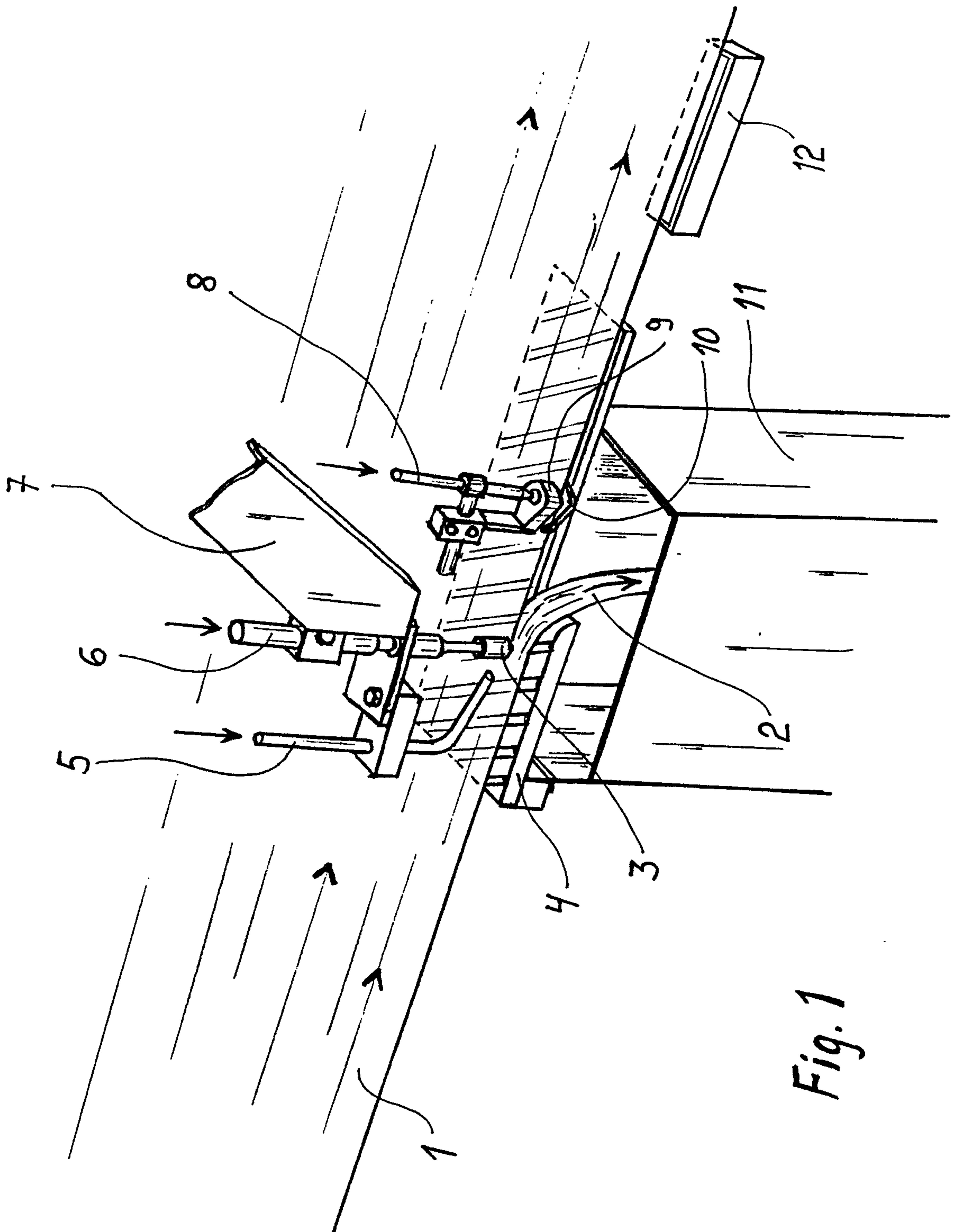


Fig. 1

