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(54) Assembly in a paper machine for effecting upward dewatering.

(57) In an assembly in a paper and cardboard machine in a twin-wire section comprising a lower wire (1) constituted of the wire (1) of a fourdrinier wire section, and an upper wire (2) which is guided on top of the lower wire (1) by means of a forming roll (3), around which the twin-wire section is curved within a predetermined sector (α). The twin-wire section situated after the forming roll (3) is provided with a guiding means (6) on the side of the lower wire (1), the twin-wire section being curved at said guiding means in an opposite direction compared with the curvature on the forming roll (3). The section between the roll (3) and the guiding means (6) is provided with one or several dewatering means (4) on the side of the lower wire (1). Within said section on the side of the upper wire (2) there is provided a dewatering means, to which is connected means for effecting suction causing dewatering.

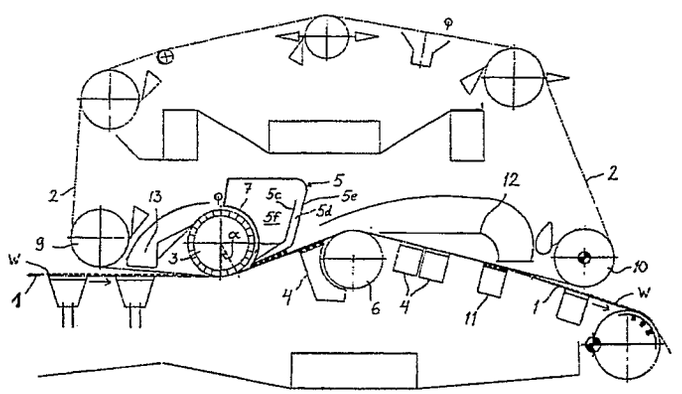

Fig. 2

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Assembly in a paper machine for effecting upward dewatering

The present invention relates to an assembly in a paper or cardboard machine for effecting upward dewatering, the assembly being defined in the preamble portion of claim 1. The invention is intended for the twin-wire section of a paper or cardboard machine. Within this section another wire is guided by means of a forming roll on top of the fourdrinier wire situated in the initial portion of the paper machine and on top of the fibrous web formed thereon, the web having been subjected to initial drainage. In this twin-wire section dewatering takes place through both the upper and lower wire, and the control of the dewatering within this section is one of the most important factors effecting the formation of a paper web.

In paper machines operating at high speed, dewatering means operating at a subatmospheric pressure are used as a rule only on the side of the lower wire. These means include suction shoes, suction boxes and the like. Such solutions are disclosed for example in Finnish Patent Application Publication No. 75375 as well as in Finnish Patent Application No. 873034. As the speeds of the paper machines increase, the mastering of the dewatering has become a problem. In this connection it has been discovered that it has not been possible to influence the presence of flocks on the top surface of the paper to a sufficient extent.

The purpose of the invention is to provide an improvement as regards to the drawbacks presented hereinabove and to disclose an assembly by means of which dewatering in the twin-wire section can be better effected both on the side of the upper wire and on the side of the lower wire. For accomplishing this purpose the assembly according to the invention is mainly characterised by what is disclosed in the characterising clause of claim 1. According to the invention on the side of the upper wire in the section following the forming roll there is a dewatering means connected to means effecting suction. By virtue of said means water can be removed in a controllable and adjustable manner also through the upper wire, in which event the fibrous flocks on the top surface of the paper web under formation can be disintegrated. The consistency of the stock after the forming roll is still so low that said flocks can still be disintegrated by shearing forces.

According to an advantageous embodiment the path of travel of the twin-wire section is straight at the location of the dewatering means on the upper wire side. The controllability of the dewatering is thus improved at said location.

Still, according to one advantageous embodiment, the means on the upper wire side effecting dewatering and a guide surface following the curvature of the forming roll are incorporated to the same structure.

The invention will be described in the following in more details with reference to the accompanying drawings, wherein

Fig. 1 shows the twin-wire section of a paper machine, in which the assembly according to the invention is used, the section being illustrated as a side view seen in the direction of the axes of the rolls guiding the travel of the wires, and

Fig. 2 shows a twin-wire section in a view similar to that of Fig. 1 according to an alternative embodiment.

The twin-wire section of the paper machine shown in Fig. 1 is preceded by a single-wire fourdrinier wire section, on which the fibrous stock is supplied from a head box. The fibrous stock advances on top of the fourdrinier wire 1 towards the twin-wire section and the initial drainage takes place at this point, the result of which is the dewatering of the fibrous web W under formation downwards through the fourdrinier wire 1. An upper wire 2 is introduced from above through a wire guiding roll 9 situated above the fourdrinier wire 1, whereafter the upper wire 2 joins the fourdrinier wire 1 on a forming roll 3. After the joining point the wires 1 and 2 wrap, the web W entrapped therebetween, the roll 3 within a sector α and leave the roll at a point, which is situated above the imaginary extension of the plane along which the fourdrinier wire 1 travels before the roll 3. After this point the wires 1 and 2 are directed obliquely upwards, and the wires 1 and 2 travel along a straight part onto a roll 6 having a smooth surface and being located on the side of the lower wire 1. On the roll 6 the wires 1 and 2 are curved again in an opposite direction compared with the curvature on the roll 6, being directed after this location obliquely downwards. After the roll 6 the wires 1 and 2 travel onto a reversing roll 8 having a smooth surface, whereafter the upper wire 2 is separated from the lower wire while being guided by the wire guiding roll 10. The web W travels on top of the lower wire 1 towards the press section. The separation of the web onto the lower wire 1 is effected by means of transfer suction boxes, on which the lower wire 1 is passed after the roll 8 and which are denoted by reference numerals 11 in the drawing.

In the following the dewatering means situated within the twin-wire section between the rolls 3 and 8 will be explained in more detail, together with the dewatering events involved.

The forming roll 3 has an open surface and at

its location the water is pressed out of the web W in both directions through the lower wire 1 and the upper wire 2. The water pressed through the upper wire 2 flows into the open points of the surface of the roll 3, and it is transferred under the influence of the centrifugal force due to the rotation of the roll and guided by a guiding surface 7 following the curvature of the outer surface of the roll after the sector α in the direction of rotation of the roll. The water slung on the surface 7 by the roll 3 will end in a trough or gutter 13, which is situated on the front side of the roll 3 between the wire guide roll 9 and the roll 3. The lower edge of the guide surface 7 terminates at a short distance above the upper wire 2 leaving a small gap between the lower edge and the upper wire 2. The upper wire 2 is thus not subjected to mechanical stress due to the guiding surface. At this location there is a straight suction box 4 lying against the lower wire 1 in the straight section following the roll 3. The suction box 4 is connected to means effecting suction and water is removed from the web through the lower wire 1 and through the open surface of the box. After the suction box there is on the side of the upper wire 2 a stationary dewatering means 5, comprising an autoslice 5a situated first in the direction of travel of the webs and one or several suction boxes 5b situated thereafter. The surfaces of the suction boxes comprise bars or blades extending transversely to the direction of travel of the wires, and the dewatering takes place therebetween through the upper wire 2 by virtue of suction provided in the suction boxes 5b. The autoslice 5a is also connected to suction and the suction within these different compartments may be controllable independently of each other. The autoslice 5a and suction boxes 5b guide the wires 1 and 2 along a straight path of travel, which is parallel with the common tangent of the roll 3 and the roll 6. After the dewatering means 5 there is still another straight suction box 4 on the side of the lower wire, situated before the smooth-faced roll 6, on which the wires are turned towards the reversing roll 8.

Within the straight section between the rolls 3 and 6 the parameters effecting the dewatering can be adjusted in a controllable manner using the suction. The pressure pulsation directed to the web is thereby caused only by the suction of the suction boxes. That kind of dewatering pressure (P) which would be caused by the tension of the wire (T) and by the radius of curvature of the web (R), being represented by the equation $P = T/R$, does not occur in said region.

At the location of the smooth-faced roll 6 water is removed from the web through the upper wire 2 due to the centrifugal force caused by the curvature of the path of travel and due to compression. The water is guided, slung by the centrifugal force, into the water collecting trough 12 above the wires. Within the straight section between the roll 6 and the reversing roll 8 the wires travel along a straight path, which coincides with the common tangent of the rolls 6 and 8. Within this section there is further two straight suction boxes 4 on the side of the lower wire 1.

In Fig. 2 there is shown another alternative of the assembly according to the invention. The twin-wire section is, like in the embodiment of Fig. 1, preceded by a straight fourdrinier wire section 1 and the top or upper wire 2 is led from above by means of a wire guiding roll 9 on top of the lower wire 1 and the web W lying thereon. The wires 1 and 2 come together on the surface of an open-faced forming roll 3, on which they are curved together upwards, the web entrapped therebetween, within a predetermined sector α. After leaving the periphery of the roll 3 at the end of the sector α they are directed obliquely upwards along the surface of a suction box 5, which follows immediately after the roll 3 and begins at the lower edge of the guiding surface 7 in a manner that no gap is left between the lower edge of the guiding surface and the upper wire. The front edge of the suction box acts thus as a prolongation of the guiding surface 7 down to the wires 1, 2, e.g. in a form of a first transversely extending element of the suction box surface. The surface of the suction box 5 on the upper wire side is in contact with the upper wire 2 by means of its transversely extending bars or blades, which define intermediate spaces, through which the dewatering can take place upwards through the upper wire 2 by means of suction connected to the suction box 5. At the location of the suction box 5 the path of the wires is guided entirely by the straight wire guiding surface of this suction box and a free space remains on the lower wire side. The water pressed through the lower wire 1 will be removed by the deflector action of the front edge of a suction box 4 situated before the roll 6.

The dewatering is still quite gentle and easily controllable at the upper dewatering means. By adjusting the suction in the upper suction box 5 it is thus possible to control the dewatering upwards making it possible to disintegrate the fibrous flocks.

The suction box 5 is integrated to the same structure as is the curved guide surface 7, which forms the wall of the suction box 5 facing the surface of the roll 3 situated after the sector α. A more simple construction and a somewhat shortened length is obtained by this arrangement. Further, the autoslice requiring a great amount of air is avoided. As is the case also in the embodiment of Fig. 1, the water collected to the open areas of roll 3 is slung by the centrifugal force upwards and will be guided by the guide surface 7 finally to the

trough 13 between the rolls 9 and 3.

The interior of the suction box 5 contains a partition 5c dividing the suction box 5 to a channel 5d extending along the whole width of the web between the partition 5c and the suction box rear wall 5e facing the direction of travel of the wires. The channel 5d is at its lower region in connection with the open spaces between the bars or blades on the wire guiding surface and thus directs the water collected through these spaces obliquely upwards. The partition 5c terminates before the upper wall of the suction box and the water passed through the channel 5d is directed backwards to a space 5f bounded by the wall forming the guide surface 7, the partition 5c, and the bottom lying above the wire guiding surface of the suction box 5. Between the bottom of the space 5f and the wire guiding surface there is a space, to which the water is first passed between the bars or blades, the height of this space increasing in the direction of travel of the wires. The space terminates at the lower end of the channel 5d and continues as the channel, which is directed more upwards. From the space 5f the water can be drawn off by conventional means not shown.

Between the suction box 5 and the trough 13 there is approximately above the uppermost point of the roll 3 a shower which washes the open areas of the roll 3. The washed water is slung off by centrifugal force together with the water drained from the web into the trough 13.

After the surface of the upper suction box there is a straight suction box 4 on the side of the lower wire 1, which guides the path of the wires to the smooth-faced roll 6, on which the path of the wires curves in the opposite direction compared with the curvature on the roll 3. The water is slung off by means of centrifugal force on the roll 6 into the trough 13. After the roll 6 there are still some suction boxes 4 on the side of the lower wire 1 and finally a transfer suction box 11, at which the separation of wires takes place and the web W formed remains on the lower wire 1. The upper wire is guided through a coach roll 10 further to its upper wire loop containing conventional means for guiding, washing and tensioning the roll.

By means of the invention, a better formation in the paper web to be formed is accomplished, to which the upward dewatering contributes significantly. In particular in case of paper grades having the grammage exceeding 50 g/m^2 the role of the upward dewatering is significant for the improvement of formation. By means of the dewatering box situated on the upper side and following the forming roll this upward dewatering can be adjusted to a desired level and the fibrous flocks still present on the upper surface can be disintegrated at a sufficiently low consistency using shearing forces. By providing a substantially straight path of travel of the wires at this location the dewatering is also enough tranquillised.

The invention is not restricted only to the embodiments shown by the Figures and explained in the description, but is can be modified within the scope presented by the appended claims. In certain cases the surfaces of the upper wire dewatering means may be also slightly curved, the radius of this curvature being, however, many times greater than that of the preceding forming roll.

Claims

1. Assembly in a paper and cardboard machine in a twin-wire section comprising a lower wire (1) constituted of the wire (1) of a fourdrinier wire section, and an upper wire (2) which is guided on top of the lower wire (1) by means of a forming roll (3), around which the twin-wire section is curved within a predetermined sector (α), the twin-wire section situated after the forming roll (3) being provided with a guiding means (6) on the side of the lower wire (1), the twin-wire section being curved at said guiding means in an opposite direction compared with the curvature on the forming roll (3), the section between the roll (3) and the guiding means (6) being provided with one or several dewatering means (4) on the side of the lower wire (1), **characterised** in that within said section on the side of the upper wire (2) there is provided a dewatering means, to which is connected means for effecting suction causing dewatering.

2. Assembly as claimed in claim 1, **characterised** in that the path of travel of the twin-wire section is straight at the location of the dewatering means situated on the side of the upper wire (2).

3. Assembly as claimed in claim 1 or 2, **characterised** in that the dewatering means (5) comprises an autoslice (5a) and one or several suction boxes (5b) situated after the autoslice (5a).

4. Assembly as claimed in any of claims 1 to 3, **characterised** in that at the point where the twin-wire section leaves the forming roll (3) after the sector (α), there is a guiding surface following the surface of the roll (3), such as a plate (7), which has connection to a water collecting container (13) situated on the side of the roll (3) facing the fourdrinier wire section.

5. Assembly as claimed in one of claims 1 and 2, and in claim 4, **characterised** in that said guiding surface (7) and said means (5) on the upper wide side effecting dewatering are incorporated to the same structure.

6. Assembly as claimed in claim 4, **characterised** in that a gap is left between the edge of the guiding surface (7) facing the upper wire (2)

and the upper wire (2).

7. Assembly as claimed in claim 6, **characterised** in that at the gap there is a suction box (4) in contact with the lower wire (1).

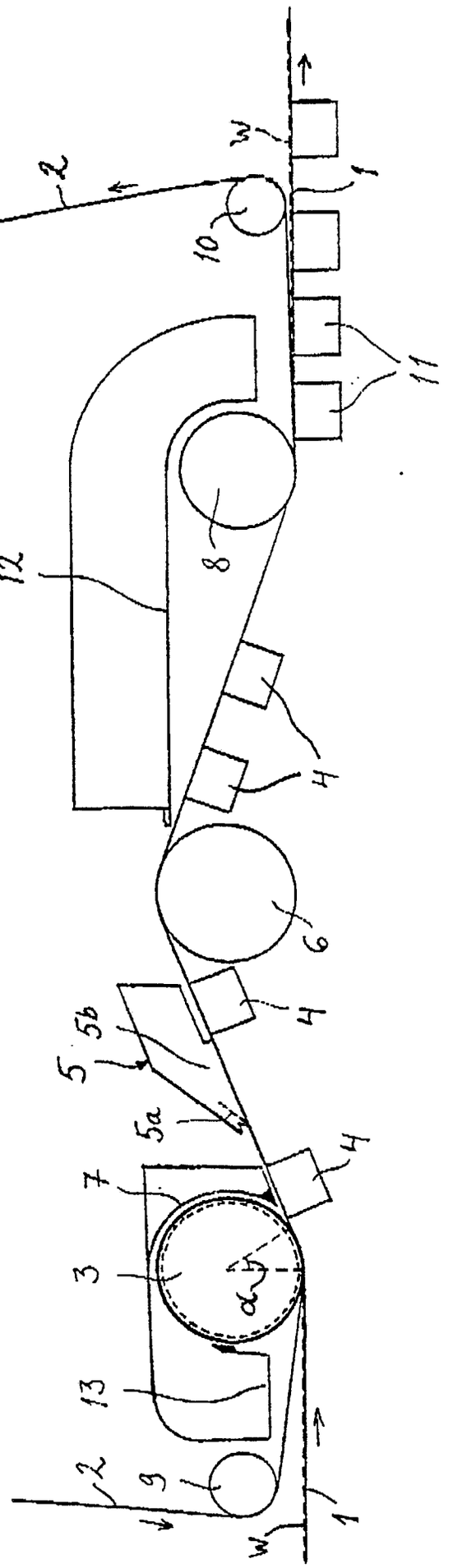

Fig. 1

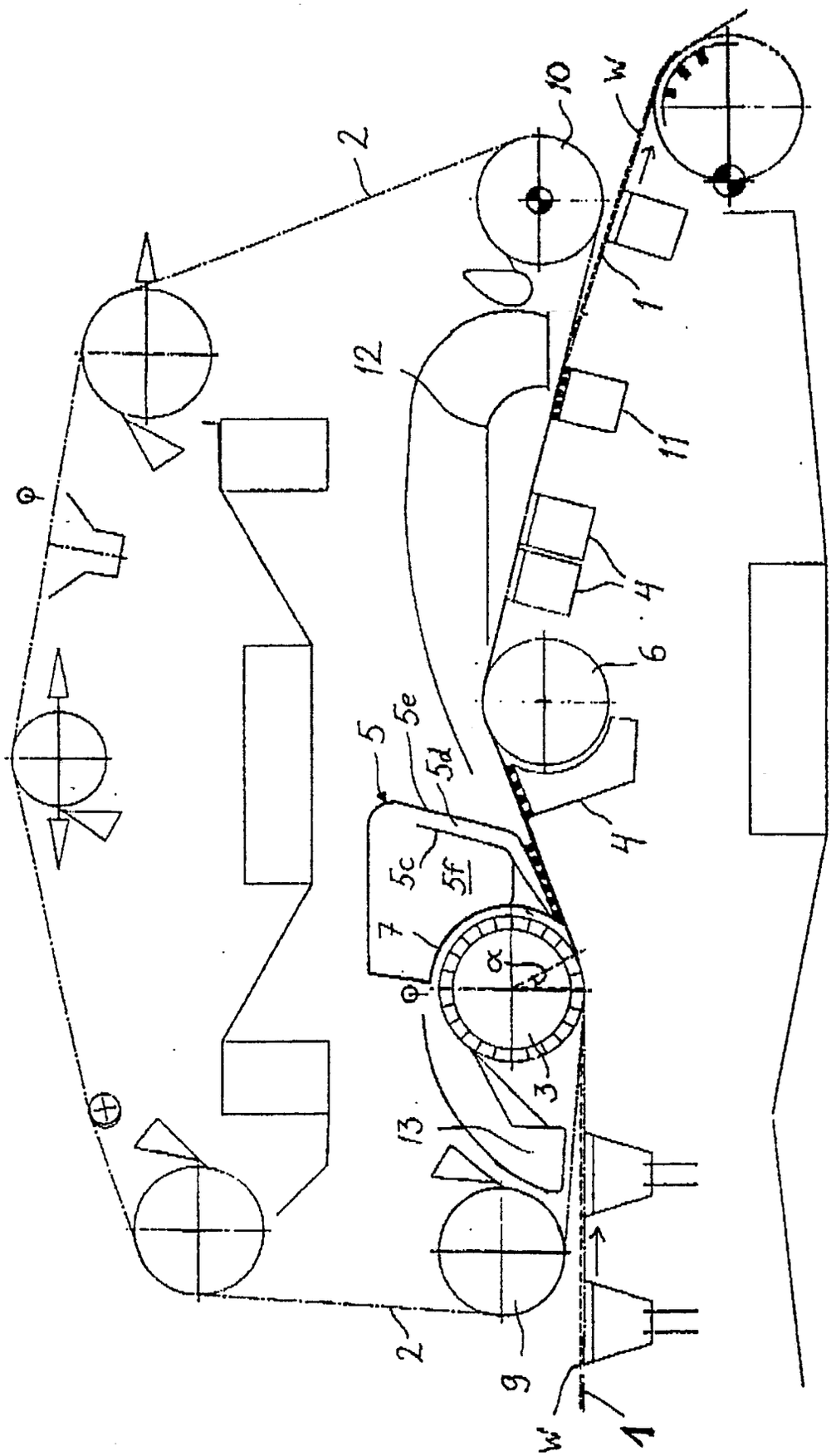

Fig. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 90107413.8

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl 5)
Y	US - A - 4 561 939 (JUSTUS) * Totality *	1,2	D 21 F 3/04
Y	DE - A1 - 3 604 522 (VALMET OY) * Fig. 1; page 14, paragraph 2 *	1,2	
D,A	FI - B - 75 375 (VALMET OY) * Fig. 1 *	1	
A	DE - A1 - 3 534 836 (VALMET OY) * Fig. 2; page 15, lines 18-20 *	4	

TECHNICAL FIELDS SEARCHED (Int Cl 5)

D 21 F 1/00
D 21 F 3/00
D 21 F 7/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	11-07-1990	KRUMPSCHMID

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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