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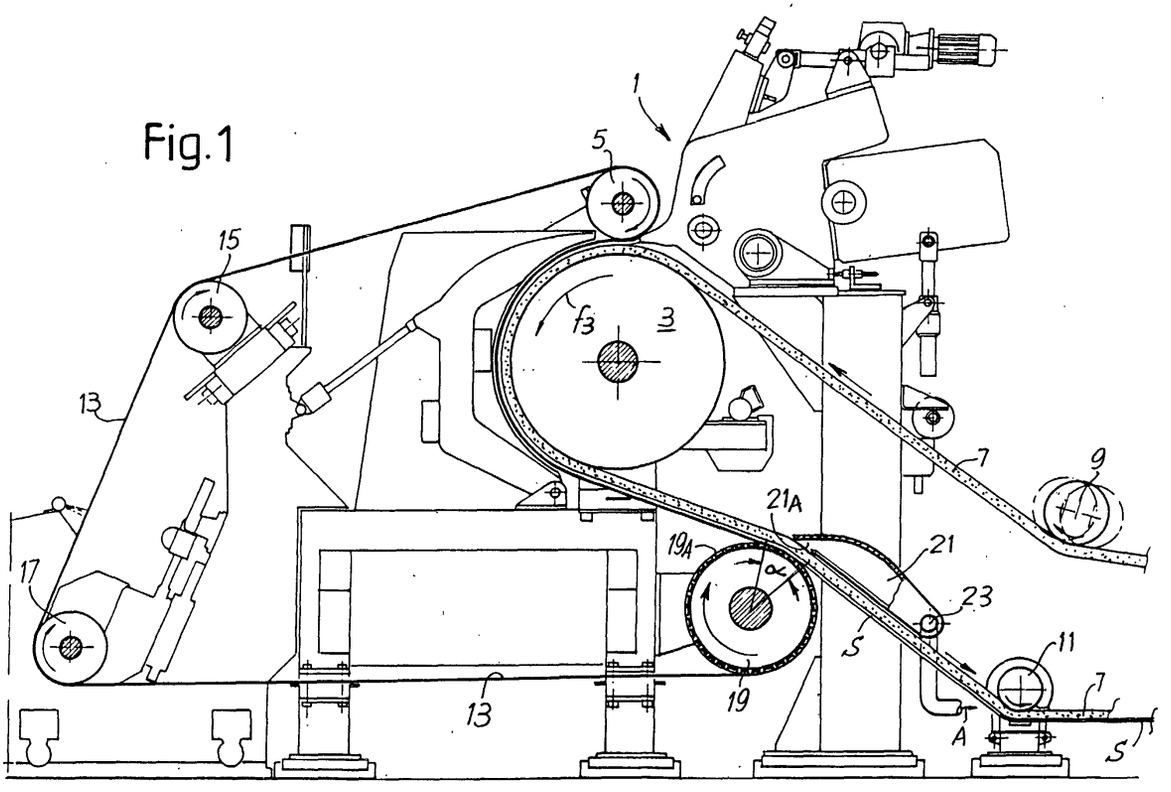
(54) Machine and method for producing a sheet of paper material

(57) The machine comprises at least one inflow vat 1 for supplying a stock containing cellulose fibres and water; at least a first continuous felt 7 running along a first closed path, on which a layer S of said stock is deposited; and a continuous screen 13 interacting with the felt and running along a second closed path. A deflecting roller 19 is placed along a common portion of the screen and felt paths, and deflects the screen and the felt in such a way as to form a convexity facing the inside of the first closed path. A means 21 placed inside said felt collects the water emerging as a result of centrifugal force from the surface of the felt opposite the surface on which the layer of stock is deposited.

Fig.1



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Description

[0001] The present invention relates to a machine for making a sheet of paper material, for example and in particular (but not exclusively) a sheet of what is known as tissue paper. The invention also relates to a method for producing a sheet of paper, and particularly, but not exclusively, tissue or crepe paper.

[0002] At the present time there are tissue paper production machines which comprise a combination of:

- at least one inflow vat for supplying a stock of cellulose fibre and water;
- at least a first continuous felt running along a first closed path, on which a layer of said stock is deposited;
- a continuous screen interacting with the first felt and running along a second closed path, the closed paths of said screen and of said felt having a common portion in which the layer of stock is squeezed between the felt and the screen.

[0003] One of the critical aspects of papermaking, and particularly the production of crepe or tissue paper, is the requirement to expel water from the stock from which the layer is formed on the felt, before drying with a system which supplies heat energy. This is because the drying entails high energy consumption due to the need to evaporate the water contained in the stock. A decrease in the content of water in the stock when it reaches the drier is accompanied by a decrease in energy consumption.

[0004] The object of the present invention is to reduce the water content in the layer formed by a papermaking machine before said layer reaches the drying area, which can be a drier of the type comprising a drying and glossing cylinder, known as a Yankee cylinder, of the through air drying (TAD) type, the dry end type, or any other suitable type.

[0005] Essentially, according to the invention, a deflecting roller is provided along the common portion of the screen and felt paths, to deflect the screen and the felt in such a way as to form a convexity facing the inside of the closed path of the felt, and a means is provided inside said first closed path, at the position of said convexity, to collect the water emerging as a result of centrifugal force from the surface of the felt opposite the surface on which the layer of stock is deposited.

[0006] Thus, efficient water drainage is achieved even at the first stage of squeezing the layer of cellulose fibres. The tendency to increase the velocity of these machines assists the operation of the device according to the invention. This is because the centrifugal force caused by the deflection of the felt path due to the presence of the return or deflecting roller increases with the velocity of movement of the screen and of the felt. With the arrangement according to the invention, the expulsion of water from the felt and partial expulsion from the layer of stock laid on it is obtained with practically no expenditure of energy.

[0007] To facilitate the expulsion of the water, it is advantageous to provide means which facilitate the entry of air through the layer of stock adhering to the felt. In theory, this can be achieved by making the deflecting roller perforated and having a slight excess pressure generated within it, or simply by enabling an air flow to be generated within it. Preferably, the deflecting roller can have a surface structure which facilitates the penetration of air through its support surface and the layer of stock. For example, it can be provided with a set of annular or spiral ribs on which a cloth, a screen, or the like is fitted and stretched.

[0008] Further advantageous characteristics of the machine according to the invention are set forth in the attached claims.

[0009] The invention also relates to a method to eliminate water from a stock of water and cellulose fibres in a papermaking machine, wherein a layer of said stock is placed between a felt and a screen, characterized in that water is expelled through the felt by the generation of a centrifugal force directed from the surface of the felt in contact with said layer of stock toward the opposite surface.

[0010] The invention will be better understood on the basis of the following description and the attached drawing, which shows a practical, non-restrictive example of embodiment of the invention. In the drawing,

Fig. 1 shows a schematic side view of the initial portion of a papermaking machine which incorporates the present invention; and

Figs. 2 to 4 show, in a schematic way, possible surface structures of the deflecting roller according to the invention.

[0011] Fig. 1 shows in a schematic way the initial portion of a machine, of the type commonly known as a crescent former, which is used to form a sheet of paper. The downstream portion of the machine is not shown and can have any suitable configuration. The part of the machine shown in Fig. 1 comprises an inflow vat 1, through which is generated a continuous laminar flow of a stock of water, cellulose fibres and any necessary additives, of a known type. The stock is fed from the inflow vat 1 into a gap between a roller 3 and a cylinder 5.

[0012] A felt 7 is run around the roller 3, which rotates in the direction of the arrow f3, to form a first closed path, part of which is visible in Fig. 1 and part of which has been removed, since it forms the downstream portion of the machine which is not relevant for the purposes of the present description. Additional return rollers 9 and 11 are indicated: these contribute to the definition of the first closed path formed by the felt 7.

[0013] A screen 13 is also run around the roller 3, and passes along a second closed path which is formed not only by the roller 3 and the return cylinder 5 but also by

further return cylinders 15 and 17 and by a deflecting roller 19. The last of these is placed in such a position that it also slightly deflects a portion of the felt 7, more precisely the portion which extends between the roller 3 and the return cylinder 11. The deflection imparted to the felt 7 by the deflecting roller 19 is such that a convexity is created in the path of the felt 7, between the roller 3 and the cylinder 11, and faces the inside of the closed path formed by the felt 7.

[0014] The deflecting roller 19 also forms the final region of a common portion of the closed paths formed by the felt 7 and by the screen 13, this common path starting in the gap between the roller 3 and the cylinder 5 and terminating in the area in which the felt 7 forms a tangent to the deflecting roller 19.

[0015] Within the closed path formed by the felt 7 there is a chute or funnel 21 with an aperture 21A, of adjustable size if necessary, facing the convexity of the felt 7 and generated by the presence of the deflecting roller 19. The aperture 21A of the chute 21 is relatively small, since the felt 7 is run around the deflecting roller 19 through a relatively small angle α, for example an angle of the order of 15° or more. The chute or funnel 21 extends downwards, following the branch of the felt 7 between the deflecting roller 19 and the cylinder 11. A small negative pressure can be created inside the chute or funnel 21, but this is not strictly necessary.

[0016] In its lower part, the chute or funnel 21 has a lateral aperture 23 which permits the extraction of the water which has been collected (in the way and for the purposes described below) inside the chute.

[0017] The water is drained off by means of a single lateral pipe or a pipe on each side of the felt, as shown schematically by the arrow A.

[0018] The machine described in a summary way above operates as follows. The inflow vat 1 forms a layer of stock S which is fed into the gap between the roller 3 and the return cylinder 5. The layer S is thus squeezed between the felt 7 and the screen 13 along the common part of the two closed paths formed by the felt 7 and by the screen 13 between the cylinder 5 and the deflecting roller 19. The water emerging from the layer is collected in a known way within the closed path formed by the screen 13.

[0019] When the layer S reaches the portion of the path around the deflecting roller 19, the centrifugal force generated by the curvature which the path of the layer takes on around the deflecting roller 19 causes water to be expelled from the felt and partially from the layer of stock adhering to the felt, toward the inside of the closed path formed by the felt 7, where it is collected by the chute or funnel 21. The mouth 21A of the chute 21 is suitably orientated to collect the water expelled from the inner surface of the felt 7, in other words from the surface opposite that which is in contact with the layer S formed by the fibre and water stock.

[0020] Thus, a more efficient expulsion of water is achieved from the layer and from said felt 7 before the layer adhering to the felt 7 is transferred from the felt to the elements downstream from the section of the machine shown in Fig. 1. The importance of extracting water from the felt (and consequently from the layer S) in the way which has been described is due to the fact that this reduces the quantity of water which has to be drained at the following stage of squeezing between the press and the drying and glossing cylinder or in another drainage system. This yields a significant energy saving, while the expulsion of water by means of the cylinder 19 does not cause any increase in energy consumption (or only a negligible increase), since the expulsion is achieved primarily or exclusively by centrifugal force.

[0021] In order to facilitate the expulsion of water by centrifugal force from the inner surface of the felt 7, the deflecting roller 19 can be shaped in a suitable way. For example, as shown schematically in Fig. 1, it can have a plurality of holes 19A in its cylindrical sleeve, through which a flow of air can be generated to promote the expulsion of the water. To generate a more efficient air flow, it is possible to create a slight excess pressure inside the deflecting roller 19, for example by means of an air delivery system running from a fan through a suitable manifold (not shown).

[0022] Alternatively, or in combination with the above, the surface of the deflecting roller 19 can be given a suitable configuration, which facilitates the penetration of air into the contact area between the surface of the deflecting roller 19 and the components consisting of the screen 13, the layer of stock S and the felt 7. Figs. 2 and 3 show in a schematic way examples of possible configurations of this type. In Fig. 2, the surface of the deflecting roller 19 has a set of annular ribs 19B on which the screen 13 bears. Air penetrates easily between adjacent ribs 19B and can be drawn by centrifugal force through the screen 13, the layer of fibres S and the felt 7. In Fig. 3, the ribs 19B are of spiral form and have essentially the same function.

[0023] The structure formed by the ribs can be suitably covered by a screen or a cloth 19C which forms a cylindrical surface, as shown in Fig. 4. The ends of the cloth or screen are integral with the end of the cylinder so that they can be suitably stretched. This arrangement prevents interference between the ribs 19B and the screen 13. The cloth or screen covering 19C of the deflecting roller 19 can be made from plastic, metal or other suitable material. Fairly large-mesh screens, of the 4-8 mesh type for example, can be used.

[0024] It is also possible to arrange for air to be introduced into the gap formed between the screen 13 and the deflecting roller 19 by means of a set of suitably orientated nozzles.

[0025] It is to be understood that the drawing shows only an example provided as a practical demonstration of the invention, and that this invention can be varied in its forms and arrangements without departure from the scope of the guiding concept of the invention.

Claims

1. A machine for making a sheet of paper material, comprising:

   - at least one inflow vat for supplying a stock containing cellulose fibres and water;
   - at least a first continuous felt running along a first closed path, on which a layer of said stock is deposited;
   - a continuous screen interacting with said first felt and running along a second closed path, the closed paths of the screen and of said felt having a common portion in which the layer of stock is squeezed between said felt and said screen;

   characterized in that a deflecting roller for the screen and felt is placed along said common portion, and deflects said screen and said felt in such a way as to form a convexity facing the inside of the first closed path; and **in that** a collecting means is placed inside said first closed path, at the position of said convexity, for collecting the water emerging as a result of centrifugal force from the surface of the felt opposite the surface on which said layer of stock is deposited.

2. Machine according to Claim 1, **characterized in that** said deflecting roller is associated with ventilation means which permit the entry of air between the surface of the return roller and the layer of stock.

3. Machine according to Claim 2, **characterized in that** said ventilation means comprise apertures in the cylindrical sleeve of the deflecting roller.

4. Machine according to Claim 3, **characterized in that** an excess pressure is maintained inside the deflecting roller.

5. Machine according to Claim 2, **characterized in that** said ventilation means comprise a surface structure of the deflecting roller which enables air to penetrate between the surface of said deflecting roller and the layer of stock.

6. Machine according to Claim 5, **characterized in that** said deflecting roller has a plurality of ribs and a screen or a cloth which covers said ribs to form the outer surface of the deflecting roller.

7. Machine according to one or more of the preceding claims, **characterized in that** said collecting means comprises a chute with an aperture facing said convexity and at least one aperture in its base from which the collected water is discharged, said chute extending over the whole width of said felt.

8. Method for eliminating water from a stock containing water and cellulose fibres in a papermaking machine, in which a layer of said stock is laid between a felt and a screen, **characterized in that** water is expelled through the felt by the generation of a centrifugal force directed from the surface of the felt in contact with said layer of stock toward the opposite surface.

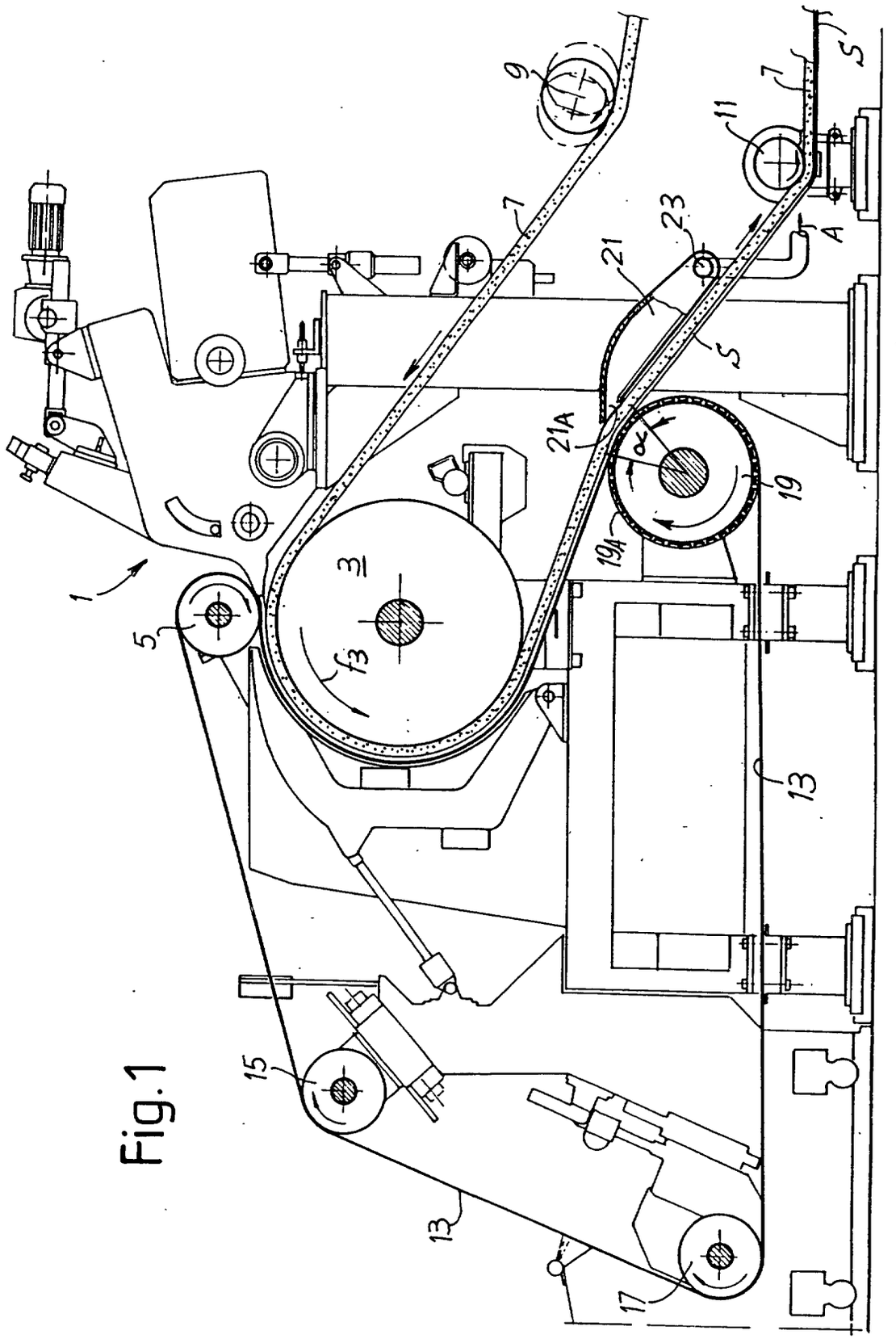

Fig.1

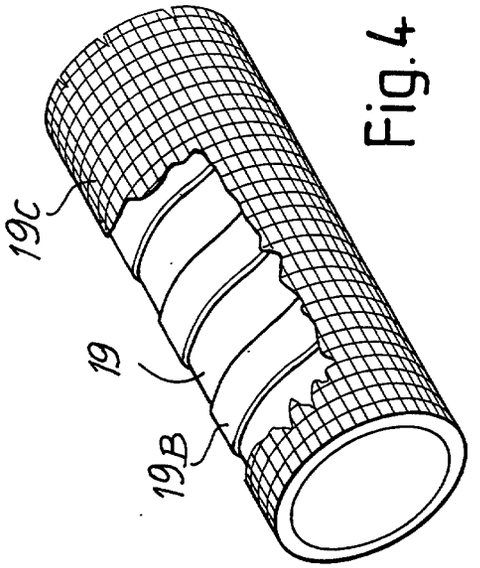

Fig. 4

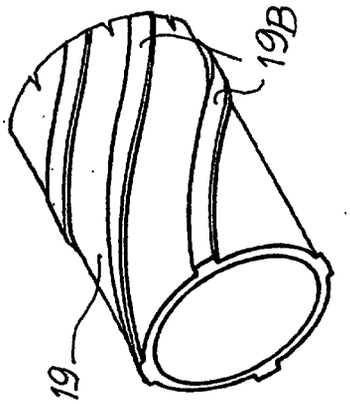

Fig. 3

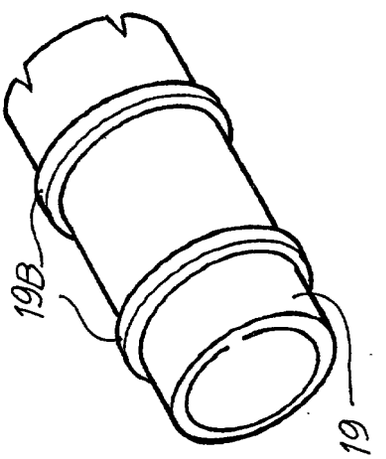

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 01 83 0204

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	9 November 2001	De Rijck, F

CATEGORY OF CITED DOCUMENTS

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