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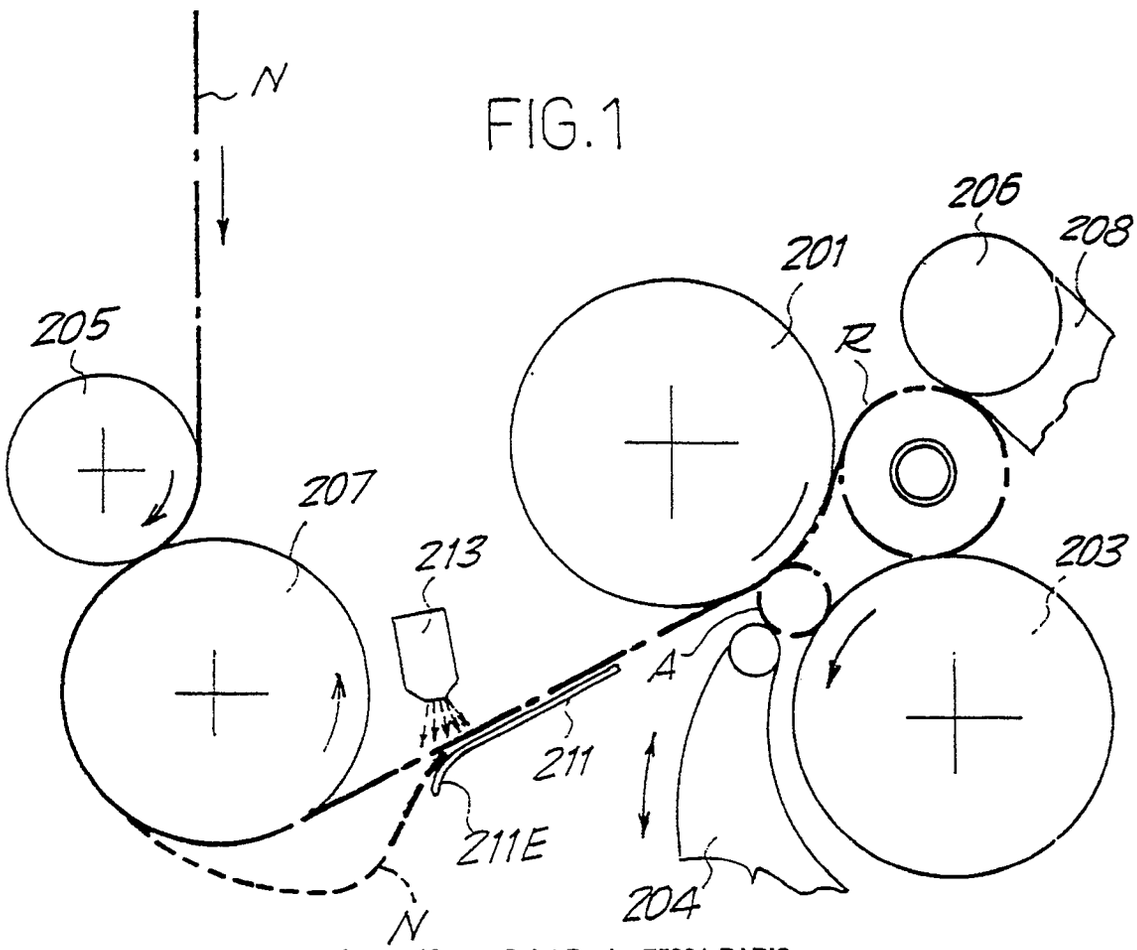
(54) Method and apparatus for temporarily accumulating an excess of a paper web.

(57) An apparatus for the temporary accumulation of a web (N) of material, which is continuously fed to means (201, 203) for the processing of the same web, is provided with transmission means (205, 207) which define the web trajectory, and means for accumulating the excess material. The means for accumulating the excess web comprise: an element (211) forming a slide surface for the web (N); and members (213; 215, 217) able to generate a pressure force between the web (N) and the slide surface. The apparatus is particularly suitable for its application in rewinders.

FIG.1



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SUMMARY OF THE INVENTION

the invention refers to an apparatus for the temporary accumulation of a web of material continuously fed to means for the processing of the same web, with at least a transmission roller defining the web trajectory, and means for accumulating the excess web.

Apparatuses of this type are used, for example, in the paper converting machines which operate in a continuous way on a web of paper which is fed at constant speed, on which web workings are carried out which involve a temporary slowing down of the output material, with the consequent need of accumulating the excess material. In a rewinder, for example, the web unreeled from a bobbin of large diameter is fed to the machine continuously and at constant speed to form logs or rolls of small diameter. When a log has been completed, it must be moved away from the winding region after the web has been torn or cut, and must be replaced with an empty core on which the winding of the successive log is to begin. The web cut or tear operation gives rise to an excess of material which has to be stored up in some way so as to maintain a sufficient tension of the web to prevent the formation of creases until the web excess is subsequently recovered by the winding means.

A first kind of apparatuses for accumulating the web excess comprises vacuum or blowing pneumatic means. The web is driven out onto a roller having a plurality of vacuum holes, so that the web adheres to the cylindrical surface of the roller. The arc of adherence of the web with the roller increases when the web is made to slow down, so that the storing up takes place because of the increase in length of the web adhering to the transmission roller. These devices have a disadvantage in that, as the suction takes place through a plurality of discrete holes, the subsequent detachment of the web from the recovery roller is abrupt and irregular, because the web is detached from the roller length-by-length and not in a smooth and uniform way, with a consequent sudden variation of the web tension.

Another kind of apparatus for the tensioning and accumulation of web is based on the use of a mechanical member, a roller or a bar, for example, on which the web being processed is driven out, and which is displaced by actuators or elastic members so as to modify the path of the web while maintaining the tension thereof substantially constant. These systems have drawbacks due to the high inertia of the mobile transmission roller, which inertia makes it impossible to carry out a timely accumulation of the web. The storing up takes place always with a slight delay, so that a delay always exists during which the web is not correctly tensioned.

It is an object of the present invention to provide an apparatus of the above-mentioned type, which does not exhibit the drawbacks of the known systems and, in particular, allows a timely accumulation of the web, a uniform tensioning thereof, and a particularly smooth and regular operation.

According to the invention, the means for the accumulation of the excess material substantially comprise an element forming a slide surface for the web, and members able to generate a force of contact between the web and the slide surface. The element forming the slide surface may be a steady lamina, a fixed cylinder or other equivalent element, as well as a roller rotating at a limited peripheral speed in a direction concordant with or opposite to the direction of advancement of the web.

This apparatus allows a timely accumulation of the excess web, which is pressed onto the slide surface by the pressure (or vacuum) generated by said members. The friction force caused by the pressure between the web and the slide surface is usually balanced by the traction or pulling force exerted on the web by the web processing means located downstream the device for the accumulation of the excess web. When this pulling force decreases, the friction on the web causes the latter to accumulate upstream the slide surface, thereby forming a loop which is recovered afterwards by an acceleration of the web processing means downstream said surface, or because of the elasticity of the material (paper, for example) forming the web. The friction force, and thus the tension in the web, may be easily adjusted according to the type of material being processed.

In order to maintain a pressure between the web and the slide surface, pneumatic means may be provided, such as a series of nozzles or equivalent means, located above the web so as to have the latter lying between the nozzles and the slide surface. The air jet from the nozzles, which is directed towards the web, causes the web to exert a pressure force onto the element forming the slide surface, thereby inducing the necessary friction force. When using these pneumatic means, the adjustment of the friction force may take place in a particularly simple way by acting on the pressure or on the flow rate of the air.

IN a modified embodiment, the web is pulled against the slide surface by a vacuum. This may be achieved, for example, by providing a suction box closed by a perforated lamina which makes up the surface onto which the web slides. the suction through the box generates the pulling force necessary to induce a sufficient friction on the web.

The apparatus according to the invention may be applied to machines of various types and, in particular, to rewinding machines commonly used in the paper converting industry. Accordingly, the invention relates also to a rewinder comprising means for the continuous feeding of a web being unwound from a bobbin, winding cylinders defining a nip for the formation of a roll or log from said web, means for the insertion of a core into said nip, means for causing the

breaking of the web upon completion of a roll, and for allowing the beginning of the formation of a new roll, and means for accumulating and retaining the excess of web due to a slowing down in the winding operations. A rewinder, according to the invention, is characterized in that said means for accumulating and retaining the excess of web comprise an element forming a slide surface for said web and members able to generate a friction force between said web and slide surface.

The invention further refers to a method for the recovery of an excess of web continuously fed to processing means through members which define the trajectory of said web and are able to collect an excess of web, characterized by generating an (adjustable) friction force between said web and a slide surface therefor, said surface being located upstream from said processing means and downstream from the members which define the web trajectory. Particularly advantageous embodiments of the method according to the invention are set forth in the attached claims.

With the above and other objects in view, more information and a better understanding of the present invention may be achieved by reference to the following detailed description.

DETAILED DESCRIPTION

for the purpose of illustrating the invention, there is shown in the accompanying drawings a form thereof, which is at present preferred, although it is to be understood that the several instrumentalities of which the invention consists can be variously arranged and organized and that the invention is not limited to the precise arrangements and organizations of the instrumentalities as herein shown and described.

In the drawings, wherein like reference characters indicate like parts:

Figs. 1 and 2 show two possible embodiments of the apparatus according to the invention.

Fig. 3 shows a modified embodiment with respect to that of Fig. 1; and

Fig. 4 shows a detail of the sliding surface.

Described herebelow are two embodiments of the apparatus according to the invention applied to a rewinder, but it will be appreciated that the same apparatus may be applied also to machines of different type whenever the working of a web, continuously fed at constant speed, requires the temporary accumulation of an excess of material.

Shown in Fig. 1 is the region of introduction of the core A between two winding cylinders 201, 203 for the formation of a roll of web material N. The web N is advanced by two transmission rollers 205, 207, which define the path of the web and maintain its upstream tension constant. The introduction of the core A may take place, for example, by means of a pusher member generally indicated by 204. When it is introduced within the nip between the winding cylinders 201, 203, the core A causes the material of web N to tear between it and the roll R, thereby stopping the feeding of the web to the roll R which is being formed between the winding cylinders 201, 203 and a roll 206 borne by an arm 208, which roll forms together with the cylinders 201, 203, a winding space for the roll R. When the new core A is inserted into the nip between the cylinders 201, 203, thereby causing the breaking of the web, and the just formed roll R is discharged, there is a slowing down of the web N in the winding region, while the speed with which said web is fed to the transmission rollers 205, 207 and to the winding means remains unchanged. It is thus necessary to temporarily accumulate an excess of web N, which will be recovered afterwards by an acceleration of the cylinders 201, 203, or by the elasticity of the material forming the web, or by a combination of these two effects.

According to the invention, to allow a temporary accumulation of excess web while maintaining the right tension in the length of web to be wound on the core A, and to allow, therefore, a subsequent smooth and regular recovery of the accumulated excess of material, a lamina 211 or other element forming a surface for the sliding of the web N is provided upstream the winding means 201, 203, which extends over the whole width of the said web. In the example shown, the lamina is substantially flat and provided with a curved flare-shaped region 211C. Above the lamina 211, in correspondence or immediately upstream thereof, there is provided a set of nozzles 213 disposed on a front which substantially extends over the width of the web N being processed. These nozzles generate an air jet which presses the web N against the slide surface formed by the lamina 211. Between the web N and the slide surface a friction force is thus generated which retards the advancement of the web and keeps the latter in tension. When the web tends to slacken because of the reduction of the winding speed, the friction force between the web and the slide surface of lamina 211 causes the formation of a loop or sag indicated by N'. The subsequent recovery of the web takes place regularly and gradually because no detachment from the slide surface takes place and the friction force remains constant. In the illustrated example, the nozzles 213 are located in front of the slide surface. However, it is also possible to dispose said nozzles slightly upstream from said surface, so that they may serve not only to create a friction force between the web and the slide surface, but also to facilitate the formation of the loop of excess web. Such embodiment is shown in Fig. 3.

Shown in Fig. 2 is a modified embodiment with respect to Fig. 1, wherein some members have been omitted. Parts equal or corresponding to the solution of Fig. 1 are indicated with the same reference num-

bers. This embodiment differs from the previous one in that the friction between the web N and the slide surface formed by the lamina 211 is generated by a vacuum. the lamina 211 makes up, in this case, one wall of a suction box 215 connected to a suction line 217. The lamina 211 is provided with a plurality of holes distributed along the whole width of the web N, through which a vacuum pulls the web N against the slide surface. Also, in this case, between the web and the slide surface, a constant friction force is generated which ensures the formation of a web loop N' and a subsequent gradual recovery thereof.

The slide surface formed by the lamina 211 may have a series of ribs 301 (Fig. 4) which are inclined with respect to the web advancement direction, which ribs have the function of spreading the web N sideways--that is to say, either maintaining or recovering the transverse tension in the web, which is likely to be reduced due to the accumulation caused by said slowing down. The ribs 301, which operate in practice like those of a spreader cylinder, may be provided also in case the slide surface is not made up of a lamina, but of a steady or rotating roller. The rotation of the roller may be concordant or discordant with respect to t5he web advancement direction.

it is to be understood that the present invention may be embodied in other specific forms without departing from the spirit or special attributes hereof, and it is therefore desired that the present embodiments be considered in all respects as illustrative, and therefore not restrictive, reference being made to the appended Claims rather than to the foregoing description to indicate the scope of the invention.

Claims

Claim 1: An apparatus for the temporary accumulation of a web (N) of material continuously fed to means (201, 203) for the processing of the same web, with transmission means (205, 207) which define the web trajectory, and means for accumulating the excess material characterized in that said means for accumulating the web excess comprise: an element (211) forming a slide surface for the web (N); and members (213; 215, 217) able to generate a friction force between the web (N) and the slide surface.

Claim 2: An apparatus according to Claim 1, characterized in that the members able to create a friction force between the web and slide surface comprise means (213) for generating an air flow which presses the web against the slide surface.

Claim 3: An apparatus according to Claim 2, characterized in that said members comprise a series of nozzles lying transversely to the web N throughout its width and at a limited height above same web, in correspondence of the slide surface or upstream thereof.

Claim 4: An apparatus according to Claim 1, characterized in that the members able to generate a friction force between the web and the slide surface comprise means which generate a vacuum below said web between it and the slide surface.

Claim 5: An apparatus according to Claim 4, characterized in that said members comprise a suction box (215) developing transversely to the web (N), closed on top by said element (211) forming the slide surface, said element being provided with a plurality of suction holes.

Claim 6: An apparatus according to any one of Claims 1 to 5, characterized in that the members able to generate a friction force between the web (N) and the slide surface are adjustable.

Claim 7: An apparatus according to any one of Claims 1-5 characterized in that the slide surface for the web is provided with a plurality of ribs for transversely spreading and tensioning the web.

Claim 8: A method for the recovery of an excess of web (N) continuously fed to processing means through members (205, 207) defining the trajectory of said web and able to store up an excess of web, characterized by generating a friction force between said web and a slide surface therefor located upstream from said processing means and downstream from said members which define the trajectory of the web.

Claim 9: A method according to Claim 8, characterized in that the web (N) is pressed against said slide surface by a jet of air.

Claim 10: A method according to Claim 8, characterized in that the web (N) is pulled against said slide surface by a vacuum.

Claim 11: A rewinder including means (205, 207) for the continuous feeding of a web unreeled from a bobbin, winding cylinders (201, 203) defining a nip for the formation of a roll or log from said web, means for the insertion of a core within said nip, means to cause the breaking of the web upon completion of a roll and to allow the beginning of the formation of a new roll, and means for accumulating and retaining the excess of web due to a slowing down in the winding operations, characterized in that said means for accumulating and retaining the excess of web comprise an element (211) forming a slide surface for said web (N) and members (213; 215, 217) able to generate a friction force between said web and said slide surface, according to any one of Claims 1 to 7.

FIG.1

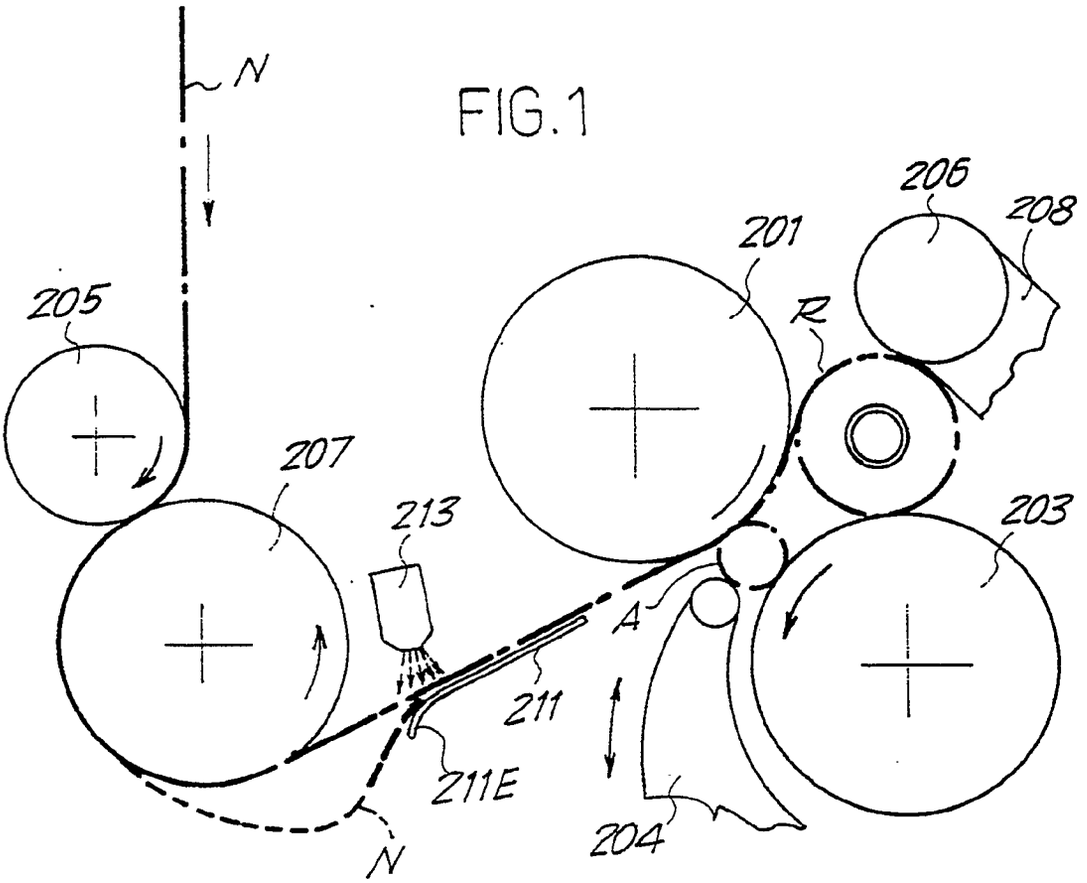
N
205
207
213
211
211E
N
A
201
R
206
208
203
204

FIG.2

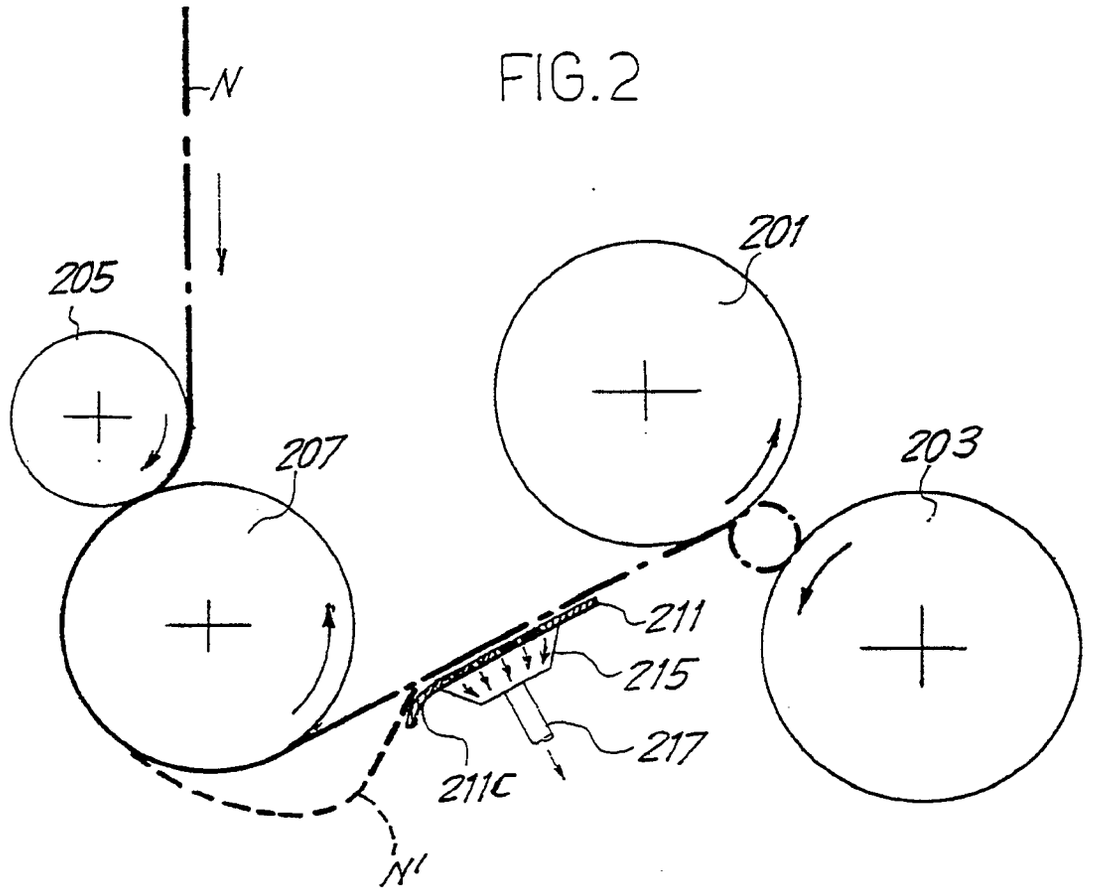
N
205
207
201
203
211
215
217
211C
N'

FIG.3

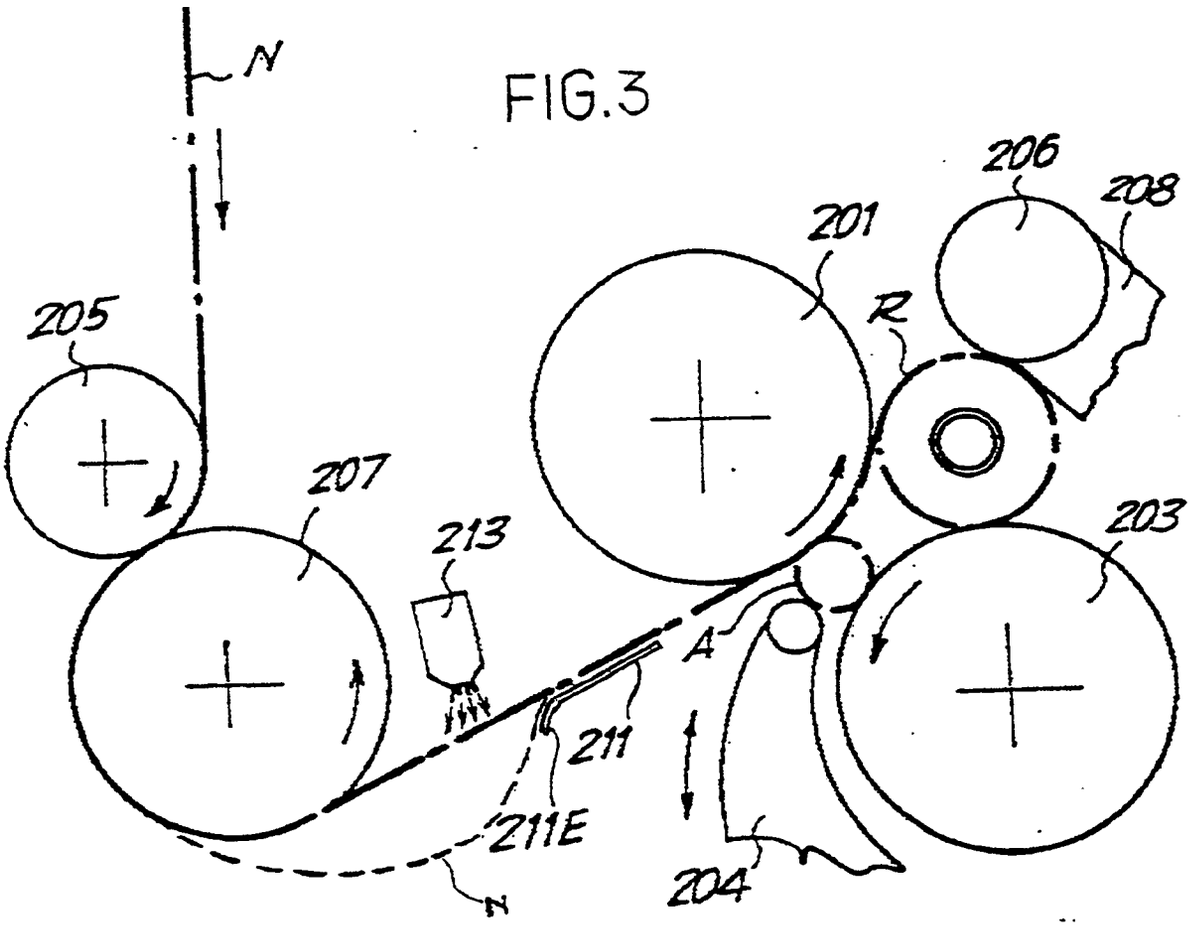

FIG.4