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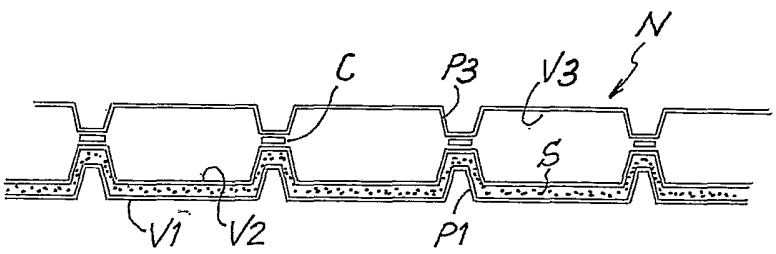
(54) Title: AN ARTICLE IN TISSUE PAPER OR THE LIKE COMPRISING A SUPERABSORBENT MATERIAL



(57) Abstract: The sheet product comprises at least one ply (V1; V2; V3) to which a superabsorbent material (S) in powder is applied.

"AN ARTICLE IN TISSUE PAPER OR THE LIKE COMPRISING A SUPERABSORBENT MATERIAL"

DESCRIPTION

Technical field

The present invention relates in general to the production of articles in sheet form, especially articles composed of one or more plies of paper, and in particular "tissue" paper, associated with superabsorbent materials to increase the absorption capacities of the finished product.

State of the Art

Paper products formed of one or more plies of tissue paper are used in many domestic and industrial applications. Tissue paper is intended as a paper with high characteristics of softness and absorption capacity. This paper is typically used to produce paper napkins, paper handkerchiefs, toilet paper, kitchen towel, facial tissues, industrial products of various types and similar products.

One of the important characteristics of these products is their capacity to absorb liquids.

In order to increase this characteristic, combination of the cellulose material, which form the basis of the ply or plies of the articles in question, with superabsorbent materials, in particular superabsorbent polymers, in the form of fibers or powders, has been proposed. According to a first approach (see WO-A-0114641) particles in the form or superabsorbent fibers or powders are mixed in an aqueous suspension also containing the fibers with which the paper plies are subsequently formed. In substance, this includes the addition of the superabsorbent materials in the wet phase of the production cycle of the paper plies, with consequent drawbacks, firstly deriving from the need to bring the superabsorbent materials into contact both with the water and with the pulps to produce the paper. This circumstance can cause damages to the superabsorbent materials and a considerable decrease in the absorption powers thereof. Consequences in terms of micro-structure of the paper ply can occur, as cavities form inside the ply after water is removed from the superabsorbent materials incorporated in the pulp during the subsequent drying phase. Elimination of water from the paper plies also requires a high energy

output, due to the considerable content of water contained in the superabsorbent materials: the quantity of water which must be evaporated is much greater than a normal tissue paper devoid of superabsorbent materials therewithin. This circumstance can also make modifications to the production plant necessary.

To remedy these drawbacks it has been suggested (see WO-A-03057990, EP-A-1325981, EP-A-1327716, US-2003/0127202) that superabsorbent material could be interposed between two pre-formed and pre-dried plies of paper. In this case, the superabsorbent materials used are in the form of fibers and, in particular – according to the publications cited above – fibers of considerable length, typically ranging from 3 to 30 mm. This requires the use of particularly complex metering devices which distribute the superabsorbent fibers in the lamination nip of an embossing-laminating device. The use of superabsorbent fibers applied by distribution on pre-formed and pre-dried plies is critical, as to obtain a finished product of high quality it is necessary to guarantee considerable uniformity in the distribution of the superabsorbent material, that is, a quantity in weight per surface unit which is as even as possible. Uneven distribution of the superabsorbent fibers causes an uneven thickness of the finished product. Although this may be acceptable for some products (i.e. diapers), it may not be for others, for example very thin products wound in rolls or folded and packaged, where in both cases an uneven thickness of the composite sheet – subsequently wound or folded – would cause uneven thickness in the finished product to be marketed. The use of fibers, and in particular fibers of the length described in prior art, causes considerable difficulties from this viewpoint.

The use of fibers rather than granular particles is considered indispensable in prior art documents in order to prevent dispersion of the superabsorbent material in the environment during production and during use. This is due to reasons regarding the cost of the material and also for reasons regarding pollution, as the superabsorbent products normally used for these purposes can be harmful to the environment and to health.

The use of superabsorbent materials in powder or granules is known in the production sector for absorbent articles, such as babies' diapers, sanitary

towels, incontinence pads and the like. In this case the plies into which the superabsorbent materials are introduced have a particularly high grammage (that is, weight per surface unit), typically of over 100 g/m^2, with consequent high product thickness. The granules of superabsorbent material used have relatively large dimensions, in view of the fact that they are introduced into articles with high thickness.

An example of application of superabsorbent materials in articles destined for the production of sanitary towels, diapers or the like is described in US-B-6572735, US-A-2003/0149415 ed in WO-A-0113966. Another absorbent material with a weight per surface unit of over 100 g/m^2 and up to 500 g/m^2 for use in the production of sanitary towels, diapers and similar products is described in US-A-5916670.

Summary of the invention

The object of the invention is to provide improvements to the methods, systems and products in the technological sector indicated above. In particular, the present invention relates to a system and a method for the production of a paper product in tissue paper or nonwoven fabric, single-ply or multi-ply, in particular to produce kitchen towel, toilet paper, napkins, handkerchiefs, facial tissues, industrial products or similar products, with the use of superabsorbent materials which overcome or reduce, fully or partly, the drawbacks of prior art. The products obtained with said systems and methods also form the object of the invention.

According to a first aspect of the invention, a method is provided for the production of a single or multi-ply article preferably in tissue paper (or nonwoven fabric), wherein a superabsorbent material in powder is distributed on the first ply (if single) or between the plies (if multi-ply) of pre-dried tissue paper. In a possible embodiment of the invention, the grain size of the superabsorbent material used is such that the particles have dimensions (i.e. diameters) typically of no more than 200 μm. More specifically, according to an advantageous embodiment, the superabsorbent material is composed of a powder the grain size of which is such that a percentage equal to at least 98% in weight of the powder has a diameter of no more than 60 μm.

Typically, each ply forming the article preferably has a grammage of no

more than 100 g/m^2 and even more preferably of no less than 10 g/m^2.

Further advantageous characteristics of the method according to the invention will be described in greater detail hereunder, with reference to non-limiting examples of embodiment of the invention.

According to a different aspect, the invention relates to a system for the production of a multi-ply tissue paper article, especially toilet paper, kitchen towel, napkins, handkerchiefs, facial tissues, industrial products or the like, comprising in combination: a section for the distribution of a superabsorbent material in powder on a first ply of tissue paper or nonwoven fabric, said section comprising applicator means for the superabsorbent powder; at least two paths for at least two paper plies, and means to join said plies and to produce a finished article in a multi-ply sheet of tissue paper. Typically, according to a preferred embodiment of the invention, the production line comprises an embossing unit and preferably an embossing-laminating unit, for embossing and joining, that is, reciprocal bonding of the first ply on which the superabsorbent material has been distributed with at least a second ply, in nonwoven fabric or preferably tissue paper.

According to a further aspect, the invention relates to a system to produce an article in single-ply tissue paper or nonwoven fabric, especially toilet paper, kitchen towel, napkins, handkerchiefs, facial tissues, industrial products and the like, comprising in combination: a section to distribute a superabsorbent material in powder on the ply of tissue paper or nonwoven fabric; a path for the paper ply; and means to make the superabsorbent material adhere to the ply and to produce a finished article in a single-ply sheet of tissue paper or nonwoven fabric.

Moreover, according to the invention, a sheet product is provided comprising at least one ply to which a superabsorbent product in powder is applied. In particular, the product according to the invention is produced in one or more plies of tissue paper and can be a folded sheet product (such as a handkerchief or the like) or in a sheet product wound in a roll.

Advantageously, the product comprises two plies, preferably in tissue paper, joined to each other, between which said superabsorbent material in powder is disposed and retained. Advantageously and preferably, the product

has a grammage of no more than 100 g/m^2 and preferably of no more than 80 g/m^2. Each ply of said product advantageously has a grammage of no more than 100 g/m^2. The quantity of superabsorbent product is more than 0 g/m^2 and preferably less than 10 g/m^2, preferably ranging from 0.1 to 10 g/m^2 and even more preferably from 0.4 to 2.4 g/m^2.

The dimension of the powders is preferably equal to or less than 200 micrometers and preferably at least 98% of the powders has a grain size within 60 micrometers. Advantageously, the superabsorbent powders are composed of a food product.

According to an improved embodiment of the invention, the superabsorbent material is a material encapsulated in the form of microcapsules. In this case, the superabsorbent material could be in the form of microfibers.

By incapsulating the superabsorbent material into microcapsules a number of advantages are achieved. Firstly, the microcapsules can be more easily supplied and applied to the web material, for example by a printing system, i.e. by a system including rollers, by a spray system or with other known techniques suitable for this type of application. Moreover, the film forming the microcapsule makes up a protection against humidity, thereby preserving the superabsorbent material and its integrity until the sheet material is used. Accordingly, even a high humidity percentage in the air does not damage the superabsorbent material and does not impair its quality and functionality. When using the sheet product, for example for cleaning a wet surface, the presence of a relatively high amount of water dissolves the capsule-forming film and releases the superabsorbent material embedded therein, the latter being thus able to carry out its superabsorbent function. As a further, non-negligible advantage, the presence of the microcapsule surrounding the superabosorbent powder can ease the adhesion thereof to the cellulosic fibers forming the sheet product.

The size of the microcapsules can vary, for example and preferably in the range of between 1 and 100 micrometers. They can be made from various materials such as: hydrophilic polymers and materials in general (arabic gum, starch, gelatin, polyvinylpirrolidone, carboxymethylcellulose, polyvinyl alchol,

arginates, pectins, polyacrylates); polymers and other hydrophobic materials (resins, ethylcellulose, cellulose acetate or nitrate, polyethylene polypropylene, silicones, nylon); paraffins; waxes; fats.

Further features and advantageous embodiments of the system, of the method and of the products according to the invention are indicated in the appended claims and shall be described in greater detail hereunder with reference to non-limiting examples of embodiment.

Brief description of the drawings

The invention shall now be better understood by following the description and accompanying drawing, which shows non-limiting examples of embodiments of the invention. More specifically, in the drawings, where the same numbers are used to indicate identical or corresponding parts in the various figures:

Figure 1 is a diagram of a system to produce a multi-ply article; and

Figures 2 and 3 are enlarged schematic cross sections of a multi-ply product; and

Fig. 4 is a microphotograph of a sample of sheet material based on cellulosic fibers, especially a tissue paper, to the fibers of which microcapsules incorporating the superabsorbent material have been attached.

Detailed description of preferred embodiments of the invention

Figure 1 schematically shows a portion of a possible system or production line to produce a single or multi-ply tissue paper article incorporating a superabsorbent material.

The term superabsorbent material is in general intended as a material capable of absorbing a quantity of liquids with a weight of at least 10 times its own weight. The superabsorbent material can be an inorganic superabsorbent material such as an absorbent clay or silica gel. Alternatively, superabsorbent materials of an organic nature, both natural and synthetic, such as agar, pectin, guar rubber, synthetic hydrogel polymers, can be used. These may include the salts of alkaline metals, polyacrylic acids, polyacrylamides, polyvinyl alcohol, polyvinyl ethers, carboxymethylcellulose, hydroxypropyl cellulose, polyvinyl morpholinone, copolymers of maleic anhydride and ethylene, polymers of maleic anhydride and isobutylene, polymers and copolymers of vinylsulfonic

acid, polyacrylates, polyacrylamides, polyvinylpyridine and the like. Starches, optionally grafted with hydrolyzed acrylonitrile or acrylic acid, and mixtures of two or more of the substances listed, may also be used. More generally, various products already used as components of diapers or sanitary towels may also be used as superabsorbent materials.

With reference to Figure 1, the numeral 1 indicates as a whole a first section of distribution of the granular particles of a superabsorbent material, and the numeral 3 indicates an embossing unit, or more precisely, an embossing-laminating unit, that is, a unit which embosses the plies of tissue paper and joins them by gluing. Three distinct paths for three plies of paper material extend along the portion of the system shown in Figure 1. A first ply, indicated with V1 travels through the section 1 and, upon deliver from this section, is joined to a second ply V2. The two plies V1, V2 are subsequently fed to an embossing-laminating unit 3, which receives a third ply of tissue paper V3. The combination of the plies V1, V2 is embossed and joined by lamination to the ply V3, also embossed in the unit 3. The structure of the individual portions 1 and 3 of the system will be described in greater detail hereunder.

The section 1 is provided with a roller 5 with a perforated cylindrical surface. A suction chamber 5A is disposed inside the roller 5, extending for a portion of the circumferential extension of the roller, to define a suction sector 5A in a fixed position along the cylindrical surface of the roller 5.

A counter roller 6 cooperates with the roller 5 and both the ply V1 and the ply V2 are fed into the nip between the rollers 5 and 6. The ply V1 is fed for an angle of approximately 180° around the roller 5.

Positioned around the roller 5 is a device 7 to distribute the powders of superabsorbent material. The device 7 forms a storage chamber, in which the particles of superabsorbent material, fed by means of a metering device of known type and not shown, are held in suspension in a flow of air. Suction through the perforated casing of the roller 5 and through the ply V1 along the extension of the suction sector 5A of said roller 5 causes attraction of the particles or powders of superabsorbent material suspended in the gaseous flow towards and against the outward facing surface (that is, not in contact with the roller 5) of the ply V1. Here the particles are partly retained through the effect of

penetration (caused by suction) between the fibers forming the ply and partly through the effect of any glue previously applied to said surface of the ply V1 by a gluing unit 9, disposed upstream of the area to distribute and apply the particles of superabsorbent material by means of applicators comprising, in this example, the device 7 and the suction roller 5.

The gluing unit 9 has a glue applicator roller 11 which cooperates with a counter roller 13. The ply V1 is fed into the nip between the rollers 11 and 13 and receives, on the face thereof facing the glue dispensing roller 11, an adequate quantity of glue to cause at least partial adhesion of the granular particles of superabsorbent product. The roller 11 may be a patterned roller, or may receive the glue according to a pattern produced on a distributor roller 15 which picks up the glue from a tank and distributes it on the cylindrical surface of the roller 11. This allows the glue to be distributed according to predetermined areas and not over the entire surface of the ply V1.

With adequate distribution of the superabsorbent particles strips or bands of ply V1 can, for example, be produced devoid of particles or powders of superabsorbent material. These bands or strips devoid of superabsorbent material can coincide with the shear planes along which the rolls or logs formed by winding of the plies V1, V2, V3 are subsequently cut, as explained in more detail hereunder, to form the finished rolls or folded products destined for distribution and consumption. In this way the powders or granular particles of superabsorbent material are not distributed in those areas in which the cutting blade acts to divide the web material formed by joining of the plies V1, V2, V3. The absence of these powders in the cutting area reduces wear of the blade and possible dispersion of particles into the surrounding environment, with evident savings in the costs of powders and absence of environmental risks.

The pressure exerted between the rollers 5 and 6 causes reciprocal adhesion of the plies V1 and V2, thanks to the glue applied by means of the dispenser 9.

The combination formed by the plies V1 and V2 and by the superabsorbent material in powder distributed therebetween is fed along a feed path to the embossing-laminating unit 3. Here the combination V1, V2 with the superabsorbent material interposed is fed around a pressure roller 17,

optionally coated in rubber or another yielding material, cooperating with a first embossing roller 19, which is provided on the surface thereof with protuberances of adequate shape, advantageously protuberances with a truncated pyramidal shape, distributed according to an adequate pattern on the circumferential extension of said roller 19.

The embossing roller 19 forms a lamination nip with a second embossing roller 21 which cooperates with a pressure roller 23 equivalent to the roller 17. A third ply V3 is fed around the pressure roller 23 and then into the nip formed between said roller 23 and the second embossing roller 21.

With this arrangement, the ply V3 is embossed by the protuberances provided on the embossing roller 21, while the combination formed by the plies V1 and V2 with the superabsorbent material interposed is embossed between the pressure roller 17 and the first embossing roller 19. In the nip between the rollers 19 and 21, the protuberances of the two rollers 19 and 21 can coincide at least partly and the interdistance between the rollers can be such as to cause depression, that is, lamination, of the plies V1, V2 and V3 between protuberances corresponding with one another of the rollers 19 and 21. In this case a "point-to-point" embossed product is obtained. Reciprocal adhesion of the unit formed by the plies V1 and V2 and by the ply V3 is guaranteed by applying a glue to the protuberances formed on the ply V3 by the points or protuberances of the embossing roller 21. This glue is applied by a glue dispenser 24 conceptually analogous to the glue dispenser 9 described previously.

Instead of a point-to-point laminating unit, an embossing-laminating unit of the "nested" type can be used (as shown in the diagram). In this case, the two embossing rollers 19, 21 have an interdistance and/or reciprocal phasing between the protuberances to ensure there is no pressure between the embossing rollers in the nip defined thereby. The plies V1, V2 and V3 embossed as described above, pass through the nip formed by the rollers 19 and 21 and are laminated together in a lamination area formed between the second embossing roller 21 and a laminating roller 27 disposed downstream of the nip between the rollers 19, 21. In this case, a nested product is obtained. Reciprocal adhesion between the combination of plies V1, V2 with the

superabsorbent material interposed and the ply V3 is again guaranteed by the glue applied by the dispensing unit 25.

The configurations, both point-to-point and nested, of the embossing laminating unit 3 are known and do not require more detailed descriptions. It is also known that the embossing-laminating device 3 can have an adjustable configuration and thus be able to operate alternatively in point-to-point or nested mode.

In a modified embodiment of the system according to the invention, the glue dispenser 9 can be replaced by a "lotion applicator", that is, a device capable of applying products other than glue, for example a softening lotion. Lotion applicators are known and already used conventionally for application to single- or multi-ply paper materials, such as in the production of cleansing wipes. In this case the path of the ply V1 can be the one indicated in Figure 1 to receive the superabsorbent material, or alternatively said ply can by-pass the applicator means of the superabsorbent material and be fed by the counter roller 13 directly around the tensioning unit 14 and from here to the embossing-laminating unit 3. This alternative path can be taken when the lotion applicator which replaces the glue dispensing unit 9 applies a lotion and therefore superabsorbent powders are not added to the product obtained. The system configured in this way is a dual system which can be used to produce products of different types.

Figure 2 schematically represents a cross section, greatly enlarged, of a portion of a multi-ply product obtained with the present invention and indicated as a whole with N. It is observed in the schematic section in Figure 2 that the plies V1 and V2 define an intermediate area or interface in which the superabsorbent material, indicated with S, is contained. In substance, a layer containing superabsorbent powders, which may be continuous or discontinuous, is formed between the plies V1 and V2. These can also be applied in combination with other types of products or additives, such as fillers or the like. In general, it is advantageous for the superabsorbent powders and any fillers or other additives to be distributed in a compound sheet of an essentially constant thickness, to facilitate the subsequent winding or cutting and folding and packaging operations and consequently to obtain a products

with increase aesthetic prestige and devoid of defects in shape.

P1 indicates the protuberances formed by the embossing-laminating unit 3 on the combination composed of the joined plies V1 and V2. These plies have been pre-glued reciprocally by the glue applied by the dispenser 9, said glue also having the function of at least partly attaching the powders of the superabsorbent material S to the ply V1.

The ply V3 is embossed with protuberances P3 formed by the embossing-laminating unit by means of the second embossing roller 21. In Figure 2 the multi-ply web material N is of the point-to-point type, and therefore the protuberances P1 coincide at least partly with the protuberances P3. The glue C is applied between these protuberances to reciprocally join the ply V3 to the combination of plies V1, V2.

Figure 3 shows, again schematically and greatly enlarged, the cross section of a multi-ply article or product, again indicated with N, obtained with a configuration of the embossing-laminating unit 3 of the nested type. The same numbers indicate parts identical or equivalent to those in Figure 2. It can be observed in this case that the protuberances P1 are intercalated between the protuberances P3 with a nested arrangement.

The plies V1, V2 and V3 advantageously can have a grammage (that is, weight per surface unit) ranging from 10 to 100 g/m^2. Preferably, the overall grammage of the article, inclusive of the superabsorbent powders, ranges from 10 to 100 g/m^2 and even more preferably from 20 to 80 g/m^2.

The superabsorbent material or product in powder which is distributed in the section 1 of the system can be a superabsorbent polymer of known type. Examples of superabsorbent polymers which can be employed for this purpose are: cross-linked sodium polyacrylate polymers; polymers originating or deriving from cellulose.

Nonetheless, according to a preferred embodiment of the invention, also in view of the destination of the finished product, the superabsorbent material is provided with food characteristics, meaning it is not harmful if inhaled or ingested. Food, or edible, characteristics are intended as the suitability of this material to come into contact with foods. In this way the finished product can also be used without contraindications as kitchen towel, for example, for

domestic use to clean kitchen worktops, dishes, or the like, as absorbent paper for use in cooking (absorbing frying oils or the like) and also to produce absorbent sheets to add to food packaging, inside trays destined to hold meat, fish or other food products that release fluids.

Examples of superabsorbent food or edible products in the sense indicated above are: polymers deriving from carboxymethylcellulose with a degree of cross-linking from low to high; or associative polymers, that is, capable of creating interactions between the molecules which cannot be represented by means of a bond.

Tests performed showed that the absorption power of the finished product initially increases as the quantity of superabsorbent materials contained therein increases; upon reaching a quantity of approximately 1.0 g/m^2 the absorption power is maximum, after which it decreases when the quantity of superabsorbent materials inserted between the plies is increased. This is because in order to expand and absorb to a maximum, the superabsorbent particles require space therebetween, said space being limited by an excessive quantity of superabsorbent particles.

According to a preferred embodiment of the invention, therefore, the quantity of superabsorbent material distributed is greater than 0 g/m^2 but preferably equal to or less than 4 g/m^2. More preferably, the quantity of said materials distributed per unit of surface is below 2.4 g/m^2 and even more preferably ranges from 0.4 to 1.2 g/m^2.

In the above and according to the representation in Figure 1, the superabsorbent powders distributed on the face of the ply V1 which comes into contact with the ply V2, in the case of multi-ply, are at least partly made to adhere by the use of a glue. Nonetheless, it would also be possible for these powders to be retained at least temporarily until reaching the embossing and laminating area of the embossing-laminating unit 3 regardless of whether glue is applied. For example, this is the case when the powders of superabsorbent material are particularly fine and remain trapped, through the effect of suction, between the fibers forming the ply V1.

Although in the example illustrated in Figure 1 a glue applicator 9 with a roller distributor 11 has been used, different distribution or application of glue on

the ply V1 would also be possible. For example, the glue could be applied in a spray or even with systems of different types.

The glue used can be chosen for example in the group comprising a solution of synthetic resins or an aqueous solution of synthetic polymers.

According to a particularly advantageous embodiment of the invention, the glue is a hot-melt resin, and according to a preferred embodiment it is based on ethylene vinyl acetate.

According to a possible embodiment of the invention, the glue itself contains particles of superabsorbent materials in powder or granules. In this case all the superabsorbent material applied to the article can be contained in the glue, in which case the applicator means of the superabsorbent material will be composed of the same glue applicator 9. In this case the suction roller 5, the distributor 7 and any other accessories for distribution of the superabsorbent powders can be omitted or deactivated. The ply V2 is joined to the ply V1, for example in the area of the counter roller 13.

Moreover, it would also be possible for the superabsorbent material to be in part mixed in the glue and in part applied in dry state by applicator means of the type of the roller 5 and the device 7 or analogous applicator means having the same function. In this case part of the superabsorbent material is made to adhere to the ply V1 during application of the glue, and a further dose of superabsorbent material is distributed in a subsequent phase and attached to the ply V1 through the effect of the glue previously applied and which contains part of the superabsorbent material.

The use of glues mixed with superabsorbent materials is known (see P.Zoromski, <<*The Development and Advantages of Absorbent Hot Melt*>>, in Nonwovens World, February-March 2004, page 63 ff.), but in relation to the production of sanitary towels, babies' diapers and other similar articles, rather than in relation to the production of thin tissue paper articles, such as toilet paper, kitchen towel, paper napkins or handkerchiefs and equivalent products, to which the present invention relates.

According to a possible embodiment of the invention, the embossing performed by the embossing-laminating unit 3 or other equivalent alternative or additional unit to the unit 3, can be produced so as to form an additional barrier

against lateral leakage of the powders of superabsorbent material included in the space between the plies V1 and V2.

The powders (or, as an alternative, other phisical forms of the superabsorbent material or product, such as fibers of very limited length) may be incorporated into microcapsules prior to the application thereof on the sheet product, typically a tissue paper. The process of forming the microcapsules, i.e. the microencapsulating process, is known per se, as are the machines suited for the application of microcapsules, for example by spreading, impression, spraying or other, onto a web material in the form of a continuous sheet. Such techniques and machinery will not therefore be described herein.

Fig. 4 is a microphotograph with a 1000x enlargement of a sample of tissue paper, to the fibers of which microcapsules M are attached, said microcapsulescontaining superabsorbent material encapsulated into the microcapsule-forming film.

It is understood that the drawing merely shows an example provided purely as a practical demonstration of the finding, which may vary in forms and arrangements without however departing from the scope of the concept on which said finding is based.

Claims

1. A sheet product comprising at least one ply to which a superabsorbent material in powder form is applied.

2. Product as claimed in claim 1, produced in tissue paper.

3. Product as claimed in claim 1 or 2, comprising at least two plies, preferably in tissue paper, joined to each other, between which said superabsorbent material in powder form is disposed and retained.

4. Product as claimed in one or more of the previous claims, having a grammage of no more than 100 g/m^2 and preferably of no more than 80 g/m^2.

5. Product as claimed in one or more of the previous claims, wherein each ply of said product has a grammage of no more than 100 g/m^2.

6. Product as claimed in one or more of the previous claims, comprising a quantity of more than 0 g/m^2 and less than 10 g/m^2, preferably ranging from 0.1 to 10 g/m^2 and even more preferably from 0.4 to 2.4 g/m^2 of superabsorbent powder.

7. Product as claimed in one or more of the previous claims, wherein said superabsorbent material has a dimension of powders of no more than 200 micrometers.

8. Product as claimed in claim 7, wherein a percentage equal to at least 98% in weight of the powders has a diameter of no more than 60 micrometers.

9. Product as claimed in one or more of the previous claims, wherein said superabsorbent material is a food material.

10. Product as claimed in claim 8, wherein said superabsorbent material is chosen from the group comprising: polymers deriving from carboxymethylcellulose with a degree of cross-linking from low to high; or associative polymers, that is, capable of creating interactions between the molecules which cannot be represented by means of a bond; or their mixtures.

11. Product as claimed in one or more of the previous claims, wherein said superabsorbent material is at least partly retained by gluing to at least one of said plies.

12. Product as claimed in claim 10, wherein said superabsorbent material is at least partly incorporated in a glue.

13. Product as claimed in claim 11, wherein said glue is a hot-melt glue.

14. Product as claimed in claim 12, wherein said glue is ethylene vinyl acetate.

15. Product as claimed in one or more of the previous claims, comprising at least an edge area devoid of superabsorbent material.

16. Product as claimed in one or more of the previous claims, comprising a first ply, a second ply and at least a third ply of tissue paper, and wherein said superabsorbent material is disposed between the first and the second ply.

17. Product as claimed in claim 15, wherein said first and said second ply are joined to each other by gluing.

18. Product as claimed in claim 15 or 16, wherein said at least one third ply is joined to the combination formed by the first and by the second ply, with the superabsorbent material disposed therebetween, by embossing.

19. Product as claimed in one or more of the previous claims, wherein said superabsorbent material is held in microcapsules applied on said at least one ply.

20. Product as claimed in claim 19, wherein said microcapsules have a dimension ranging form 1 to 100 micrometers.

21. Product as claimed in claim 19 or 20, wherein said microcapsules are made from a material chosen from the group comprising: arabic gum, starch, gelatin, polyvinylpirrolidone, carboxymethylcellulose, polyvinyl alchol, arginates, pectins, polyacrylates, hydrophobic resins, ethylcellulose, cellulose acetate, cellulose nitrate, polyethylene polypropylene, silicones, nylon, paraffins, waxes, fats.

22. A sheet product comprising at least one ply to which a superabsorbent material is applied, said superabsorbent material being held in microcapsules attached to said ply.

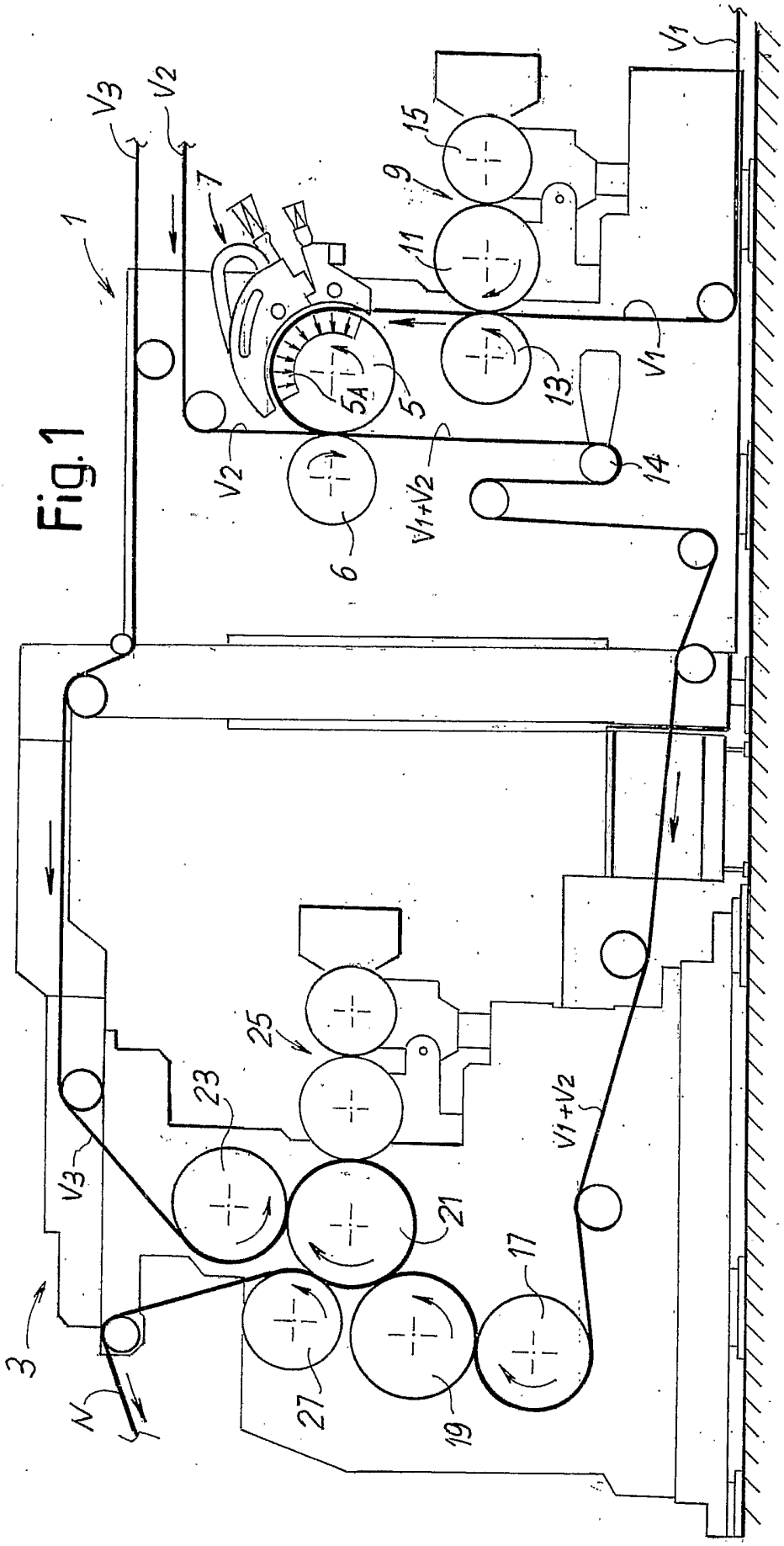


Fig.1

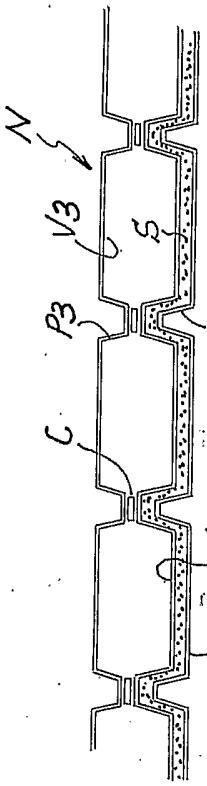


Fig.2

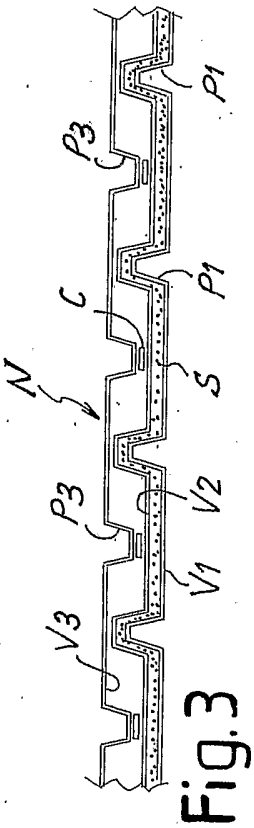


Fig.3

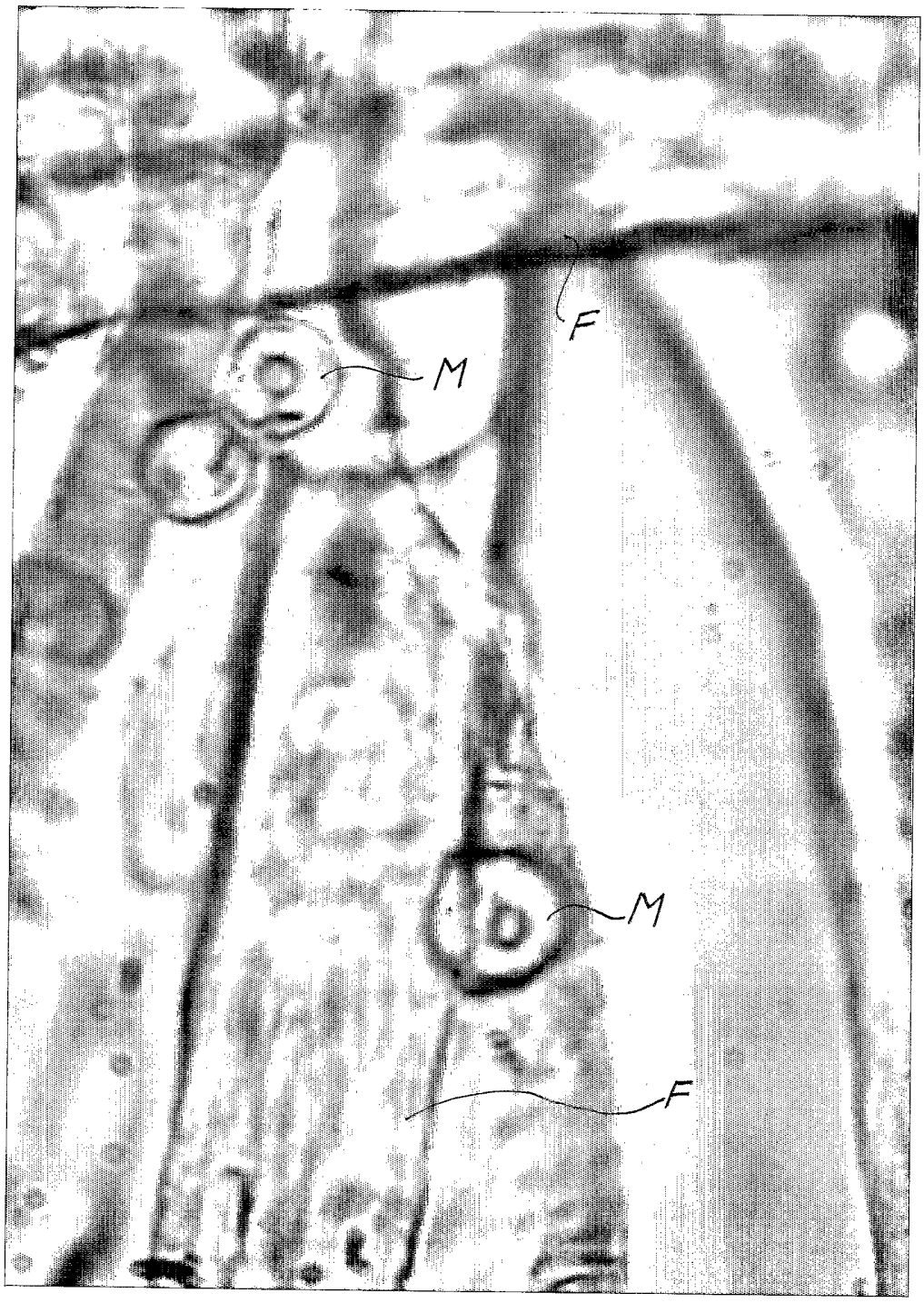


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2006/000022

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61F13/534 A61F13/539

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61F A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 4 360 022 A (USAMI ET AL) 23 November 1982 (1982-11-23) column 6, line 5 - line 39; figures 4,5	1,15
A	WO 95/00183 A (MOELNLYCKE AB; STEGER, CHRISTINA; GUIDOTTI, EDWARD; OESTERDAHL, EJE; W) 5 January 1995 (1995-01-05) claim 1	19-22
A	FR 2 627 080 A (CELATOSE SA) 18 August 1989 (1989-08-18) claims; figures 3,9	19-22

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 April 2006	26/04/2006

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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