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(54) **Substantially inorganic fibrous material and method for the production thereof.**

(57) A substantially inorganic fibrous sheet material and a method and a filler for the production thereof are disclosed. The sheet material comprises

(a) cationic inorganic fibres,

(b) a cationic inorganic filler including a mixture of talc and soapstone,

(c) an anionic binder including an anionic polyelectrolyte and, optionally, cellulose fibres, and

(d) strength-improving additives including thermoplastic polymer particles.

To produce the sheet material, a stock is formed of the above-mentioned components, the stock charge being adjusted such that a substantially charge-neutral system is obtained, and the stock being formed into a sheet.

The filler consists of a mixture of talc and soapstone.

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Description

SUBSTANTIALLY INORGANIC FIBROUS MATERIAL AND METHOD FOR THE PRODUCTION THEREOF

The present invention relates to a substantially inorganic fibrous sheet material, to a method for the production of such a sheet material by paper technology, and to a filler for the production of such a sheet material.

By "paper technology" is meant the technology used for papermaking, i.e. preparing an aqueous suspension or stock of the different constituents and dewatering the suspension, to form a sheet which is then subjected to drying and, optionally, to subsequent treatment, such as calendering.

In the conventional production of fibrous sheet materials, cellulose fibres are the principal constituent. Cellulose fibres are disadvantageous in so far as they impart to the sheet material inferior dimensional stability and a tendency to mildew. The sheet material therefore is unsuitable for use in, for example, humid environments.

It is known to partly replace the cellulose fibres of such sheet materials by inorganic fibres and fillers. The constituents are bonded together in conventional manner by stock sizing or by application of a binder in a size press, or by a combination thereof.

Thus, it is previously known from European patent application 78850011.4 (Publication No. 1539) to produce a carrier material in the form of a fibrous mat by proceeding from mineral fibres and cellulose fibres in an aqueous suspension which also contains an acrylate binder. After the suspension has been dewatered on a wire, the sheet thus formed is pressed and dried, whereupon a binder in the form of a styrene-butadiene latex is added. One disadvantage of this known material is that the styrene-butadiene latex splits off formalin, and furthermore the high cellulose fibre content of the material makes it unstable against moisture and mildew.

From DK patent application 5436/76 it is previously known to prepare a composite material containing cellulose fibres, film-forming particulate or fibrous polymer material, polyelectrolyte, and optionally an inorganic particulate or fibrous material. Also this material has a high content of cellulose fibres (15-40% by weight), because of which the material does not satisfy the requirements for dimensional stability and resistance to moisture and mildew.

In the above-mentioned prior art technique, the cellulose fibres of the sheet material have been but partly replaced by inorganic fibres. One reason why a relatively high content of cellulose fibres in the sheet material was retained, in spite of the disadvantages in respect of inferior dimensional stability and resistance to moisture and mildew, is that the material must have a given wet strength to make its production by paper technology possible. In conventional papermaking, the wet strength is provided by the cellulose fibres which have a bonding effect by hydrogen bonds during formation of the paper web. Consequently, a rapid wet strength development requires rapid formation and dewatering, which also is advantageous in so far as it affords an opportunity to increase the production capacity.

However, this aspiration for a rapid dewatering has caused difficulties in the production of sheet materials containing inorganic fibres, such as glass fibres because inorganic fibrous materials do not develop hydrogen bonds and therefore do not themselves contribute any bonding strength. Rapid dewatering thus gives an inferior wet strength, and to set this right it has therefore been necessary to retain, in prior art technique, a relatively high content of cellulose fibres in the material, and furthermore wet strength agents in the form of, for example, melamine resins were added.

One application where the requirements placed on the material are especially high are wall materials for bathrooms or laundry-rooms, so-called wet room wallpaper, i.e. vinyl plastic layers on a backing material.

This type of wall material is difficult because it is set up with the lengths in edge-to-edge relationship and welded by means of a joint sealing liquid. After that, the wallpaper is not allowed to move under the action of moisture and/or heat because the wallpaper will then bulge out and detach itself from the wall so that the joint opens out in an unattractive manner, permitting moisture to penetrate behind the wallpaper. Earlier backing materials consisted of paper, but this has now been replaced by nonwoven glass fibre materials resistant to moisture and mildew. Nonwoven glass fibre material, on the other hand, suffers from the disadvantage that the vinyl plastic must be applied in at least two steps - priming (sealing) and finishing - because the vinyl plastic will otherwise flow through the nonwoven glass fibre material. The two-step application means a considerable rise in price. Besides, many people dislike working with nonwoven glass fibre materials since they are apt to cause skin irritations.

The present invention aims at obviating the disadvantages of prior art materials and providing a material which is substantially inorganic, i.e. it consists to at least 50% by weight of inorganic material, and which is dimensionally stable and resistant to temperature changes, moisture and mildew.

This is achieved, in accordance with the invention, by a unique combination of constituents and steps for making a sheet material therefrom.

More particularly, the present invention provides a substantially inorganic fibrous sheet material which is characterised in that it comprises

(a) cationic inorganic fibres;

(b) a cationic inorganic filler including a mixture of talc and soapstone;

(c) an anionic binder including an anionic polyelectrolyte and, optionally, cellulose fibres; and

(d) strength-improving additives including thermoplastic polymer particles.

The invention also provides a method for producing, by paper technology, a substantially inorganic fibrous sheet material, said method being characterised by forming a stock of

(a) cationic inorganic fibres;

(b) a cationic inorganic filler including a mixture of talc and soapstone;

(c) an anionic binder including an anionic polyelectrolyte and, optionally, cellulose fibres; and

(d) strength-improving additives including thermoplastic polymer particles, the charge of the stock being controlled such that a substantially charge-neutral system is obtained;

and forming a sheet from the stock.

The invention also provides a filler for the production of a substantially inorganic fibrous sheet material which is characterised in that the filler consists of a mixture of talc and soapstone.

Further characteristic features of the invention will appear from the following description and the appended claims.

Among the constituents of the sheet material according to the invention, the inorganic filler is an especially characteristic and significant constituent. The inorganic filler of the invention is cationic and includes a mixture of talc and soapstone. Besides acting as a filler, the mixture of talc and soapstone acts as a dewatering controller, more particularly in order to provide a controlled slow dewatering. Moreover, the filler contributes to creating a product which is "dead", i.e. a product which is dimensionally stable and does not change under the action of moisture and temperature changes.

The function of the filler as a dewatering controller is due to the fact that, in contrast to conventional sheet material production by paper technology, the present invention does not require maximum dewatering, but instead a slower and controlled dewatering. The reason for this is that, because inorganic fibrous materials do not themselves contribute any wet strength, the present invention utilises the water of the sheet material suspension as an initial contributor to the wet strength. To this end, the water of the sheet material suspension must be retained until the sheet material has developed a sufficient dry strength through the binders added. The mixture of talc and soapstone utilised by the present invention has been found to possess unique and extremely advantageous properties for this purpose. The reason for this has not been fully explained.

The generic term "talc" usually includes (a) the mineral talc, (b) steatite, which is a compact variant of talc, and (c) the rock type soapstone.

The mineral talc is a hydrated magnesium silicate of the ideal composition $Mg_3Si_4O_{10}(OH)_2$. The talc content of commercial talc is high and usually lies at about 97% by weight. For the production of commercial talc, talc mineral is crushed and comminuted and then purified by flotation to provide a talc product having a high talc content and whiteness.

Soapstone is a natural product consisting mineralogically of talc in mixture with a high content of chlorite and minor amounts of carbonate and amphibole. For example, soapstone from Handöl in Sweden has the following mineral composition

talc	about 67% by weight
chlorite	about 18% by weight
carbonate	about 8% by weight
amphibole	about 3% by weight
ore material	about 4% by weight

For maximum results in respect of dewatering and wet strength, the talc and the soapstone in the filler mixture of the invention should have different mean particle sizes. Thus, it is preferred that the talc is coarse grained and has a mean particle size of about 10-20 µm, while the soapstone is fine grained or micronised and has a mean particle size of about 5-10 µm. The relative proportions of talc and soapstone in the filler mixture of the invention may vary within wide limits, preferably from a weight ratio of about 30:70 to about 70:30, more preferred from about 40:60 to about 60:40, and most preferred about 50:50. The filler content in the sheet material of the invention may also vary within wide limits, but is preferably about 1-80% by weight, more preferred 45-70% by weight.

In addition to the especially characteristic cationic, inorganic filler described above, the sheet material of the invention also contains cationic inorganic fibres. The content of inorganic fibres in the sheet material may vary within wide limits, but is preferably about 1-80% by weight, more preferred about 20-40% by weight. In principle, the inorganic fibres may be freely selected among existing inorganic fibres, provided that they are cationic, i.e. have a positive charge. If the inorganic fibre is not cationic in itself, it can be made cationic by subjecting the fibre in per se known manner to a surface treatment such that the fibre will obtain a positive surface charge. It is preferred, in the present invention, that the inorganic fibres are mineral fibres, and most preferred are glass fibres. The fibre length and diameter are not critical, but it is preferred that the mean fibre diameter is within the range 1-20 µm, and that the mean fibre length is in the range 2-20 mm, preferably 5-15 mm.

The sheet material according to the invention may comprise, as a further cationic constituent, a cationic polyelectrolyte in a content of up to about 2% by weight.

A polyelectrolyte is a polymer having the character of an electrolyte, which means that, like an electrolyte, it is dissociated in aqueous solution in ions and is electrically conductive. Depending on whether the polymer main chain is positively or negatively charged upon dissociation, the polyelectrolyte is said to be cationic or anionic, respectively. The starting material of cationic polyelectrolytes are derivatives of esters and amides. A characteristic feature of these polyelectrolytes is an ammonium group which may be present in the form of a salt of tertiary amine, or as a quaternary ammonium group. The starting material for anionic polyelectrolytes usually is acrylic and methacrylic acid.

The cationic polyelectrolyte, together with the remaining cationic constituents, i.e. the inorganic filler and the inorganic fibres, serves to balance the negative charges of the anionic constituents of the sheet material. In principle, such balancing of the positive and negative charges to obtain charge neutrality can be attained by suitable adjustment of the amounts of inorganic filler and inorganic fibres, and the cationic polyelectrolyte therefore is no indispensable constituent of the sheet material according to the invention. However, it has proved to be both simpler and more practicable, especially in the continuous production of the sheet material of the invention, to effect the said balancing and achieve charge neutrality by adding a cationic polyelectrolyte, and the invention therefore prefers to do so. As will be discussed in more detail hereinafter, the cationic polyelectrolyte is preferably added in repeated doses.

The cationic polyelectrolyte can be selected among any available polyelectrolytes of this type, and since these are per se well known, no detailed enumeration would here seem necessary.

As examples, however, mention may be made of the cationic polyelectrolytes commercially available from the company Stockhausen under the trade names Prestol 436k and Prestol 521k, and from the company Röhm GmbH, Federal Republic of Germany, under the trade name ROHAFLOC KL 925.

In addition to the cationic constituents mentioned above, the sheet material also contains anionic constituents in an amount such that they form, together with the cationic constituents, a charge-neutral system. As has been mentioned before, the anionic constituents include a binder comprising an anionic polyelectrolyte and, optionally, also cellulose fibres. The use of anionic polyelectrolytes as dispersing and flocculating agents is previously known, but the inventor is not aware that they have been used before as a binder or, as in the present invention, added to an aqueous suspension or stock in order to develop dry strength in the sheet material formed. Generally, the anionic polyelectrolytes are in the form of diluted aqueous solutions having a concentration of about 10-35% by weight. Since anionic polyelectrolytes are per se well known, a detailed enumeration thereof would not seem necessary. As examples, however, mention may be made of the flocculating polymers commercially available under the trade name Prestol, for example Prestol 2935/74 which is manufactured by Stockhausen, and of the anionic polyelectrolyte Prodefloc N2M from the company Prodeco in Italy, and PLEX 4911 from the company Röhm GmbH. In the sheet material according to the invention, the content of anionic polyelectrolyte suitably is 3-20% by weight, preferably about 5-10% by weight.

As mentioned above, the sheet material according to the invention may optionally contain cellulose fibres to improve the dry strength of the material. However, a high content of cellulose has a negative effect on the dimensional stability of the sheet material and its resistance to moisture and mildew, for which reason the cellulose fibre content of the invention is maintained as low as possible, such as at most about 8% by weight, preferably at most about 5% by weight. The cellulose fibres are preferably added in a content of about 2-5% by weight, more preferred about 4-5% by weight. For the production of sheets on a pick-up felt paper machine, the cellulose fibres can be left out completely. This is different from prior art technique which generally uses cellulose fibres in contents of 30% by weight and more. In contrast to prior art technique, the cellulose fibres of the present invention furthermore are not long, but have preferably been thoroughly beaten to a dewatering resistance of about 75-100° Schopper-Riegler (°SR).

In addition to the above-mentioned cationic and anionic constituents, the sheet material of the invention also contains a strength-improving additive including thermoplastic polymer particles. By "particles" are here meant not only granules, but also flakes and fibres. The strength-improving additive is intended to impart dry strength to the sheet material in that the thermoplastic polymer particles during sheet production in, for example, the drying section or in a hot-calender are heated to cause them to sinter or fuse together at their contact or crossing points, while substantially maintaining their original configurations, such that the particles form a coherent three-dimensional network structure or reinforcement imparting dry strength to the sheet material.

The thermoplastic polymer particles are preferably included in a content of about 2-20% by weight in the sheet material according to the invention.

In principle, the charge of the thermoplastic polymer particles is not especially critical, and they may be for example anionic or nonionic, but it is especially preferred that they are nonionic. The thermoplastic polymer particles can be freely selected among available thermoplastic polymer particles or mixtures thereof. However, since the temperature in the drying section of the paper machine used for the production of the sheet material, and also in the hot-calender, lies at about 70-120°C, the thermoplastic polymer particles should be allowed to soften within this temperature range, preferably at about 70-80°C. An especially preferred thermoplastic polymer in the context of the invention is polyvinyl alcohol. Among other useful thermoplastic polymers, mention may be made of polyethylene, polypropylene, polyvinyl chloride, polyester and polycarbonate. As has been mentioned, the thermoplastic polymer particles may be in the form of fibres. The fibre dimensions are not critical, but it is preferred that they have a mean length of about 0.6-12 mm, preferably about 1-6 mm, and a weight length of about 0.5-10 dtex, preferably about 1-6 dtex.

The sheet material according to the invention normally has a thickness of about 0.1-1.5 mm, preferably about 0.1-0.5 mm, and most preferred about 0.15-0.25 mm, but greater thicknesses can be obtained without difficulty by multi-layer techniques (using for example several head boxes).

The production of the substantially inorganic fibrous sheet material according to the invention will now be described. As has been mentioned in the introduction, the sheet material is produced by paper technology, and since paper technology is a well-known and well-established technique, it would not seem necessary to give a detailed description of this technique and the equipment utilised. Instead, the description hereinafter is drawn to the characteristic features of the invention, i.e. the method by which the components are combined to form the sheet material, and the sequence in which this is done.

In the method according to the invention, the inorganic fibres, preferably surface-treated glass fibres according to the above, are slushed in water. The glass fibre concentration preferably is about 1% by weight since the fibres in higher concentrations, for example above about 3% by weight, tend to form lumps.

Then the inorganic filler which includes a mixture of talc and soapstone according to the above, is added to the glass fibres suspension, and preferably cellulose fibres are added as well to contribute to the strength of the material.

Then the anionic polyelectrolyte is added to the resulting slurry or stock.

After the anionic polyelectrolyte has been added, a charge-neutral system must be established, and if necessary the desired charge neutrality is adjusted by adding cationic material. As has been mentioned before, charge neutrality can be achieved in principle by relative adjustment of, on the one hand, the amounts of the anionic polyelectrolyte and any cellulose fibres present and, on the other hand, of the cationic inorganic filler and the cationic inorganic fibres. Such adjustment can be conveniently carried out during batchwise production of the sheet material according to the invention. In continuous sheet production utilising conventional paper technology, for example on a fourdrinier, or a Yankee machine, such controlled adjustment is not readily achieved, and it is therefore preferred to add cationic polyelectrolyte, whereby a charge-neutral system is quickly established.

All of the requisite cationic polyelectrolyte can be added in one go, but it has surprisingly been found that it is to advantage if the cationic polyelectrolyte is added in several, preferably two doses. Thus, it was found that adding the cationic polyelectrolyte in one go gives an about 60-70% precipitation of the remaining anionically charged constituents of the sheet material, whereas a 95-100% precipitation is obtained if the cationic polyelectrolyte is added in two doses. The higher precipitation is readily observable visually in that the initially slightly milky suspension becomes limpid upon precipitation. When the cationic polyelectrolyte is added in batches, the first batch is preferably added to the stock after the anionic polyelectrolyte has been added, whereupon the second batch is added immediately ahead of the head box. The major part of the cationic polyelectrolyte, for example 60-95% by weight, preferably about 85-95% by weight, is added with the first batch. If use is made of nonionic thermoplastic polymer particles, such as the nonionic polyvinyl alcohol particles preferred according to the invention, the system must be charge-neutral if one is to obtain uniform distribution of the nonionic thermoplastic polymer particles.

Besides the above-mentioned principal components of the sheet material according to the invention, one or more additives known in paper technology, such as hydrophobating agents, antifoaming agents, colourants, optical brightening agents, retention agents and lubricants, may be added as well.

Care should be taken that the aqueous suspension or stock has a suitable ionic strength that can be controlled by means of alkali or alkaline earth salts, such as sodium, magnesium or calcium salts, of which calcium salts, such as calcium chloride, give the best result. The salt addition reduces the repulsion of the electric double layer between the less charged surfaces of the upper and lower sides of the filler particles. Normally, the calcium ion content is supplied by the water hardness which should be about 18-26° dH (German hardness), but if the water hardness is unsuitable, it is adjusted by adding a calcium salt so that the calcium content will be about 7-18 mol/m^3 H_2O, which corresponds to about 0.4-1.0 kg $CaCl_2$/m^3 H_2O.

When all constituents have been supplied to the stock, the stock is run through the head box onto the wire and conducted through the press and drying sections of the paper machine in conventional manner. According to the invention, it is preferred that the first part of the drying section is heated to maximum temperature (about 90-120° C) to quickly achieve dry strength of the sheet material. To avoid fibre rising, the second part of the drying section should have a lower temperature (about 60-70° C). Furthermore, it is preferred to calender the sheet material after the drying section at a temperature of about 70-120° C and at a pressure of about 18-25 N/mm. As has been mentioned before, the strength-improving thermoplastic polymer of the sheet material should be selected such that it begins to soften on the surface at about 70° C, whereby the thermoplastic particles are bonded together at the crossing points during treatment in the drying section and the hot-calender. The thermoplastic particles should not, however, melt completely and flow into each other at the temperatures used in the drying section and the hot-calender, respectively.

The sheet material according to the invention has a variety of applications, for example in wall, floor and roof covering materials (e.g. in roofing felt), and in foamed products, such as polyurethane, polyvinyl chloride and phenol plastics. The sheet material according to the invention may be included as a carrier or backing material, but may also be included as, for example, an intermediate layer, or be used separately.

The sheet material according to the invention contains, as mentioned above, at least 50% by weight of inorganic material. Preferably, the sheet material contains 70-80% by weight or more of inorganic material, and so far as the inventor is aware it has not previously been possible, by using paper technology, to produce sheet materials with these high contents of inorganic fibres and fillers.

To further illustrate the invention, the following nonrestrictive Examples are given.

Examples 1-3

Three pieces of sheet material were produced, using the constituents and the contents (% by weight) indicated in Table 1.

The soapstone used in the Examples was of type H340 from Handöl, Sweden. This is a micronised soapstone having a mean diameter of 5-10 µm. The talc content is about 67% by weight, and the loss on ignition about 8% by weight. The oil absorption value is 55 g oil/100 g soapstone, and the melting point is 1500° C.

The talc used in the Examples was of the type Finntalk P40 from Outokumpu Oy, Finland, which has a mean diameter of about 10-20 µm, a talc content of about 97% by weight, a loss on ignition of 7% by weight, and an oil absorption value of 32 g oil/100 g talc. The melting point is 1375° C.

The thermoplastic particles used in the Examples were polyvinyl alcohol flakes of the type Moviol from Hoechst and polypropylene fibres of the type Pulpex P from Herkules.

TABLE 1

Examples	1	2	3
Glass fibres (cationic, length 10 mm, diameter 3 µm)	20	35	29
Soapstone	40	33	25
Talc	28	13	25
Cellulose (long-fibre pine sulphate cellulose which has been beaten and bleached, 95° SR)	4	6	-
Cationic polyelectrolyte (ROHAFLOC KL 925 from Röhm)	0.5	1.0	-
Anionic polyelectrolyte (PLEX 4911 from Röhm)	5	7	10
Thermoplastic particles (PVA)	2.5	5	11

First about 1.0 kg $CaCl_2/m^3$ H_2O is added to the stock water to give a water hardness of 23° dH. Then the cationic glass fibre is added and slushed to a slurry having a concentration of about 1.0% by weight. To the slurry, the cationic soapstone and the talc are admixed. The soapstone is greyish-green, and the talc practically white. In those cases where the composition includes cellulose fibres, these are also supplied to the slurry.

Then the anionic polyelectrolyte is added, and the system now begins to turn into a charge-neutral system. To ensure that the system is indeed a charge-neutral system, the cationic polyelectrolyte is added in several (two) doses. Finally, the thermoplastic particles are added to the charge-neutral system.

The resulting slurry or stock is supplied to the paper machine, and the water is sucked off immediately ahead of the drying section. The first part of the drying section has been heated to maximum temperature (about 90-120° C) to rapidly increase the dry strength of the sheet. After the drying section, the sheet is hot-calendered at a pressure of 23 N/mm.

The properties of the sheet materials thus produced were then tested, and the results obtained are indicated in Table 2.

TABLE 2

Examples	1	2	3
Grammage, g/m²	130	135	132
Thickness, mm	0.163	0.151	0.175
Density, g/dm³	798	894	754
Air resistance No. (Gurley), s	5	4	2
Tensile index, machine direction	15.2	18.3	33.9
Tensile index, cross direction	7.9	8.9	16.2
Elongation, machine direction, %	2.1	1.6	4.2
Elongation, cross direction, %	1.5	1.7	4.6
Bending force, mN	59	53	91
Dimensional stability, machine direction % *	0.13	0.14	0.12
Dimensional stability, cross direction % *	0.16	0.16	0.14
Z-strength, kPa	183	158	222
Coal ash %	88	81	79

* The values of dimensional stability are the difference in per cent in the machine and cross directions, respectively, of the dimensions of the material before and after soaking in water for 10 min.

Claims

1. Substantially inorganic fibrous sheet material, **characterised** in that it comprises

(a) cationic inorganic fibres;

(b) a cationic inorganic filler including a mixture of talc and soapstone;

(c) an anionic binder including an anionic polyelectrolyte; and

(d) strength-improving additives including thermoplastic polymer particles.

2. Sheet material as claimed in claim 1, wherein the mixture of talc and soapstone is present in a weight ratio of about 30:70 to about 70:30.

3. Sheet material as claimed in claim 1 or 2, wherein the talc has a mean particle diameter of about 10-20 μm, and the soapstone a mean particle diameter of about 5-10 μm.

4. Sheet material as claimed in any one of the preceding claims, comprising1-80% by weight of inorganic filler,
1-80% by weight of inorganic fibres,
3-20% by weight of anionic polyelectrolyte,
2-20% by weight of thermoplastic polymer particles.

5. Sheet material as claimed in any one of the preceding claims, further comprising up to about 2% by weight of cationic polyelectrolyte.

6. Sheet material as claimed in any one of the preceding claims, further comprising cellulose fibres as an anionic binder.

7. Sheet material as claimed in claim 6, comprising up to about 8% by weight of cellulose fibres.

8. Sheet material as claimed in claim 6 or 7, wherein the cellulose fibres have a beating degree of about 75-100° SR.

9. Sheet material as claimed in any one of the preceding claims, wherein the thermoplastic polymer particles are thermoplastic polymer flakes.

10. Sheet material as claimed in claim 9, wherein the thermoplastic polymer particles are nonionic thermoplastic polymer flakes.

11. Sheet material as claimed in claim 9 or 10, wherein the thermoplastic polymer particles consist of polyvinyl alcohol.

12. A method for producing, by paper technology, a substantially inorganic fibrous sheet material, **characterised** by forming a stock of
(a) cationic inorganic fibres;
(b) a cationic inorganic filler including a mixture of talc and soapstone;
(c) an anionic binder including an anionic polyelectrolyte, and
(d) strength-improving additives including thermoplastic polymer particles,
the charge of the stock being controlled such that a substantially charge-neutral system is obtained
and forming a sheet from the stock.

13. A method as claimed in claim 12, wherein the stock is formed of an inorganic filler including a mixture of talc and soapstone in a weight ratio of from about 30:70 to about 70:30.

14. A method as claimed in claim 12 or 13, wherein the stock is formed of an inorganic filler including a mixture of talc having a mean

particle size of about 10-20 μm and soapstone having a mean particle size of about 5-10 μm.

15. A method as claimed in any one of claims 12-14, wherein the stock charge is adjusted by adding up to about 2% by weight of a cationic polyelectrolyte which is preferably added in several doses.

16. A method as claimed in any one of claims 12-15, wherein thermoplastic polymer particles, preferably of polyvinyl alcohol, are added as strength-improving additive.

17. A method as claimed in any one of claims 12-16, wherein up to about 8% by weight of cellulose fibres, preferably having a beating degree of about 75-100° SR, is also added as anionic binder.

18. Filler for producing a substantially inorganic fibrous sheet material, **characterised** in that the filler consists of a mixture of talc and soapstone.

19. Filler as claimed in claim 18, wherein the mixture contains talc and soapstone in a weight ratio of from about 30:70 to about 70:30.

20. Filler as claimed in claim 18 or 19, wherein the talc has a mean particle diameter of about 10-20 μm, and the soapstone has a mean particle diameter of about 5-10 μm.

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 89 85 0055.8

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	GB-A-1 597 369 (KJELD HOLBEK APS) *Claims 1-10* ---	1-20	D 21 H 5/18
A	EP-A1-0 003 214 (GAF CORPORATION) *Abstract* ---	1-20	
A	GB-A-2 031 475 (PAPETERIES DALLE ET LECOMTE) *Claims 1-2* -----	1-20	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			D 21 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
STOCKHOLM	12-05-1989	NILSSON B.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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