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(54) **Coating composition**

(57) The invention relates to a coating composition intended for coating paper, board or other fibrous webs, which coating composition comprises mineral pigment and binder and optionally other additives. The pigment amounts to 100 parts per weight and the binder amounts to 6-36 % by weight calculated on the weight of pigment, said pigment comprising gypsum and said binder com-

prising both latex and starch. The invention also relates to a process for the manufacture of a coated paper, board other fibrous web and to a coated paper product, a coated board product, and a printed paper or board comprising the inventive coating.

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DescriptionTechnical field

5 **[0001]** The present invention relates to a coating composition intended for the coating of paper, board or other fibrous webs.

Background of the invention

10 **[0002]** The present invention relates to a coating composition intended for coating of paper, board or other fibrous webs, which composition comprises gypsum. Interest in gypsum as an ingredient in paper and board coatings has grown during recent years. Coatings that contain gypsum result in coated products with improved printing properties and brightness as compared with other earlier coatings, without impairing the smoothness and gloss of the product. WO 01/55506 discloses such a coating comprising gypsum.

15 **[0003]** It has, however, been found that gypsum has a negative impact on the runnability of the coating at the coating station as compared with coatings comprising only kaolin and/or calcium carbonate. The occurrence of bleeding, whiskering and misting is more common and the coating equipment needs to be cleaned more frequently. This problem is particularly pronounced in blade coating stations, since coating containing gypsum has a tendency to stick to the blade. Coating in rod coating stations, e.g. film coating, is also impaired by this phenomenon. The paper web travels at high
20 speed at the coating station and forces the surrounding air to move in the same direction. As a result, air is drawn away from the upper edge of the blade or rod, leading to a negative pressure and whirl formation in this area and coating particles move upwards and against this side of the blade. The coating particles cling to the surface of the coating equipment and whiskers or stalagmites comprising both fibres and coating particles are formed at the upper edge of the blade. These whiskers may result in bleeding, leading to uneven coating and impairing the paper quality. There is also
25 a risk that flakes of coating that were stuck on the coating blade or rod detach and land on the surface of the coated surface, which can lead to contamination of equipment parts down-stream from the coating station. Such loose flakes on the coated surface can also lead to sticking together of the paper web during rolling of the web, which may lead to holes in the web and to web break. The whiskering may also impair the printing properties since these flakes are not effectively bonded to the coated surface, and instead may fall off during or after printing, thus giving a less attractive
30 printed product. Poor runnability at the coating station results in production disturbances affecting the whole production process, which are thus rather expensive.

[0004] Therefore a need remains to find a way to avoid the runnability problems, and the object of the present invention is to provide a solution to the runnability problems that are connected with gypsum containing coatings.

35 Summary of the invention

[0005] The above object is achieved by the coating composition of the present invention. The solution according to the invention is based on the surprising finding that a combination of latex and starch as the binder in the coating composition results in a much better runnability and the problems with bleeding, whiskering and misting are essentially
40 avoided, whereas the printing properties, brightness, smoothness and gloss of the coated product are not impaired. The use of the coating of the invention thus leads to a lower disturbance frequency in the production of the coated paper products, which in turn provides considerable economical savings.

[0006] The invention relates to a coating composition intended for coating paper, board or other fibrous webs, which coating composition comprises mineral pigment and binder and optionally other additives. The pigment amounts to 100
45 parts per weight and the binder amounts to 6-36 % by weight calculated on the weight of pigment, said pigment comprising gypsum and said binder comprising both latex and starch. The invention also relates to a process for the manufacture of a coated paper, board other fibrous web and to a coated paper product, a coated board product, and a printed paper or board comprising the inventive coating.

[0007] Without wanting to be bound by theory, the following percentages of ingredients are believed to provide the
50 beneficial properties described below.

[0008] The binder of the coating preferably comprises at least 3% by weight of starch, calculated on the weight of pigment, as this gives excellent runnability. Moreover, the binder preferably comprises less than 18 % by weight of starch, calculated on the weight of pigment, in order to maintain the surface strength at a satisfying level, and more preferably less than 8 % by weight of starch, calculated on the weight of pigment, in order to improve the surface strength
55 and to maintain paper gloss. In order to achieve a proper binding of the coating, the coating composition preferably comprises at least 3 % but less than 18 % by weight of latex, more preferably less than 12 % by weight of latex, calculated on the weight of pigment. Further, the pigment of the coating preferably comprises 20-100% by weight of gypsum calculated on the total weight of pigment, and 0-80% by weight kaolin or calcium carbonate or a mixture thereof. Kaolin

improves the paper gloss, and calcium carbonate may be used as a complement to a part of the gypsum, which may be desirable for economic reasons.

[0009] As mentioned above the invention also relates to a process for the manufacture of a coated paper, board or other fibrous web, which comprises the following steps:

- a) forming a fibrous web from a pulp; b) coating the fibrous web in at least one coating stage, wherein the fibrous web is coated with the above coating composition.

[0010] The invention also relates to a coated paper product and a coated board product comprising the coating. Paper and board that are coated with the coating composition of the invention have excellent printing properties and are especially suitable for heatset offset or digital printing techniques. The invention thus also relates to a printed paper or board comprising a paper or board product coated with the above coating composition and which is printed by heatset offset or digital printing techniques.

Detailed description of the invention

[0011] The coating composition of the invention comprises gypsum, latex and starch. In previous gypsum-containing coatings it was common to use latex alone as a binder, since starch was believed to have a negative influence on runnability and paper quality.

[0012] It has now been found that starch combined with latex as the binder in a gypsum-containing coating composition does not impair the properties of the resulting coated product. Surprisingly, it considerably improves the runnability of the composition at the coating station.

[0013] The coating composition should preferably comprise at least 3% by weight of starch calculated on the weight of pigment, as the improvement in runnability is not so pronounced below this level. The more starch the better the coating runnability, but also the poorer surface strength. Runnability is thus to be balanced against surface strength. In order to keep surface strength at a satisfactory level, the starch content should preferably be less than about 18 % by weight calculated on the weight of pigment, preferably less than 8 %. Further preferred percentages of starch are 4%, 5 %, 6 % and 7 %. The starch used may be of any suitable kind, such as potato starch. The starch also contributes to water retention, viscosity control, pumpability and is a carrier of optical brightening agents (OBA). By combining starch in the binder, the amount of CMC added may be reduced and PVA may be omitted.

[0014] The content of latex is preferably 3-18 % by weight calculated on the weight of pigment, preferably 3-12 %, and the combined starch and latex content should preferably amount to 6-36 % by weight calculated on the weight of pigment. Further preferred percentages of latex are 5 %, 8 % and 10%. The latex may be synthetic latex, such as styrene-butadiene latex.

[0015] Gypsum preferably comprises 20-100% by weight of gypsum calculated on the total weight of pigment. As a complement to the gypsum, the pigment may preferably contain 80-0% by weight kaolin or calcium carbonate or a mixture thereof.

[0016] In addition to the above components the coating composition may also comprise further additives which are commonly used in paper coating compositions, such as CMC, PVA and optical brightening agents (OBA).

[0017] In a preferred form the coating composition thus comprises:

- 100 parts per weight of pigment, of which
 - 20-100 % by weight is gypsum, e.g. 20-99% or 50-80%
 - 0-80 % by weight is another pigment, such as kaolin and/or calcium carbonate, e.g. 1-80% or 20-50%
- 3-18% by weight of starch binder, calculated on the weight of pigment,
- 3-18% by weight of latex binder, calculated on the weight of pigment, and
- optionally any desired additives, such as CMC, PVA and/or OBA.

[0018] The coating composition is used in a process for the manufacture of a coated paper, board or other fibrous web, which comprises the steps of: a) forming a fibrous web from a pulp; b) coating the fibrous web in at least one coating stage with the above described coating composition. The coating is preferably carried out in a blade coating station or a rod coating station, e.g. film coating station. The fibrous web is preferably coated with 6-15 g/m² of coating composition per coating layer. The fibrous web may be coated with one or more coating layers. The coated product may thus be a paper web, a board web or other fibrous web. The coated paper product may be calendered, e.g. by online calendaring or soft offline calendaring.

[0019] The coated products of the invention have excellent printing properties and are especially suitable for heatset offset or digital printing techniques. These coated products are particularly advantageous when high gloss and delta gloss (i.e. a difference between printed and unprinted gloss) is desired.

Examples

[0020] A series of trial runs were performed in order to evaluate the runnability of different coating colour compositions. Three different coating colours were prepared, of which one was according to the present invention (A), and two (B and C) were comparative examples. The ingredients of the coating colour composition are shown in table 1.

Table 1

	Trial A	Trial B (comparative)	Trial C (comparative)
Gypsum (parts by weight)	50	50	-
Calcium carbonate (parts)	30	30	60
Clay (parts)	20	20	40
Starch (parts)	3,5	-	4,5
Latex (parts)	9,0	12,5	8,0
CMC (parts)	0,45	0,6	0,2
OBA (parts)	0,6	0,6	0,4

[0021] The trials were performed using printing paper web in a blade coating station. In each trial the paper web was coated with one layer of the coating colour. Paper properties, i.e. gloss, smoothness, brightness, delta gloss, IGT, and wet pick of the coated paper web were measured and runnability was evaluated. Runnability was evaluated through observations made at the coating station by the equipment operators staff. The coating station operator inspected the coating station equipment after each tambour and noted whether cleaning of the equipment was necessary. The coating colour in trial B resulted in a much higher frequency of cleanings of the coating equipment. The results are shown in table 2.

Table 2

	Trial A	Trial B	Trial C
Gloss ts (%)	23	25	31
Gloss ws (%)	27	27	32
Smoothness (PPS) ts (u)	2,4	2,5	2,6
Smoothness (PPS) ws (u)	2,4	2,7	2,8
Brightness (%)	80,2	79,7	77,7
Delta gloss ts (%)	39	37	27
Delta gloss ws (%)	30	29	24
IGT ts (m/s)	1,5	1,4	0,9
IGT ws (m/s)	1,4	1,4	0,9
wet pick ts (%)	< 1	< 1	3,0
wet pick ws (%)	< 1	< 1	6,2
Runnability	Good	Bad	Good

[0022] The results show that the gloss, smoothness and brightness are comparable for all three trial runs. The delta gloss was improved with coating colours A and B which contain gypsum. The surface strength, as measured in terms of IGT and wet pick, was decreased for coating colour A and B. The runnability was poor in trial B, in which the coating colour did not comprise the combination of latex and starch. The runnability of trial A was good, and equivalent to the runnability of trial C.

[0023] The combination of latex and starch in the binder thus renders the runnability of the gypsum-containing coating composition as good as non-gypsum-containing coating compositions.

Claims

1. A coating composition intended for coating paper, board or other fibrous webs, which coating composition comprises mineral pigment and binder and optionally other additives, and wherein the pigment amounts to 100 parts per weight and the binder amounts to 6-36 %, preferably 8-20 % and most preferably 10-15 % by weight calculated on the weight of pigment, said pigment comprising gypsum and said binder comprising both latex and starch.
2. The composition of claim 1, wherein the binder comprises at least 3 % by weight of starch calculated on the weight of pigment.
3. The composition of claim 2, wherein the binder comprises less than 18 % by weight of starch calculated on the weight of pigment, and preferably less than 8 % of starch.
4. The composition of any one of claims 1-3, wherein the binder comprises at least 3 % and less than 18 %, preferably less than 12 % by weight of latex calculated on the weight of pigment.
5. The composition of any one of claims 1-4, wherein the pigment comprises 20-100% by weight of gypsum calculated on the total weight of pigment.
6. The composition of any one of claims 1-5, wherein the pigment comprises 0-80 % by weight kaolin or calcium carbonate or a mixture thereof, calculated on the total weight of pigment.
7. A process for the manufacture of a coated paper, board other fibrous web comprising the following steps:
 - a) forming a fibrous web from pulp, and
 - b) coating the fibrous web with least one coating layer,wherein the fibrous web is coated with the coating composition of any one of claims 1-6.
8. A coated paper product comprising a coating composition of claims 1-6.
9. A coated board product comprising a coating composition of claims 1-6.
10. A printed paper or board comprising the products of claims 8 or 9 and being printed by heatset offset or digital printing techniques.



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Place of search Munich		Date of completion of the search 26 June 2006	Examiner Karlsson, L
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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