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A METHOD OF DE-INKING WASTE PAPER MATERIALS

ABSTRACT

A method of de-inking waste paper materials consists in pulping the paper material in a hydropulper 1 to form a fibrous stock, and adding a substance in the form of a mixture of phosphated and carbonated sodium salts to the fibrous stock to disperse ink particles from the stock. The stock and dispersed ink particles pass through washing stages 4, 7 and 8, in a centrifugal cleaner 5, in order to remove the ink particles from the fibrous stock.

This invention relates to a method of de-inking waste paper materials.

In the paper and board industry, the use of secondary fibres derived from recycling waste paper materials is well-known, and the dispersal and separation of ink particles from waste paper materials and its secondary fibres is a necessary step in the recycling of the material, particularly in the production of paper for newsprint, tissues, and fine paper.

In known re-cycling processes, the waste paper or "furnish" is usually placed in a hydrapulper where it is mixed with water and the following chemicals:

(1) caustic soda or other de-inking chemical,

(2) sodium metasilicate as a buffering agent, and

(3) hydrogen peroxide or other bleaching agent.

In the hydrapulper, the "furnish" is disintegrated into a fibrous pulp, which is then de-inked and bleached by the added chemicals. From the hydrapulper the fibrous pulp or slushed fibres, with a consistency of 15% (as in high

consistency pulping) or 5-6% (as in Mills not using high consistency pulping), is dumped into a series of "dump" or storage chests where the slushed fibres are diluted down to a consistency of around 1.5%.

The "stock" or diluted slushed fibres then pass to the de-inking equipment, which either consists of flotation cells or washing screens or a combination of these, where the dispersed ink particles are removed from the slushed fibres.

In the method of utilising flotation cells, a "collector" soap is added to the "stock" prior to entering the de-inking cell to agglomerate the dispersed ink particles which then float to the surface of the cell on air-bubbles which are sourced at the base of the flotation cell and which are then skimmed off.

In the washing method of de-inking the disparsed ink particles are washed out of the system by passing the stock onto a rotary decker, a sidemill screen, a screw press, or similar equipment, using large volumes of water.

These known methods of de-inking thus require the addition of a number of different de-inking chemicals. Some chemicals are also only effective

for one of the two different methods, i.e. flotation and washing methods, and cannot be used in the other method. Furthermore, caustic soda, which is most commonly used in relatively large amounts as a de-inking chemical, can attack the fibres and may not be regarded as being environmentally safe when emptied from the mill into external water sources.

It is therefore an object of the present invention to provide a method of de-inking waste paper materials which substantially removes the above-mentioned problems associated with known methods.

Accordingly, the present invention consists in a method of de-inking waste paper materials comprising the steps of:-

pulping the paper material to form a fibrous stock of a slush-like consistency;

adding a substance to the fibrous stock to disperse ink particles from the stock;

and removing the dispersed ink particles from the fibrous stock;

characterised in that the substance used to disperse ink particles consists of a mixture of phosphated and carbonated sodium salts.

Preferably, the substance consists of 1 to 75% weight in weight of sodium carbonate and 25 to 99% weight in weight of sodium phosphate.

The substance may also include 1 to 2% weight in weight of metasilicates and/or 0.5 to 2% weight in weight of caustic soda.

The substance may also include hygroscopic salts, together with a non-caustic booster, and may include a sanitiser.

If desire, a bleaching chemical may be added, for example 0.25 to 5% weight in weight of hydrogen peroxide or any other suitable bleaching agent.

The invention will now be further described by way of example with reference to the accompanying drawing, which illustrates schematically one embodiment of the present invention.

Referring now to the drawing, there is shown a flow diagram of a washing method of de-inking, the steps of which are well-known to those skilled in the art, except for the replacement of known de-inking substances by the substance as used in accordance with the present invention.

In the illustrated method, waste paper is fed

into a hydrapulper 1, in which it is disintegrated into a fibrous pulp or fibrous stock of a slushed consistency. Water is added to the stock, together with a substance to disperse ink particles from the stock. From there, the stock and dispersed ink particles pass into a centrifugal cleaner 2 to remove grit, pins, clips, etc, and through a screen 3 to remove oversized particles.

The stock then passes to a first washing stage 4 consisting of a thickener 5 and a fine deflaker or disperser 6, which produces a well defibered stock, which is reasonably clean and free from ink specks but still contains very small ink particles. From there, the stock passes to second and third washing stages 7 and 8 respectively, each including a vertical screen 9 and in which dilution water is added to the stock. A fourth washing stage 10 consists of another thickener 11, and the clean stock is then passed from the thickener 11 to refiners and paper-making machinery.

In accordance with an embodiment of the present invention, the substance added to disperse the ink particles consists of a mixture of 1 to

75% weight in weight of sodium carbonate and 25 to 99% weight in weight of sodium phosphate, with a typical composition being 8% weight in weight of sodium carbonate and 92% weight in weight of sodium phosphate.

The substance may also include small quantities of metasilicates (for example 1 to 2% weight in weight) and/or caustic soda (for example 0.5 to 2% weight in weight). The composition may be further enhanced by using hygroscopic salts, together with a non-caustic booster, and may include a sanitiser. A bleaching agent, for example 0.25 to 5% hydrogen peroxide, may also be added.

As an alternative to the above-described washing method of de-inking, the substance may be utilised to disperse ink particles in known flotation methods.

The use of this substance in de-inking methods has advantages over the use of the chemicals generally used as follows:-

(1) It is an effective ink dispersant in both traditional methods of de-inking (i.e. Flotation and Washing), unlike other de-inking products which are only effective in one or other

of the traditional methods but not both.

(2) By virtue of its formulation, it can be used as a "one-shot" ink dispersant in the hydrapulper, without the need for the addition of buffering agent or any other chemical in the hydrapulper.

(3) It is effective as an ink dispersant at low temperatures (eg. $9^{o}C$), and therefore saves the power required to heat the hydrapulper contents to 50^{o}-$60^{o}C$, as is necessary in known methods using other de-inking chemicals.

(4) Unlike caustic soda, it does not attack the fibres, and therefore gives a stronger paper end product, and may be used as a caustic soda replacement in the hydrapulper.

(5) As an ink dispersant, it does not necessarily require a collector soap in Flotation de-inking, nor the high temperature ($60^{o}C$) necessary when a collector soap is used, this giving further economies in use.

(6) It is safer to the environment, i.e. it is much less toxic to aquatic wildlife, and has lower and more acceptable Biological Oxygen Demand (B.O.D.) and Chemical Oxygen Demand (C.O.D.) when emptied from the mill into external water sources

than other de-inking products at the present time e.g. caustic soda or bleach.

(7) In mill trials, it has been found to have excellent "former" properties in that it gives a uniform distribution of fibres in the finished paper which results in a better quality end product.

Furthermore, mill machine runs and further experimental procedures utilising this substance in de-inking methods have revealed the following additional advantages:-

(a) striking increases in the strength of the recycled products of between 5 to 30%, depending on the waste mix in the furnish used;

(b) production of a better, less speckled product when used to de-ink better grade, office-type waste paper, hitherto known as "difficult to de-ink" grade (i.e. wood-free waste);

(c) successful attacks on laser print, xerographic print, hitherto known as "difficult to remove" inks, and on the new FLOXO inks, as well as producing a higher brightness than standard de-inking products; and

(d) enabling up to 85% of "stickies" or gums

to be passed out, thus removing the bulk of a major problem of the paper recycling industry, which can account for expensive "down-time" of the machines.

Whilst particular embodiments of the present invention have been described, various modifications will be envisaged without departure from the scope of the invention, as defined in the appended claims.

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CLAIMS

1. In a method of de-inking waste paper material comprising the steps of:-

pulping the paper material to form a fibrous stock of a slush-like consistency;

adding a substance to the fibrous stock thus formed to disperse ink particles from the fibrous stock;

and removing the ink particles thus dispersed from the fibrous stock;

the improvement, which enables the method to be carried out at ambient temperatures, consists of using a mixture of phosphated and carbonated sodium salts as the substance for dispersing the ink particles from the fibrous stock.

2. A method as claimed in claim 1, wherein the substance consists of 1 to 75% weight in weight of sodium carbonate and 25 to 99% weight in weight of sodium phospahte.

3. A method as claimed in claim 2, wherein the substance consists of 8% weight in weight of sodium carbonate and 92% weight in weight of sodium phosphate.

4. A method as claimed in claim 1, wherein the substance includes metasilicates.

5. A method as claimed in claim 4, wherein

the substance consists of 1 to 2% weight in weight of metasilicates.

6. A method as claimed in claim 1, wherein the substance includes caustic soda.

7. A method as claimed in claim 6, wherein the substance consists of 0.5 to 2% weight in weight of caustic soda.

8. A method as claimed in claim 1, wherein the substance includes hygroscopic salts, together with a non-caustic booster.

9. A method as claimed in claim 1, wherein the substance includes a sanitiser.

10. A method as claimed in claim 1, wherein the substance includes a bleaching agent.

11. A method as claimed in claim 10, wherein the substance consists of 0.25 to 5% weight in weight of hydrogen peroxide.

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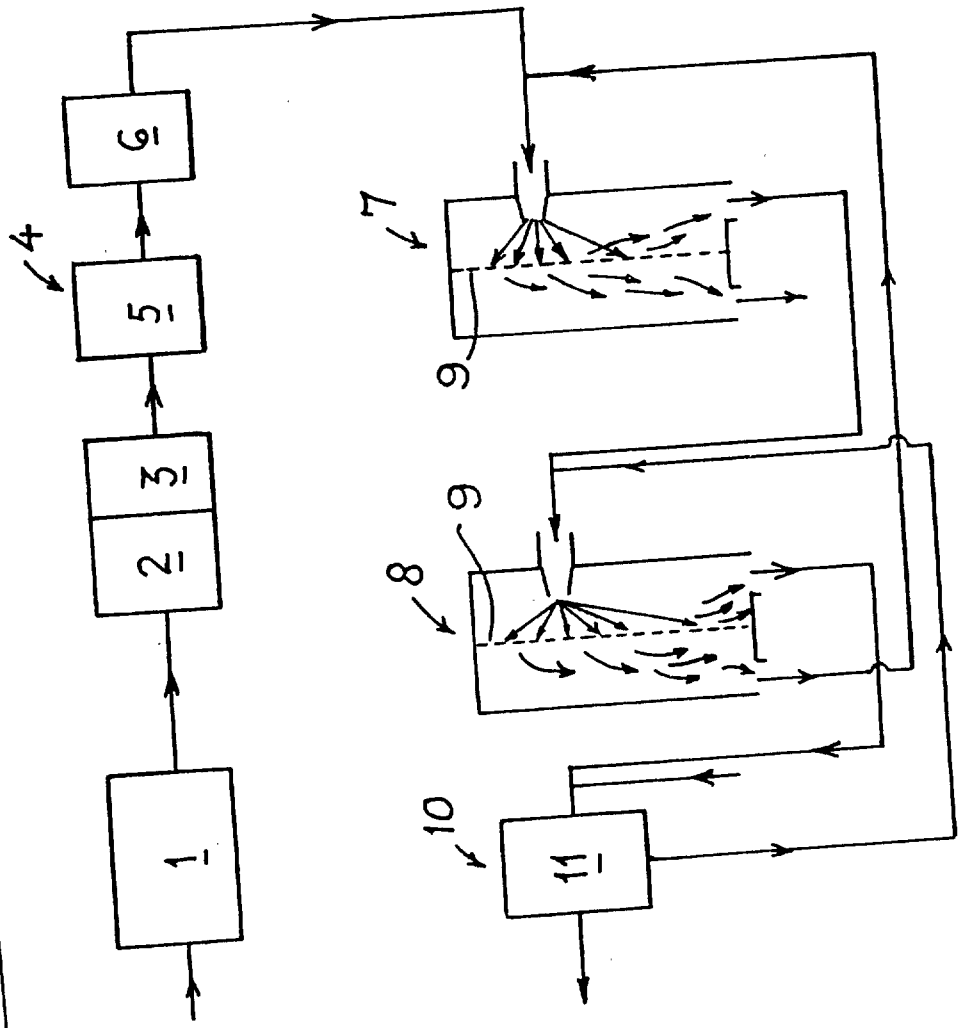
Patented FEB 1 1993 Patent No. 27030



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