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TREATMENT OF FELTS FOR PAPER
MACHINES

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The invention relates to the treatment of paper machine felts.

These felts are used on paper machines as wide bands, as rollers, or as tubes for removing the water from, and drying paper, cardboard, or cellulose. Up to now fibrous materials (wool or cotton) as pure as possible and free from all color which show a maximal absorbing capacity and which do not contaminate sensitive varieties of paper, have been used, and it was the general opinion that any addition would impair the durability of the felts instead of increasing it.

Detailed investigations have shown that additions of the kind described below under certain circumstances do not impair the felts nor the paper and the cellulose but increase the durability of the felts.

The deterioration which the felts undergo during use consists in their becoming brittle; in some cases the felts were damaged during storage.

The so-called wet felts which are used on the wet stages of the paper manufacture showed considerable deterioration during the summer months, and lasted but a fraction of the ordinary time, without the reasons being hitherto recognized. The so-called dry felts i. e. the felts which dry the paper or the like by the action of heated rollers likewise become impaired or brittle during use in the course of time. The reason for this deterioration was hitherto supposed to lie either in the manufacture of felts from fibres which were injured or defective from the beginning, or in improper procedures in the course of the manufacture of the felts. It was also believed that traces of sulphurous compounds remaining in the paper fibres from the preparation of the wood cellulose formed strong acids which were transferred to the felts and damaged them. Therefore it has been proposed to treat the felts, before use, with an alkali, preferably water glass, in the presence of a soluble oil. This treatment however is either insufficient since the alkaline substances if applied in moderate amounts are soon consumed during use, while if a large excess of these substances is used, the felts will be damaged thereby.

I have found that in most cases the injury to the felt is not due to the presence, within the paper fibres, of sulphur compounds which would have better been neutralized within the paper mass, for instance in the vat. I have also found that frequently the felt becomes impaired only after its manufacture and during its use, and that such deterioration is due to different causes,

It has been ascertained that the felts, as far as they are not used on the dry parts of the machine and especially the wet felts are destroyed during use and sometimes even during storage, by bacteria which gradually consume the wool. These bacteria grow particularly in the interior of the wool fibres under their sheaths and for this reason were not discovered prior to my investigations. These investigations have also shown, as regards dry felts, that their deterioration is caused mostly by an increase or enrichment of free sulphuric acid which is formed by hydrolysis from the alum or aluminumsulphate used in sizing the paper. This free acid is absorbed by the felt and enriched on the side of the felt which comes in contact with the paper. The consequence is a gradual destruction of the fibres on that side, while the fibres at the other side of the felt are not impaired for the acid does not penetrate throughout the felt.

To overcome these difficulties, I have devised certain novel features which will appear from the description following hereinafter and which will be particularly pointed out in the appended claims.

Against the action of bacteria bactericidal or immunizing substances have generally been proved suitable. Oxides, hydroxides and salts of metals such as magnesium, aluminium or chromium, particularly of bactericidal metals are available, but also diluted weak acids such as formic or acetic acid and their salts are suitable. Other substances as silicofluorides, phenols, chinones and their derivatives and also certain bactericidal dyestuffs such as Methylene blue, Auramine and malachite green have a similar effect. Furthermore substances which are derivatives of picric acid or the cresoles may be used.

Certain of these substances have a greater affinity for free sulphuric acid than the textile fibres; therefore they also protect the latter from the action of the acid.

Of course, several of these substances may be used together in order to increase or to compensate their specific effect.

As to protection of the felts against damages caused by free acid, neutralizing substances are used which do not attack the fibres. Water-insoluble basic substances such as oxides, hydroxides of the alkaline earth metals or of the earth metals or heavy metals or compounds of such metals with weak acids such as the carbon or boric acid are suitable.

This treatment however is not confined to the preparation of the felts.

In some cases it has proved advantageous to treat the felts continually while in use, by adding small quantities of suitable substances.

One may incorporate a certain quantity of suitable substances in the paper mass itself so that on the paper machine small quantities of these substances are absorbed by the felt.

- 10 Preferably, neutralizing or bactericidal substances may be continually added in small portions on the paper machine itself during the operation of such machine, to that side of the felts which is exposed to the detrimental action of the free acid or the bacteria. It has been proved that in this way a perfect and lasting protection is obtained without the felt being permeated by the treatment medium throughout its whole thickness. Other substances of a strongly alkaline reaction may also be used which otherwise are detrimental to the felts, for instance ammonia or alkali, for the small quantities of alkaline substances are consumed at once by the acid which is continually absorbed by the felt; while a woolen felt ordinarily is attacked by ammonia or alkali, a continual treatment of the felts on the paper machine with small quantities of such substances which are just sufficient to neutralize the absorbed free acid, is quite harmless, for said alkaline substances are neutralized at once and the neutralization products such as ammonium sulphate or sodium sulphate are not injurious to the wool.

- 35 This treatment of the felts is preferably carried on continually by means of wetting rollers or spraying nozzles. Moreover vapors or gaseous substances are also suitable. The dust, mist or vapor of these substances may be admixed to the warm current of air which is ordinarily used for the purpose of drying the felts. The felts may also, as far as volatile substances are used, simply be conducted over an open trough or channel filled with these volatile neutralizing substances.

- 45 As far as wetting rollers are used but a small effect is obtained if pure water is used without any neutralizing substance, by which the acid is continually washed out from the felt.

- 50 The paper felts treated in one of the ways set out above have a considerably longer life than hitherto, while the absorbing power is not impaired.

- In the same way bactericidal substances may be applied by using them alone or intermixed with neutralizing substances on one of the sides of the felt.

- Of the numerous performances of my invention, some examples are given in the following, without limiting the scope of my invention:

- 60 1. A paper felt of 80 kg. is dyed after scouring or in the washing machine by a bath of 1000 liter containing 10 g. Malachite green during half an hour; then 150 ccm. diluted acetic acid are added. The felt may also be preliminarily mordanted. The concentration of the bath may be varied within wide limits.

2. A felt is treated in the washing machine by diluted solutions of chlor cresole or chlor-thymole or sulphonated butyl naphthalene or mixtures of such substances and dried without rinsing.

3. The felts are soaked with a solution of borax and dried at once. By the action of free sulphuric acid sodium sulphate is formed while boric acid which is not injurious to the fibres is freed.

4. The felts are treated, preferably in the washing machine, with a solution of chromium acetate or aluminium acetate, then steamed and dried or dried without steaming. Instead of aluminium or chromium acetate other mordant agents may be used, v. g. chromic acid or its salts.

5. The felts are washed with diluted formic acid or acetic acid or other acids or salts of acid reaction to remove or decrease the soluble al-
bumines which favor the formation of bacteria, and then dried. It is advantageous to leave an acid content corresponding to a P_H -value of about 5.

Silicofluorides are applied in a similar way.

6. For the purpose of neutralization of woolen felts, such felts, while on the paper machine, are continually moistened on that side which comes in contact with the paper with a solution of very dilute ammonium formate or acetate, by the use of a roller running in a bath of one of these solutions. Cotton felts are treated in a similar way, for instance with a solution of ammonium carbonate. Instead of ammonium salts other compounds of alkaline reaction may be used, such as amides. The traces of sulphuric acid which are absorbed by the felt are at once neutralized by the ammonium, and the free weak acid is vaporized as well as any excess of unchanged ammonium salt.

In a similar way immunizing substances may be applied on the other side of the felt which is mainly exposed to damages by bacteria.

7. Woolen felts are treated on the paper machine according to the preceding example, but 35 applying the neutralizing or immunizing medium in the form of dust, mist or vapor, which may be carried to one side of the felt by the current of air which is ordinarily used for the purpose of drying the felts.

8. The neutralizing or immunizing media may also be added to the paper fibre mass or to the paper band.

What I claim is:

1. In the treatment of felts for paper making machines the use of dyestuffs.

2. In the treatment of paper machine felts, the step which consists in adding, while the felt is on the paper machine, exclusively on that surface of the felt which is adapted to be in contact with the paper during the manufacture of the paper, a neutralizing substance adapted to render such felt resistant to acids, thus causing such felt to possess a maximum of acid-resisting power at that surface which is adapted to be in contact with the paper during the manufacture of the paper.

3. In the treatment of paper machine felts, the step which consists in adding, exclusively on that surface of the felt which is adapted to be out of contact with the paper during the manufacture of the paper, a substance adapted to render such felt resistant to bacteria thus causing such felt to possess a maximum of bacteria-resisting power at the surface which is adapted to be out of contact with the paper during the manufacture of the paper.

4. In the treatment of paper machine felts, the step which consists in adding to the felt continually, while it is on the paper machine and during the operation of said machine, a neutralizing substance in an amount sufficient to render such felt resistant to acids.

5. In the treatment of paper machine felts, the step which consists in adding continually, while

the felt is on the paper machine and during the operation of said machine, exclusively on that surface of the felt which is adapted to be in contact with the paper during the manufacture of the paper, a neutralizing substance adapted to render such felt resistant to acids, thus causing such felt to possess a maximum of acid-resisting power at that surface which is adapted to be in contact with the paper during the manufacture of the paper.

6. In the treatment of paper machine felts, the step which consists in adding continually, while the felt is on the paper machine and during the operation of said machine, exclusively on that surface of the felt which is adapted to be out of contact with the paper during the manufacture of the paper, a substance adapted to render such felt resistant to bacteria, thus causing such felt to possess a maximum of bacteria-resisting power at the surface which is adapted to be out of contact with the paper during the manufacture of the paper.

7. In the treatment of paper machine felts, the step which consists in adding to the felt continually, while it is on the paper machine and during the operation of said machine, such small quantities of a neutralizing substance as are sufficient to neutralize the acid traces passing from the paper mass to such felt.

8. In the treatment of paper machine felts, the step which consists in adding to the felt continually, while it is on the paper machine and during the operation of said machine, small quantities of a liquid neutralizing substance.

9. In the treatment of paper machine felts, the step which consists in adding to the felt continually, while it is on the paper machine and during the operation of said machine, a mist of sprayed neutralizing liquid.

10. In the treatment of paper machine felts, the step which consists in treating the felt con-

tinually with neutralizing vapors while it is on the paper machine and during the operation of said machine.

11. In the treatment of paper machine felts, the step which consists in treating the felt continually with a volatile neutralizing substance while the felt is on the paper machine and during the operation of said machine.

12. In the treatment of paper machine felts, the step which consists in treating such felt, while it is on the paper machine and during the operation of the machine, with a current of drying air laden with a neutralizing substance.

13. In the treatment of paper machine felts, the step which consists in treating the felt continually while it is on the paper machine and during the operation of such machine, with an ammoniacal substance.

14. In the treatment of paper machine felts the steps which consist in adding continually, while the felt is on the paper machine and during the operation of said machine, exclusively on that surface of the felt which is adapted to be in contact with the paper during the manufacture of the paper, a neutralizing substance adapted to render such felt resistant to acids, thus causing such felt to possess a maximum of acid resisting power at that surface which is adapted to be in contact with the paper during the manufacture of the paper, and which consist further in adding continually, while the felt is on the paper machine and during the operation of said machine, exclusively on that surface of the felt which is adapted to be out of contact with the paper during the manufacture of the paper, a substance adapted to render such felt resistant to bacteria, thus causing such felt to possess a maximum of bacteria-resisting power at the surface which is adapted to be out of contact with the paper during the manufacture of the paper.

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