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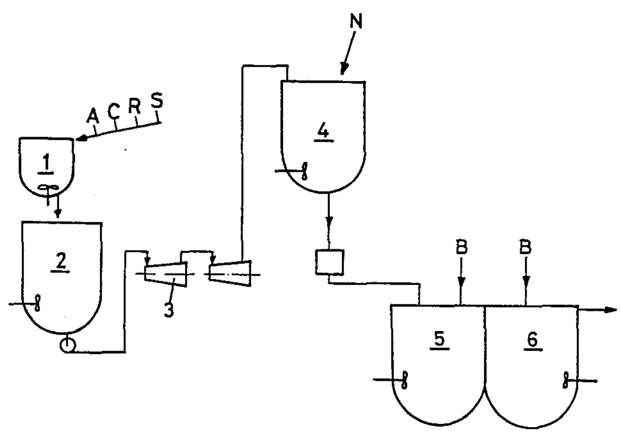
(54) **Neutral paper and process for its manufacture.**

(57) A neutral or alkaline paper having highly uniform tone, higher bursting point and greater opacity is described. The manufacturing process consists primarily in neutralizing to a pH of 7 or more and acid mixture of fibers, sizing agents and aluminium sulphate with alkaline-earth metal oxides or hydroxides and their derivates. The mixture so neutralized allows the use of calcium carbonate as a filler in the stock, resulting in greater ingredient retention and a lesser amount of fines in the water, this residual water being a clear water that can be recycled. The substitution of clays by calcium carbonate reduces or eliminates machinery wear. Implementation of the process does not require using additional, new or different manufacturing equipment while it implies an immediate reduction in costs.



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NEUTRAL PAPER AND PROCESS FOR ITS MANUFACTURE

General Field of the Invention

Paper manufacturing uses cellulose as raw material. Conventionally, the process comprises the steps of separating the cellulose fibers, suspending it in water to a consistency of about 3 to 4 %, introducing it into a refiner in which fibers are severed and combed, it then flows to a mixer in which a rosin size solution is added and mixed with all fibers. Aluminum sulphate is then added until a pH acidity of 4.2 is reached causing precipitation of the rosin size due to the aluminum sulphate being dissociated into Al^{+++} cations at said pH. The stock is then homogenized and a fiber structure and orientation takes place. Water is eliminated from the suspension leaving only a mass. Water extraction is started until a 65 to 60 % range is reached, and the remaining humidity is eliminated by applying pressure and heat, and the resulting product is finished to obtain a smooth paper sheet having different characteristics.

As it can be observed, it is necessary to dissociate the aluminum sulphate into Al^{+++} cations in order to obtain positive charges that allow a correct adhesion between fibers and a sizing agent. Without this adhesion there is no sizing of the paper. However, this adhesion causes acidity which remains in the solution until the final product is formed, thus obtaining an acid paper. The reason for this, is that as the cellulose is a colloid, when it is suspended in water it generates a negative potential known as Z potential and as the rosin is also electronegative, the two substances reject each other. When aluminum sulphate is dissolved it dissociate into an Al^{+++} cation and a $SO_4^{=}$ anion, therefore said Al^{+++} cation changes the negative potential into a positive potential and under such circumstances the size is fixed. But as there are also $SO_4^{=}$ ions, these react with water producing sulphuric acid which makes the paper acid, thus reducing its quality. It has not been possible to obviate such acidity because aluminum sulphate dissociates into Al^{+++} cations and, $SO_4^{=}$ since otherwise charges would remain negative and the size would not be fixed to cellulose fibers. Besides, in an acid medium, certain charges such as calcium carbonate, which is cheaper than clay, cannot be used.

On the other hand, during trial runs of the claimed process, several obvious inconveniences in said conventional process have been brought to light which are satisfactorily solved by means of the claimed process. Among other inconveniences there is a greater wear of machinery when using abrasive loadings such as clay, because it quickly wears out metallic equipment. Water usage is very high because not all of the water can be recycled. Fines retention is low. Ashes retention is also comparatively low, because the resulting paper has less weight and fiber orientation is less than satisfactory.

Paper resulting from the described novel process is comparatively better because it is neutral or alkaline, it has a better fiber orientation, its absorption characteristics are much more homogeneous, it can have greater opacity, it has a higher bursting point and it does not become yellowish.

Neutral paper manufacturing, based on cellulose and the use of colophony-aluminum sulphate as sizing has a great importance due to the lower cost of materials used and to the fact that there is no need to make changes or additions to manufacturing equipment normally used. This process is important, because economic changes together with environmental pressures have caused many paper manufacturers to consider a neutral or alkaline process.

The paper industry in the United States is producing about 60 million metric tons of paper and cardboard annually. Most of this production is carried out with chemical products of an acid nature. These products determine the use of fillers such as clays which do not react in an acid medium but do unfortunately harm the paper manufacturing equipment. In known processes, it is impossible to obtain a greater retention of fines once the filler has been added and the product has been pressed, therefore water extracted has a milky aspect containing a great number of particles and fine fibers. This byproduct cannot be recycled without using a purifying recovery process which is very costly, slow and unpractical. Therefore, acid water is discharged into rivers, lakes and seas helping to destroy the environment and eventually the food chain which supports life in the planet. Dissatisfaction has been caused by the use of conventional methods and materials for paper manufacturing. As the acid medium almost requires the use of clay as filler, and this is an abrasive element which harms machinery, paper manufacturers are now eagerly looking for neutral and even alkaline processes. This would let them use calcium cabonate as a filler obtaining operative advantages in paper manufacturing and considerably reducing environmental contamination.

On the other hand, in Chemical Business, of June 1984, pages 13-18, the desirability of using $CACO_3$ as the ideal filler, increase solid retention during the process and increase the strength in humid paper to allow a faster mechanical process, etc. is mentioned.

Important changes are pointed out for the use of neutral or alkaline paper such as book manufacturing because a neutral paper has a longer life. It will also be useful in all those activities in which documents of historic, legal and technical importance, among others, are handled.

In view of the above, it will be understood that the purpose of the invention is to obtain a neutral or alkaline paper through an easily implemented process which also has economical advantages for the paper manufacturer.

One of the main advantages of the neutral or alkaline process with respect to the acid process, is the cost reduction obtained when using calcium carbonate as a filler, because it has a lower cost than fillers such as titanium dioxide and clays. The advantage of titanium dioxide is its opacity, but as its cost is more than double the cost of calcium carbonate, without any doubt, titanium dioxide will be displaced by calcium carbonate to provide opacity.

Another object is to provide a paper with better absorption characteristics.

A further object is to provide a paper with a higher bursting point.

A further object is to provide a fine touch paper.

Another object is to provide a paper with uniform tone which does not decolorize with time and which better withstands adverse conditions such as humidity.

A further object is to provide a paper manufacturing process which can be carried out with conventional paper manufacturing equipment.

Another object is to reduce paper manufacturing costs.

A further object is to obtain a paper of higher weight.

Another object is to avoid corrosion in the manufacturing equipment.

A further object is to obtain clear water at the end of the process to recycle it and reduce consumption thereof.

A further object is to provide a paper having an increased opacity.

Another object it to use calcium carbonate as a filler in the stock.

Background of the invention

For more than 100 years, paper has been sized using principally tar or colophony, either fully or partially saponified or emulsified, fixed by aluminium sulphate.

During World War II, when colophony supply was scarce, the Naval Stores industry started to produce fortified colophony sizes, but these products were only 30 to 40% more efficient.

In the 70's technological changes were made to the paper manufacturing equipment. There were changes in paper machines wherein roller tables supporting the metal cloth which forms the paper, were replaced by a plastic sheet supporting a cloth which becomes plastic, which greatly improved retention of all types of additives as well as of the rosin size.

There are other synthetic sizing agents such a stearic acid ketene dimer, acrylic resines, alkyl succinic anhydride, etc. These synthetic sizes are equally effective in alkaline or neutral media. Synthetic sizes are self-adhesive and do not need aluminum sulphate to be fixed to cellulose. These sizes produce certain problems to paper manufacturers, however, because running time is longer and paper sizing results are known only several days after the paper has been manufactured. Besides, synthetic sizes are more expensive than the rosin-aluminum sulphate system.

Residual acidity has been partially neutralized by adding caustic soda to the stock to a pH of 6, but this is the maximum level, because when the pH goes beyond 6, the size is lost because caustic soda sodium reacts with the abietic acid changing it into the sodium salt which is water soluble and, therefore, extracts the size from the fiber.

There are other processes in which a mixture of aluminum sulphate and sodium aluminate has been used looking for aluminum hydroxide formation, which having a great adsorption fixes to the fiber and, on the other hand, it fixes the tar thus obtaining a sized paper. It also has a great inconvenience because due to its great adsorption power it tends to plug the equipment, causing incrustations on cloth, felts and presses, finally clogging them. Moreover, when adhering to the presses, paper tends to stick to the presses making it difficult to be loosened, therefore reducing production. Even more, aluminum hydroxide absorbs 90% of its weight in water in a persistent manner, making it difficult to drain the paper sheet which makes drying all the more difficult.

Due to the above and after observing the above concepts during paper manufacturing, it can be seen that the presence of aluminum hydroxides in the system is highly harmful. The practical phenomena which harm the manufacturer and consequently the intermediary and final consumer are pointed out as follows:

1. Aluminum sulphate consumption is greatly increased because a large portion of it precipitates with the aluminum hydroxide. Therefore, not more than 34% of it is used.

2. Taking into consideration the great adsorption power of hydroxides, when they are already adsorbed in the cellulose and the wet paper is transported through the machine, manufacturing table, presses, suction presses, felts, etc., they cause an adsorption action on all these surfaces making it difficult for the paper sheet to be loosened thus causing paper breakings, and dirtying and clogging the equipment. Paper production is slower as a consequence of the intensive maintenance required by the equipment.

3. The recycling water system gets contaminated, and total acidity increases and this harms sizing (P.M. and P.B.M. Tappi III page 44): "Recycled white water increases aluminum ions and sulphate ions concentration in the precipitate and flocculation will

form only at a lower pH. Strazdins mentions that acid alumina in recycling water may cause premature aggregates of the size.

4. The mullen is reduced due to the presence of hydroxides and sulphate complexes.

5. For the same reason, folding resistance is reduced.

6. Taking into consideration that hydroxides form gels, i.e., they retain great amounts of water, cellulose drainage on the manufacturing table is reduced.

7. If drainage is reduced, the drying system is overcharged causing an increase in cost and reduction in efficiency and production.

8. To improve water drainage from cellulose on the manufacturing table, suction must be increased, therefore, fines increase in recycling water.

All of the above show, from any point of view that the presence of aluminum hydroxides should be eliminated.

Figures

Detailed description of the neutral paper manufacturing process per batch, one line only based on the process diagram of fig. 1.

Water (A), cellulose (C), rosin (R) and aluminum sulphate (S), are deposited into the hydrapulper (1) where cellulose fibers are separated. After cellulose fibers have been separated it flows into a tub (2) for homogenization of the system and then flows to the refiner (3) which will develop certain properties in the paper, based on certain factors such as consistency, type of refiner and nature of the fiber. As refining advances a mucilage is produced, causing a chain effect on the fibrous structure which will improve paper strength. This treatment is carried out in certain apparatus known as refiners. There are refiners of many different designs and sizes, whose effect is valued in degrees by means of special devices known as the Schopper-Riegler and Canadian Standard.

After going through the refiner the stock flows into a supply tub (4) in which the neutralizing agent (N), is added and then the paste flows into a supply tub (5) and machine tub (6) in which the loading is added to the stock (in this type of process $CaCO_3$ (B), can be added, in order to fill fiber interspaces in the paper sheet and for smoothing its surface, improving brilliancy and printing capacity, reducing transparency and increasing opacity, for providing softness and flexibility and for increasing whiteness degree. The stock then flows towards the paper machine for drying and winding in rolls.

Detailed description of the invention.

In the process of obtaining neutral paper, cellulose is supplied to the paper factory in a humid state of air-dried. It is introduced to the paste section in order to transform it into a pasty mass whose fibers will be separated when flowing to the refining section wherein fiber agglomerations and lumps will be desintegrated by means of continuous refiners.

Raw material thus prepared, flows to the mixture tube or tanks wherein consistency normalization and fiber combination will take place by the addition of sizing agents, loading and additives.

As mentioned before, cellulose is a colloïd and when it is suspended in water it generates a negative potential known as Z potential. As the rosin size has a negative potential, cellulose fibers and the size reject each other. In order to fix the size to cellulose fibers, aluminum sulphate which is a binding agent for cellulose and the sizing agent, and which in this case is rosin, is used.

Aluminum sulphate is used because it is the least expensive and colorless salt and because it contains a trivalent element, the Al^{+++} as a cation. This changes the Z potential from -30 mlv to $\pm$5 mlv in order to fix the size to the fiber. But aluminum sulphate leaves an acid residue which will deteriorate the resulting paper, because in an aqueous solution, it gets dissociated and hydrolized producing hydrate mixture, i.e.,

$$Al_2(SO_4)_3 + H_2O \rightleftarrows 2Al^{+++} + 3SO_4^{=}$$

but water hydrolizes it too

$$2Al^{+++} + 3SO_4^{=} + 6H^{+} + 6OH^{-} \rightleftarrows 2Al(OH)_3 + 3H_2SO_4 \text{ and}$$

$$2Al^{+++} + 3SO_4^{=} + H^{+} + {}^{-}OH \rightleftarrows Al(OH)^{++} + H_2SO_4$$

looking at it in another way and taking into account Werner's theory on complexes, the coordinating number of Al is 6

$$Al\ (H_2O)_6^{+++}$$

all electrons between aluminum and oxygen being present and ordered towards oxygen, there is a hydrogen rejection which is liberated as a proton. (Andrews and Kokes, page 770, Fundamental Chemistry).

As aqueous ions are a chemical species, it is possible to calculate bonding energies between water molecules and ions. A sodium gaseous ion is disolved in water, releasing energy, i.e.:

$$Na^+\ (g) + 6H_2O\ (aq) \longrightarrow Na(H_2O)^+_{6(aq)}\ E{=}{-100}\ Kcal$$

With a charge increase and a reduction in the cation size, hydrating energy increases. For aluminum ions:

$$Al^{+++}\ (g) + 6H_2O\ (aq) \longrightarrow Al\ (H_2O)_6^{+3}\ \Delta E{=}{-1100}\ Kcal$$

which corresponds to a bonding energy of about 200 Kcal. Due to such high bonding energy, electrons concentrate between aluminum and oxygen atoms. This electron displacement makes the hydrogen atom more positive and causes a proton rejection by the positively charge aluminum ion and a weaking of the OH bonding; therefore, the following hydrolysis occurs:

$$\left[(H_2O)_5Al{:}\overset{H}{\ddot{\underset{..}{O}}}{:}H\right]^{+3} \longrightarrow \left[(H_2O)_5\ Al{:}\overset{H}{\ddot{\underset{..}{O}}}{:}\right]^{+2} + H^+$$

$$\left[(H_2O)_5Al\ (OH)\right]^{++} \longrightarrow \left[(H_2O)_4\ Al(OH)_2\right]^{+} + H^+$$

$$\left[(H_2O)_4Al(OH)_2\right]^{+} \longrightarrow \left[(H_2O)_3\ Al(OH)_3\right]^{0} + H^+$$

This is the reason why the aluminum sulphate in solution has an acid reaction, i.e., it is a proton producer. Therefore, if we desire to obtain a neutral paper, acidity in said cellulose, rosin and aluminum sulphate mixture, has to be neutralized. For this end, once the system is homogenized, a certain amount of alkaline-earth metal oxides and hydroxides or their derivates are added in an amount sufficient to reach a pH of 7, and then the filler is added, in this case $CaCO_3$ in an amount of from 20 to 30% by weight based on the weight of cellulose and then normal manufacturing process is continued.

As alkaline-earth metal salts with abietic acid or its derivates are water insoluble, alkaline-earth metal oxides and hydroxides cannot extract the size which has been fixed to the cellulose fiber and, therefore, paper size is not harmed.

There is, moreover, a two-fold advantage of using oxides and hydroxides of alkaline-earth metals. First, because it helps eliminating $SO_4^=$ ions in the water because of the formation of MSO_4 in the "stock". Since MSO_4 precipitates "white water" comes out clean and transparent and can be recycled. Second, because MSO_4 remains with the working material as additional load and finally with the paper adding up "weight" to said paper. This benefits the economics of paper manufacturing. Thus, transparent reusable water means no waste, non-contaminating, fully efficient paper manufacturing.

Due to its low price and characteristics, calciumoxide or calcium hydroxide which is added to water as calciumoxide is the preferred neutralizer.

The process is carried out at a normal manufacturing temperature and the neutralizing substance is added in amounts necessary to obtain the neutral or alkaline pH desired.

Once fiber suspension is neutralized, the paste system enters into the paper machine through an inlet box feeding the formation table wherein it is transformed into a fiber interwoven sheet by water elimination. This information sheet from now on will be subjected exclusively to water extraction by physical and mechanical means.

Once the sheet formation is completed, it is transported into the wet press section which regularly consists of two or three pressure nips, the first being generally a suction nip and the other two being flat nips. In this section a range of 65 to 60% dryness is reached.

The paper sheet is transported to a variable number of steam heated rotating cylinders in which water will be slowly eliminated from both faces of the sheet when it enters in contact with the smooth surface of the cylinder and on the transporting felt.

Then the paper sheet goes through a calender which presses the sheet and provides smoothness and brilliancy to it.

At the final step the paper is wound up in mandrels which rotate around a drum called the winder which keeps a linear speed, thus forming a master roll and/or final product.

This master roll will then be cut into thinner rolls according to customer's requirements.

This final stage of cutting and packing takes place at the finishing section.

It is also contemplated using alkaline-earth metal oxides or hydroxides and their derivatives at any one or several stages of the process.

If only a given pH is desired without looking for the beneficial use of $CaCo_3$ as a filler, alkaline-earth metal oxides or hydroxides and their derivatives can be sprayed onto paper sheets wet or drying.

It is further pointed out that there might be a necessity of obtaining acid paper, in which case alkaline-earth metal oxides or hydroxides and their derivatives are used as a means to regulate pH in the process and product.

Summarizing alkaline-earth metal oxides or hydroxides and their derivatives can be used to control alkalinity, neutrality or acidity in the paper products by the simple addition of the neutralizer.

Although it should preferably be added in the stock to obtain all the possible advantages, such as using $CaCo_3$ as filler and the like, the fact is that it is, independently of other concerns, a highly efficient neutralizer in its own right.

Thus, we might the advantages of the preferred embodiments are of no consequence.

The fillers more frequently used are clays (aluminum silicate), talc (magnesium silicate), calcium carbonate, fixed white (precipitated barium sulphate) and titanum dioxide which also has a covering power. Fillers are generally dispersed in water.

The invention will be better understood from the following illustrative, although not limitative, examples:

<u>Example 1</u>

A calcium hydroxide mixture was prepared as follows:

200 kg of lime are added to an 8000 lt tank under continuous stirring.

The dosage to the silo increased slowly in order to find out the effect on the pH, until a pH of 7 was reached, at which pH the process was carried out.

The dosage used for resin, colophony or tar was the same (8 kg/ton), and the dosage used for aluminum sulphate was slightly lower (18 to 14 kg/ton), i.e., it was practically sized in the same conditions.

When the pH of 7 was reached a postbattery steam pressure effect was observed, for it rose from 0.28 to 0.46 kg/cm^2. This was due to the fact that the retention during the first step also increased from 68 to 71.7%. The turbidity change in the process water was outstanding because at a neutral pH, water at the cone and at the clear water tank was very clear.

Once the fines retention equilibrium was reached, steam pressure reached the initial values at the postbattery (0.28 kg/cm^2).

Dosage of calcium hydroxide in solution as an average was was 60 lt/min. Dosage of the filler, which in this case was $CaCO_3$, was 20% based on the weight of cellulose.

Water hardness at the head increased from 140 to 190 p.p.m.

Acidity in the system decreased from 100 to 28 p.p.m.

Quality characteristics were maintained, and although a size reduction of from 66 to 42 seconds was observed, it was not considered critical.

Comparative table

	CONVENTIONAL PROCESS	INVENTION-PROCESS AT A NEUTRAL pH
Sodium abietate	8 kg/ton	8 kg/ton
Aluminum sulphate	18 kg/ton	14 kg/ton
pH at head	4.8	7.1
System acidity	100 p.p.m.	28 p.p.m.
Hardness at head	140 p.p.m.	190 p.p.m.
First steo retention	68 %	72 %
Ashes in the paper	8.6%	9.1%
Lime solution dosage	---	60 lt/min.
Internal size	66 sec.	42 sec.
Paper's pH, cold method	4.8	7

Conclusions:

Working at a neutral pH did not imply comparative problems, nor changes in quality characteristics.

An outstanding improvement in fines retention was observed which caused an increase in steam pressure, but once the system was equilibrated, steam pressure returned to its normal level. Waste water improved greatly, coming out clean and clear due to an increased retention of ingredients in the stock.

Reduction in the internal sizing can be improved by making the rosin-aluminum sulphate ratio more effective.

Example 2

A dosaged milk of lime preparation (calcium hydroxide) at the silo of the paper machine was used.

200 kg of lime were added to an 8000 lt tank under continuous stirring. The dosage at the silo was slowly increased until it reached a pH of 7.5, working at this range the remaining of the day.

The internal sizing was carried out under the following conditions: 8 kg/ton rosin and 14 kg/ton aluminum sulphate, i.e., a ratio of 1:1.75.

It was again observed that steam pressure had an increasing effect because from the average of 0.3 kg/cm^2 it came to 0.5 kg/cm^2 returning to normality after adjustments to the operation were made.

Another supporting effect was the increase of retention in the first step, for it reported an increase of from 68% to 72%. The outstanding change in the process water was also confirmed, because when the pH was neutralized water coming from the cone and from the clear-water tank, was transparent.

Calcium hydroxide dosage had an average of 65 lt/min.

The hardness of the head water increased from 150 to 210 p.p.m.

Acidity of the system was reduced from 90 to 33 p.p.m.

It is important to mention that quality characteristics were maintained within normal bounds. Thus, in this example a reduction in the average sizing values was of from 60 to 50 seconds, which is usual in acid processes.

Comparative table

CONCEPT	CONVENTIONAL PROCESS	INVENTION-PROCESS AT A NEUTRAL pH
1. Rosin size	8 kg/ton	8 kg/ton
2. $Al_2(SO_4)_3$	18 kg/ton	14 kg/ton
3. pH at head	4.8	7.7
4. System acidity	90 p.p.m.	33 p.p.m.
5. Hardness at head	150 p.p.m.	210 p.p.m.
6. First step retention	68 %	72 %
7. Ashes in paper	8.5%	9.5%
8. Lime dosage	---	65 lt/min.
9. Internal size	60 sec.	50 sec.
10. Kg of Ca $(OH)_2$/ton of paper	---	4.7
11. Paper's pH, cold method	4.8	7.8

Conclusions:

1. It was demonstrated that neutral pH work (24:00 hours), did not imply operative problems nor changes in quality characteristics.

2. There was an outstanding improvement in the retention of fines; thus, it was necessary to increase steam pressure to dry the wet material.

3. Waste water came out clear and transparent again.

4. Although the reduction in the value of internal spring was present again, these variations are normal in the acid process.

QUALITY CONTROL STANDARDS

TYPE OF PAPER: WHITE GRAPHIC BOND 72 g/m^2

CHARACTER-ISTICS	UNIT	STANDARD	1st TEST	2nd TEST	IMPOR-TANCE	FREQUENCY OF TEST
Base weight	g/m^2	72	73	71.3	1	All rolls
Humidity	%	5.0	4.89	4.53	1	Three times per shift
Smoothness L.F.		110	110	120		Every two rolls
Smoothness L.T.	ml/min	130	140	150	1	
Gauge	mm	3.4 0.086	3.2	3.0	2	Every two rolls
Explosion	kg/cm^2	18 1.3	17.0	16.0	3	Three times per shift
Tearing S.M.	g	38	40.0	38.0	2	Three times per shift
Tearing S.T.	g	42	44.0	44.0	2	Three times per shift

QUALITY CONTROL STANDARDS

TYPE OF PAPER: WHITE GRAPHIC BOND 72 g/m^2

CHARACTER-ISTICS	UNIT	STANDARD	1st TEST	2nd TEST	IMPOR-TANCE	FREQUENCY OF TEST
Tension S.M.	kg	5.5	5.4	5.0	2	Three times per shift
Tension S.M.	kg	4.0	3.9	3.6	2	Three times per shift
Porosity	Sec.in 100 cc	100	115	151	4	Three times per shift
Size	Sec.in 100 cc	60	OK	OK	2	Three times per shift
Dennison	No.	14	16	14	3	Three times per shift
Whiteness	Photo-volt	78	76	76	3	One time per shift
Opacity	Photo-volt	84	*84	*84	3	Three times per shift
Ashes	%	8	9.0	9.2	3	One time per shift
Joints					1	Well made
Paper's pH		5	7	7.5		

* There was no change in opacity because koalin was used as a loading.

Example 3

5 g bleached kraft cellulose were suspended in 170 ml of water obtaining a 3% cellulose stock. Said stock was refined and 0.1 g rosin size (colophony, mass or tar) were added to said water/cellulose mixture. After 10 minutes of mixture homogenization 0.5 g aluminum sulphate and then 0.16 g calcium hydroxide were added and after homogenization 1 g calcium carbonate as a loading was added and, finally, 330 ml water were added.
A neutral paper having the same characteristics than acid paper was obtained, however, opacity and size improved.

By using the same amount of ingredients Example 3 was repeated, changing the type of cellulose and the neutralizer as indicated in the following table:

EXAMPLE NO.	TYPE OF CELLULOSE	NEUTRALIZER
4	Bleached Kraft	0.125 g $Mg(OH)_2$
5	Bagasse	0.125 g $Mg(OH)_2$
6	Bleached Kraft	0.3 g $Sr(OH)_2$
7	Bagasse	0.3 g $SR(OH)_2$
8	Bleached Kraft	0.38 g $Ba(OH)_2$
9	Bagasse	0.38 g $Ba(OH)_2$
10	Bagasse	0.16 g $Ca(OH)_2$

In the above examples a neutral paper having a pH of about 7-7.5, a good size and opacity were obtained; however, in the examples where bagasse was used, paper strength was lower because the bagasse fiber is shorter.

WAT I CLAIM IS THE FOLLOWING:

1. Process for the manufacture of neutral paper comprising the steps of:

a) Separating cellulose fibers.

b) Forming a stock of suspended fibers.

c) Adding a sizing agent (rosin).

d) Adding aluminium sulphate and controlling the pH until a pH of 4.2 is reached in order to precipitate the rosin size.

e) Homogenizing the system.

f) Adding a neutralizing substance until a pH of 7 or more is obtained, said substance is selected from among alkaline-earth metal oxides or hydroxides and their derivatives.

g) Adding the loading and other additives.

h) Eliminating water by mechanical and thermical means.

i) Finishing the resulting paper sheet.

2. Process according to claim 1, wherein the neutralizing substance is $Ca(OH)_2$.

3. Process according to claim 1, wherein the size is rosin or tar.

4. Process according to claim 1, wherein the mechanically eliminated water contains such a low fines ratio, that it can be recylced and used in the formation of a stock of fiber suspension.

5. Process according to claim 1, wherein the calcium carbonate filler is used in the stock.

6. Process according to claim 1, wherein bleached Kraft cellulose is used as cellulose.

7. Process according to claim 1, wherein bagasse is used as cellulose.

8. Process according to claim 1, wherein the neutralizing substance is CaO.

9. Process according to claim 1, wherein the alkaline-earth hydroxide derivative is alkaline complexes.

10. Process according to claim 1, wherein the pH is akaline.

11. Process according to claim 1, wherein MSO_4 forming in the stock becomes an additional load ending up as part of the resulting paper.

12. Process according to claim 1, wherein $CaSO_4$ forming in the stock becomes an additional load ending up as part of the resulting paper.

13. Process of neutralizing paper by the addition of alkaline-earth metal oxides or hydroxides and their derivatives at any one or more stages of the process.

14. Paper obtained according to claim 1, which comprises a pH of 7 or more.

15. The neutral paper of claim 14, having an homogeneous fiber distribution, greater opacity, uniform shade, higher tear strength, high whiteness degree and lower tendency to become yellowish.

16. Neutral paper containing $CaCo_3$ in any desire range.

17. Neutral of alkaline paper neutralized or made alkaline by the use of alkaline-earth metal oxides or hydroxides and their derivatives.

18. Neutralizing substance to be added to a stock of suspended fibers in a paper manufacturing process using rosin and aluminum sulphate, wherein the substance is

$$MO \text{ or } M(OH)_2$$

or its derivates wherein M is an alkaline-earth metal.

19. A paste for the manufacture of paper containng at least the combination of H_2O, rosin size, $Al_2(SO_4)_3$, cellulose, alkaline-earth metal oxides and hydroxides and their derivatives, and $CaCO_3$ as a filler.

20. The addition of alkaline-earth metal oxides or hydroxides and their derivatives to wet sheet paper before pressing, drying and winding.

21. The use of alkaline-earth metal oxides or hydroxides and their derivatives in a liquid stte for neutralizing paper.

22. The use of alkaline-earth metal oxides or hydroxides and their derivatives to regulate acidity in paper manufacturing processes.

23. Controlled alkalinity, neutrality or acidity in paper products by the use of alkaline-earth metal oxides or hydroxides and their derivatives.

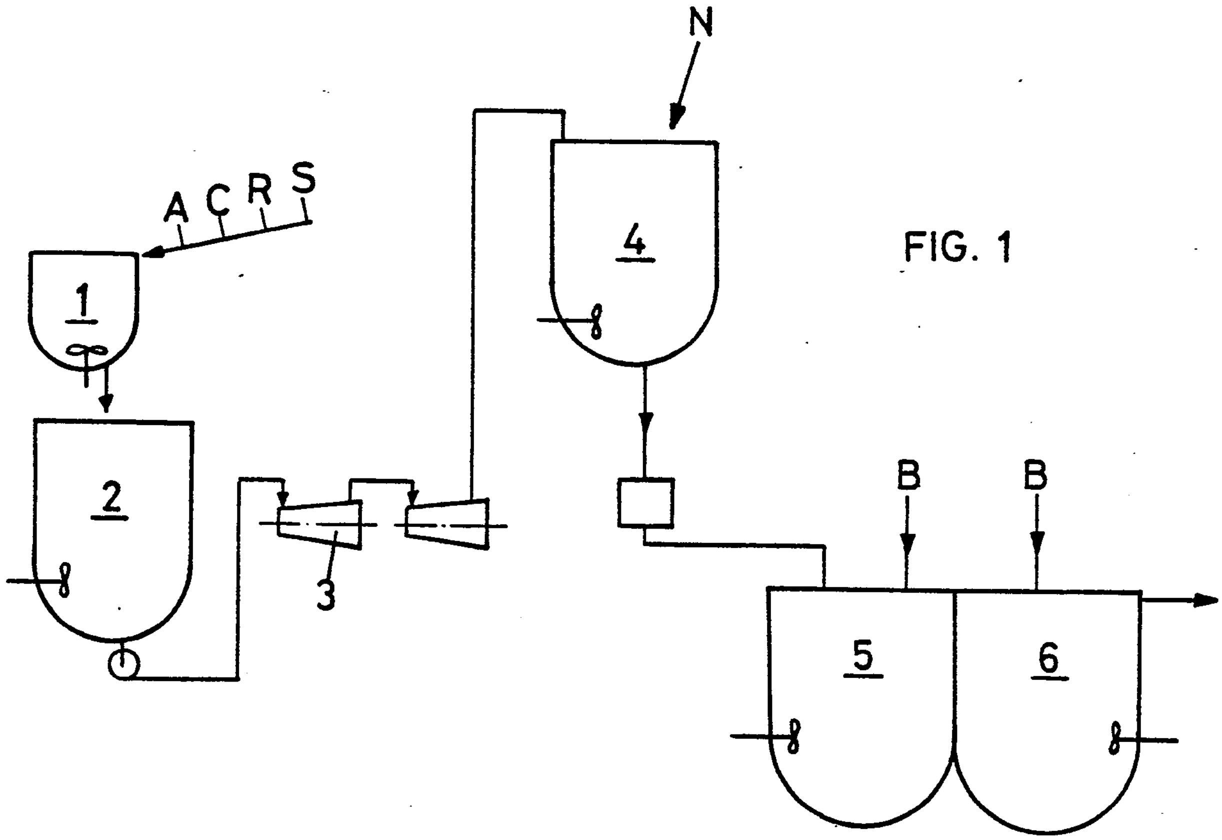

FIG. 1