Patented Feb. 16, 1937 2,071,304

UNITED STATES PATENT OFFICE

2,071,304

PROCESS OF MANUFACTURE OF PRODUCTS OF GROUND WOOD PULP

Wilhelm Hirschkind, Berkeley, Calif., assignor to Great Western Electro-Chemical Company, a corporation of California

No Drawing. Application December 4, 1934, Serial No. 755,929

3 Claims. (Cl. 8—2)

This invention relates to ground wood or mechanical pulps, and, more particularly, to the manufacture of products from such a pulp. Because of the uses to which this pulp is put, for cheap paper products, the cost of manufacture must be kept down. In accordance with my invention, I provide a process for the manufacture of a mechanical pulp of very light color at low cost.

Mechanical pulp, being produced directly by mechanical disintegration of wood, contains lignins and other encrusting matter. It can not therefore be bleached by the ordinary oxidizing bleaching agents. I have found that, by maintaining certain pH control conditions during the manufacture, a pulp can be obtained of a very light color and yet very cheaply.

More particularly I have found that pulping of the wood and certain later handling of the wood pulp is best conducted in an aqueous stream which is at a pH of 7 or above so that it is alkaline. Under these conditions the pulp will invariably take on a rather dark color, often a dark brown. It will not, however, pick up iron from the equipment and form complex compounds of iron with tannic acid, nor will it corrode the equipment. A pulp containing even a small quantity of iron will have a gray color due to iron tannates which is carried to the finished paper. Removal of this color is difficult and costly.

The pulping of the wood in this invention is only by mechanical means and the alkaline stream does not and is not used to effect any pulping. That is the alkaline pulp containing stream is never placed under such conditions that any appreciable or material "cooking" occurs and the present process is not to be confused with chemical pulp manufacture for it is in no way concerned with this very different problem.

The alkaline pulp, though dark in color, can be brightened simply and with great ease by the addition of a hydrosulphite. The brightening effected by the hydrosulphite can be further enhanced by adding sufficient amount of acid or acidic material to bring the pH to the acid side. For maximum brightening effects a pH from 5 to 3 should usually be attained. For an acidifying medium, any mineral acid such as sulphuric, hydrochloric, phosphoric acid can be used, as well as sulphur dioxide and oxalic acid. Acid salts such as bisulphites, bisulphates, alum, et cetera, can also be used.

Subsequent finishing of the pulp into paper will necessitate contact with iron or other metals which will be corroded and cause renewed discoloration of the pulp. The metal corrosion can be avoided by the addition of certain inhibitors such as organic nitrogen compounds, organic sulphur compounds, sulphite waste liquor, arsenic compounds, et cetera. Instead of adding these inhibitors I can neutralize the acid. Now, while ordinary alkalies or alkaline salts cause an immediate reversion of color, I have found that the addition of certain buffers, such as calcium sulphite or bisulphite, sodium sulphite, or bisulphite, calcium phosphate or borate, et cetera, will not darken the pulp, even if the pH should go as high as 6.5 to 7. In actual practice I prefer to maintain in this case a pH of around 5. The enumerated materials which are useful can be classed as buffering salts which show little if any pH change between pH5 and pH7, and are thus effective to maintain said pH at the desired values.

It is an object of the invention to provide an improved process for the manufacture of mechanical pulp.

Another object of the invention is to protect against corrosion the apparatus used for manufacture of a wood pulp.

A further object of the invention is to produce a mechanical pulp of improved color.

The invention includes other advantageous features, and has other objects, some of which will appear hereinafter, wherein I have detailed a preferred manner of practicing my invention. The process set forth is that presently preferred. It is of course subject to variation and is set forth by way of example and not by way of limitation.

In practicing my invention I prefer to shower the pulp grinder with an aqueous stream having a pH of 7 or above and to carry the pulp through to the bleaching operation in such a stream. The alkaline condition can be maintained by addition of any suitable alkali or alkaline earth radical. Of course, the alkaline condition in the pulp circuit can be created after pulping, but if this is done a portion of the advantage is lost thereby. In actual operation, I have added the hydroxides or carbonates of the alkaline earths, principally lime and magnesia to the ground pulp with satisfactory results, as well as using showers on the grinder made alkaline with the hydroxide or carbonates of alkali metals, including ammonia. The alkaline circuit is maintained through to the bleaching operation, through the various intermediary operations such as the beating, mixing, screening and refining operations. Although the alkaline condition causes the pulp to darken, this is a temporary condition easily overcome by my bleaching operation. Mechan-

ical pulps, being usually acid, pick up iron from the apparatus, thus causing a high corrosion rate of the equipment and occasioning complexes in the pulp including iron which are not lightened except at the cost of the product and of increased reagents. The alkaline pH (7 or above) is maintained throughout the circuit up to the bleaching step to avoid these disadvantages.

When the pulp is ready for bleaching I add a hydrosulphite, usually in an amount ranging in quantity from .2% to 10% of the weight of the pulp. Alkali metal hydrosulphites, including ammonia, alkaline earth hydrosulphites or zinc hydrosulphite can be used. The hydrosulphite can be added as a solid or in solution or formed in situ in the pulp by adding zinc dust and sulphur dioxide. Either before, simultaneously with, or after the hydrosulphite addition, I bring the pH from 7 or above to as low as 3 with an acid or acidic material. From thereon, various procedures are possible, as outlined above. Thus, I can easily remove the excess of acid by a washing step; I can add certain inhibitors to the acid pulp so as to prevent any corrosion on metal equipment; or I can neutralize with certain buffering compounds, as mentioned above, to reduce and maintain a pH of between 5 and 6. In case of washing, the pH is preferably kept below 7 so that color reversion does not occur.

As inhibitors against metal (e. g., iron, steel, copper, et cetera) I use organic nitrogen compounds, more particularly nitrogen bases including pyridine, aniline, phenyl-hydrazine, quinoline, acridine, and derivatives thereof, and other nitrogen basic compounds comprising substituted ammonias including amines, amides, amidines, aldehyde ammonias, cyanamide and derivatives thereof, and amides of carbonic acid, including aliphatic, carbo- and heterocyclic compounds and mixed compounds as alkyl-aryl compounds.

Organic sulphur compounds as the mercaptans, sulphur derivatives of carbonic acid as thio-urea and derivatives thereof are included.

Sulphite waste liquor is also an inhibitor as are arsenic compounds which are soluble in the acid solution, examples of which are arsenic acid, H_3AsO_4 arsenic trioxide, As_2O_3, or a soluble arsenate or arsenite, such as the corresponding alkali metal salts.

The inhibitors act to prevent acid attack on the metal equipment and ordinarily their mere presence suffices. They therefore need not be added in any great quantity. In the case of calcium sulfite or bisulfite, a change in pH is effected in some instances and more of the material must therefore be used. The reduction in metal corrosion has two aspects; a reduction in apparatus deterioration, and an improved color due to the absence of metal complexes coloring the pulp and later the paper. Oxalic acid can be used since though it corrodes, its complexes are not colored. The use of phosphoric acid results in a phosphate deposit on the metal that resists acid attack.

Bleached or unbleached sulphite pulp or other pulp can be added to the mechanical pulp before or after bleaching so that the mechanical pulp is diluted therewith.

The bleaching operation disclosed can be applied to a pulp ground and treated before bleaching in an acid condition since this has advantages and value in itself although the whole process, including the alkaline pulping, usually is the most advantageous.

I claim:—

1. Bleaching a mechanical wood pulp suspension with a hydrosulphite at a pH substantially between 5 and 6 and maintaining said pH of said suspension by adding a salt of the class consisting of sodium or calcium sulphite, sodium or calcium bisulphite, calcium phosphate or borate.

2. Bleaching a mechanical wood pulp suspension with a hydrosulfite at a pH substantially between 5 and 6 while maintaining said pH during said bleaching by addition of an inorganic buffering salt effective to maintain said pH substantially constant.

3. A process for treatment of a mechanical wood pulp suspension comprising subjecting pulp in said suspension to reduction by a salt of hydrosulfurous acid while maintaining said suspension at a pH substantially between 5 and 6 by addition of an inorganic salt effective as a buffer substantially at said pH.

WILHELM HIRSCHKIND.