

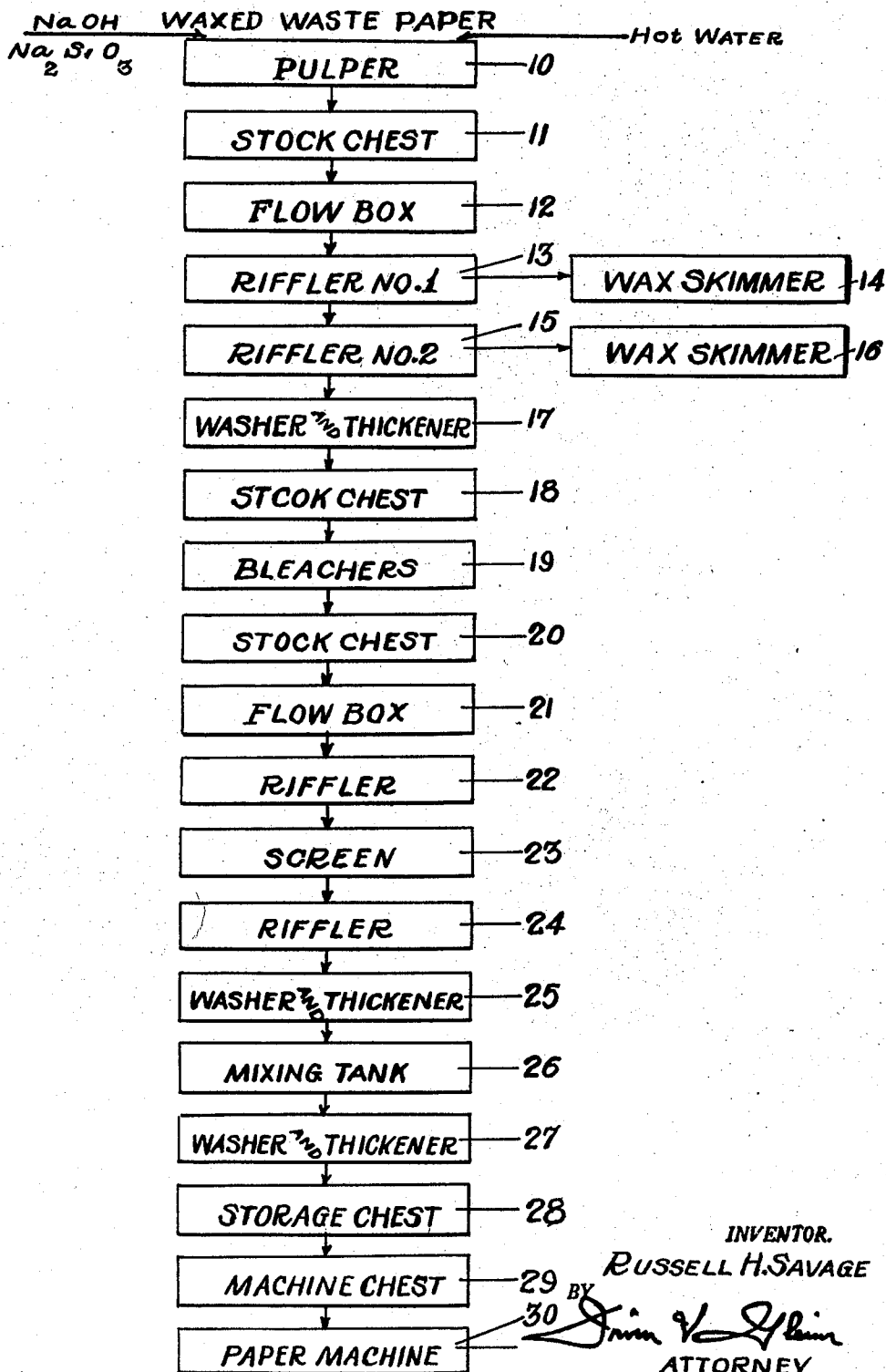
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PAPER STOCK RECOVERY PROCESS

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PAPER STOCK RECOVERY PROCESS

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This invention relates to the treatment of waste waxed material and more particularly to the sequential recovery of the essential fiber content and the wax of waste waxed fibrous paper material.

The successful defibering and the dewaxing of waxed paper stock has been a problem of long standing. Numerous attempts have been made in the past to develop processes which could successfully break down waxed stock of fibers and to preserve the wax as an end product. These former attempts have proved to be unsuccessful. This has been particularly true in the case of certain waste waxed paper stock, i.e., bread wrappers, waxed cartons, drinking cups, and various other types of waxed paper stock of varying weights.

In view of the demand in the paper industry for bleached sulphite fibers and in view of the large supply of waste waxed paper stock, the development of a successful commercially acceptable process for dewaxing and defibering such stock has long been a problem in the paper industry.

In waxing paper, or in making laminated papers using molten wax or similar material as the laminating material, a web of paper ordinarily is subjected to treatment with hot wax, after which the treated paper is passed under one or more rolls heated to elevated temperatures. The heating effect of such waxing and laminating operations drives the wax in and about the fibrous structure of the paper, making removal and recovery of the wax exceedingly difficult, so that waste waxed paper and waste waxed paper products are largely disposed of by burning or throwing away.

When attempting to remove the wax content of such paper, or paper products, it is important that the physical properties of the fibrous structure of the paper are not decreased or deteriorated for subsequent utilization. At the same time, care must be exercised to avoid retention of the wax on the paper or on the fibrous material which would preclude its subsequent formation or inclusion as a paper pulp component.

It is accordingly one of the principal objects of this invention to provide economical and efficient methods for the removal of wax from webs of waxed waste paper and other fibrous material by treating such materials in a satisfactory manner under such controlled conditions as to remove from the waxed material a desired amount of wax or similar materials without the use of undesirable large amounts of chemicals such as would tend to damage or otherwise deteriorate the fiber structure of the paper material.

It is a further object of the invention to provide such a method which includes a simple and highly efficient recovery system whereby the fibrous material and the wax may be recovered for reuse, and reaffixation of wax to the fibrous material during the recovery procedure is avoided.

It is also an object of the invention to provide such a method by which printed or unprinted waste waxed cellulosic fibrous material may be treated under such con-

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trolled conditions that the wax is substantially completely removed from the cellulosic fibrous material, the fibrous material being recovered as pulp capable of reuse in making high grade papers, as for example, book or magazine paper or other pulp products.

Still another object of the invention is to provide a method of dewaxing and defibering which is effective with respect to waxed waste paper and other waxed fibrous materials to impart high brightness to the recovered fibrous materials comparable to high grade chemical fibrous pulp as used for the manufacture of high grade book or magazine paper.

Another object is to provide pulp for high grade papers, such as magazine and book papers, containing substantial or large quantities of recovered waxed paper waste fibrous material and having a brightness of not less than approximately 80-82.

Another important object is to provide a method of separating wax from waxed waste wherein the resulting pulp has a small percentage of wax remaining, on the order of 0.1%-1% of wax, giving a pulp suitable for the production of high quality paper.

Still another object is to provide a method of separating wax from fibers wherein small wax nodules are formed at a predetermined temperature, which nodules function as nuclei for the formation of floatable wax agglomerates.

Other objects and advantages will be apparent from the following description, the accompanying drawing and the appended claims.

This invention may be practiced economically and satisfactorily, using well known equipment and materials and with a controlled sequence of operations; the single figure of the drawing being a diagrammatic representation of a flow sheet showing an embodiment in the practicing of the invention.

It has been found that, through the present invention, waste papers containing large quantities of wax, as for example paraffin or microcrystalline waxes or combinations thereof, may be readily dewaxed without any unusual operating difficulties or costs, and that the resulting defibered material may be bleached so as to restore the fibrous material to a desirably white color so as to impart brightness equal to good grades of chemical pulp. Such fibrous material has been satisfactorily used as the furnish as well as in the furnish for producing pulp products and high quality bond, tissue, book or magazine paper. This high quality paper has a color and brightness comparable to the best grades of magazine or book papers. Moreover, this astonishing result is accomplished without the necessity of difficult or costly operations or apparatus.

As illustrating one embodiment in the practicing of the invention, which has been satisfactorily used in large scale commercial operations for the manufacture of high grade book or magazine paper, the invention is described in connection with waxed waste paper usually containing up to approximately 25-35% wax, the wax ordinarily having a melting point range of about 120-185 degrees F. In such practicing of the invention during the sequential operations illustrated in the drawing flow sheet, the waxed waste paper is preferably introduced into the pulper 10. Pulper 10 is a conventional type pulper having a large steam-heated cylindrical vat provided adjacent its bottom surface with a pulping wheel or beater which is appropriately rotated from a source of power to continually circulate the stock batch within the pulper and to disintegrate and break down the fibrous mass therein. When initiating the process, hot water is first introduced into the pulper at a temperature of approximately 150° F. with the pulping wheel rotating at a comparatively high rate of speed. Simultaneously with the introduction of the hot water into the pulper, two basic chemical compounds are introduced into the pulper from suitable cali-

brated tanks in amounts determined by the nature of the stock to be processed. These two compounds are sodium hydroxide (NaOH) and sodium silicate (Na_2SiO_3). The sodium hydroxide is preferably a 48% solution and the sodium silicate is preferably of 42° Bé. Each may be introduced in an amount up to 7% by the weight of the air dry stock to be processed, but the percentage of each may be less than this amount, depending upon the nature of the stock.

When necessary, due to the nature of the stock, small percentages of additional chemical compounds may be added. These compounds are aluminum stearate ($\text{Al}(\text{C}_{18}\text{H}_{35}\text{O}_2)_3$), sodium hydrosulfite ($\text{Na}_2\text{S}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$) and sodium carbonate (Na_2CO_3). Each of the three additive compounds has a different action on the stock. One or more may be added to the two basic chemical compounds depending upon the nature of the stock being processed, as will be hereinafter discussed in detail.

When the water in the pulper has reached a substantial depth, the introduction of the waxed paper stock into the pulper is begun and is continued until the entire charge of stock, usually from one thousand to three thousand pounds, has been introduced therein. During the introduction of the stock, steam is passed through a steam coil surrounding the lower periphery of the pulper and continues to be introduced until the temperature of the stock batch in the pulper has been raised to approximately 170° F. The steam supply is controlled to maintain the temperature in the pulper at approximately 170° F. for as long a period of time as is required to accomplish the dewaxing and defibering of the stock. It has been determined that the time normally required to complete the operation in a conventional pulper is from twenty-five to forty-five minutes, depending upon the nature of the stock. During this time the temperature of the batch is maintained at approximately 170° F. to melt off the wax and assist in the separation of the fibers.

After the batch has been processed from twenty-five to forty-five minutes, it is sampled by a scoop and a small hand sheet is made from the sample. If this hand sheet indicates that the separation of the fibers has been satisfactorily completed and that the wax has been satisfactorily separated therefrom, the temperature of the batch is then dropped to a point slightly below the melting point of the wax (approximately 120–125° F., in most instances) by the introduction of cold water into the pulper. The temperature of the stock batch is maintained at that point for an appreciable period of time, approximately from ten to twenty minutes, until the molten wax melted off during the first stage of the pulping commences to form into small nodules of wax on the surface of the batch. Any pigment content of the stock also appears to be entrained in these wax nodules. If the wax does not form properly at this lower temperature, the temperature of the stock in the pulper may again be raised to a point above the melting point of the wax and held there until fiber separation and wax removal has been completed. The temperature is then dropped slowly again to slightly below the melting point of the wax and held there to accomplish the formation of the wax nodules. The nodular or granular surface wax with its entrained pigment is tested periodically until formation of the wax particles is satisfactory and the wax may be observed to be lumping and floating on top of the batch in comparatively large agglomerates.

With the wax so formed, and the fibers separated, the pulper is then dumped and the entire stock batch is then started through the balance of the system, as will be hereinafter discussed in detail.

From the pulper 10, the stock batch is pumped into a stock chest 11 at approximately 2.5% consistency. From the stock chest 11 the batch is then pumped through a flow box 12 wherein it is reduced to a consistency of .5%. From the flow box 12 the batch is passed to the first riffler 13. Riffler 13 is of considerable length, giving

approximately 200 feet of travel to the batch. During this first riffling a high percentage of the "agglomerated" wax and entrained pigment particles float to the top of the batch and are skimmed off at the terminal end of the first riffler 13 by means of a series of skimmers 14 which are slowly actuated by an endless chain assembly. A considerable amount of pigment is absorbed on the "agglomerated" wax particles. In the first riffler 13 approximately 95% of the wax content of the stock is removed and this wax together with entrained pigment is removed from the terminal end of riffler 13 as well as from wax skimmer 14 and is passed to appropriate wax tanks for storage and transmittal to suitable wax trays.

From the first riffler 13, the substantially dewaxed and partially depigmented fiber stock is passed through a second riffler 15, wherein the consistency is held at .5% and more wax agglomerates and entrained pigment are removed by skimmers 16. The stock is then passed through screens to a washer and thickener 17 wherein the consistency of the stock is increased to approximately 5% and more of the suspended wax and pigment are removed. The washed and thickened stock is then dumped into another stock or storage chest 18 wherein it is held at a consistency of approximately 5%.

From stock chest 18, the stock is pumped to the bleach towers 19, preferably consisting of three conventional Bellmers, wherein it is bleached and substantially all of the remaining wax and pigment content are removed. Each Bellmer is equipped with an individual heating system and an agitator which may be belt-driven from a line shaft. Sodium hypochlorite (NaClO) and sodium hydroxide (NaOH) are added to the stock in the bleach towers 19 in amounts of approximately 2% and 2.5% respectively by air dry weight of the fiber content thereof, thereby increasing the pH to approximately 10.0–11.25 and bleaching is continued for about one hour at a temperature of 110°–115° F. The temperature of the stock in the bleach tower is then raised to approximately 140°–165° F., ammonium aluminum sulfate ($\text{NH}_4\text{Al}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$) is added so as to reduce the pH to approximately 6.25–6.75, and the stock is so treated at this temperature and pH for approximately one hour. The temperature of this stock is then dropped to below the melting point of the wax by the introduction of cold water into the bleach towers 19 to accomplish the formation and "agglomeration" of residual wax which has been removed from the fibers.

The bleached stock is then dumped from the bleach towers 19 to stock chest 20. From this stock chest, the bleached stock is then pumped to another flow box 21 wherein the consistency of the stock is again reduced to approximately .5%. From this flow box, the stock is passed to a long riffler 22 wherein the small remaining residue of "agglomerated" wax in the bleach tower is removed by skimming.

After this riffling, the stock is passed over a screen 23 wherein the fibers are screened and all undefibred stock and remaining wax agglomerates are rejected and returned back to the pulper 10 for reprocessing.

From the screen 23, the screened fibers are pumped to a final riffler 24 where all remaining dirt and wax traces are removed. From this riffler 24, the stock at a consistency of .5% passes by gravity to washer and thickener 25 where any remaining pigment is washed out and the stock is thickened to a consistency of approximately 5%. The thickened stock is then passed to a mixing tank 26 where water is added to reduce the consistency again to .5%. From mixing tank 26, the stock is passed to a washer and thickener 27 wherein it is washed completely and thickened to a consistency of 5%. The thickened stock is then passed to storage chest 28 from which it is pumped to machine chest 29. From machine chest 29, the stock is pumped through a conventional mixing box, head box and finally to the paper machine 30, wherein the bleached, dewaxed and depigmented fibers are

formed into pulp sheets and dried and rolled for delivery to the consumer.

The foregoing is a condensed description of the complete process from the start with waste waxed paper stock to the finish where the high grade wax-free and pigment-free sulphite pulp or fibers are reclaimed for reuse in the paper industry.

The various major steps in this embodiment of the invention which make it completely commercially feasible as distinguished from other processes heretofore known, will now be considered more in detail. For example, the first stage of the process involves the operation of a conventional pulper 10 under such critical temperature control conditions as to effect proper forming of the wax into agglomerates, without which it would be impossible to get a clean fiber separation and a complete removal of the wax and pigment content of the waxed paper stock. As has been previously stated, hot water of approximately 150° F., the requisite chemical compounds and the raw stock are introduced into the pulper simultaneously. When the consistency of the batch in the pulper is approximately 10% by air dry weight of the stock, the temperature is raised to approximately 170° F. by the introduction of steam into the coils of the pulper, raising the temperature of the batch above the melting point of the wax and also to promote the action of the chemicals and facilitate the separation of the sulfite fibers. This temperature of 170° F. is maintained for a period of from twenty-five to forty-five minutes until it is ascertained from the sample and hand sheet that fiber separation is complete and that most of the wax and pigment have been separated from the fibers. At this point in the procedure, the wax and entrained pigment lie on top of the batch in a fluid and nucleated condition. If the batch were dumped with the wax and pigment in this condition, it would be subsequently impossible to get a clean separation of the wax and pigment from the fibers. Therefore, in order to produce the formation of floatable wax agglomerates carrying the pigment content, the temperature in the pulper is dropped to approximately 2°-3° F. below the melting point of the wax by the slow introduction of cold water into the pulper. This temperature drop from approximately 170° to approximately 120° F. causes a transformation into megascopic agglomerates wherein the wax passes from a fluid to a grainy or nodular state and agglomerates to form sizeable lumps on the surface of the batch. Chemical analysis of these wax agglomerates shows that a high percentage of the separated pigment is entrained in these wax agglomerates. As the temperature in the pulper 10 is maintained below the melting point of the wax until it is dumped, the wax and entrained pigment remain in this agglomerated state when the pulper is dumped and passed to the first stock chest and on through the first riffler 13 equipped with a series of baffles from the surface of which the wax agglomerates are readily removed by the skimmers 14. The length of the riffler 13 is important as it slows down the speed of the batch and assures the flotation to the top thereof of substantially 95% of the "formed" wax content of the batch. It is at this point in the process that all but a small residual percentage of the wax and much of the entrained pigment are removed from the fibers.

Another and extremely important aspect of the operation in the pulper is that pertaining to the introduction of the chemical compounds which assist in the dewaxing and defibering of the waxed paper stock. As has been previously stated, the two basic chemical compounds necessary for the successful operation in the pulper are sodium hydroxide (NaOH) and sodium silicate (Na₂SiO₃). The sodium hydroxide is preferably a 48% solution and the sodium silicate is preferably 42° Bé. The preferred quantity of either of these compounds which may be used is 5% by air dry weight of the stock in the batch. Normally however, a lower percentage as

for example 3% of sodium silicate is used and a higher percentage, as for example, 7% of the caustic soda is used, the percentages of the compounds used being controlled by the nature of the waxed paper stock, the weight and thickness of the paper, rosin size, whether calendered or not calendered, and the amount of other components as for example ink in the stock. Moreover, a high percentage of chemicals is employed for a heavy weight, hard sized, super calendered and heavily printed wax paper stock. Whereas, proportionately smaller percentages of chemicals are used with lighter and less heavily printed stock, i.e., bread wrappers.

The function of each of these basic compounds is believed to be as follows: the sodium hydroxide is utilized as it attacks the carrier of the pigment, i.e., linseed oil, etc., saponifies the carrier and as a result, the pigment is suspended and washed away from the fibers. A further action of the sodium hydroxide is as a preferential wetting agent which reduces the surface tension of the water and causes penetration of the water between the fibers to promote fiber separation.

The sodium silicate is believed to act as a protective colloid and is adsorbed on the suspended pigment and wax agglomerates to prevent redeposition of either pigment or wax on the fibers. The sodium silicate is also believed to assist in the wax agglomeration.

As previously stated, certain other additional chemical compounds may be utilized in the pulper as required by the condition of the stock and to assist the sodium hydroxide and the sodium silicate in their functions. These additional compounds include aluminum stearate, sodium hydrosulfite, sodium carbonate and sodium montmorillonite.

It is seldom necessary to use all of these additional compounds, though frequently percentages of one or more may be required. The function of these additive compounds is believed to be as follows:

The aluminum stearate is used to assist in the wax "agglomeration," i.e., the formation of wax nodules which function as nuclei for the formation of floatable wax agglomerates. In addition, the aluminum stearate serves to raise the melting point of the wax and thereby increases its hardness.

The sodium hydrosulfite is used in amounts up to .165% by air dry weight of the fibers when the hand sheets shows color or traces of ink spots and acts to remove excess color and ink spots from the fibers. It also has an incidental bleaching action, acting as a reducing agent.

The sodium carbonate preferably of 58% chemical purity is used in amounts up to 3.33% of the air dry weight of the fibers. It acts substantially in the same fashion as the caustic soda, but in view of the fact that it is weaker than the caustic soda, it retards the drastic action of the caustic on the fibers to preserve the fiber strength. It also acts to remove ink and pigment from the fibers and has a preferential wetting action on the fibers.

The sodium montmorillonite is used in amounts up to 5% by the weight of the air dry stock and by reason of its strong adsorbing properties serves to refine the wax which has been removed from the fibers.

The use of these aforementioned additive chemicals, or any one of them, depends upon the requirements of the particular stock batch and whether a conventional pulper or a dynopulper, hereinafter referred to in an alternate method of procedure, is utilized in the first stage of the process.

Another important step in the process of this embodiment is the processing of the stock in the bleach towers after it has first been pulped in the pulper, most of the wax removed in the first riffler, a second riffing and wax removal has been had in the second riffler and the stock washed and thickened in the first thickener. As the stock enters the bleach towers 19, the fibers are well separated.

and a high percentage of the wax and pigment has been removed.

In the bleach towers 19 the pulped stock is first subjected to agitation by a series of rotating vertically disposed propeller type agitators at a temperature of approximately 110°–115° F. for a period of from forty to sixty minutes, up to 2% of sodium hypochlorite and at least 2.5% of sodium hydroxide being added during the introduction of the stock into the towers. If necessary a small percentage, up to 2%, of sulphuric acid (H_2SO_4) may be added to augment the bleaching action of the sodium hypochlorite. With respect to white waste wax stock, when the desired brightness is obtained, the temperature is dropped to the "agglomeration" point of the wax as previously determined in the pulper, by the introduction of cold water into the bleach towers. This dropping of the temperature of the batch in the bleach towers to below the melting point of the wax is designed to form the small percentage of residual wax remaining in the stock into wax agglomerates. This temperature in the bleach towers is maintained until the residual wax particles have agglomerated on the top of the batch. This residual wax is subsequently skimmed off the bleach stock in the third riffler and screen through which it next passes after it has been dumped from the bleach towers.

The bleaching operation which is preferably performed in three Bellmers effects the dual function of bleaching the fibers to the desired brightness and concomitantly removing any residual wax and pigment remaining on the fibers. The removal of the residual wax and pigment remaining on the fibers is primarily accomplished by the ammonium aluminum sulphate which appears to release substantially all of the residual wax from the fibers, as long as the pH remains between 6.25–6.75 and at this pH has unexpectedly no affinity for the fibers in the stock. After the stock has been introduced into the Bellmers, the temperature is brought to approximately 110°–115° F., the pH is increased to 10.0–11.25 by the addition of sodium hypochlorite and sodium hydroxide and the bleaching is preferably continued for approximately one hour. For most types of waste wax stock, the temperature is then raised to approximately 140°–165° F. and ammonium aluminum sulfate ($NH_4Al(SO_4)_2 \cdot 12H_2O$) is added in an amount to reduce the pH to 6.25–6.75 and agitation is continued for approximately one hour. At times the stock, after the bleaching treatment, may contain numerous ink spots. When this occurs, a small amount of either sodium hydrosulfite or zinc hydrosulfite may be added to the stock concurrently with the ammonium aluminum sulfate. Such an additive should, however, be avoided if at all possible inasmuch as it may reduce strength value of the stock and if added should not alter the 6.25–6.75 pH limitation.

The temperature is then slowly reduced to below the melting point of the wax, i.e., to approximately 120° F. in most instances, thereby effecting the agglomeration of the residual wax on top of the batch in the Bellmers, which wax is subsequently removed in the third riffler and screened after the batch is dumped from the Bellmers.

The wax removed from the waxed paper stock in each stock batch is a mixture of different types of waxes, i.e., paraffin wax, microcrystalline wax, and others, which have a different range of melting points. The melting point of the wax content in each stock batch will thus vary, necessitating some variation in the wax "agglomeration" temperature, which should be a few degrees below the melting point of the wax content. It has been determined, however, that for most stock batches a wax "agglomeration" temperature of approximately 120° F. will satisfactorily accomplish the "agglomeration" of the wax content.

The two end products of the process are pure white, bleached sulfite fibers and commercial wax. The color

of the recovered wax depends upon the type and the amount of link which was contained in the original waxed paper stock and varies in a wide range. This wax is suitable for various types of commercial use and forms an extremely valuable by-product of the process.

While the present process as described above is specifically designed for the dewaxing and defibering of printed or colored waxed paper stock, it may also be used with great efficiency on plain white waxed paper stock. As the problem of de-inking or removal of the pigment from the fibers is not present when processing plain white stock, the chemical compounds used primarily for the removal of ink and certain of the washing steps may be eliminated when working with plain white stock. The processing of plain white stock results in an extremely refined white sulfite fiber and in very light colored wax.

It will be understood that the foregoing specification is by way of illustration of one embodiment of the present process and that changes may be made therein without departing from the spirit of the invention. For example, chemical equivalents of the various chemical compounds disclosed may be substituted therefor without departing from the spirit of the invention.

Moreover, as an alternative procedure for initiating the process of the present invention, a defibering device well known as a dynopulper may be used in lieu of the conventional pulper 10 to make down the waste waxed paper stock. While a dynopulper is a type of pulper unit which is designed to break up pulp or paper, it differs in construction from a conventional pulper in that inside each end of the dynopulper is a dynopeller resembling a concave steel disc with diamond-hard points of tungsten carbide embedded in its surface. Each dynopeller is a separate unit driven by its own motor. Revolving in opposite directions, these impellers twist the flow of waste wax stock in a "figure 8." The rough-toothed discs tear and shred the waste stock, quickly reducing it to a slush or slurry.

The initial temperature control of approximately 150° F. in the dynopulper as well as the chemicals previously described which are added to the charge is like that in the pulping operation of the pulper 10. However, after a dynopulper pulping interval of about thirty to forty minutes, the stock is transferred to several forming tanks, each of which is connected to the dynopulper. These forming tanks are equipped with coils which deliver either live steam or cold water to the stock. Each forming tank has a motor driven agitator to keep the stock well mixed while forming the wax and after the batch is received in the forming tanks, the agitator is started, the steam is turned on and the temperature is controlled in the same manner as described in connection with pulper 10. Thereafter the stock is treated in accordance with the steps of the process of the invention following the pulper 10, heretofore described.

While the methods herein described, and the forms of apparatus for carrying these methods into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise methods and forms of apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a process for defibering waxed paper stock, and separating wax therefrom the steps comprising pulping the stock in a pulper at a temperature above the melting point of the wax until the fibers are completely separated, lowering the temperature of the pulped mass to a point below the melting point of the wax until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the granular wax and pigment particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower at a pH of the order of

10.0–11.25 wherein said stock is first subjected to a temperature below the melting point of the wax while being subjected to the action of bleaching compounds, increasing the temperature of said stock above the melting point of the residual wax content while concomitantly subjecting the stock to agitation and to the action of ammonium aluminum sulfate at a pH of the order of 6.25–6.75 until the residual wax has nucleated, subsequently dropping the temperature to a point below the melting point of wax until the residual wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

2. In a process for defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a temperature above the melting point of the wax while subjecting it to the action of small percentages of caustic soda and sodium silicate until the fibers are completely separated, lowering the temperature of the pulped mass to a point below the melting point of the wax until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the granular wax and pigment particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower wherein it is subjected to a temperature above the melting point of the wax while being subjected to the action of bleaching compounds and ammonium aluminum sulphate and subsequently dropping the temperature to a point below the melting point of wax until the wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

3. In a process for breaking down and defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a temperature of approximately 170° F. while subjecting it to the action of small percentages of caustic soda and sodium silicate until the fibers are completely separated and the wax and pigment separated therefrom, lowering the temperature of the pulped mass to a point below the melting point of the wax until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the granular wax particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower wherein it is subjected to a temperature above the melting point of the wax while being subjected to the action of bleaching compounds and ammonium aluminum sulphate and subsequently dropping the temperature to a point below the melting point of the wax until the wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

4. In a process for defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a consistency of approximately 10% by air dry weight of the stock at a temperature of approximately 170° F. while subjecting it to the action of less than 5% each of caustic soda and sodium silicate until the fibers are completely separated, lowering the temperature of the pulped mass to a point below the melting point of the wax until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the agglomerated

wax particles for storage, washing the substantially dewaxed fibers, bleaching the fibers in a bleach tower wherein they are subjected to a temperature above the melting point of the wax while being subjected to the action of bleaching compounds and ammonium aluminum sulphate and subsequently dropping the temperature to a point below the melting point of wax until the residual wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

5. In a process for defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a consistency of approximately 10% by air dry weight of the stock at a temperature of approximately 170° F. while subjecting it to the action of small percentages of caustic soda and sodium silicate until the fibers are completely separated and most of the wax and pigment have been removed therefrom, lowering the temperature of the pulped mass to approximately 120° F. until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the agglomerated wax particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower wherein it is subjected to a temperature above the melting point of the wax while being subjected to the action of bleaching compounds and ammonium aluminum sulphate and subsequently dropping the temperature to a point below the melting point of wax until the wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

6. In a process for defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a consistency of approximately 10% at a temperature of approximately 170° F. while subjecting it to the action of approximately 5% each of caustic soda and sodium silicate until the fibers are completely separated and most of the wax and pigment have been removed therefrom, lowering the temperature of the pulped mass to approximately 120° F. until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the granular wax and pigment particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower wherein it is subjected to a temperature above the melting point of the wax while being subjected to the action of bleaching compounds and ammonium aluminum sulphate and subsequently dropping the temperature to a point below the melting point of wax until the residual wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

7. In a process for defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a temperature of 170° F. while subjecting it to the action of small percentages of caustic soda and sodium silicate until the fibers are completely separated and most of the wax and pigments have been removed therefrom, lowering the temperature of the pulped mass to 120° F. until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the agglomerated wax and pigment particles for storage, washing substantially dewaxed stock, bleaching the stock in a

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bleach tower wherein it is first subjected to a temperature below the melting point of the wax while being subjected to the action of bleaching compounds, increasing the temperature of said stock above the melting point of the residual wax content while concomitantly subjecting the stock to agitation and to the action of ammonium aluminum sulfate at a pH of the order of 6.25-6.75 until the residual wax has nucleated, subsequently dropping the temperature to a point below the melting point of wax until the residual wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

8. In a process for defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a temperature above the melting point of the wax until the fibers are completely separated, lowering the temperature of the pulped mass to a point below the melting point of the wax until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the agglomerated wax and pigment particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower under the action of a small percentage of sodium hypochlorite and ammonium aluminum sulphate at a temperature above the melting point of wax and subsequently dropping the temperature to a point below the melting point of wax until the residual wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

9. In a process for defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a temperature above the melting point of the wax until the fibers are completely separated, lowering the temperature of the pulped mass to a point below the melting point of the wax until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the agglomerated wax and pigment particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower under the action of a small percentage of sodium hypochlorite and ammonium aluminum sulphate at a temperature of approximately 150° F. and subsequently dropping the temperature to approximately 120° F. until the residual wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

10. In a process for defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a temperature above the melting point of the wax until the fibers are completely separated, lowering the temperature of the pulped mass to a point below the melting point of the wax until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the agglomerated wax and pigment particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower at a consistency of 5% under the action of approximately 2% of sodium hypochlorite, approximately 2.5% sodium hydroxide and approximately 2% ammonium aluminum sulphate at a temperature of approximately 150° F. until the fibers are bleached and then dropping the temperature of the batch to approximately 120° F. until the residual wax has agglomerated on top of the batch, and subsequently riffing the batch

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and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

11. In a process for defibering waxed paper stocks and separating wax therefrom the steps comprising pulping the stocks in a pulper at a temperature of 170° F. until the fibers are completely separated, lowering the temperature of the pulped mass to 120° F. until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the agglomerated wax and pigment particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower wherein it is subjected to a temperature above the melting point of the wax while being subjected to the action of bleaching compounds and ammonium aluminum sulphate and subsequently dropping the temperature to a point below the melting point of wax until the wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

12. In a process for defibering printed waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a temperature of approximately 170° F. until the fibers are completely separated and most of the wax and pigment are removed therefrom, lowering the temperature of the pulped mass to approximately 120° F., maintaining the temperature at approximately 120° F. until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the pulped and separated batch and skimming off the wax and pigment particles, passing the wax to storage, washing the fibers, bleaching the fibers in a bleach tower wherein they are subjected to a temperature of approximately 150° F. until bleaching is completed and subsequently dropping the temperature to approximately 120° F. until the residual wax has formed on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

13. In a process for defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a temperature above the melting point of the wax until the fibers are completely separated, lowering the temperature of the pulped mass to a point below the melting point of the wax until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the agglomerated wax and pigment particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower under the action of approximately 2% of sodium hypochlorite and 2.5% of sodium hydroxide at a pH of approximately 11.25 and at a temperature of approximately 115° F., nucleating the residual wax under the action of ammonium aluminum sulfate at a pH of approximately 6.75 and at a temperature of approximately 165° F., and subsequently dropping the temperature to approximately 120° F. until the residual wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

14. In a process for defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a temperature above the melting point

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of the wax, lowering the temperature of the pulped mass to a point below the melting point of the wax until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the granular wax and pigment particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower under the action of approximately 2% of sodium hypochlorite and 2.0% of sulphuric acid at a temperature of approximately 115° F., nucleating the residual wax under the action of ammonium aluminum sulfate at a pH of approximately 6.75 and at a temperature of approximately 165° F., and subsequently dropping the temperature to approximately 120° F. until the residual wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

15. In a process for defibering waxed paper stock and separating wax therefrom the steps comprising pulping the stock in a pulper at a temperature above the melting point of the wax until the fibers are completely separated, lowering the temperature of the pulped mass to a point below the melting point of the wax until the wax and pigment particles have become granular and have agglomerated on the surface of the batch, riffing the batch and skimming off the agglomerated wax and pigment particles for storage, washing the substantially dewaxed stock, bleaching the stock in a bleach tower under the action of

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2% sodium hypochlorite and 2.5% of sodium hydroxide at a temperature of approximately 115° F., nucleating the residual wax under the action of ammonium aluminum sulfate at a pH of approximately 6.75 and at a temperature of approximately 165° F., and subsequently dropping the temperature to approximately 120° F. until the residual wax has agglomerated on top of the batch, and subsequently riffing the batch and removing the agglomerated residual wax, washing and thickening the bleached stock prior to pressing it into sheets in hot press rolls, whereby said resulting sheets have less than 1% wax and have a brightness of not less than approximately 80 to 82.

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