A ticket stock and manufacturing process wherein a pulp is formulated from a blend of recycled furnishes, with added starch for enhancing sheet stiffness and reducing linting and dusting on cut edges of the stock, and clay or other opacifier for enhancing opacity of the stock. A preferred pulp comprises a blend of recycled solid bleached sulfate plate stock, recycled coated soft white, and recycled ground wood furnish such as newsprint or the like. In one embodiment, the blend comprises about 25-50 wt. % recycled solid bleached sulfate plate stock, about 25-50 wt. % recycled coated soft white, and about 15-25 wt. % recycled ground wood furnish. The furnish blend is repulped with minimal mechanical refining, is treated with steam injection for hydrating and softening the fibers, and is formed into a web that is pressed, dried, and soft calendared. The caliper of the resulting stock is about 7 to 9 points.
RECYCLED WHITE TICKET STOCK AND METHOD OF MAKING SAME

BACKGROUND OF THE INVENTION

[0001] The invention relates in general to papermaking, and in particular relates to the manufacture of paper suitable for use as ticket stock used for making redemption tickets of the type commonly dispensed from automated machines in game arcades and the like.

[0002] Game arcades often have electronic games that disperse redemption tickets as a reward for having played the game well. Depending on the game score achieved by the player, the game machine dispenses a different number of tickets. The tickets typically can be redeemed for prizes such as toys, stuffed animals, candy, and the like. The game machines generally employ an automated ticket dispenser that dispenses a number of tickets based on the game score.

The tickets are supplied in the form of a roll of interconnected tickets separated from one another by perforations. The tickets usually have a printed bar code on one side and may have other indicia and/or graphics on the opposite side. The automated ticket dispenser includes an optical sensor that detects the bar code or other printed marking on each ticket, and in that manner the dispenser is able to count how many tickets are dispensed. Arcades sometimes also include ticket counting machines that operate on a similar principle, such that tickets to be redeemed are fed into the counting machine, which counts the tickets by using an optical sensor.

[0003] For proper functioning of the ticket dispensers and ticket counters, and for good aesthetics of the tickets, it is important that the paper or stock making up the tickets have a high opacity so that printed ink on one side of the tickets does not show through to the other side. At the same time, it is desirable for the tickets to have a soft feel in the hand, to have edges that are not so sharp as to pose a risk of cutting the users’ hands, to have relatively high strength so they are not easily torn, and to have a highly smooth surface for good printability. Currently available ticket stocks do not always achieve all of these desirable characteristics.

[0004] The majority of ticket stocks currently being produced are formed on multi-ply paper machines, and have a thickness or caliper of about 9.5 to 13 points (i.e., 0.0095 to 0.013 inch). Some ticket stock is also produced as a coated solid bleached sulfate (SBS) sheet with a caliper as low as 7 points, but the coating is essential for achieving sufficient opacity to enable proper functioning of the automated ticket dispensers. Such coated SBS ticket stock generally does not have a desirable soft feel in the hand.

[0005] Ticket stock of lower caliper is desirable for improving the ticket yield per unit weight of the papermaking furnish, and for increasing the number of tickets per roll of a given diameter. However, reducing the caliper generally has an adverse impact on some of the other desirable characteristics. For instance, a thinner paper, all other things being equal, has a reduced opacity, a reduced stiffness, and a reduced strength. There is also a certain caliper threshold below which the tickets do not have a good “feel” in the hand, as being too flimsy or insubstantial. It is generally thought that the practical lower limit is about 6.5 to 7 points, as tickets below this caliper level generally feel flimsy and are not favored by consumers.

Additionally, although some ticket stocks are colored, there is a sizeable market for white ticket stock. Such white ticket stock must have a high brightness.

[0007] Additionally, although some ticket stocks are colored, there is a sizeable market for white ticket stock. Such white ticket stock must have a high brightness.

[0008] Accordingly, it would be desirable to provide a white ticket stock of relatively low caliper, such as about 7 to 9 points, more preferably about 7 points, having a high opacity, a soft feel, and a highly smooth surface for good printability.

BRIEF SUMMARY OF THE INVENTION

[0009] The invention addresses the above needs and achieves other advantages, by providing a ticket stock and manufacturing process wherein a pulp is formulated from a blend of recycled furnish, with added starch for enhancing sheet stiffness and reducing linting and dusting on cut edges of the stock, and with added clay or other opacifier for enhancing opacity of the stock. A preferred pulp comprises a blend of recycled solid bleached sulfate plate stock, recycled coated soft white, and recycled ground wood furnish such as newsprint or the like. In one embodiment, the blend comprises about 25-50 wt. % recycled solid bleached sulfate plate stock, about 25-50 wt. % recycled coated soft white, and about 15-25 wt. % recycled ground wood furnish. Starch can be added in the amount of about 25 to 35 pounds per ton of the finished stock. Clay can comprise about 80 to 120 pounds per ton of the finished stock.

[0010] The ticket stock preferably has a caliper of about 7 to 9 points, more preferably about 7 points. The formulation of the pulp leads to an opacity (measured according to the TAPPI 519 method) of at least about 98 percent. The ticket stock has a Parker Smoothness not substantially exceeding about 8 microns, more preferably not substantially exceeding about 6 microns, and still more preferably not substantially exceeding about 5 microns.

[0011] A process for making a ticket stock in accordance with the invention entails formulating a pulp from a mixture of recycled furnish as noted above, and adding starch and clay or other opacifier to the pulp. The recycled furnish are repulped with minimal mechanical refining or fiber shortening. The pulp is then processed at elevated temperature to hydrate and soften the fibers; this can be accomplished, for example, in a unit that injects steam into the pulp while the pulp is at a high consistency. In the case where the recycled furnish includes some printed furnish, this treatment is also effective to break up ink and other contaminants into very fine particles.

[0012] Next, the pulp is fed at a suitable consistency level to a former, which forms a wet web. The former can comprise any of various forms known in the art, including single-ply and multi-ply formers. In one embodiment, a fourdrinier former is employed to form a single-ply web.

[0013] The wet web is then dewatered and pressed in a press section. The press section can comprise various types and numbers of presses. In one embodiment, the press section comprises two sequentially arranged presses such as roll presses equipped with dewatering fabrics. The web is then advanced through a drying section. The drying section can be of various configurations. In one embodiment of the invention, the drying section comprises a series of heated drying cylinders that the web is brought into contact with in turn. The web can be urged into firm contact with the cylinders by fabrics.
After drying, the web is fed through a soft nip calender. The calendering of the web imparts a smooth surface to the web for good printability and enhances the soft feel of the web.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

FIG. 1 is a schematic depiction of a papermaking machine and process in accordance with one embodiment of the invention;

FIG. 2 is a schematic illustration of one cylinder group of the drying section in accordance with one embodiment of the invention; and

FIG. 3 shows a roll of redemption tickets formed of a stock in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

The present inventions now will be described more fully hereinafter with reference to the accompanying drawings, in which some but not all embodiments of the invention are shown. Indeed, these inventions may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

With reference to FIG. 1, an apparatus and process for making a paper suitable for use as a ticket stock is illustrated. The process begins by placing a mixture of furnishings into a pulper, or repulper, 10 along with a quantity of water and agitating the mixture to break up the furnishings down into a pulp. The mixture of furnishings comprises a blend of recycled furnishings. A preferred mixture comprises a blend of recycled solid bleached sulfate (BSB) stock, recycled coated soft white, and recycled ground wood furnish such as newsprint or the like. In one embodiment, the blend comprises about 25-50 wt. % recycled solid bleached sulfate (SBS) plate stock, about 25-50 wt. % recycled coated soft white, and about 15-25 wt. % recycled ground wood furnish. A particularly advantageous blend comprises about 30 wt. % SBS plate stock, about 50 wt. % coated soft white, and about 20 wt % newsprint. The furnishings advantageously are blank or unprinted, but alternatively one or more can be printed. The pulper 10 preferably repulps the furnishings without any substantial degree of mechanical refining or fiber shortening. In this regard, the pulper preferably comprises a large open metal vessel with a high shear agitator in the bottom. A slurry of pulp at a consistency of 4%-6% solids is formed by feeding dry paper bales along with process white water into the pulper and agitating until the slurry can be extracted through a perforated plate and pumped to a receiving chest for further processing.

After the furnishings are pulped in the pulper 10, the resulting pulp is cleaned using suitable cleaning equipment 12 to remove certain undesirable contaminants such as plastic, metal, glass, wood splinters, and dirt. The cleaning equipment comprises liquid cyclone cleaners which continuously remove particles of high specific gravity and contaminant materials such as sand, glass, paper clips, and staples, and also includes barrier screens which are designed to continuously remove oversized particles from the pulp stream prior to refining and formation.

The pulp is then fed into a disposer 14 that injects steam into the pulp while the pulp is at a high consistency (e.g., approximately 12%-20%). The disposer is a horizontally oriented, pressurized cylindrical vessel with a screw type feeder designed to keep slurry moving continuously through the vessel. The injected steam softens and hydrates the fibers of the pulp. Additionally, if any of the furnish used is printed, the steam injection breaks the inks down into very small particles which remain in the finished product but can barely be seen with the naked eye. Pigment in the form of high-brightness clay can be added later in the process to offset the loss of brightness caused by the presence of ink.

The pulp is fed from the disposer into a machine chest 16 where additional water is added to the pulp to reduce the consistency to a level suitable for paper forming. Additionally, one or more additives can be added to the pulp at this stage. For example, advantageously an amount of clay, liquid opacifier, or other opacifying agent can be added to the machine chest 16 for enhancing the opacity of the finished paper. In one embodiment, clay is added in an amount of about 80 to 120 pounds per ton of the finished paper stock.

Next, a process of fiber refining 18 can be performed using suitable equipment such as fractionating units or the like, to achieve a pulp having fiber lengths in a desired range. Such fractionating units and processes are known in the art and hence need not be described in detail herein. Advantageously, the pulp after the refining step 18 has developed sufficient bonding sites on the fiber cell walls for strength development with minimum fiber length reduction. Following the refining step, a size agent such as starch can be added to the pulp as shown. Starch can be added in the amount of about 25 to 35 pounds per ton of the finished stock.

The pulp advantageously is then subjected to a thin stock cleaning process 20. This process consists of pumping dilute slurry (<1% solids) through a bank of multiple high velocity centrifugal cleaners to remove a large percentage of remaining fine particle contaminant materials (approx. 70%-90% removal rate).

The pulp is then fed into a headbox 22 of a fourdriner former 24. The headbox injects a stream of pulp onto a traveling wire 26 of the former. Dewatering elements 28 beneath the wire drain some of the water from the web formed on the wire. Advantageously, a Dandy roll 30 (i.e., essentially a roll with a wire screen wrapped around it) contacts the upper surface of the formed web to assist in web formation.

The web formed in the fourdriner former 24 is advanced to a press section 32 for further dewatering. The press section can comprise various types and numbers of press devices, including roll presses, extended-nip or shoe presses, or the like. In the illustrated embodiment, the press section comprises a first roll press 34 and a second roll press
36. Each of the roll presses includes a pair of dewatering fabrics (not shown) between which the wet web is sandwiched. The fabrics with the web therebetween are passed through the nip between the two rolls of the press. The pressure exerted on the fabrics and web causes water to be transferred from the web into the fabrics, as known in the art. The linear nip load exerted on the fabrics and web is generally higher in the second press 36 than in the first press 34. For example, the nip load in the first press advantageously can be about 400 lb/linear inch (PLI) while the load in the second press can be about 1,400 PLI.

[0027] The web can be treated by a steam box 38 prior to the press section 32 in order to heat the wet sheet and improve pressing and drying efficiency.

[0028] After pressing, the web is fed through a dryer section 40 for thermally drying the web to a desired low moisture content. The dryer section is made up of a first group of heated drying cylinders 42 and a second group of heated drying cylinders 44. Each group of cylinders includes a pair of fabrics for urging the web against the cylinders. FIG. 2 shows the first group of cylinders 42 in greater detail. The cylinders are arranged so that the web W passes in serpentine fashion about each cylinder in turn, whereby one side of the web contacts the first cylinder, the other side of the web contacts the next cylinder, and this alternate cycle repeats for the next two cylinders, etc. A first fabric 46 is arranged to pass around a first set of the cylinders 42. Guide rolls 48 guide the first fabric 46 from one cylinder to the next and allow the fabric to wrap about a substantial portion of the circumference of each cylinder. The web W is arranged so that it is between the first fabric 46 and each cylinder 42. A second fabric 50 is arranged to pass around a second set of the cylinders 42, and guide rolls 52 guide the second fabric from one cylinder to the next and allow the fabric to wrap about a substantial portion of the cylinder circumferences.

[0029] The second group of drying cylinders 44 likewise has a pair of fabrics that operate in the way described above.

[0030] With reference again to FIG. 1, after the web exits the drying section 40, it can optionally be coated on one or both sides in a coating applicator 54. The applied coating(s) can then be dried in a dryer 56. Advantageously, however, a ticket stock in accordance with preferred embodiments of the invention does not have any coating.

[0031] Next, the web is passed through a calender 58. The calender advantageously comprises a soft nip calender wherein one of the calender rolls has a surface that is deformable so that the nip formed between the deformable roll and the opposing roll is somewhat elongated rather than being a single tangent point between two rigid rolls. The calender is preferably heated. A suitable calendering temperature is between about 400°F and about 500°F. Calendering of the web in the soft nip calender imparts a smooth surface to the web for good printability, and enhances the soft feel of the web.

[0032] Finally, the finished web is wound into a roll in a reel-up 60. The roll of finished stock typically is shipped to a converter where it is converted into redemption tickets or other products. In the case of redemption tickets, the stock is unwound from the roll, slit, perforated, printed, and wound into individual rolls of redemption tickets such as the roll 70 shown in FIG. 3.

[0033] The stock in accordance with preferred embodiments of the invention is manufactured to have a caliper of about 7 to 9 points, more preferably about 7 points. The formulation of the pulp leads to an opacity (measured according to the TAPPI 519 method) of at least about 98 percent for the finished stock, more preferably at least about 99 percent. The stock preferably has a Parker Smoothness, on at least one of its surfaces, not substantially exceeding about 8 microns, more preferably not substantially exceeding about 6 microns, and still more preferably not substantially exceeding about 5 microns.

[0034] As an example of a stock made in accordance with one embodiment of the invention, a white ticket stock was manufactured from 30 wt % SBS plate stock, 50 wt % coated soft white, and 20 wt % blank newsprint. Clay was added to the pulp in the amount of about 100 pounds per ton of the finished stock. Starch was added in the amount of about 28 to 31 pounds per ton of finished stock. The stock was manufactured using the above-described process, without the optional coating. Five rolls of the stock were prepared, and three samples from each roll were tested for various properties. The average of all samples was computed for each measured property. The average properties are listed below:

[0035] Caliper: 6.84 points
[0036] Basis Weight: 32.65 lbs/1000 ft²
[0037] Density: 4.78 lbs/point (per 1000 ft²)
[0039] Water Drop (TAPPI RC-70): 103 secs. (back), 85 secs. (top)
[0040] Taber Stiffness: 18.9 g-cm (MD), 10.2 g-cm (CD)
[0041] Parker Smoothness: 5.97 μ (top), 4.29 μ (back)
[0042] Minolta Color (avg. of top and back): 84.72 L, 1.77 A, 2.51 B
[0043] Opacity (TAPPI 519): 99.61%

[0044] The finished stock was clean and bright, with little or no specs or particles that could pick off the surface when printed. The stock had a matte finish and a generally soft feel in the hand. Slit edges were clean and substantially free of linting or dusting.

[0045] Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

What is claimed is:

1. A paper product, comprising:

a. a web formed from a pulp comprising a mixture of:

recycled furnish including recycled solid bleached sulfate plate stock, recycled coated soft white, and
recycled ground wood furnish, the pulp further comprising starch for enhanced stiffness and reduction of linting and dusting on cut edges of the paper product, and an opacifier for enhanced opacity of the paper product.

2. The paper product of claim 1, the paper product having a caliper of about 7 to 9 points, a TAPPI 519 opacity of at least about 98 percent and a Parker Smoothness not substantially exceeding about 8.0 microns.

3. The paper product of claim 2, wherein the Parker Smoothness is not substantially in excess of about 6.0 microns.

4. The paper product of claim 2, wherein the Parker Smoothness is not substantially in excess of about 5.0 microns.

5. The paper product of claim 1, wherein the recycled furnish comprises about 25-50 wt. % recycled solid bleached sulfate plate stock, about 25-50 wt. % recycled coated soft white, and about 15-25 wt. % recycled ground wood furnish.

6. The paper product of claim 5, wherein the recycled ground wood furnish comprises newsprint or newsprint substitute.

7. The paper product of claim 5, wherein the starch comprises about 25-35 lb/ton of the pulp.

8. The paper product of claim 5, wherein the opacifier comprises clay.

9. The paper product of claim 8, wherein the clay comprises about 80 to 120 lb/ton of the pulp.

10. The paper product of claim 1, wherein the paper product comprises a single ply.

11. A paper product formed from a pulp consisting essentially of a mixture of recycled solid bleached sulfate plate stock, recycled coated soft white, recycled ground wood furnish, starch for enhanced stiffness and reduction of linting and dusting on cut edges of the paper product, and an opacifier for enhanced opacity of the paper product.

12. A process for making a paper product, comprising the steps of:

(a) repulping a mixture of recycled furnish to produce a pulp;
(b) adding starch and opacifying agent to the pulp;
(c) hydrating and softening the fibers of the pulp under elevated temperature conditions;
(d) forming a wet web out of the pulp from step (c);
(e) dewatering and pressing the wet web in a press section;
(f) drying the web on a series of heated drying cylinders; and
(g) soft-nip calendering the dried web.

13. The process of claim 12, wherein step (a) comprises repulping a mixture including recycled solid bleached sulfate plate stock, recycled coated soft white, and recycled ground wood furnish.

14. The process of claim 13, comprising repulping a mixture of about 25-50 wt. % recycled solid bleached sulfate plate stock, about 25-50 wt. % recycled coated soft white, and about 15-25 wt. % recycled ground wood furnish.

15. The process of claim 12, wherein step (d) comprises forming the wet web using a fourdrinier former.

16. The process of claim 12, wherein step (e) comprising dewatering and pressing the wet web in a pair of sequentially arranged presses.

17. The process of claim 12, further comprising the step of treating the web with a steam box between steps (f) and (g).

18. The process of claim 12, wherein step (f) comprises using fabrics to urge the web against the heated drying cylinders.

19. The process of claim 12, wherein step (h) comprises adding starch in the amount of about 25-35 lb/ton of the pulp.

20. The process of claim 12, wherein step (i) comprises adding clay as the opacifying agent.

21. The process of claim 20, wherein the clay is added in the amount of about 80-120 lb/ton of the pulp.

22. A process for making a white ticket stock, comprising the steps of:

(a) repulping, with minimal mechanical refining or fiber shortening, a mixture of white recycled furnish to produce a pulp;

(b) adding starch and opacifying agent to the pulp;

(c) hydrating and softening the fibers of the pulp under elevated temperature conditions;

(d) forming a wet web out of the pulp from step (c);

(e) dewatering and pressing the wet web in a press section;

(f) drying the web on a series of heated drying cylinders; and

(g) soft-nip calendering the dried web.

23. The process of claim 22, wherein step (a) comprises repulping a mixture of solid bleached sulfate plate stock, coated soft white, and ground wood furnish.

24. The process of claim 22, wherein step (c) comprises processing the pulp in a hot dispersion unit.

25. The process of claim 24, wherein the pulp has a relatively high consistency during step (c), and further comprising the step of reducing the consistency of the pulp after step (c) but before step (d).

26. The process of claim 22, wherein step (d) comprises forming a single-ply web.

27. The process of claim 22, further comprising the step of treating the web with a steam box between steps (f) and (g).

28. The process of claim 22, wherein step (f) comprises using fabrics to urge the web against the heated drying cylinders.

29. A roll of redemption tickets formed as an elongate strip of ticket stock having perforations to define a series of interconnected redemption tickets, the ticket stock comprising a fibrous web formed from a pulp comprising a mixture of recycled furnish including recycled solid bleached sulfate plate stock, recycled coated soft white, and recycled ground wood furnish, and further comprising starch for reduction of linting and dusting on cut edges of the redemption tickets and opacifying agent for enhanced opacity of the redemption tickets, the redemption tickets having a caliper of about 7 to 9 points.

30. The roll of redemption tickets of claim 29, wherein the redemption tickets have a Parker Smoothness not substantially exceeding about 8.0 microns.
31. The roll of redemption tickets of claim 29, wherein the redemption tickets have a Parker Smoothness not substantially exceeding about 6.0 microns.

32. The roll of redemption tickets of claim 29, wherein the redemption tickets have a Parker Smoothness not substantially exceeding about 5.0 microns.

33. The roll of redemption tickets of claim 29, wherein the redemption tickets have a TAPPI 519 opacity of at least about 98 percent.

34. The roll of redemption tickets of claim 29, wherein the furnish comprises about 25-50 wt. % recycled solid bleached sulfate plate stock, about 25-50 wt. % recycled coated soft white, and about 15-25 wt. % recycled ground wood furnish.