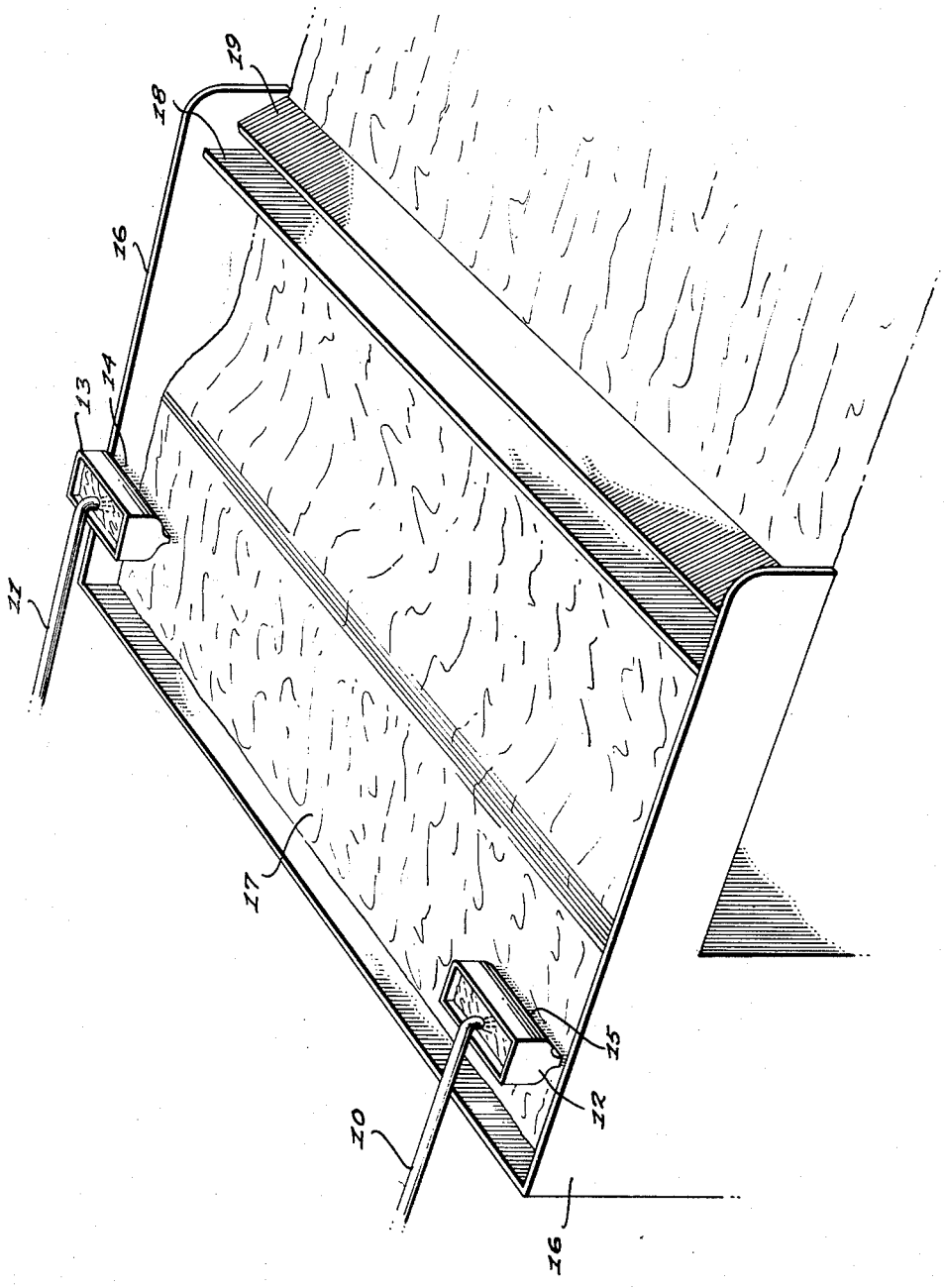
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METHOD OF ADDING EXTRA FILLER TO THE EDGES OF PAPER

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METHOD OF ADDING EXTRA FILLER TO THE EDGES OF PAPER

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This invention relates to the method of increasing the filter content at selected locations in a paper sheet. The method may find utility in the manufacture of various types of paper where it is desired to introduce into the paper sheet, at any desired location, additional amounts of filter. Also, the filler may be of various and sundry types, such as calcium carbonate, magnesium carbonate, titanium dioxide, clay, starch, etc., and all of these variations are intended to be included within the scope of the present invention.

The invention has been found to have great utility and substantial commercial importance in the manufacture of cigarette paper, wherein the calcium carbonate filler content at the edges of the cigarette paper is increased during the formation thereof on a paper machine. The purpose of this is to increase the porosity of the edges of the paper and thereby increase the burning rate of cigarette paper wrappers made from these edge portions. The invention will be described hereafter, by way of illustration, with reference to the production of cigarette paper on a Fourdrinier type of paper machine and the introduction of the added carbonate into the furnish of fiber and filler just prior to the point at which this furnish is flowed onto the paper machine wire to form the paper sheet.

Heretofore, cigarettes wrapped in paper cut from the center of the sheet at the reel of the paper machine have burned more rapidly than those wrapped in paper taken from the edges of the sheet. The difference in burning rate is directly proportioned to the difference in porosity and this in turn is proportioned to the difference in calcium carbonate filler content at the center and edges of the sheet, respectively.

Heretofore, the paper machine operators attempted to maintain a delicate balance of quality by manufacturing a paper of higher average porosity than required so that the edges of the sheet would only be slightly deficient in porosity. However, this practice resulted in a paper that tended to burn too fast at the center of the sheet. By diverting a small amount of the main supply of the filler and directing it to the edges of the stream of stock flowing onto the Fourdrinier, it has been found possible to eliminate the difference in porosity between the edges and the center of the sheet. At substantially no extra cost, this method has greatly facilitated the control of the porosity, and hence of the burning rate, of the cigarette paper, and has practically eliminated the danger of paper with off-quality porosity getting out to the trade.

Typical but non-limiting examples of the method of this invention are as follows:

Example I

During the manufacture of standard cigarette paper comprised of flax pulp and precipitated chalk, paper sampled at about the center of the sheet as it was wound up at the reel weighed 20.88 grams per square meter, had a porosity of 47, an opacity of 72.5, a filler content of 25.5%, a tensile strength of 3.71 kilograms per 3 centimeters, and a stretch at break of 2.2%. Samples taken at the edge of the sheet averaged 21.88 grams per square meter in weight, 65 in porosity, 71.5 in opacity, 24.0% in filler content, 3.99 kilograms per 3 centimeters in tensile strength, and 2.2% in stretch at break. The porosity was 80 at the very edge, and 60 nine inches from the edges. Similarly, the opacity of the sheet was 70 at the edge of the sheet, and 71 about nine inches from the edge.

In order to improve the porosity and the opacity of

the paper at and near the edge of the sheet, a carbonate slurry consisting of 12½ lbs. of calcium carbonate per 50 gallons was fed at the rate of about 0.85 gallon per minute at a point approximately 14" behind the slice through a ⅜" shower pipe having 3/16" holes on 1" centers. The outermost hole was about ½" from the edge of the pond behind the slice. The speed of the paper machine during this run was 100 meters per minute. After the extra filler was added, the porosity at the edge of the sheet averaged 47, the weight of the paper 21.86 grams per square meter, the opacity 73.0, the filler content 27.3%, the tensile strength 3.53 kilograms per 3 centimeters, and the stretch 2.1%. Samples of paper taken from the middle of the sheet showed a porosity of 47, weight of 21.18, opacity of 72.8, filler content of 25.7%, tensile strength of 3.72 kilograms per 3 centimeters, and stretch of 2.1%.

These data are collected below. By porosity is meant the time in seconds for a given volume of air to flow through the paper specimen under standardized conditions: the lower the value the more porous the sheet. Opacity was measured by means of a Photovolt reflectometer: the lower the value, the less opaque the sheet.

	Average Center Values	Average Edge Values	
		Before Addition of Extra Filler	During Addition of Extra Filler
Weight	20.88	21.88	21.86
Porosity	47	65	47
Opacity	72.5	71.5	73.0
Filler Content	25.5	24.0	27.3
Tensile	3.71	3.99	3.53
Stretch	2.2	2.2	2.1

From the foregoing data, it is apparent that the extra filler added at the edges of the paper improves the porosity and the opacity without serious impairment of the strength of the paper and without excessive change in weight. This is a very important result, since it shows that the extra filler added at the edges makes the edges of the paper equal in combustibility and in general appearance to the middle of the sheet. A difference in porosity between 65 and 47 indicates a marked difference in rate of combustibility. Thus, a cigarette rolled in cigarette paper with a porosity of 65 would burn much more slowly than when the same tobacco is rolled in cigarette paper having a porosity of 47.

Example II

In another example of procedure, about 0.58 gallon per minute of carbonate slurry of the same strength used in the foregoing example of procedure was similarly added to the edge of the pond. The data observed are as follows:

	Average Center Values	Average Edge Values	
		Before Addition of Extra Filler	During Addition of Extra Filler
Weight	21.18	21.8	22.12
Porosity	47	61	51
Opacity	72.8	72.3	72.2
Filler Content	25.7	24.8	26.2
Tensile	3.72	3.86	3.47
Stretch	2.1	2.1	2.1

In this experiment, as in the first, it is apparent that the extra filler added to the edge of the sheet improved the porosity without serious loss in strength.

Example III

In a third example of procedure, a slurry containing 0.24 lb. of filler per gallon was added at the rate of 0.31 gallon per minute to distributing showers at each edge of the machine flow box. Below are listed the data observed.

	Front Edge Averages		Back Edge Averages	
	Before Addition of Extra Filler	During Addition of Extra Filler	Before Addition of Extra Filler	During Addition of Extra Filler
Weight	22.30	23.19	22.56	23.38
Porosity	59	54	60	52
Opacity	70.9	73.1	71.4	73.0
Filler Content	22.1	24.5	22.0	24.6
Tensile	4.30	4.10	4.27	4.15
Stretch	2.4	2.4	2.3	2.4

Example IV

In a fourth example, the conditions were similar to those in the previous example. The data observed are as follows:

	Front Edge Averages		Back Edge Averages	
	Before Addition of Extra Filler	During Addition of Extra Filler	Before Addition of Extra Filler	During Addition of Extra Filler
Weight	21.75	22.49	22.70	23.57
Porosity	58	49	59	51
Opacity	72.3	73.4	72.2	75.8
Filler Content	23.2	25.3	23.5	25.8
Tensile	4.10	4.09	4.18	4.21
Stretch	2.4	2.4	2.3	2.4

The above "front" and "back" edges refer, respectively, to the "front" and "back" side of the paper machine as commonly termed by the machine attendants.

Example V

A slurry containing about $\frac{2}{10}$ of a pound of filler per gallon was added at the edges of the paper machine flow box through two narrow troughs set at right angles to the direction of travel of the Fourdrinier wire. The troughs were about 6" long, 4" wide, and 8" deep, and were provided at the bottom with six holes on 1" centers. The hole nearest the edge of the flow box was $\frac{3}{16}$" diameter, the second hole from the edge was $\frac{11}{64}$" in diameter, the third $\frac{9}{64}$", and the other three holes were each $\frac{3}{32}$" diameter. The reason for the variation in hole diameter was to permit increased proportion of carbonate to be added at the very edge of the flow box. About 0.7 of a gallon per minute of slurry was added to each of the distributing boxes. The results obtained are summarized in the following table.

	Center of Sheet Averages		Front Edge Averages		Back Edge Averages	
	Before Addition of Extra Filler	During Addition of Extra Filler	Before Addition of Extra Filler	During Addition of Extra Filler	Before Addition of Extra Filler	During Addition of Extra Filler
Weight	21.54	21.17	22.02	21.76	21.85	21.83
Porosity	46	46	55	46	53	45
Opacity	72	72	71	71	72	73
Filler Content	25.5	25.6	24.3	25.9	24.4	26.1
Tensile	3.78	3.75	3.80	3.74	3.75	3.86
Stretch	2.1	2.1	2.2	2.0	1.9	2.0

The accompanying drawing illustrates diagrammatically the method of this invention for directing small amounts of calcium carbonate filler, to the cigarette paper furnish in the flow box. As shown, this calcium carbonate filler is introduced through pipes **10** and **11** into the two narrow troughs **12** and **13** of the type described in Example V above, and which are supplied with spaced holes in the bottom to provide more or less separate small streams of the calcium carbonate slurry indicated at **14** and **15**. These troughs **12** and **13** are located above and near the corners, at the rear, of the flow box **16**, which contains the pool of paper furnish **17**. A fixed slice **18** and a flexible slice **19** are provided for controlling the flow of the furnish onto the machine wire. The desired quantity and concentration of the additional calcium carbonate filler **19**, is furnished, through the pipes **10** and **11**, from a source of carbonate supply (not shown) and is fed by any suitable type of supply and metering device to provide a uniform flow of the slurry. The source of carbonate supply for these edge additions may be the same as the supply of carbonate to the entire furnish, or it may be a separate supply.

The additional calcium carbonate filler slurry **14** and **15** is incorporated into the pool of paper furnish **17** and tends to distribute itself quickly and uniformly in the furnish, although leaving the predominant amount of the added calcium carbonate filler within the relatively narrow area where it is introduced. This method of addition causes no streaks in the paper sheet formed from this furnish, and the paper sheet is substantially the same in appearance as that produced on this type of machine without these edge additions of the calcium carbonate filler, except for the improved opacity which is effected at the edges of the sheet by the method of this invention.

Various changes and modifications may be made in the above-described materials, method and equipment without departing from the scope of this invention as defined in the appended claims.

I claim:

1. A method of improving the uniformity of distribution of the carbonate filler in a cigarette paper sheet produced on the forming wire of a paper machine, from a pulp and filler furnish supplied from a head box, comprising adding additional amounts of carbonate filler to the furnish in the head box at locations adjacent the edges thereof and in line with the edges of the forming wire, the amount of added filler being sufficient to make the carbonate filler content at the edges of the paper sheet substantially equivalent to the carbonate filler content at the center of the sheet.

2. A method of avoiding the usual deficiency of filler content at the edges of a filled paper sheet produced on the forming wire of a paper machine, comprising adding controlled amounts of filler slurry to the pulp and filler furnish in the paper machine head box at locations adjacent to the edges of the head box in line with the edges of the paper sheet produced on the forming wire, the added amounts of filler blending with the pool of furnish in the head box and although leaving the predominant amount of the added filler within the relatively narrow areas where it is introduced, nevertheless causing no streaks in the paper sheet formed from said furnish.

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