

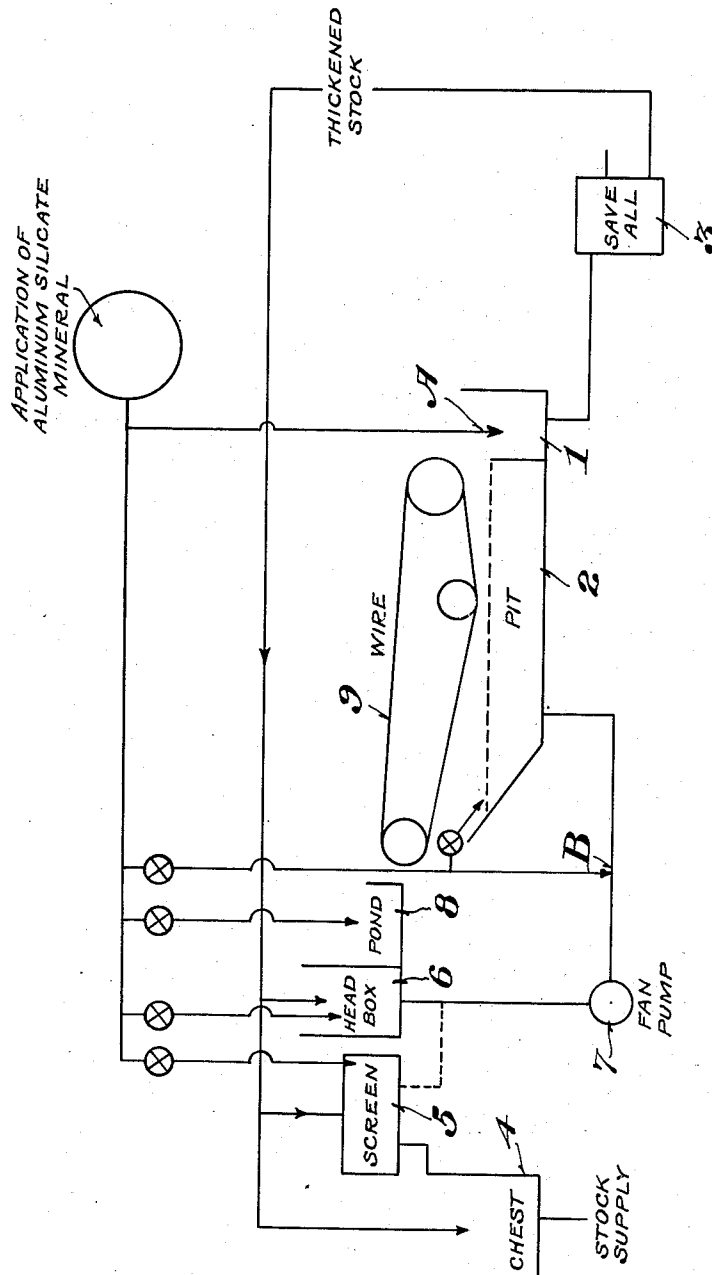
Feb. 6, 1945.

L. M. BOOTH

2,368,635

PROCESS OF MANUFACTURING PAPER AND BOARD

Filed May 11, 1939



Inventor
L.M. Booth, Dec'd.
BY **Alice L. Booth, EXECUTRIX,**

By *William H. & Co.*
Attorneys

UNITED STATES PATENT OFFICE

2,368,635

PROCESS OF MANUFACTURING PAPER
AND BOARDLevis M. Booth, deceased, late of Plainfield, N. J.,
by Alice Lippincott Booth, executrix, Plainfield,
N. J.

Application May 11, 1939, Serial No. 273,136

4 Claims. (Cl. 92—21)

This invention relates to a method of forming a sheet of paper or ply of paperboard from a dilute suspension of fibers. It has particular reference to the distribution of fibers in the sheet and the retention of fines therein.

One of the objects of this invention is to provide a more economical and advantageous means of distributing fibers in a formed sheet. It is customary to enhance the uniformity of fiber distribution by shortening the fiber length. This is ordinarily accomplished by beating or other mechanical treatment which is both expensive and deleterious to the fibers themselves. However, by the practice of this invention it is possible chemically to produce a sheet having greater strength and better folding properties than is ordinarily produced by a process which includes the usual amount of mechanical treatment, and with greater economy.

Another object of this invention is to retain in the sheet a large portion of the fines which are present in fiber suspensions used in making paper.

In the drawing the figure is a diagrammatic flow sheet illustrating a typical paper making layout showing the points of possible application of the chemical.

In practice, it has been found advantageous to apply to the fiber suspension a preformed aluminum silicate mineral. By aluminum silicate mineral is meant that group or series of claylike materials known as bentonite which have been formed by the alteration of volcanic ash. The aluminum silicate mineral is a mixture of colloidal matter, minute crystalline material and unchanged impurities. Only those aluminum silicate minerals which have the property of expanding when moist and contracting when dry to add to or lose a large percentage of their bulk are useful in the performance of this invention.

This aluminum silicate mineral, which has relatively great bulk when in water as compared with the dry bulk, when added to the water suspension of the fibers physically separates the fibers so that a more uniform distribution is attained without excessive mechanical treatment. When the fibers and the mineral with which they are intermingled are dried the separating substance shrinks without disturbing the distribution of the fibers except to bring them closer together.

The colloidal matter of which this material is primarily composed is of distinct advantage in the practice of this improved invention. The hydrophilic colloid constituted by this aluminum silicate mineral bearing an electrical charge in the presence of ions of unlike charge attracts and

precipitates these ions, and the colloid itself constitutes a part of the precipitate. In a paper making system fines or finely divided particles may be composed of fibrous matter or clay particles or finely divided size. The coagulation of these fines to larger particle size permits their incorporation in the sheet to good advantage and removes them from the paper making system where they are detrimental.

One of the particular advantages of the aluminum silicate mineral used in the practice of this invention is that the material itself is highly insoluble and adds no further soluble salts to the paper making system. In mills where it is the practice to continuously reuse the water the addition of the usual type of coagulating material increases the concentration of soluble salts sometimes to an objectionable degree.

In the manufacture of certain grades of paper and paperboard from stock which frequently contains certain contaminating substances a disagreeable or objectionable odor is often produced. The power of adsorption and of absorption which is exhibited by this mineral overcomes the difficulty and rids the system of the odor.

In order to obtain any or all of the previously mentioned results the aluminum silicate mineral may be added to a water suspension of the stock at a time when the dilution approximates or is less than that which is customarily found at the point of sheet formation in paper or paperboard manufacture. It may be added to a minor portion of water suspension of the stock which is later mixed with the major portion of the water suspension of the stock which is used to form the sheet of paper or paperboard or otherwise as convenient.

The quantity of aluminum silicate mineral employed in the practice of this invention is established by the character of the paper or paperboard in the process of manufacture. The quantity is in proportion to the amount of suspended matter plus the amount of soluble ions in the dilute suspension of the stock which is mixed with the balance of the stock and subsequently used to form paper and paperboard.

In practice it has been found convenient to handle and feed the aluminum silicate mineral in an aqueous suspension. Such a suspension can be made by feeding the dry commercial material from a conventional dry feeder into a mixing tank through which water is continuously passed to act as a wetting agent and vehicle for delivery to the desired point in the paper making system. It has also been found practical in cer-

tain instances to add the dry mineral of the white water of the paper making system at a point where sufficient agitation exists. In this way the aluminum silicate mineral is conducted to the sheet forming section of the system through one of the standard recirculating channels.

In connection with the flow sheet, several alternate methods of applying aluminum silicate mineral as practiced in this improved invention are shown.

One point of application of the aluminum silicate mineral is indicated at A in sump 1 which catches the overflow from pit 2 of the paper making machine. As indicated the treated outlet from sump 1 passes to the saveall 3 which may be of either the screen or tank type. The coagulating properties of the mineral assist in the operation of the saveall. The thickened stock from the saveall containing the mineral is returned to the chest 4, the screen 5 or the head box 6 and thus to the wire 9 where the separating properties of the mineral are used to advantage. The clarified effluent from the saveall is reused as desired.

Another point of application which may be advantageously used is at point B which is in the suction line between pit 2 and fan pump 7. In this way the aluminum silicate mineral is introduced to the main flow of stock in head box 6 from which it flows through pond 8 to the sheet forming wire 9. This point of application may be desirable in the practice of the invention since at this point in the paper making system the percentage of stock present which is less than 2% consistency is composed of the finely divided matter which has passed through the paper making wire. The addition of the aluminum silicate mineral by its action adsorbs these fines and upon mixing with the main body of the stock produces a uniform distribution of the fibers and its consequent benefits. To produce the same results it may be more convenient to introduce the aluminum silicate mineral in pit 2.

Another point of application may be at the pond 8 or head box 6 of the paper machine at which point the stock is diluted to less than 2% consistency and passes from here through the pond 8 to the paper forming wire 9. After the addition of the aluminum silicate mineral the chemical attraction of its particles and the physical adsorption of its structure serves to maintain in the web of paper a uniform and even distribution of the fibers. Substantially similar results may be effected by the application of the aluminum silicate mineral at the screen 5 which may be in use previous to the head box 6, when the dilution at that point is 2% or less.

In instances where desirable to complete the coagulation an alkaline substance as for example hydrated lime may be added. Whether and to what extent this should be done is determined by the furnish of the paper being produced. The alkaline substance may be applied in the form of a solid, a solution or a water suspension. Instead of using the alkaline substance, the completion of the coagulation may be obtained by using an acidifying substance, such as sulphate of aluminum.

The preferred method of application of the alkaline substance or the acid bearing substance is previous to, following or coincident with the application of the aluminum silicate mineral to the stock at a stage in the process where the stock has a consistency of less than 2% based on the weight of water in the mixture, that is, at the paper machine, close to the point of sheet formation. The addition of the alkaline or acid substance at this point where the consistency is less than 2%, minimizes the reaction of the alkaline or acid substance with the fibers, which would take place to a considerable and undesired extent if such substance is added at a previous point in the system where the consistency is greater and a longer time is provided for reaction.

What is claimed is:

1. In the art of making continuous web paper and paper board, the method of effecting uniform distribution of fibers and the retention of fines in the stock deposited on the wire which comprises introducing bentonite alone in colloidal form in quantity which in reacting will result in coagulation into the stock circulating system at a point subsequent to the beaters where the consistency of the stock is less than 2%, and without the introduction of a supplemental coagulant whereby the disassociated bentonite is brought into contact with the fiber suspension to produce flocculation and physical retention of the fibers on the said wire, and, upon drying, the bentonite shrinks to bring the fibers closer together and maintain even distribution thereof in the finished product.

2. In the art of making continuous web paper and paper board, the method of effecting uniform distribution of fibers and the retention of fines in the stock deposited on the wire, which consists in introducing bentonite in colloidal form in quantity which in reacting will result in coagulation into the stock circulating system at a point subsequent to the beaters where the consistency of the stock is less than 2%, and adding a substance to enhance coagulation to react with the bentonite present.

3. In the art of making continuous web paper and paper board, the method of effecting uniform distribution of fibers and the retention of fines in the stock deposited on the wire, which consists in introducing bentonite in colloidal form into the stock circulating system at a point subsequent to the beaters, where the consistency of the stock is less than 2%, and adding an alkaline substance to react with the bentonite present to enhance coagulation.

4. In the art of making continuous web paper and paperboard, the method of effecting uniform distribution of fibers and the retention of fines in the stock deposited on the wire, which consists in introducing bentonite in colloidal form into the stock circulating system at a point subsequent to the beaters, where the consistency of the stock is less than 2%, and adding an acidifying substance to react with the bentonite present to enhance coagulation.

ALICE LIPPINCOTT BOOTH,

Executrix of the Estate of Levis M. Booth, Deceased.