July 9, 1935. A. R. HARVEY 2,007,470

PAPER MANUFACTURE

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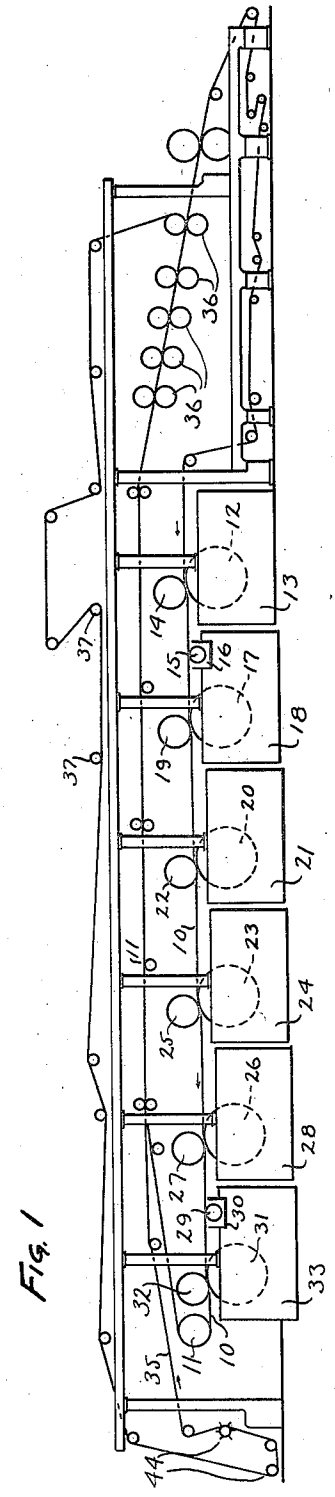


Fig. 1

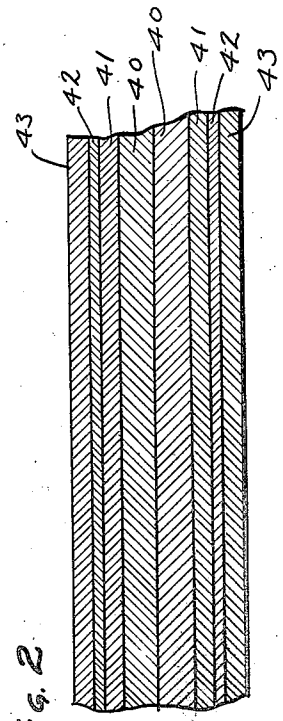


Fig. 2

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12 Claims. (Cl. 92—41)

This invention relates to paper manufacture, and more particularly to the manufacture of paperboard.

It is an object of the present invention to provide a paperboard product which has great strength and which at the same time has an attractive finish and an appearance greatly improved over the ordinary appearance of conventional paperboard.

It is a further object to provide a paperboard product combining the qualities of strength and good appearance while at the same time being simple and inexpensive to manufacture.

It is a further object to provide a method of and apparatus for making such a product that is simple, inexpensive, and efficient in use.

Further objects and advantages will be apparent from a study of the detailed description, the accompanying drawing, and the appended claims.

In the drawing,

Fig. 1 illustrates diagrammatically an apparatus suitable for carrying out the present invention; and

Fig. 2 is a sectional view on an enlarged scale of a paperboard product produced in accordance with this invention.

Paperboard as generally manufactured is largely made up of filler or body layer or layers comprising fibrous material of relatively coarse grade. This body may be made up in several ways, for instance, it can conveniently be made by forming and uniting several plies to form a homogeneous web, as on a conventional cylinder mold machine. The filler forms the body of the paperboard but because of the quality of the fibrous material used therein its appearance is usually rather dark and somewhat rough. In order to improve the outside surface of the paperboard, additional liner layers of fibrous material have been applied, this material being of better quality than the fibrous material composing the inner body. When one or several layers of this liner material are applied to the surface of the body, a finer paperboard is obtained which has a much lighter appearance than the body itself and which consequently is more desirable for many uses, such as making boxes and the like. The liner layers, which are composed of fibrous material of a better grade, are relatively thin in comparison with the thickness of the body, but nevertheless the high cost of the better grade fibrous material materially increases the cost of manufacture, particularly when more than one layer is required in order to produce the desired light colored appearance in the final product.

According to the present invention a paperboard product is provided which has a better appearance than that ordinarily obtained heretofore and which can be produced at a lower cost than previously known paperboard. In the present case an inner liner layer of fibrous material of a medium grade, that is, of a better grade than the fibrous material comprising the body but inferior to the fibrous material used as a final coating for the outside layer, is applied directly to the traveling filler web. The sheet is next passed over a "color" roll, which roll serves to apply to the sheet a coating of color. The word "color" is used to designate a class of materials that may advantageously be used, which generally are in the nature of filler clay or a similar substance having a light colored appearance. Suitable size may also be admixed with the filler clay in a water suspension, the size serving as a bonding agent. A second or outer liner layer comprising fibrous material of good quality is next applied to the traveling sheet directly over the layer of color. Thus a sheet is provided which has a very light or high white surface, on account of the layer of color underneath the outer liner layer which forms a light colored background for the outer liner layer.

Referring now to the drawing wherein there is illustrated a preferred embodiment of the invention, there is shown at 10 a continuous felt which is adapted to travel around a plurality of guide rolls 11, the direction of felt being as indicated by the arrow. The felt first comes into contact with a cylinder mold 12 which is rotated in vat 13. The vat contains fibrous material of good quality and such as is suitable for forming the outer liner layer of the paperboard. The level of the pulp suspension in the vat may be maintained at a fixed point by any of the means well known in the art. A couch roll 14 cooperates with the felt in the formation of a continuous traveling web of liner which is carried along on the lower side of the traveling felt.

The traveling web next passes over a color application roll 15 which rotates in a vat 16 containing a suitable suspension of color. The roll carries a film of the color on its surface and into contact with the traveling web and thus serves to provide a light colored background for improving the final appearance of the sheet. The roll 15 preferably is in the form of a wire screen, of the order of one hundred mesh, which is rotatably supported in any suitable frame work. It has

been determined that a fine mesh screen is more satisfactory in actual operation than a smooth surfaced roll and that the mesh should be of the order of that mentioned above, as with a larger mesh screen there is a tendency to direct the color away from the roll. It will be understood however that any other known type of color applying means may be satisfactorily used.

An example of a suitable color comprises a water suspension of filler clay and starch, the approximate composition of the bath being 150 pounds of clay and 1.5 pounds of starch to 500 gallons of water. It will be noted that the percentage of starch to clay is approximately 1% and it has been found that this ratio gives very satisfactory results. If the quantity of starch is materially increased above this amount, the board becomes brittle on bending and is liable to crack, while if materially less starch is used there is insufficient bonding between the two layers of liner and there is a tendency for one to split off from the other. Good results are obtained by the use of approximately ½ to 1 pound of clay per 1000 square feet of board, although this quantity may vary under different conditions and with different grades of paper or color combinations.

The web with the coating of color next passes to a second cylinder mold **17** rotating in a vat **18**. This vat preferably contains fibrous material of a medium quality inasmuch as it is not exposed to the surface, and consequently a cheaper pulp may be used and the cost of the materials for the paperboard materially reduced. If desired, however, this material may be similar to that contained in vat **13** so that the two machines will form outer and inner liner layers of high quality fibrous material. The inner liner layer is caused to bond with the outer liner layer through the action of the size contained in the coating of color in such a manner that the outer liner will not split off from the inner liner. A couch roll **19** cooperates with the cylinder **17** in the formation of the web.

The felt then carries the sheet over a third cylinder mold **20** which also is associated with a pulp containing vat **21** and a couch roll **22**. The fibrous material contained within vat **21** is of a low quality and is adapted to form a body or a filler web. This web is usually of greater thickness than either of the liner webs and serves to make up the body of the sheet. This web is caused to adhere to the inner surface of the inner liner layer through the action of the couch roll **22** upon the newly formed web of body material. While generally the body web is formed of material inferior to that of the inner liner layer, in some cases it may be desirable to use the same fibrous material for both of these vats, a low or intermediate grade of material being suitable. Usually however it is desirable to use a lower grade material for the body web which is dark in color, relatively inexpensive and unsuitable for use in other places.

One or more body webs may be formed and applied to the traveling sheet, the drawing illustrating a second cylinder mold **23**, cooperating with a vat **24** and a couch roll **25**, these parts being exactly similar in construction and function with the previously described cylinder mold **20** and its parts.

In some instances it is only necessary to provide a liner layer to one side of the product and in such a case the sheet at this point is passed through presses into driers to be finished in the usual manner. However, if it is desired to form a liner material on both sides of the product the web is continued and an inner liner layer is applied by means of cylinder mold **26** and couch roll **27**. Vat **28** contains usually a fibrous material of better quality than that comprising the body web and substantially the same material as contained in the corresponding vat **18**.

If it is desired to provide the opposite side of the product with a light colored appearance the sheet is next passed into contact with a color applying roll **29** rotating in a vat **30** of a color combination similar to that contained in the vat **16**. In some cases however this color application step may be omitted and the opposite side of the sheet only supplied with liners, without the addition of color.

Cylinder mold **31** is shown in the final position where it is adapted to supply over the coating an outer liner similar in all respects to that formed by the cylinder machine **12**. This machine is likewise provided with a couch roll **32** and a vat **33** and corresponds in all respects with the first mentioned cylinder machine.

The felt with the built up sheet of paper then passes around the guide rolls **11** and brings the sheet into contact with an upper felt **35**. The sheet is confined between the two felts and as it passes through a series of press rolls **36**, water is expelled therefrom and the sheet is prepared for the action of the final driers which are not shown herein as they constitute conventional apparatus only. The upper felt **35** may be suitably provided with guide rolls **37** and may be passed through suitable washing or cleaning apparatus **44**.

It will also be understood that when it is desired to form a paper product having a liner layer on only one side thereof, the first two cylinder machines **12** and **17**, may be eliminated and the cylinder mold **20** may form a body of filler directly on the felt. The remainder of the process may correspond with that described above in that additional body webs may be provided and subsequently an inner liner layer, a coating of color, and finally an outer liner layer.

In Fig. 2 is shown an enlarged sectional view of a paperboard constructed in accordance with the present invention. The central body of filler material is shown at **40** which is provided at either side with an inner liner layer **41**, relatively thin with respect to the thickness of the layer of filler, and composed of fibrous material of better quality than the filler. A coating of color **42**, admixed with size, is provided overlying the inner liner layer and an outer liner layer **43**, of fibrous material of a better grade, is formed over the top of the coating of color, the two liner layers being bonded together by the size contained in the color. However, if so desired, more than two liner layers can be utilized and coatings of color may be applied between each successive pair of liner layers, or between any two such liners.

While the product and the method of manufacturing the product herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A sheet of paperboard comprising a body, a plurality of liner layers of fibrous material thereon, and a coating of mineral color and a binder interposed between two of said liner layers for

the purpose of improving and whitening the appearance of the sheet.

2. A paperboard product comprising a body of fibrous material, a relatively thin liner layer of fibrous material of better quality than the fibrous material composing said body, and a coating of mineral color directly beneath said liner layer adapted to giving a light colored background for the liner to improve the appearance and whiteness of the product.

3. A paperboard product comprising a body of fibrous material, a plurality of relatively thin liner layers of fibrous material of better quality than the fibrous material composing the body, and a coating of mineral filler between adjacent liners to provide a light colored background for improving and whitening the appearance of the product.

4. A paperboard product having a body of fibrous material, a plurality of liner layers of fibrous material, a coating comprising a water suspension of clay and size between adjacent liner layers for the purpose of bonding said layers together and for improving the appearance of the product.

5. The method of making a paper product having great strength combined with a good appearance which comprises forming a fibrous body, applying a thin layer of fibrous material of better quality to the body, coating said layer with a water suspension of clay mixed with sufficient size to serve as a bonding material, and applying a further layer of fibrous material of good quality.

6. The method of making a paper product of the character described which comprises forming a body of fibrous material, applying successively to the same side of said body a plurality of relatively thin liner layers of fibrous material of better quality than the body, and applying a coating of non-fibrous mineral color between adjacent liner layers for improving and whitening the appearance of the finished product.

7. The method of making a paper product of the character described, which comprises forming a continuous sheet of body, applying a thin inner liner layer of fibrous material of better quality than said body, applying a coating of mineral filler mixed with size to said inner liner layer, and applying a thin outer liner layer of fibrous material, the mineral filler forming a light colored background and serving to improve the appearance of the product.

8. The method of making a paper product of the character described which comprises forming an outer liner layer of fibrous material of good quality, applying a coating of mineral filler to said outer liner, applying an inner liner layer of fibrous material of inferior quality over said mineral filler, forming a body web of fibrous material and passing it into contact with said inner liner layer, and applying another liner layer of fibrous material to the opposite side of body web.

9. The method of making a paper product of the character described which comprises forming an outer liner layer of fibrous material of good quality, applying a coating of mineral filler to said outer liner, applying an inner liner layer of fibrous material of inferior quality over said mineral filler, forming a body web of fibrous material and passing it into contact with said inner liner layer, applying another inner liner layer to the opposite side of said body web, applying a coating of mineral filler to said inner liner layer, and applying an outer liner of fibrous material of good quality over said coating of mineral filler.

10. The method of making a paper product of the character described, which comprises forming a body web of fibrous material, applying a coating of mineral filler over said body web to give a properly colored background, and applying a liner layer of fibrous material of better quality than that forming said body web over said coating of mineral filler, said coating of mineral filler further serving to bond said liner layer to said body web.

11. The method of making a paper product of the character described, which comprises forming a liner layer of good quality fibrous material, applying a coating of mineral color to the surface of said liner layer to give a properly colored whitened background therefor, and forming a body web of fibrous material of inferior quality over said coating of color.

12. The method of making a paper product of the character described, which comprises forming an outer liner layer of fibrous material of good quality, applying a coating of mineral filler mixed with size to said outer liner, applying an inner liner layer of fibrous material of an inferior quality to said coating, the size contained in the coating serving to bond the two liners together and the mineral filler serving to improve the appearance of the product, and applying a body web and pressing it into contact with said inner liner layer.

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