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CORRUGATED PAPER BOARD

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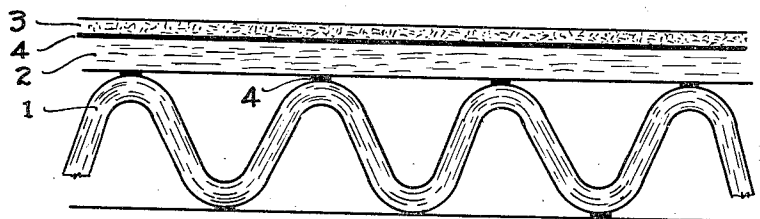


FIG-1

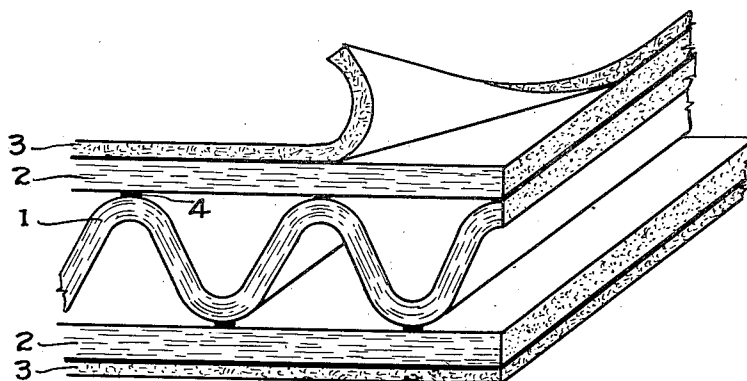


FIG-2

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CORRUGATED PAPER BOARD

Application filed September 29, 1930. Serial No. 485,068.

It has at various times been suggested to use multiply sheets for the facers, or liners, of corrugated paper board, but as far as my knowledge goes no such corrugated paper boards have been very successful commercially. This is in my belief due to the fact that in all such instances paper of the same construction has been used and except where the adhesive or binding material between the various plies gives to the composition a particular advantage, such as waterproofness, the multiply facers have substantially the same properties as a single ply board of the same thickness. The added cost of making and using the multiply sheet does not compensate for whatever other advantages have been obtained in the corrugated board made from such multiply sheets.

By construction of the paper I refer to the method or type of paper machine used to produce it. Two main types of construction of paper are known.

In the older, cylinder machines, a paper is produced in which the individual fibres are laid substantially in one direction only, parallel to the run of the sheet, resulting in a product which has a different strength in various directions and by a tearing test one can easily distinguish a paper made on a cylinder machine.

The operation of a cylinder machine involves superimposing several layers, usually up to 6, of pulp stock, which blend into a single sheet or board; each layer may have incorporated in it different sizes and pulp stocks, etc., but in all layers the fibres will have substantially the same direction. Any desired thickness of paper or even board, practically up to 0.08", or even more, can be made directly on a cylinder machine.

The other type of paper differing in construction from cylinder paper is obtained on what is known as a Fourdrinier paper making machine. The fibres in the Fourdrinier paper lay in all possible directions, whereby a paper of uniform strength is obtained. The thickness of a paper which can be made on a Fourdrinier machine is practically limited by the speed at which such a machine can be run economically, and it seldom exceeds

0.018". Another distinguishing feature of the Fourdrinier paper is that any size or waterproofing agent added to the paper stock will be distributed equally and uniformly throughout the whole mass of the paper.

My invention comprises a corrugated paper board in which one or more of the facers are made of a multiply sheet in which papers of a different construction are combined.

My invention further contemplates the use of multiply paper of the above type in which the various sheets are united in a particular manner. This particular type of multiply sheet is disclosed and claimed in my co-pending application, Serial No. 485,300, filed on even date herewith, and will be referred to in detail below.

A corrugated board according to my invention consists of the usual corrugated sheet, to which is attached at its crowns a facing sheet, said facing sheet being built up of a relatively thick cylinder paper which gives to the board the necessary body and a relatively thin Fourdrinier paper, which gives to the composition additional strength, particularly in the direction parallel to the grain of the cylinder paper. I produce in this manner a board of greater strength than a board made with facers of cylinder paper only, or in other words, at equal strength across the grain of the cylinder paper, boards according to my invention will be lighter, thinner and have an improved strength in the direction of the grain.

The appended figures show an embodiment of my invention in its simplest form.

Figure 1 represents a greatly enlarged cut or profile through part of a corrugated board made according to my invention.

Figure 2 is an unshaded perspective view, enlarged, of a piece of corrugated board according to my invention.

No. 1 in Figure 1 is the usual corrugated sheet of straw, chip or other board. No. 2 is a board as made on a cylinder machine and the drawing shows the fibres laying substantially all in one direction. No. 3 is a sheet of Fourdrinier paper and the lining in the drawing of this member is intended to indicate that the fibres are laying in all possible direc-

tions, parallel and across the profile of the paper. Nos. 1 and 2, and 2 and 3 are united by an adhesive shown at No. 4.

The numerals in Figure 2 designate the same members as in Figure No. 1; a piece of the Fourdrinier sheet No. 3 is represented as being broken away from its bond with board No. 2. In the board of Figure 2 both facing sheets are alike, and consist each of an inner cylinder board and an outer Fourdrinier sheet. The drawing is intended to show the direction of the fibres which in the cylinder boards 2 is parallel to the front face of the board, whereas in the side face the fibres are cut through at right angle. The Fourdrinier liner sheet shows the fibres in both profiles to have the same arrangement.

I have shown in this drawing facing sheets made from one cylinder board and one Fourdrinier sheet only, but it should be understood that my invention is not restricted to 2-ply faces and that several sheets of cylinder and Fourdrinier paper can be alternated to build up a multiply facer useful in my invention.

It should also be understood that I do not limit myself to a construction of corrugated boards made up of a corrugated sheet faced with multiply liners, wherein a cylinder paper, or board, face of the liner, is attached to the crowns of the corrugated sheet. I might with good results reverse the order of the different papers forming the facers, as for instance, attach the Fourdrinier paper to the corrugated sheet and use a cylinder board as the outer sheet, though this would, for obvious reasons, not be as practical as the construction illustrated above. I could also use an uneven number of sheets, whereby one Fourdrinier paper would lay between two cylinder sheets or one cylinder sheet between two Fourdrinier papers and use such composite sheets as facers.

I prefer, however, a construction according to the appended figures for the following reasons:

Sodium silicate is the commonest adhesive used in the construction of corrugated board. Its alkalinity attacks the rosin size contained in the liner, and particularly when single Fourdrinier paper sheets are used, the alkalinity may work through the entire sheet and destroy the water-resistant qualities of the surface, at least at the places opposite the crowns and in many instances produce an unsightly discoloration.

In a corrugated board built according to my invention I can use a cylinder sheet composed of weak stock, such as made from old papers, commonly known as "chip" stock, and I prefer a cylinder sheet, which is substantially unsized, or slightly sized, and therefor absorbent throughout. Silicate of soda solution when applied as an adhesive to such a porous or absorbent sheet loses immediately part of its water by absorption into the po-

rous sheet, thereby producing a more concentrated adhesive at the interface, and immediate initial set is obtained.

The unsized absorbent corrugated sheet acts similarly in respect to the silicate adhesive, and a quick bond is formed between the crowns of the corrugated sheet and the flat surface of the absorbent liner.

The two absorbent constituents of the board continue absorbing some of the water of the silicate adhesive, whereby complete bond is gradually obtained, the water absorbed in the sheets is finally expelled in the drying process.

In a similar manner, when attaching a highly sized or water resisting Fourdrinier paper to the above absorptive chip cylinder sheet, the absorptive properties of the chip will prevent the migration of the water of the silicate or other adhesive into the body of the Fourdrinier paper, and in this manner prevent attack or decomposition of the size of the Fourdrinier paper and its discoloration.

In my preferred embodiment of the invention I contemplate making the multiply liner before attaching it to the corrugated sheet. Thereby I can apply considerably more pressure and consequently use less adhesive for uniting the cylinder sheet to the Fourdrinier paper than if I should first attach the inner lining sheet to the corrugated board and then face it with one or more liners of paper of a different construction.

The multiply sheet composed of one or more sheets of unsized, or partly sized, but absorbent cylinder sheets alternating with highly sized or highly water-resistant Fourdrinier paper sheets forms the subject matter of my co-pending application referred to above. It will be understood from the above description that in the preferred embodiment of my invention I will have a multiply facer or liner, attached to the crowns of the corrugated board, said facer being composed of one or more highly sized or water-resistant Fourdrinier paper sheets and one or more unsized or moderately sized absorbent cylinder sheets which will have absorbed small amounts of moisture from the water soluble adhesive, whereby action of the water from the adhesive upon the Fourdrinier paper has been substantially prevented, the cylinder sheets and Fourdrinier sheets alternating in layers, and I also prefer to attach my facers or liners to the corrugated board in such a manner that the cylinder sheet is in contact and attached to the crowns of the corrugations.

The construction of my corrugated board is effected in the commonly used machines, using the ordinary adhesives for this purpose, such as sodium silicate, etc. I prefer in this construction to form the multiply liners first and attach said finished multiply liners to the corrugated board in exactly the

same manner as single ply liners have been attached previously to the corrugated board, and as this process is well known to those skilled in this art it does not need to be described in detail.

It is also possible to attach first one sheet to the corrugated board and then face this with one or more additional sheets of paper of different construction, but this latter procedure would appear to be less practical than the preferred one disclosed above, inasmuch as it is impossible to use high pressure when uniting a facer to a corrugated sheet without crushing the corrugations and, therefore, a considerably larger amount of adhesive is required with the possibility of less uniform distribution of the moisture of the adhesive throughout the absorptive cylinder paper used in my invention.

The improved corrugated board made according to my invention can be used to advantage for insulating purposes, etc., but it is mainly intended for the construction of corrugated fibre shipping containers. Containers so made will be stiffer and stronger and will still retain the cushioning effect of the corrugated sheets. They will also resist rough handling and safely carry heavier loads than corrugated containers made as at present.

I claim:

1. A corrugated board comprising a corrugated sheet of paper faced with a liner consisting of sheets of paper of different construction, joined together by an adhesive part of said sheets being cylinder paper, other sheets being Fourdrinier paper.

2. A corrugated board comprising a corrugated sheet of paper faced with a liner comprising alternating sheets of cylinder and Fourdrinier paper, joined together by an adhesive.

3. A corrugated board comprising a corrugated sheet of paper faced with a liner comprising a sheet of cylinder paper and a sheet of Fourdrinier paper, joined together by an adhesive.

4. A corrugated board comprising a corrugated sheet of paper faced with a liner comprising a sheet of substantially unsized, absorbent cylinder paper and a sheet of highly sized Fourdrinier paper, joined together by an adhesive.

5. A corrugated board comprising a corrugated sheet of paper faced with a liner consisting of alternating sheets of substantially unsized, absorbent cylinder paper and sheets of highly sized Fourdrinier paper, said lining being attached by an adhesive to the crowns of the corrugations at one of its faces consisting of a cylinder sheet.

6. A corrugated board comprising a corrugated sheet of paper to which is attached at the crowns of the corrugations a sheet of substantially unsized, absorbent cylinder pa-

per, which is faced by a sheet of highly sized Fourdrinier paper, the various sheets being joined together by an adhesive.

In testimony whereof, I affix my signature.
CHARLES DE LORMAN WOOD, Sr.