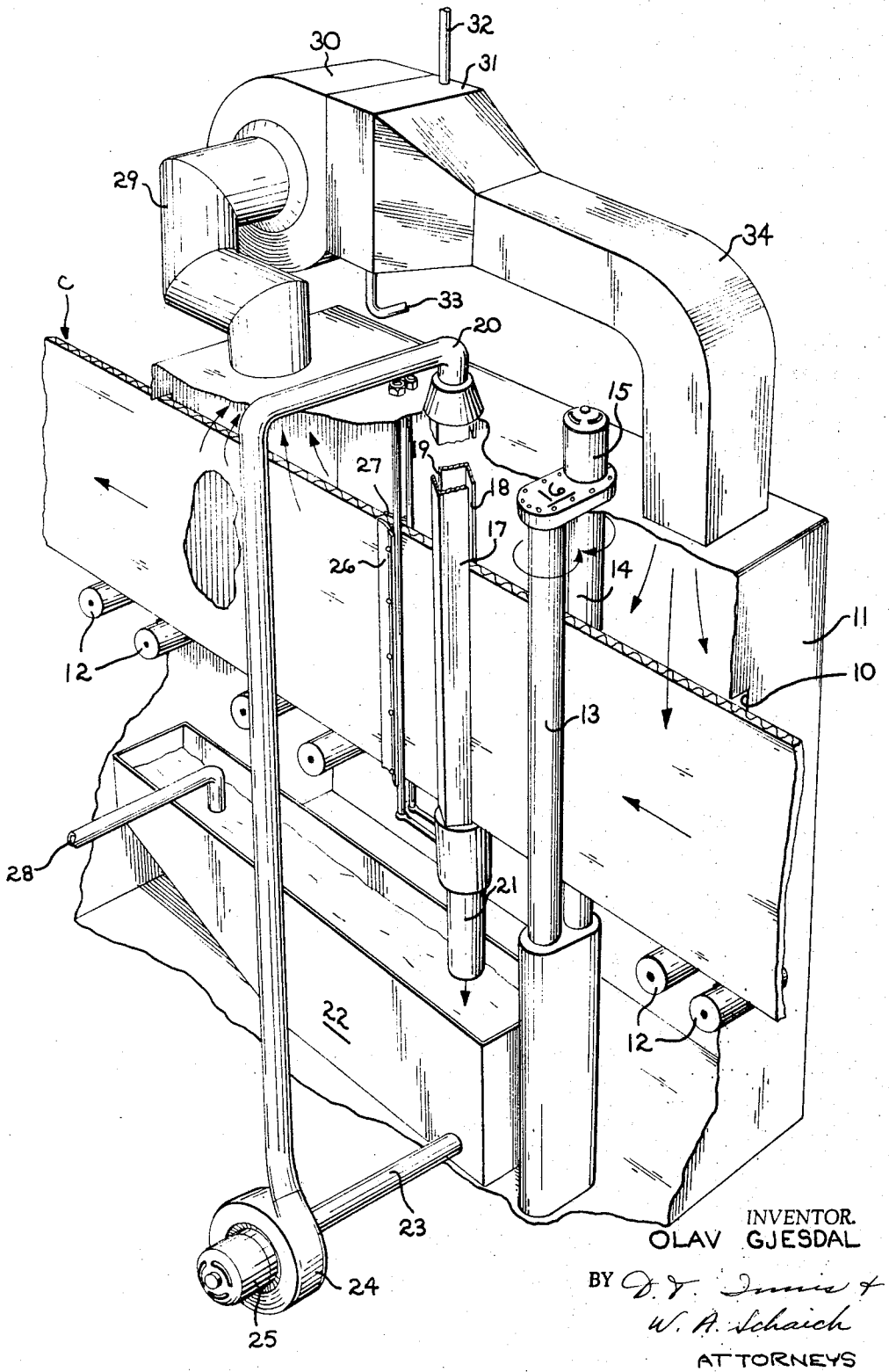
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METHOD AND APPARATUS FOR IMPREGNATING CORRUGATED BOARD

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METHOD AND APPARATUS FOR IMPREGNATING CORRUGATED BOARD

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This invention relates to a method and apparatus for impregnating corrugated paper board with a heated liquid such as wax.

This invention further relates to a method and apparatus for impregnating paper strip material with a liquid impregnant, which is continuous in operation or may be intermittently operated.

In the making of cardboard boxes, particularly those of the type which are made of corrugated paper board, it is frequently desirable to have a board impregnated with a water repellant material so as to provide wet strength to the board. Many things which are packed within paper board cartons are of the type in which moisture may have a deleterious effect, thus requiring that the package be made moisture-proof.

It is common practice to impregnate the paper board with solutions of hot wax or to coat one side of the board with wax. The present practice involves the moving of a continuous web of corrugated paper board in a horizontal plane and during its movement dipping the board in a vat or bath of heated wax while the board is still disposed with the direction of corrugation generally horizontal. In the case where the paper board that is being impregnated is corrugated paper board, it is difficult, if not impossible, to have the wax reach the interior of the corrugations without leaving the board in the wax for a time sufficient to permit it to migrate from the edges to the middle. When operating in a continuous manner it is impossible to operate with any speed and still provide full impregnation of the corrugated paper board. After being taken from the wax it is now necessary to drain the board and remove excess wax. This involves providing a relatively long out-channel to collect wax dripping off of the board. Frequently it is necessary to provide air blasts to remove the excess wax.

In the prior art process, if the operation is one of relatively high speed it can readily be seen that only the outer surfaces of the liner will become impregnated with wax and little, if any, wax will find its way into the corrugations of the board.

With the foregoing in mind, it is an object of this invention to provide a method of impregnating paper board with a liquid impregnant.

It is a further object of this invention to provide a method of impregnating corrugated paper board by moving the board through a confined, continuous flow of impregnant.

It is a still further object of this invention to provide a method of impregnating corrugated paper board by passing the board through a confined flow of heated impregnant with the corrugations of the board running parallel to the direction of flow of the impregnant.

It is an additional object of this invention to provide apparatus for impregnating corrugated paper board with a liquid impregnant.

It is a still further object of this invention to provide apparatus for impregnating corrugated paper board utilizing a vertical flow chamber having openings therein to permit movement of the paper board through the vertical flow chamber with the directions of corrugations of the board being vertical.

Other and further objects will be apparent from the following description taken in conjunction with the annexed sheet of drawing, wherein:

The drawing is a schematic, perspective view of the corrugated board impregnating apparatus of the invention with parts broken away to permit viewing the interior thereof.

With reference to the drawing, the apparatus of the invention will be described in detail. It is believed that the inventive process shall also be clearly disclosed from the following description of the manner of operation of the apparatus.

Corrugated paper board "C," which it is desired to impregnate, for example, with a wax impregnant on a continuous process basis, is fed through an opening **10** formed in an enclosure **11**. The board, during its travel through the enclosure **11**, is guided and supported by a plurality of rollers **12** positioned with their axes horizontal and normal to the direction of movement of the corrugated paper board "C." The board is driven in its edgewise attitude by a pair of driving rolls **13** and **14** driven by a motor **15** through a suitable gear box **16**. As shown in the drawing the drive rolls **13** and **14** are rotated in the direction shown by the arrows thereon and serve to move the corrugated board, with its direction of corrugation vertical, through a vertical flow chamber **17**.

The vertical flow chamber **17** is provided with oppositely or diametrically opposed, vertically extending openings **18** and **19**. These openings have a width approximating the thickness of the corrugated board which is to be impregnated. The upper end of the flow chamber is connected to a supply pipe **20** while the lower end of the flow chamber is connected to a drain pipe **21**. The drain pipe **21** has its lower open end positioned over a sump **22**. The sump **22** is elongated in form in the direction of movement of corrugated board "C" and serves to catch excess liquid impregnant as it drips from the board "C" after passing through the vertical flow chamber **17**.

Adjacent the bottom of the sump **22** is an outlet pipe **23** which is connected to a pump **24**. The pump **24** is driven by a motor **25** and has its outlet connected to the supply pipe **20**. Thus it can be seen that the pump **24** provides a continuous flow of liquid impregnant from the sump to the top of the vertical flow chamber **17** wherein the liquid will then flow down by gravity to fully impregnate the board "C" during its passage through the flow chamber **17**. After the board passes through the flow chamber a pair of side-engaging wipers **26** and **27** in the form of doctor blades serve to remove the excess wax which may be adhering to the outside of the liner board. The corrugated board itself is permitted to drip into the sump **22**. Obviously, after continuous operation the wax supply in the sump may be depleted and additional wax may be added through an inlet pipe **28** connected to a suitable source.

When the impregnant is of a type which requires heat to maintain it in its liquid state with relatively low viscosity, it is advantageous to surround the board by a heated atmosphere during the impregnation thereof. In the present invention such an atmosphere is provided by the enclosure **11** having a hot air circulating system connected therewith. This air circulating system comprises an inlet duct **29** opening into the upper end of the enclosure **11** which leads to the inlet of a fan **30**. The outlet of the fan **30** forces the air through a heat exchanger **31** which may take any form. For convenience, the heat exchanger **31** is shown as being of the type in which steam or hot water is introduced through an inlet pipe **32** and follows a tortuous path within the heat exchanger **31** and exits through the pipe **33**.

It should be readily appreciated that electrical heating elements over which the air would pass would serve equally well as a heat exchanger.

After the air is heated by its passage through the heat

exchange **31**, it passes through the duct work **34** which opens into the enclosure **11**.

It thus can be seen that with control of the operation of the fan **30**, the atmosphere within the enclosure **11** may be maintained at an elevated temperature. It is advantageous when coating corrugated board with liquid wax that the board remain in a heated atmosphere a short time after being impregnated or coated so that the excess wax within the flute area or corrugations will maintain its fluidity sufficient to drip or drain therefrom.

While the above invention has been described principally with respect to the impregnating of corrugated board with wax, it should be kept in mind that other liquid impregnants could be equally applied to strip material other than board by the method of this invention and the apparatus set forth above. Furthermore, in those situations where a heated atmosphere would not be particularly helpful, such could be eliminated and the enclosure **11** also eliminated.

Other and further modifications may be resorted to within the spirit and scope of the appended claims.

I claim:

1. The method of impregnating paper board with a liquid impregnant comprising the steps of, establishing a confined continuous gravity flow of impregnant and moving said board edgewise through said flow.

2. The method as defined in claim **1**, wherein said board is corrugated and the direction of corrugation is parallel with respect to the direction of flow of impregnant.

3. The method as defined in claim **1** wherein said paper board is in the form of a continuous strip and is moved continuously through said flow.

4. The method as defined in claim **1**, wherein said flow is established in a vertical column having a cross-section substantially larger than the thickness of the board being treated.

5. The method of impregnating paper board with a heated liquid impregnant comprising the steps of, continuously flowing a heated liquid impregnant in vertical flow path, surrounding said path with heated atmosphere, moving said paper board with its width oriented in a vertical plane into said heated atmosphere, passing said heated board through said vertical flow path of heated impregnant, moving said board out of said flow path into said heated atmosphere and removing the impregnated board from the heated atmosphere.

6. The method as defined in claim **5**, wherein said board is corrugated and the direction of corrugation is parallel with respect to the direction of flow of impregnant.

7. The method as defined in claim **5**, wherein said heated impregnant is wax.

8. The method as defined in claim **5**, wherein said paper board is in the form of a continuous strip and said board is moved continuously through said heated atmosphere and said flow path of said liquid impregnant.

9. The method as defined in claim **5**, further including the step of doctoring the excess impregnant from the surfaces of said board after passing through said flow path.

10. Apparatus for impregnating paper board with a liquid impregnant comprising, a vertical flow chamber, a pair of diametrically opposed, vertically extending, openings formed in said flow chamber, means connected to one end of said flow chamber for feeding liquid impregnant to said chamber, and means for feeding paper board into one opening and out the other opening in said flow chamber.

11. The apparatus as defined in claim **10**, further including, means in contact with the surfaces of said board for doctoring the excess impregnant from said board after passing through said flow chamber.

12. The appartus as defined in claim **10**, further including a cabinet surrounding said flow chamber and means connected to said cabinet for heating the atmosphere in said cabinet.

13. The apparatus as defined in claim **12**, further including a sump mounted within said cabinet beneath said flow chamber into which said flow chamber empties.

14. The apparatus as defined in claim **13**, wherein said means for feeding liquid impregnant to said flow chamber comprises, a pump connected between said sump and the upper end of said flow chamber for circulating heated liquid impregnant to said flow chamber.

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