United States Patent [19]

Hanley

[11] **3,921,368**

[45] **Nov. 25, 1975**

[54] **METHOD OF ADHESION OF SURFACES ESPECIALLY AS APPLIED TO CORRUGATED PAPER BOARDS**

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[22] Filed: **Apr. 29, 1974**

[21] Appl. No.: **464,938**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 337,946, March 5, 1973, abandoned.

[52] **U.S. Cl.** ..... **53/47;** 53/374; 53/388; 93/36 M; 156/80

[51] **Int. Cl.²** **B31B 1/26**

[58] **Field of Search** ..... 156/80, 282, 498, 69, 155, 156/311; 62/62, 63; 53/47, 374, 375, 387, 53/388; 264/28; 93/36 M, 39 R, 40, 41, 49 M

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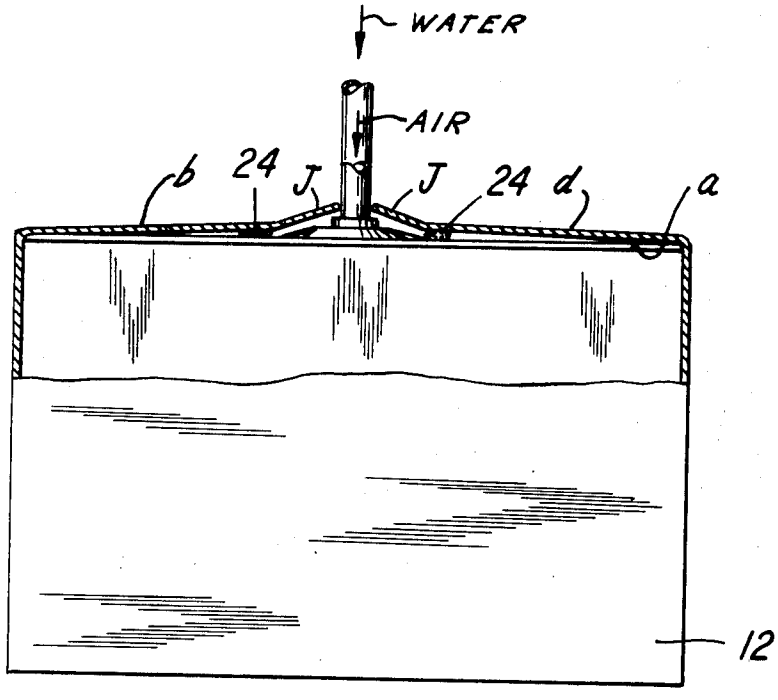
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[57] **ABSTRACT**

A method by which two corrugated paper surfaces are secured together by adhesion during the setting of a permanent glue comprising the freezing of a layer of water introduced between the paper surfaces after a layer of glue has been applied. The time calculated for the water to remain frozen is to be longer than the time required for an inexpensive glue to solidify.

2 Claims, 7 Drawing Figures



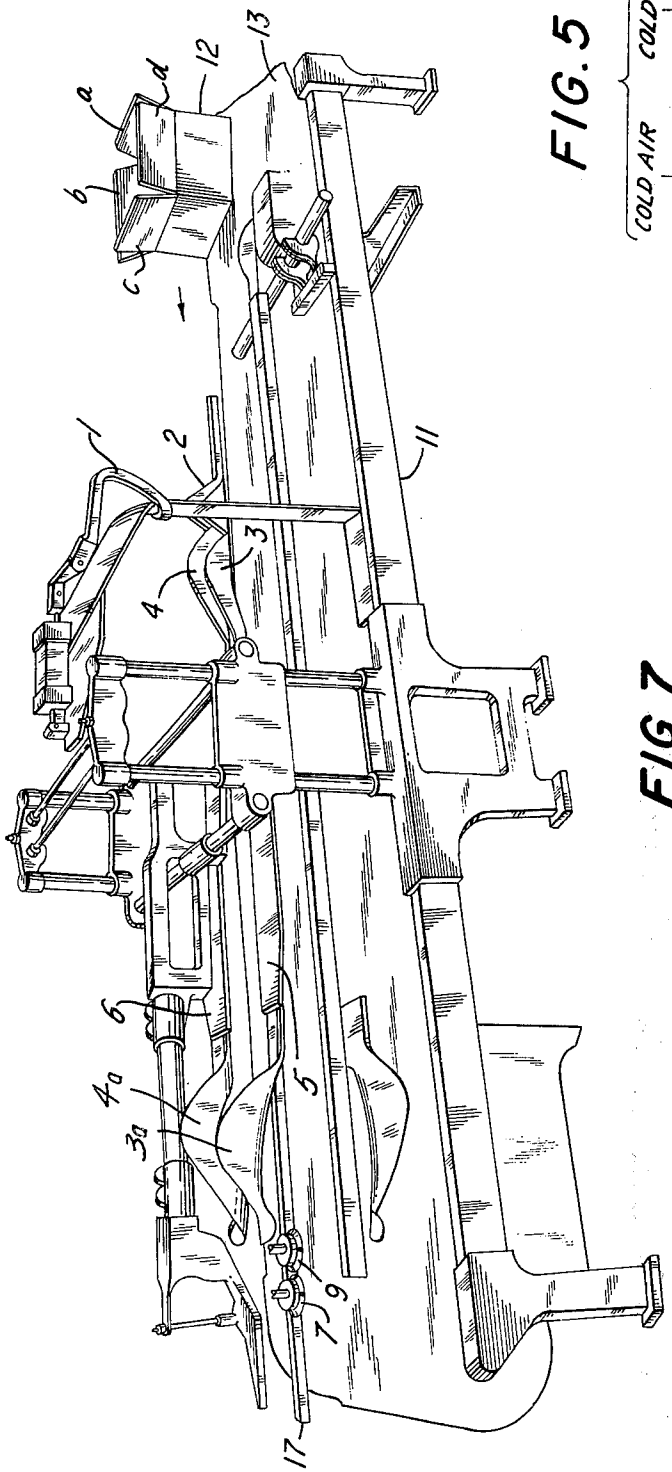


FIG. 1

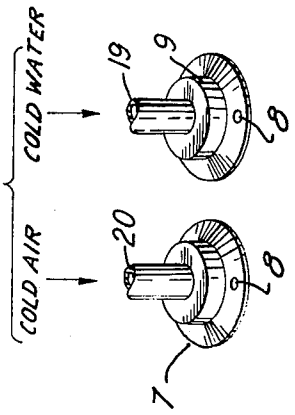


FIG. 5

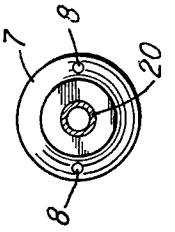


FIG. 7

FIG. 2

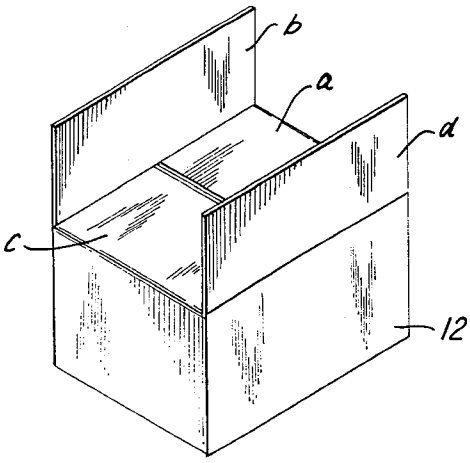
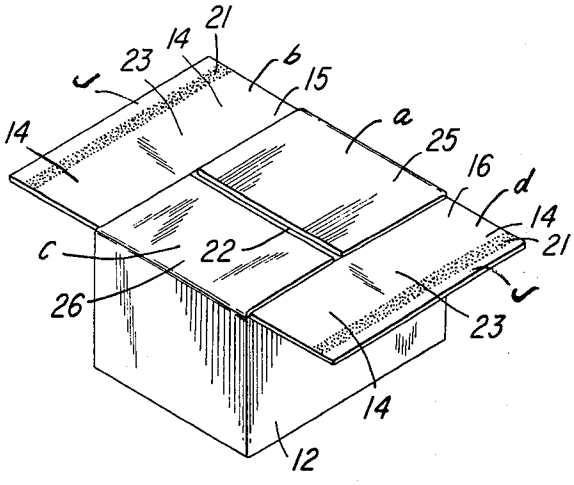


FIG. 3



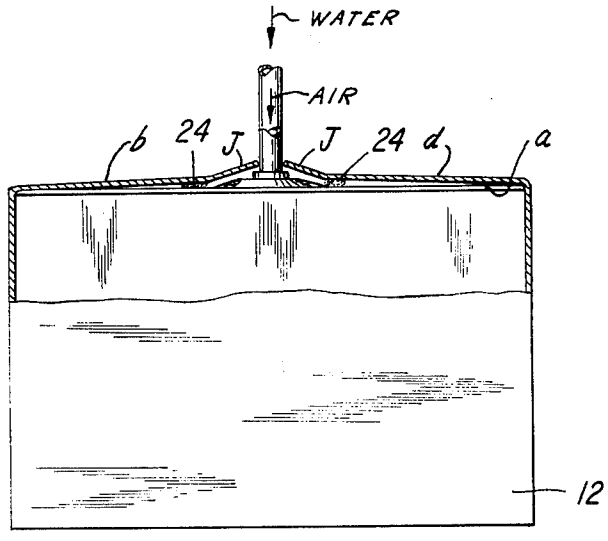


FIG. 6

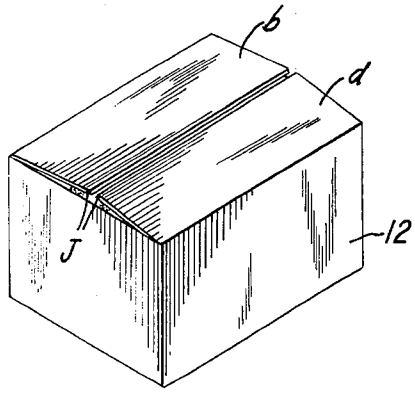


FIG. 4

METHOD OF ADHESION OF SURFACES ESPECIALLY AS APPLIED TO CORRUGATED PAPER BOARDS

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my earlier filed pending application, Ser. No. 337,946, filed Mar. 5, 1973 now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a method and device to secure two or more surfaces such as the flaps of a corrugated paper case, by means of introducing a layer of water already at freezing temperature between the flaps of the case to which glue has been applied and immediately afterwards directing a blast of refrigerated air towards the water to immediately freeze the water to ice. Since the surfaces of the flaps are wetted, the ice thus formed holds the flaps together while the glue dries. The method of the invention can be used for the temporary adhesion of materials such as leather, plastics, or cloth that must be held together while a permanent glue sets.

2. Description of the Prior Art

In a conventional case sealer, two methods have been commonly used to secure the surfaces to be adhered to provide time for the glue to solidify:

1. Use of a long compression belt, whose length is determined by the speed of the output of the production line, to gain the time required for a glue to dry.

2. Use of a fast drying or a fast solidifying glue, namely some type of hot melt glue, combined with a short compression time.

In the first method, a relatively inexpensive glue, such as a dextrin glue with a corn starch base, is normally used. The solidification time for this type of glue is long, thus the surfaces required to be bonded must be held securely for a long time and a compression unit is needed to hold the surfaces together while the glue is hardening. Use of a faster drying glue without raising the temperature involves the use of an expensive glue called "cold glue." In the second method, the use of a hot melt glue involves the use of an even more expensive glue than the types used in the first method. In both methods, a case sealing machine manufacturer is obliged to use a compression belt to keep the flaps of a case in a compressed position until the glue used is completely solidified.

Methods of temporarily adhering two materials by chilling the materials themselves or by moistening the materials and freezing are known, but my method has substantial differences from the methods described in the prior art. In particular, my method differs from the method described in U.S. Pat. No. 3,767,495 entitled "Method of Producing a Non-Woven Pile Product," in which the materials must be stacked and moistened completely, then moved into a freezing chamber. Thereafter the frozen slabs are sliced and must be defrozen and dried before being bonded to a layer of backing material. As an alternate method, the patent teaches the use of water soluble adhesives on the still frozen slab. In addition to having an entirely different purpose from the teachings of the patent, my method differs from those of the patent in that a permanent glue is applied first and is entirely separated from the water used for freezing, thereby completely eliminating the problem of the compatibility of the glue and water. Further, my method requires only a thin layer of water to be applied to the edges of the surfaces to be adhered and provides for freezing the water immediately by the use of a stream of cold air.

SUMMARY OF THE INVENTION

It is a principal objective of this invention to extend the time needed for solidifying a glue and to eliminate the need for a compression unit in a corrugated case sealing process.

Another objective of this invention is to enhance the use of inexpensive but slow-setting glues in the corrugated case sealing process.

It is a further object of this invention to provide a method to extend the time needed for solidifying of a glue and to eliminate the need for a compression unit in processes that require two surfaces to be held together while the glue or adhesive hardens.

It is a further object of this invention to provide a method of forming a bead of ice between two surfaces to be bonded by the use of inexpensive equipment which is easy to adapt to various bonding methods.

These and various other objects and advantages of this invention will be more fully apparent from a consideration of the following description, drawings and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a conventional case sealer incorporating the apparatus of my invention.

FIG. **2** is a perspective view of a packing case with two flaps in a closed position.

FIG. **3** is a perspective view of a packing case with two side flaps extended outwardly.

FIG. **4** is a perspective view of a packing case with the side flaps folded inwardly.

FIG. **5** is a perspective view of the two manifolds.

FIG. **6** is a partial sectional view of an end view of a packing case with one manifold in operating position.

FIG. **7** is a top plan view of one of the manifolds.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now specifically to the drawings, a conventional case sealer apparatus **11** is shown in FIG. **1.** The arrow in FIG. **1** indicates the direction of travel of a case **12** along the case sealer conveyor **13.** A conventional corrugated shipping case has four flaps on the top and four flaps on the bottom. As shown in the figures only the top four flaps, indicated by the letters *a*, *b*, *c*, *d*, are shown. As shown in FIG. **1,** flap *a* is attached to the back of the case, flap *c* to the front of the case and flap *b* and flap *d* are attached to the sides of the case **12.** Each flap has two surfaces, an inner surface which faces into the case when the case is closed and an outer surface which faces outward of the case when the case is closed. As a case **12** is conveyed along the conveyor **13** in the direction of the arrow shown in FIG. **1,** flap *c* is folded inwardly to a horizontal position over the case by a plow **2** and flap *a* is folded inwardly to a horizontal position over the case by the sweeping action of an air operated kicker **1.** The side flaps *b*, *d* are then opened to a horizontal position outward from the case by flap guides **3, 4.** The flaps *b*, *d* of the case **12** are then in a position shown in FIG. **3.** Glue applicators (not shown in the drawings) apply glue **14** to portions

of the inner faces **15, 16** of the outwardly held side flaps *b, d* leaving a void **23** between the glue layers **14** so that no glue seeps into the contents of the case through the seam **22** left between the front and back flaps *a, c* when they were closed. The glue is applied to the center portion of each side flap *b, d* leaving a strip or margin J along the unattached edge of each flap without glue so that a person opening the carton can grasp an unglued portion of the flap to facilitate his opening the case. After the glue is applied, arms **5, 6** hold the flaps *b, d* above a one hundred eighty degree plane; then foldover flap guides **3***a*, **4***a* fold the open flaps through a one hundred eighty degree angle from an outward horizontal position inwardly to a substantially horizontal position over the previously closed flaps *a, c*, the unglued margins J, J of the side flaps *b, d*, being slightly raised from the outer faces of the closed flaps *a, c*. The case is then in a position shown in FIG. **4.** The operation of a conventional case sealer as here described is well known in the art and further details of its operation are not believed to be necessary.

The apparatus of the invention consists of two manifolds, one for water passage **9** and one for air passage **7**, each independent of the other, but attached to the same support **17** at the position on the case sealer apparatus **11** where the flap guides **3***a*, **4***a* fold over the glued flaps *b, d* of the case. The water manifold **9** is constructed with connecting means **19** such as a pipe, to a refrigerated water supply. The air manifold **7** is constructed with connecting means **20,** such as a pipe, to a source of compressed air cooled to a temperature below the freezing temperature of water.

Each manifold is provided with a pair of discharge nozzles **8** diagonally opposite each other and spaced to fit within the junction formed between the unglued strips J, J along the unattached edges of the inner faces **15, 16** of the side flaps *b, d* and the upper faces **25, 26** of the front and back flaps *a, c*, as shown in FIG. **6.**

In operation the discharge nozzles **8** of the manifolds are covered by the unglued strips J, J of flaps *b* and *d*, commencing at the leading or front edge of the case when the flap guides **3***a*, **4***a* fold flaps *b* and *d* over flaps *a* and *c*. At a predetermined signal, refrigerated water is squirted from the water manifold **9** to deposit a layer of water **21** along the line of juncture of the front and back flaps *a, c* and the slightly raised side flaps *b, d*, as shown in FIG. **6.** As previously described in respect to the application of the glue, the operation of the water manifold can be interrupted at the middle of the case to prevent water from seeping into the contents of the case through the seam **22** formed between the front and back flaps *a, c*. Immediately thereafter, a stream of cold air is directed at the layer of water, forming a strip or bead of ice **24** thereby freezing the outer flaps *b, d* to the inner flaps *a, c*. The temperature of the cold air is maintained at below 32° Fahrenheit, the freezing temperature of water, so that the thin layer of water freezes almost instantly upon contact with the cold air. In practice, the air is cooled to a predetermined temperature below the freezing temperature of water, the exact temperature depending on the ambient conditions of the sealing operation. The flaps of the carton are held together by the ice for a period long enough for the permanent glue to set. It has been found that the slowest setting glue used in case sealing operations hardens in approximately two minutes. The ice bead **24** formed between the flaps remains solid without further refrigeration for more than 2 minutes, thus the flaps are firmly held together without compression while the glue sets. After several minutes the ice melts and the water evaporates at room temperature leaving the flaps of the case sealed with the permanent glue.

It can be seen that the method described can be used to temporarily bond any surfaces which are to be permanently secured or bonded by a glue or adhesive and that the method can be adapted for use with other sealing machines. In general, a glue is applied to at least one of the two surfaces to be bonded and the second surface to be bonded is placed over the glued surface. A thin layer of water is injected or squirted between the edges of the surfaces to be secured and the layer of water is frozen by directing a stream of cold air at the layer of water or by other refrigeration means. The two surfaces are thereby held securely by the ice bead while the glue or adhesive sets. It will thus be seen that I have provided a new and improved method for securing two surfaces together while a permanent glue sets.

I claim:

1. A method of securing the flaps of a conventional shipping case having a front flap, a back flap, and two side flaps each flap having an inner surface which faces into the case when the case is closed and an outer surface which faces outward of the case when the case is closed, comprising:

a. Folding the front and back flaps inward over the case;

b. Applying a layer of glue to the center area of the inner face of each side flap leaving an unglued strip along the unattached edge of each side flap;

c. Folding the side flaps inward over the front and back flaps over the case;

d. Squirting a thin layer of cold water between the edges of the flaps along the junction of the unglued strips of the side flaps with the upper faces of the front and back flaps;

e. Freezing the layer of water to ice; and

f. Removing the ice by melting the ice and evaporating the water at room temperature.

2. A method of securing the flaps of a conventional shipping case as set out in claim **1** wherein the layer of water is frozen by directing at the layer of water a stream of air cooled to a predetermined temperature below the freezing temperature of water.

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