

PATENT SPECIFICATION

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(54) METHOD AND APPARATUS FOR VACUUM PACKAGING COMPRESSIBLE MATERIALS

(71) We, JOHNS-MANVILLE CORPORATION, a corporation organized under the laws of the State of New York, United States of America, having a place of business at Ken-Caryl Ranch, Jefferson County, Colorado, mailing address: P.O. Box 5723, Denver, Colorado 80217, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

Heretofore, techniques for the vacuum packaging of compressible materials include reducing pressure in a flexible-impervious container that encapsulates the compressible material so as to draw air out of the container to compress the mass, followed by the securing of the container and its compressed contents by the provision of a restraining means therearound. The prior art is characterised by the maintaining of the pressure reducing action within the container until the restraining means has first been applied around the compressed package. This fact has hindered flexibility in the prior art packaging procedures and apparatus.

With the apparatus of the prior art only one package can be compressed at a time. Thus, when short packages, e.g. 3 feet (.9m) or less, are produced it requires almost as much time to package a short package as it does to package a longer package. Meanwhile, the short packages are being manufactured at a much greater rate than long packages since material output (in pounds of material) is about the same whether making long packages or short packages. In view of this, a bottleneck in the process results at the packaging station which necessitates utilisation of a plurality of packaging devices and additional people to operate them.

It is an object of the present invention to overcome the disadvantages of the prior art techniques and apparatus, by providing a

method and apparatus for vacuum packaging compressible material in an efficient manner. 50

Accordingly, the present invention provides a method of packaging a compressible material including positioning said compressible material within a tubular container made of a flexible fluid impervious material, creating a partial vacuum within said container by withdrawing air from the container in order to compress the compressible material within the container, and applying a restraining sleeve around the compressed container so as to maintain the compressible material in a compressed state when said partial vacuum is eliminated, wherein any open ends of said container are fastened after said compressible material has been positioned therein, a sealed area is created around a portion of the exterior of said flexible container, one or more perforations is made in the flexible fluid impervious material within said sealed area, air is withdrawn from inside the container through said perforations until said compressible material is compressed to the desired extent, then said withdrawing of air from the container is stopped, and thereafter applying said restraining sleeve. 55 60 65 70 75

The present invention also provides an apparatus for use in packaging compressible material in a tubular, flexible fluid impervious sealed container comprising an elongated cantilever mounted tongue for contacting a portion of the exterior of said container and for creating a sealed area around a portion of the exterior of said fluid impervious container when a partial vacuum is developed between said tongue and said fluid impervious container, said tongue having at least one opening in a surface adapted for contacting said fluid impervious container, a chamber located within said tongue and communicating with said surface of said tongue through said 80 85 90 95

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opening and said chamber being connected to a device for the creation of a partial vacuum therein, and a puncturing assembly located within said chamber and adjacent said opening in said tongue for puncturing said container in the vicinity of said opening when said container is drawn into said opening by the creation of a partial vacuum in said chamber.

In the method and apparatus of the present invention, compressible material sealed in a fluid impervious container or bag can be placed on an apparatus for compression packaging, or the apparatus can be suspended by a hoist or the like and lowered onto packages for the compression packaging. Other orientations are also possible.

In the accompanying drawings:

Figure 1 is a plan view of a preferred embodiment of the present invention with a portion broken away to illustrate a feature of the embodiment.

Fig. 2 is an elevational view of the apparatus illustrated in Fig. 1 with a portion broken away to illustrate a feature of the apparatus.

Fig. 3 is an end view of the apparatus shown in Figs. 1 and 2.

Figs. 4 and 5 better illustrate a feature of the preferred embodiment shown in Figs. 1-3.

Figure 6 is a partial end view of the apparatus shown in Figures 1-3 with a package in place.

Figure 7 is an elevational view of the apparatus shown in Figures 1-3 with a long package in place.

Referring to Figures 1-3, a preferred embodiment of the invention comprises a tongue assembly 2, a chamber 4 communicating between the top of the tongue assembly and a vacuum pump, a perforating assembly 6, and a base assembly 8.

The tongue assembly 2 comprises a curved upper plate 10 and a curved lower plate 12. The upper plate 10 and the lower plate 12 are joined at their longitudinal edges 14 by welding or by any other suitable fastening means. A typical curvature for the top surface of the upper plate 10 is a radius of about 9 inches (22.9 cm), but any radius is suitable so long as it permits a seal to be formed between the top surface of the upper plate 10 and a flexible fluid-impervious container material. For this reason, the top surface of the upper plate 10 is smooth so as to enable an air seal to be formed with the flexible container material. The upper plate 10 contains at least one opening 16, and preferably a plurality of spaced openings 16, along its length. The shape of the opening(s) is not critical. While a circular shape is shown, each opening

could be an oval, a longitudinal slot, a square, a diamond, etc.

The tongue assembly 2 is cantilever supported in a frame 18 which in the embodiment illustrated, is attached to the base assembly 8. While the tongue assembly can be of any length, it preferably has a length of at least four times its width and most preferably the length is sufficient to accommodate a package having a length in the range of 6-12 feet (1.83-3.66 m) and especially in the range of 8-12 feet (2.44-3.66 m) or longer.

The lower plate 12 tapers to the upper plate 10 in an end portion 20 such that the tongue assembly 2 has a thickness at its extremity 22 of only about the combined thickness of the upper plate 10 and the lower plate 12. The upper plate 10 can be welded to the lower plate 12 along the edge of its extremity 22. The significance of the tapered end portion 20 will become apparent later in the description of how the apparatus is used in the method of the present invention.

A chamber 24 is formed inside the tongue assembly 2 by joining the edges of the upper plate 10 and the lower plate 12. The chamber 24 communicates with a conventional vacuum pump (not shown) by way of one or more outlets 26, a conventional on-off valve (not shown), and conventional hoses (not shown). The conventional on-off valve used to connect the chamber 24 with the vacuum pump through the outlets 26 can be of the type that when positioned in its off position air bleeds into the chamber 24 so as to eliminate a partial vacuum within the chamber 24. Such valves are conventional in the art for this purpose. Two or more stiffening members 28 are welded to the frame 18 and plug welded to the upper plate 10 and to the lower plate 12 so as to strengthen the cantilever mounted tongue assembly 2.

In the apparatus of the present invention, perforating means are located beneath each opening 16. The perforating means can be a sharpened blade 30 rigidly fastened in an upright position below each opening 16 so that the uppermost point of the blade rests slightly below the top surface of the upper plate 10. To increase the dimension of the perforations, the blade 30 can be mounted in a movable manner such as by the perforating assembly 6. Each blade 30 is rigidly attached to a support 32, which can be a threaded bolt (see Figures 4 and 5). Each of the supports 32 are embedded in a common shaft 34 which extends for most of the length of the tongue assembly 2 and which extends through the frame 18. The shaft 34 is supported and guided in the chamber 24 guide members 36 located

periodically along its length and attached to the top surface of the lower plate 12 by any suitable means, such as by welds 38.

5 A clevis 40 is attached to the end of the shaft 34 protruding through the frame 18. The clevis is attached to a lever 42 by a pin 44 extending through a generally vertically elongated slot 46 located in the lever 42 intermediate the two ends of the lever. The
10 lower ends of the lever 42 is pivotally attached to the base assembly 8 with a pin 48. When the lever is moved back and forth by a handle 41 in the direction indicated by
15 arrows 50, the shaft 34, and the knives 30 attached thereto, move back and forth in the directions indicated by arrows 52 (Figure 5). The handle 41 on the end of lever 42 extends through a slot 43 in a
20 horizontal table 45 attached adjacent to the frame 18 on the opposite side of the tongue assembly 2.

In the preferred embodiment illustrated in Figures 1—3, the apparatus is supported by the base assembly 8. The base assembly 8
25 is used in applications where it is desirable to mount the tongue assembly at a distance spaced from the floor and with the upper plate 10, containing the holes 16, facing upwardly. The base assembly shown in the
30 illustrated embodiment comprises a vertical plate 54 located on each side of the frame assembly 8 and connected by any suitable means to the frame 18, to a base plate 56 and to a reinforced box base 58.
35 Strengthening members 60 are attached in any suitable manner to the base plate 56 and to the reinforced box base 58. The structure of the base assembly 8 is not critical so long as it supports the tongue
40 assembly 2 and the perforating assembly 6 in a stable manner. It would be within the ordinary skill in the art to modify the structure of the base assembly from that shown in the drawings to accomplish the
45 above described result.

In the method of the present invention, and using the apparatus disclosed in Figures 1—5, a compressible material 61, such as a
50 roll of glass fiber insulation, a stack of glass fiber batts, or a bulk quantity of blowing or pouring wool, is placed in a container made from a fluid impervious and flexible
55 material 62, such as 1—2 mil thick polyethylene, and the container is sealed such as by tightly tying the one or more open ends 64 (Figure 7) to form a sealed container 66. The sealed container 66 of
60 compressible material is then lifted onto the tongue assembly 2 such that the container rests on the top surface of the upper plate 10. The valve connecting the chamber 24 with the vacuum pump is turned to the on
65 position which draws air from the chamber 24 and also through the openings 16. Removal of air through the openings 16

(see arrows in Figures 4 and 5) tends to pull the flexible fluid impervious container material against the top surface of the upper plate 10 forming a seal and once the seal is formed, the fluid impervious material 62 is pulled through the openings 16 due to the normal air pressure inside the container. As the fluid impervious container material 62 is pulled down through the openings 16, as shown in Figure 5, it contacts the sharp edged blades 30 causing the blades 30 to perforate the fluid impervious material 62. The handle 41 of the lever 42 can then be moved back and forth in the slot 43 in the direction of the arrows 50 to cause the blades 30 to move back and forth in the direction of the arrows 52. This lengthens the perforation or slits in the fluid impervious container material 62 allowing the air therein to be withdrawn more rapidly through the openings 16 and into the chamber 24.

As the air is removed through the slits in the fluid impervious material the partial vacuum created within the container material along with the compressibility of the product contained therein results in compression of the compressible material by the normal atmospheric pressure pressing against the outside of the fluid impervious container material. When the compressible material has been compressed to the desired degree, which is usually a somewhat greater amount than is desired in the finished package, several alternatives are available to alert the operator for finishing the package or packages. First, if a conventional pressure regulator is installed in the vacuum lines such that the partial vacuum in the chamber 24 reaches a level just sufficient to compress the compressible material to the desired extent and no more, the pressure regulator can be equipped with a conventional switch to sound an alarm or to activate a light to indicate to the operator that the desired compression has been obtained. In a second method, a conventional vacuum gauge is attached to communicate with the chamber 24 and the operator can observe this gauge and turn the conventional valve in the vacuum line to the off position when the desired degree of partial vacuum is obtained that provides the desired compression.

Once the desired compression has been obtained the operator can apply a conventional restraining sleeve to the outside of the package while the package rests on the tongue assembly 2. Typical conventional restraining sleeve are multi-layered kraft paper tubes, heavy duty polymer tubes, such as 5—6 mil polyethylene tubes or sleeves, or plastic netting, such as that sold under the Registered Trade Mark Vexar and

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5 marketed by E. I. duPont de Nemours, Co. Because of the relatively small thickness dimension of the tongue assembly 2 and the fact that the compressible material is compressed to a greater degree than is desired in the final package, the retainer sleeve can be slipped around the outside of the tongue assembly 2 from the end 22 and simultaneously over the package positioned on the tongue assembly. The tapered portion 20 of the tongue assembly 2 aids the starting sleeve over that end of the package adjacent to the end 22 of the tongue assembly 2.

10 15 Either before or after the retainer sleeve is in position, the conventional valve in the vacuum line can be moved to a position that allows atmospheric air to rapidly bleed into the chamber 24 thereby eliminating the partial vacuum therein and permitting the package to be easily removed from the tongue assembly 2. When the partial vacuum is lost in the chamber 24, the partial vacuum remaining within the package pulls the flexible fluid impervious material surrounding the slits caused by the blades 30 away from the knives and against the package. This action tends to seal the slits such that only a very slow rate of air flow into the package is experienced, thus the package remains in its compressed state long enough to allow the retainer sleeve to be applied to the package later, either while the package remains on the tongue assembly 2, or after the package is removed from the tongue assembly 2 to another area or to another apparatus for applying the retaining sleeve. The fact that the perforations formed by the process and apparatus of the present invention tend to be substantially self-sealing is another unique feature of the present invention which permits flexibility in the packaging procedure not heretofore practical with the prior art techniques and apparatus. When several short packages are being drawn down simultaneously on the tongue assembly 2, this feature permits the retaining sleeves to be added first to the package closest to the end 22, and then that package can be removed from the tongue assembly 2 and the restraining sleeve added to the adjacent package, etc.

55 Having had the benefit of the inventor's disclosure, many modifications will occur to those skilled in the art. For example, as mentioned earlier, the tongue assembly 2 need not be supported in the position shown in the drawings, i.e., with the top surface of the upper plate 10 facing upward, but instead could be supported in any orientation. By using a conventional hoist and counterbalancing weights, the tongue assembly could be inverted and supported from above to be lowered onto a package

resting on a floor, table, etc. In this position, once the package is compressed and as long as the partial vacuum remains in the chamber 24, the tongue assembly can be raised, thereby raising the package off of the floor or supporting surface in order to apply the restraining means. Also, the tongue assembly can be mounted relatively close to the floor and on edge such that a rounded package could be rolled against the top surface of the upper plate 10 to begin the compression operation. Once the partial vacuum is obtained in the chamber 24 and the package compressed, the tongue assembly 2 can be pivoted through conventional supporting means to raise the package off the floor or supporting surface sufficiently to apply the retaining sleeve. The latter feature would not be necessary though, because the package could be removed from the tongue and it would retain its compressed state sufficiently long to allow retaining sleeve to be applied.

While the tongue assembly shown in the drawings has a curved upper plate 10 this is not critical. The upper plate 10 is curved only because many packages to be compressed and packaged with the apparatus of the present invention have a curved outer surface. Some products packaged in a compressed state have a flat outer surface, for example a stack of insulation batts. When packaging flat products in the process and using the device of the present invention, the upper plate 10 of the tongue assembly 2 is preferably flat.

When it is desired to apply the restraining sleeves while the packages rest on the tongue assembly 2, it is frequently desirable to treat the edges 14 of the tongue assembly 2 to reduce the friction with the restraining material being slid along these edges. This can be done by spraying a Teflon, a trademark of E. I. duPont de Nemours, Co. or other smooth coating onto the edges of the tongue assembly 2 or by applying a slick surface tape such as Teflon tape a product of E. I. duPont de Nemours, Co. over the edges.

In describing the invention certain embodiments have been used to illustrate the invention and the practice thereof. However, the invention is not limited to these specific embodiments as other embodiments and modifications within the scope of the invention as defined by the appendant claims will readily occur to those skilled in the art on reading this specification.

WHAT WE CLAIM IS:—

1. A method of packaging a compressible material including positioning said compressible material within a tubular

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In describing the invention certain embodiments have been used to illustrate the invention and the practice thereof. However, the invention is not limited to these specific embodiments as other embodiments and modifications within the scope of the invention as defined by the appendant claims will readily occur to those skilled in the art on reading this specification.

WHAT WE CLAIM IS:—

1. A method of packaging a compressible material including positioning said compressible material within a tubular

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5 container made of a flexible fluid
impervious material, creating a partial
vacuum within said container by
withdrawing air from the container in order
to compress the compressible material
within the container, and applying a
restraining sleeve around the compressed
container so as to maintain the
compressible material in a compressed
10 state when said partial vacuum is
eliminated, wherein any open ends of said
container are fastened after said
compressible material has been positioned
therein, a sealed area is created around a
15 portion of the exterior of said flexible
container, one or more perforations is made
in the flexible fluid impervious material
within said sealed area, air is withdrawn
from inside the container through said
20 perforations until said compressible
material is compressed to the desired
extent, then said withdrawing of air from
the container is stopped, and thereafter
applying said restraining sleeve.

25 2. The method according to Claim 1
wherein said perforation or perforations are
in the form of one or more slits in the fluid
impervious container.

30 3. A method according to either of
Claims 1 or 2 wherein a plurality of spaced
perforations are made generally in line
along a major portion of the length of said
container.

35 4. An apparatus for use in packaging
compressible material in a tubular, flexible
fluid impervious sealed container
comprising an elongated cantilever
mounted tongue for contacting a portion of
the exterior of said container and for
40 creating a sealed area around a portion of
adapted for containing said fluid impervious
container when a partial vacuum is
developed between said tongue and said
fluid impervious container, said tongue
45 having at least one opening in a surface
adapted for containing said fluid impervious
container, a chamber located within said
tongue and communicating with said
surface of said tongue through said opening

and said chamber being connected to a
device for the creation of a partial vacuum
therein, and a puncturing assembly located
within said chamber and adjacent said
opening in said tongue for puncturing said
55 container in the vicinity of said opening
when said container is drawn into said
opening by the creation of a partial vacuum
in said chamber.

5. An apparatus according to Claim 4
wherein said tongue has a length of at least
60 six feet.

6. An apparatus according to either of
Claims 4 or 5 wherein said tongue surface is
curved transverse of the length thereof.

7. An apparatus according to any of
Claims 4—6 wherein said tongue has a
plurality of openings spaced along the
length thereof.

8. An apparatus according to any of
Claims 4—7 wherein said puncturing
assembly includes at least one sharpened,
70 blade having a point or leading edge
located slightly inward of said surface of
said tongue.

9. An apparatus according to Claim 8
wherein said blade or blades can be moved
back and forth lengthwise of said tongue to
facilitate puncturing or cutting of said fluid
impervious container.

10. An apparatus according to any of
Claims 4—9 wherein said tongue is tapered
at the unsupported end portion toward said
end portion.

11. An apparatus substantially as
hereinbefore described with reference to,
85 and as shown in, the accompanying
drawings.

12. A method substantially as
hereinbefore described with reference to
the accompanying drawings.

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