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Sundin

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[54] **WRAPPING APPARATUS FOR CYLINDRICAL SHAPES**

[75] Inventor: **George Holger Sundin**, Duluth, Minn.

[73] Assignee: **Conwed Corporation**, St. Paul, Minn.

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[52] **U.S. Cl.** **53/30**; 53/33; 53/184; 53/211; 53/389

[51] **Int. Cl.** **B65b 11/48**

[58] **Field of Search** 53/30, 32, 33, 211, 212, 53/378, 379, 380, 389, 184, 137

[56] **References Cited**

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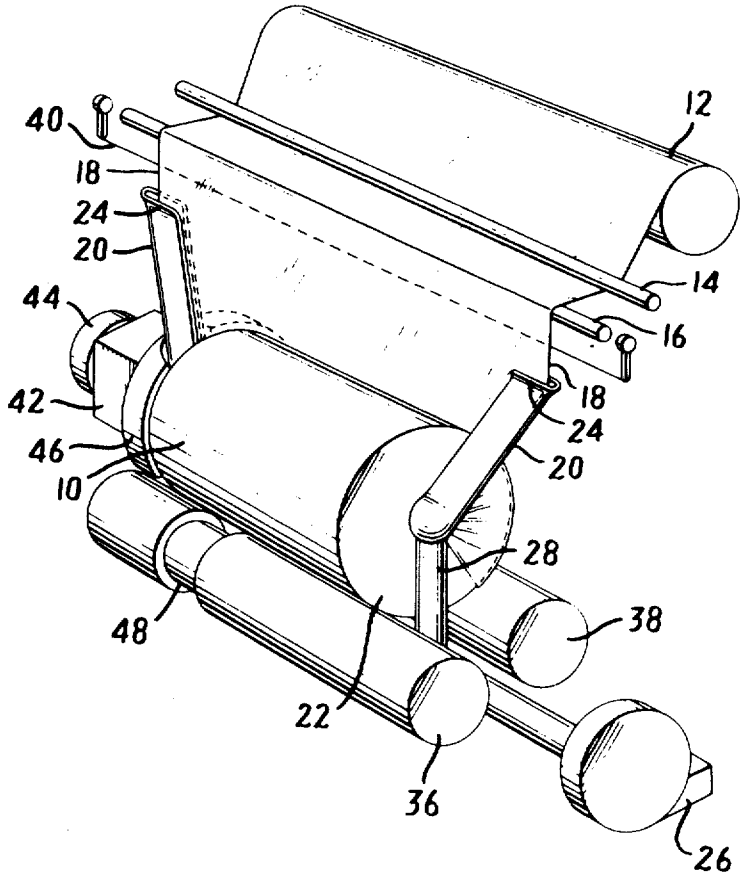
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Primary Examiner—Travis S. McGehee
Assistant Examiner—Horace M. Culver
Attorney, Agent, or Firm—Eyre, Mann & Lucas

[57] **ABSTRACT**

A packaging machine for cylindrical shapes is disclosed. Wrapping material is applied to the cylindrical shape using vacuum in a new and useful manner whereafter the ends of the wrapping material are gathered, preferably heat shrunk, and then heat sealed, pinched, wired, taped or otherwise closed. An advantage of the machine is its ability to wrap large cylindrical shapes.

13 Claims, 3 Drawing Figures



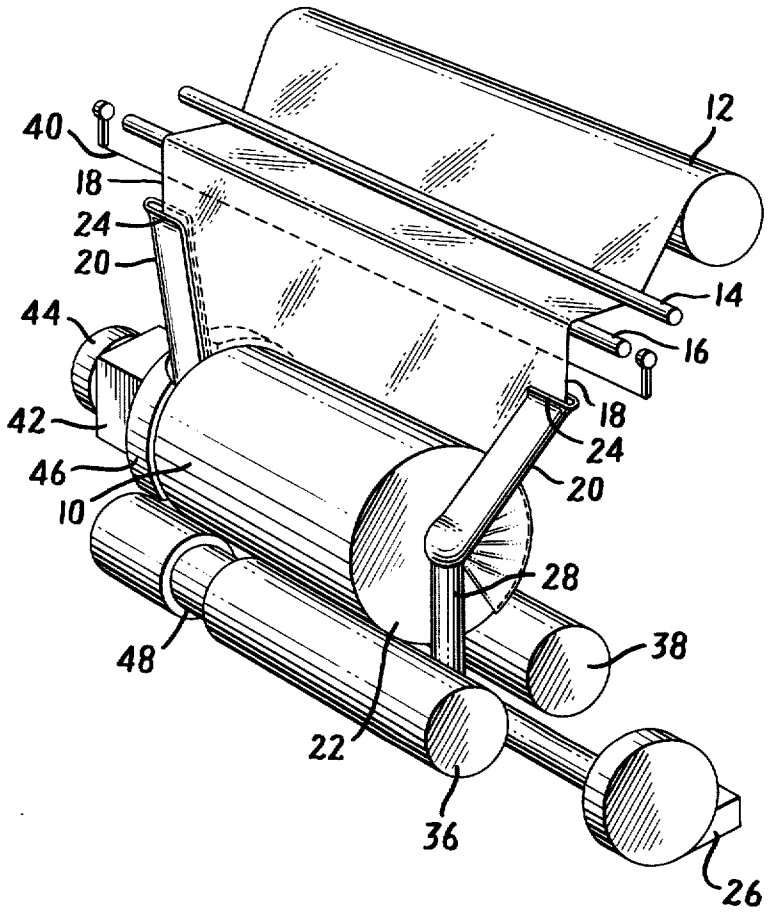


FIG. 1

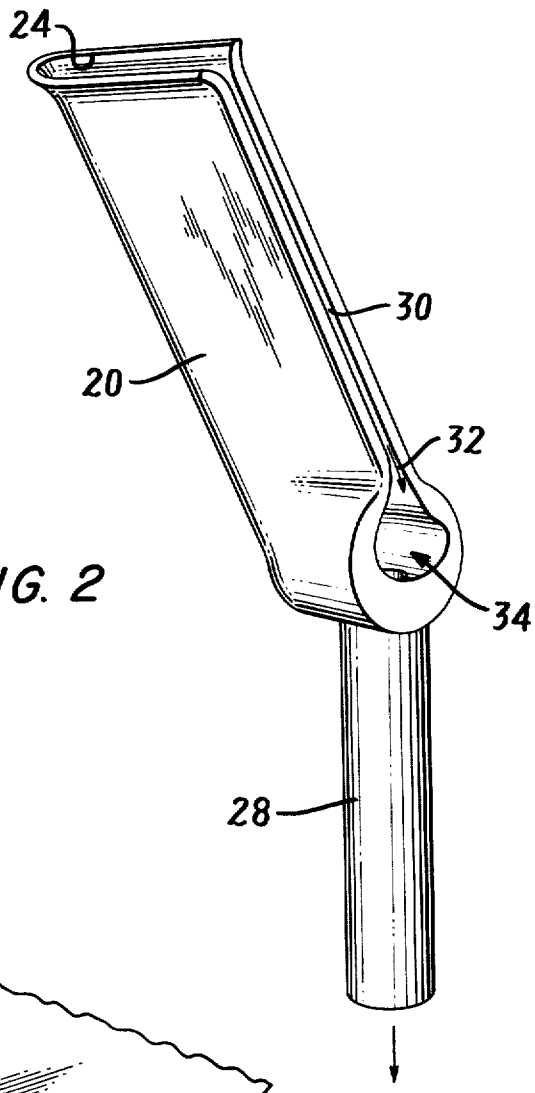


FIG. 2

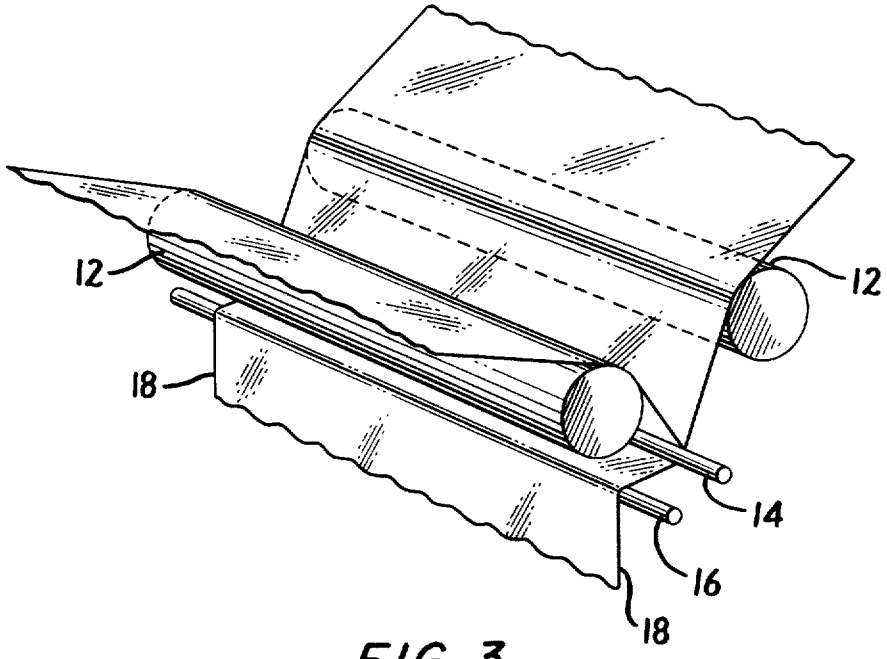


FIG. 3

WRAPPING APPARATUS FOR CYLINDRICAL SHAPES

The present invention relates to an apparatus for packaging of cylindrical objects and has particular application to relatively large cylindrical objects such as rolls of insulation, cotton batting, fibrous mats, foam sheets, paper and the like.

Large cylindrical objects are frequently difficult to package, especially with thin plastic materials such as polyethylene film. Air tends to be entrapped in the package during the packaging procedure so that a tight wrapping cannot be effected unless vent holes are punched or otherwise provided and in many applications such vent holes are undesirable. Furthermore, where heat shrinking and sealing are employed the air tends to expand thus making the entrapment problem that much worse. Additionally, large cylindrical objects tend to be clumsy to handle thus increasing wrapping problems.

In accordance with the present invention there is provided a machine for the wrapping of cylindrical objects, especially large cylindrical objects. The wrapping material such as plastic film is fed from a roll into a pair of shaped plenums which are under vacuum. The vacuum plenums are angled in towards the ends of the cylinder to be wrapped and the wrapping material moves down towards the cylinder with its edges held, guided and pulled by vacuum pressure. When the wrapping material comes into contact with the cylinder, which is rotating, the packaging material follows the cylinder and wraps around it. Since the vacuum plenums end at approximately the center of the cylinder, they collect the edge of the wrapping material at this point. After the cylinder has been completely enveloped, vacuum is continued and the wrapping material is then sealed by any suitable means but preferably by heat sealing. The finished product is the cylinder with a packaging material tightly wrapped around it.

These and other features of the invention may be more fully understood with reference to the drawings in which:

FIG. 1 is an elevational diagram of the apparatus of the present invention;

FIG. 2 shows one of the vacuum plenums; and

FIG. 3 shows the way in which more than one layer of the material can be applied.

Referring to FIG. 1 there is shown a cylinder **10** of felted fibers to be wrapped in polyethylene film **12.** The polyethylene film is contained on a rotatable roll supported by suitable means (not shown). The polyethylene film **12** is advanced by a drive roll **14** in connection with a feed roll **16.** The edges of the film **18** are fed into vacuum plenums **20** on each side of the cylinder. The vacuum plenums are movable and are also at a converging angle with respect to each other from the outer edges **18** of the film to the ends **22** of the cylinder **10** to be wrapped. The vacuum plenums **20** preferably have tapered openings **24** for easy reception of the polyethylene film **12.** Vacuum in the vacuum plenums is maintained by means of a vacuum fan **26** which is suitably connected to the vacuum plenums through a connecting tube **28,** only the right side one being shown.

Referring now to FIG. **2,** there is shown one of the vacuum plenums **20.** The film enters the vacuum plenum at **24** and advances down track **30** in the direction of the arrow **32.** The width of the track **30** is not

critical but it should be narrow enough so that the vacuum applied to the vacuum plenums will create sufficient air flow to hold the edges **18** of the wrapping material in the plenum. This width can suitably be one-sixteenth inch when 3 mil polyethylene is used and a vacuum of 4 inches of water is maintained. The bottom of the vacuum plenum **20** is enlarged as shown at **34** to collect the packaging material as it wraps around the cylinder **10.**

As the polyethylene sheet **12** is fed into the vacuum plenum **20** it is drawn towards enlarged chamber **34.** When the wrapping material comes into contact with cylinder **10** which is rotating due to driven winding roll **36** and idler roll **38,** it will follow the roll thus enveloping it. The edges of the packaging material will be collected in enlarged chamber **34** of the vacuum plenum. When a sufficient amount of packaging material **12** has been reeled off of the packaging material roll, the packaging material can be cut as for example with a hot wire **40** when the packaging material is plastic. This cutting can be effected by hand or can be automatically controlled in known manner. While a hot wire is the preferred form of cutting means, it will be understood that any form of automatic cutting may be employed or the packaging material could even be cut by hand with a razor blade. After the packaging material completely envelopes the cylinder **10** the ends of the packaging material are sealed. Vacuum is continued to be applied during this sealing operation so that the packaging material will be tightly wrapped around the cylinder. The preferred form of sealing comprises heat shrinking and sealing which can be accomplished by forcing heat from a heater **42** by means of a fan **44** into a shroud **46** which covers the end of the cylinder. It is most preferred that the heat only be sufficient to shrink the packaging on the ends of the cylinder since this will leave unshrunk and therefore stronger packaging material covering the main body of the cylinder. After the ends of the packaging material have been sealed either by heat sealing or other means the wrapped cylinder is then removed from the machine either by hand or automatically.

In order to accommodate different sized cylinders, one or both of the vacuum plenums and associated heating and vacuum assemblies are movable in forward and away relationship to each other. If desired, the winding roll **36** and idler roll **38** may also be made of adjustable width to accommodate the different sized cylinders as for example by means of telescoping member as shown at **48.**

It will be appreciated that more than one layer of packaging material may be applied to the cylinder. While this can be accomplished by simply continuing the rolling of the cylinder for two revolutions during wrapping, a far simpler method is shown in FIG. **3.** In this Fig. two layers of wrapping material are applied simultaneously, since they are brought together from separate rolls before drive roll **14.** The two separate layers of packaging material to be applied could be the same material or they could be different materials if desired. Furthermore, it will be understood that three of four or even more layers could be applied simultaneously in the same manner that two layers are shown being applied in FIG. **3.**

The materials from which the apparatus of the present invention is constructed are not particularly critical. However, where heat sealing is the form of sealing

applied to the packaging material, then it is highly advantageous to have the vacuum plenum **20** of a material which will not readily conduct heat so that the wrapping material **12** is not melted as it travels through channel **30** of the vacuum plenum. Alternatively, means could be provided for cooling the vacuum plenum **20** to prevent melting of the packaging material **12.**

It will be understood that the claims are intended to cover all changes and modifications of the preferred embodiments of the invention, herein chosen for the purpose of illustration, which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. A packaging apparatus for packaging of cylinders comprising:

a. means for feeding packaging material;

b. stationary transporting means for receiving the edges of the packaging material and for transporting the packaging material to the ends of the cylinder to be wrapped said transporting means comprising two plenums having lenghwise channels therein said plenums converging towards each other as they approach the ends of the cylinder;

c. vacuum means for maintaining a vacuum in the plenums and to effect the transporting of the packaging material to the ends of the cylinder;

d. means for rotating the cylinder to be packaged thus causing the packaging material to envelop it; and

e. means for sealing the packaging material at the ends of the cylinder.

2. The apparatus of claim **1** wherein the sealing means is a heat sealing means and wherein the heat sealing means also serves as means for shrinking the packaging material at the ends of the cylinder.

3. The apparatus of claim **2** wherein the heat sealing means also serves as means for shrinking the packaging material.

4. The apparatus of claim **3** wherein the heat sealing means only shrinks the packaging material at the ends of the cylinder.

5. The apparatus of claim **2** wherein the heat sealing means comprises a heater and a fan to blow hot air from the heater to a shroud which directs the hot air towards the end of the cylinder.

6. The apparatus of claim **1** further comprising means for shrinking the packaging material at the ends of the cylinder before sealing the packaging material.

7. The apparatus of claim **1** further including means for cutting the packaging material.

8. The apparatus of claim **7** wherein the cutting means comprises a hot wire.

9. The apparatus of claim **1** wherein the plenums are in movable relationship in toward and away direction from each other.

10. The apparatus of claim **1** wherein the means for rotating the cylinder to be packaged comprises a drive roll and an idler roll.

11. The apparatus of claim **10** wherein the idler roll and drive roll are adjustable in length.

12. A method for packaging cylindrical materials comprising:

a. feeding packaging material to a plenum;

b. maintaining a vacuum in the plenum;

c. transporting the packaging material through the plenum by vacuum pressure to the ends of a cylinder to be packaged;

d. rotating the cylinder;

e. contacting the leading edge of the packaging material with the rotating cylinder whereby the packaging material follows the circumference of the cylinder;

f. continuing the rotation of the cylinder at least until the cylinder is completely enveloped by the packaging material; and

g. sealing the packaging material at the ends of the cylinder while continuing to maintain a vacuum in the plenum.

13. The method of claim **12** further comprising shrinking the packaging material at the ends of the cylinder before step (g).

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