

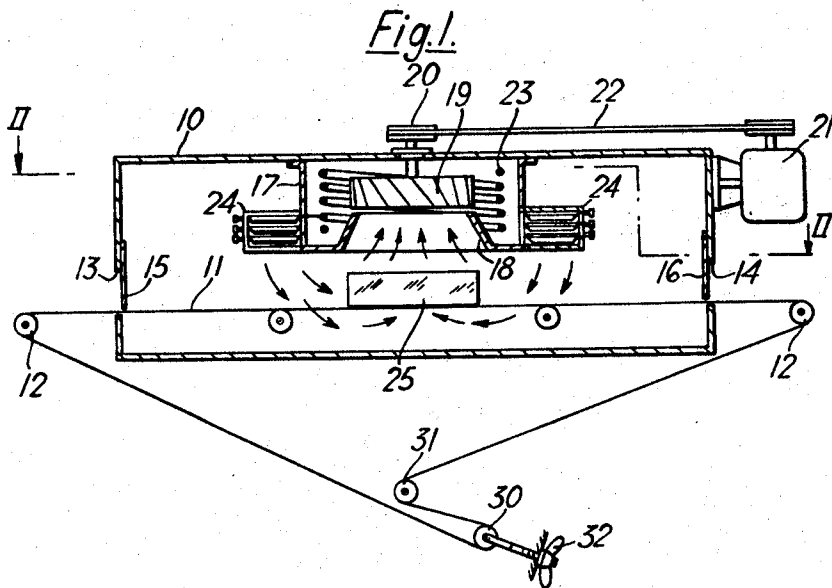
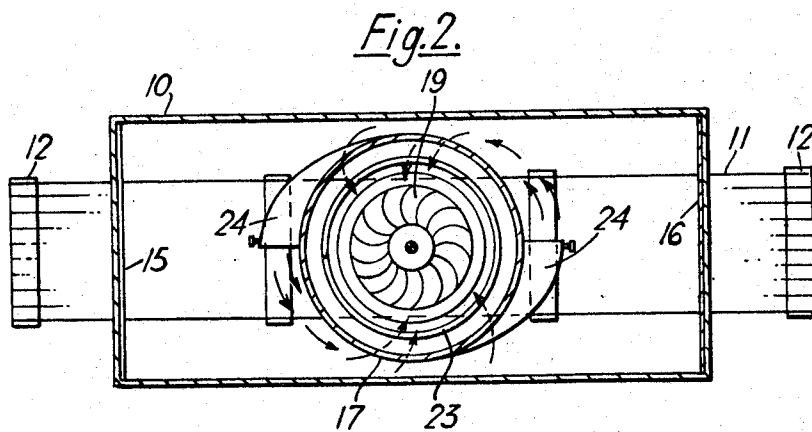
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METHOD AND APPARATUS FOR HEAT SHRINKING PACKAGING FILM

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METHOD AND APPARATUS FOR HEAT SHRINKING PACKAGING FILM

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ABSTRACT OF THE DISCLOSURE

A heated gas moving in a recirculating vortex as packages wrapped in heat shrinkable film pass therethrough.

The present invention relates to a method of and apparatus for heat shrinking packaging film.

In recent years it has become increasingly popular to package articles, particularly for display purposes, in a film of transparent plastics material, for example polypropylene film, by enclosing the article in an envelope of film and then causing the film to be shrunk closely to the profile of the article by blowing hot air over the film. In a conventional apparatus for shrinking the film, the article wrapped in a sealed envelope of the film, is passed on an air permeable conveyor through the interior of a double walled tunnel. The inner wall of the tunnel is perforated and a blower blows air into the space between the two walls so that it enters the interior of the tunnel from the top, bottom and both sides through said perforation. The air withdrawn from the tunnel through an outlet in the bottom of the tunnel and passed to the blower so as to be recirculated. This method is quite satisfactory for articles which are very thin, but when one is trying to wrap thicker articles the envelope has a large amount of spare overlapping material particularly at the corners. This spare material, using the conventional method, is not shrunk to a sufficient extent to adhere closely to the packaged article and an unsatisfactory appearance results.

It is an object of the present invention to provide a method and apparatus for heat shrinking the packaging film which eliminates or reduces the above disadvantage.

According to one aspect of the invention there is provided a method of heat shrinking a packaging film envelope on an article such method comprising causing heated gas, preferably air, to move in a vortex and withdrawing the gas through the vortex for recirculation and passing the article having thereover the film envelope to be shrunk through such a vortex. Desirably the article is passed through or near to the centre of the vortex. The article is conveniently passed at an angle to the axis of the vortex and preferably it is passed at right angles to the axis of the vortex.

By using the method according to the invention, we have found that a most satisfactory packaged article is obtained. The film adheres closely to the contour of the article packaged and in particular when an article of substantial thickness is being packaged by the method of the invention, the excess film which is located around the sides and ends of the article and particularly at the corners is neatly shrunk against the article. Such packaging has hitherto been unobtainable.

According to another aspect of the invention there is provided apparatus for heat shrinking packaging film into an article, such apparatus comprising a housing adapted to receive the article and means for creating a vortex of gas within said housing so that the gas is caused to pass over such article and return through the vortex for recirculation. Conveniently the housing is a tunnel and the article is passed through the tunnel on an air permeable

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conveyor, preferably a wire conveyor, i.e. a conveyor in which the conveyor surface is formed by a plurality of transversely spaced wires extending longitudinally of the conveyor. Advantageously, the means for producing the vortex comprise an impeller mounted at the upper part of the housing with its axis vertical such impeller being driven through a belt drive by a motor mounted away from the chamber. Around the impeller there may be provided a heating element such as an electric heating element and this in turn may be surrounded by a casing desirably having curvilinear gas outlet ducts adapted to impart the necessary swirl to the gas to effect the formation of the vortex, the arrangement being such that the gas is then drawn back into the centre of the impeller over the article i.e. it is drawn through the centre of the vortex.

In order that the invention may more readily be understood the following description is given by way of example of one embodiment of apparatus according to the invention, the operation of the apparatus being given to illustrate the method according to the invention. Reference is made to the accompanying drawings in which:

FIGURE 1 is a schematic side elevation, shown in section, of the described embodiment of apparatus of the invention; and

FIGURE 2 is a schematic plan view, sectioned on the line II—II of FIGURE 1.

This apparatus comprises a housing 10 in the form of a generally rectangular tunnel. Through the tunnel pass the wires of a wire conveyor having rollers 12 externally of the opening at each end of the tunnel and also internally thereof. The conveyor is driven by one or more of said rollers being driven and means are provided for varying the rate of travel of the conveyor. The opening 13, 14 at each end of the tunnel is provided with a heat proof curtain 15, 16 respectively which can pass articles placed on the conveyor, but assists in retaining hot air within the tunnel. Mounted centrally in the roof of the tunnel is an inner casing 17 of generally annular shape with its axis vertical and an opening 18 on the lower side thereof. An impeller 19 is mounted coaxially within the casing on polytetrafluoroethylene bearings with a pulley 20 secured to the impeller shaft externally of the tunnel. An electric motor 21 is mounted at a position relatively remote from the housing and has a belt drive 22 for rotation of the impeller. Electric heating coils 23 are mounted around the outside of the impeller 19 so that air issuing from the impeller passes over the heating element. Suitable controls are provided for regulating the temperature of the air and the speed of the motor to any desired value. The wall of the inner casing has two curvilinear outlet ducts 24 (FIGURE 2) arranged to impart a swirling motion to the air within the tunnel, the outlets of such ducts being arranged at diametrically opposed positions on a circle and being arranged tangentially to the circle and also angled downwardly.

The inlet to the impeller 19 is at the centre thereof and is arranged over the opening 18 in the bottom of the inner casing 17 so that air is withdrawn from the tunnel up through the centre of the air swirl and said opening is circulated via the outlet ducts 24 back into the tunnel.

The said outlet ducts 24 are arranged to be adjustable so that the angle at which the air is blown therefrom into the tunnel may be varied.

In operation of the above described apparatus, the motor 21 and the electric heater 23 are switched on and the necessary adjustments made so that the desired rate of flow of air and the desired air temperature are attained. As soon as this condition has been reached the conveyor drive is operated at the appropriate speed for the articles to be treated. An article 25 to be packaged is then placed on the conveyor with a sealed envelope of a suitable film, e.g. polypropylene film, surrounding the article. The con-

veyor 11 passes the article through the tunnel where it is subjected to the hot air therein and the film shrunk. The article 25 passes out from the tunnel with the film closely conforming to the shape to the article. The flow pattern within the housing is such that the air issues from the two outlet ducts 24 and rotates within the housing in a vortex form passing around the article 25, through the conveyor 11 up over the article and through the centre of the vortex to the opening 18 in the inner casing and thence to the inlet of the impeller.

By giving the air this swirling motion in which it returns through the centre of the vortex it has been found that the heating of the film on the article is far more thorough than in apparatus known hitherto and those parts which would in the latter have been insufficiently heated are, using this apparatus, shrunk to the desired degree. In particular, when the article to be packaged is for example a deep box or of any other shape in which the envelope of the film has a substantial overlap, the method and apparatus of this invention ensure that all parts of the film are given sufficient heating to ensure the necessary shrink. It is believed that this effect is achieved by the air striking the article obliquely whereas in the conventional apparatus it strikes it normally and thus forms a "boundary layer" of cooler air around the film. Further, whereas with previously known apparatus it has been necessary, in order to obtain a reasonable product, to adjust carefully the variable factors, i.e. speed of the conveyor and temperature, speed and distribution of the air, to suit the article being processed, using the method and apparatus of this invention the values of these variable factors are not so critical for the achievement of good results. An additional advantage is that means do not have to be provided, as they are in previously known apparatus, to change the position of the article on the members, e.g. wires, of the conveyor since using this invention it has been found that the film on the underside of an article is satisfactorily shrunk even though some parts of the film are, throughout the whole travel through the tunnel in contact with the conveyor wires. We have thus provided a method and apparatus for shrinking packaging film which is simple in construction and most effective in use.

As can be seen more readily from FIGURE 1, the wires of the conveyor 11 are led outside the tunnel around rollers 30 and 31. The tension of the wires is adjustable by means of device 32 acting on roller 30. The wires are thus cooled by passing out of the tunnel, so that burning of the film is prevented.

I claim:

1. A method of heat shrinking a packaging film envelope on an article, such method comprising the steps of wrapping the article in an envelope of heat shrinkable film, causing heated gas to move in a vortex having a centre withdrawing the gas through the vortex for recirculation and passing the article through such vortex.

2. A method as specified in claim 1, wherein the article is passed at least near to the centre of the vortex.

3. A method of heat shrinking a packaging film envelope on an article, such method comprising the step of placing the article in an envelope of heat shrinkable film, causing heated air to move in a vortex having an axis, withdrawing said air through the vortex for recirculation and passing said article through and at right angles to the axis of the vortex.

4. A method of forming a packaged article comprising the steps of wrapping the article in an envelope of polypropylene film, causing heated air to move in a vortex having an axis, withdrawing said air through the vortex for recirculation and passing said article through and at right angles to the axis of the vortex.

5. Apparatus for heat shrinking packaging film onto an article, such apparatus comprising a housing adapted to receive the article and means for creating a vortex of gas within said housing so that the gas is caused to pass over such article and return through the vortex for recirculation.

6. Apparatus for heat shrinking packaging film onto an article such apparatus comprising a tunnel, means for creating a vortex of air in such tunnel, means for feeding an article to be packaged through said vortex and means for causing the air from said vortex to return through said vortex and over said article for recirculation.

7. Apparatus for heat shrinking packaging film onto an article such apparatus comprising a tunnel, means for creating a vortex of air in such tunnel, a plurality of laterally spaced wires passing through said tunnel longitudinally from one end to another, means for causing the air from said vortex to return through said wires and through said vortex for recirculation.

8. Apparatus for heat shrinking packaging film onto an article such apparatus comprising, a tunnel, ends and an upper part to said tunnel, an impeller mounted in said tunnel with its axis vertical in the upper part of said tunnel, means for rotating said impeller to create a vortex of air in said tunnel, a plurality of laterally spaced wires through said tunnel passing longitudinally from one end to the other, roller means driving said wires longitudinally in one direction through said tunnel to pass through said vortex and means for causing the air from said vortex to return through said wires and through said vortex for recirculation.

9. Apparatus as specified in claim 8, wherein said wires are arranged as a conveyor, a return run to said conveyor being situated externally of said tunnel.

10. Apparatus as specified in claim 8, wherein an electrical heating element is disposed around said impeller.

11. Apparatus as specified in claim 8, wherein an annular casing is disposed about said impeller tangentially extending air outlet ducts being provided on said casing to impart the necessary swirl to effect the formation of swirl vortex.

12. Apparatus as specified in claim 11, wherein said annular casing defines a central opening effective to permit air to be drawn back through the centre of the vortex and through said wires.

13. Apparatus as specified in claim 11 wherein said outlet ducts are adjustable.

References Cited

UNITED STATES PATENTS

3,156,812	11/1964	Forman et al.	34-225
3,222,800	12/1965	Siegel et al.	34-217

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