AUTOMATIC WRAPPING MACHINE INCLUDING A SUCTION STOP PLATE

Fig. 3

Fig. 4

Fig. 5

Inventor:
William W. Plumb

By
Gary Parker, Justino C. Cullinan
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William W. Plumb, Dallas, Tex., assignor to St. Regis Paper Company, New York, N.Y., a corporation of New York

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This invention relates to improvements in automatic wrapping machines and more particularly to an apparatus for adapting wrapping machines which were designed for use with relatively stiff wrapping materials such as paper and cellophane may be used for wrapping articles with relatively soft and supple sheets or films of thermoplastic resins such as polyethylene, polypropylene and the like.

A number of commercial machines for wrapping articles such as cakes, cookies and the like are used in the baking industry. These machines operate by moving the article to be wrapped to a position from which it is subsequently raised through an opening over which a sheet of wrapping material had previously been placed. As the article is raised, the sheet of wrapping material is pushed upwardly while side-folding arms of the machine cause the sheet to wrap about the lateral sides of the article. When the article reaches the level of the folding table, the lateral ends of the wrapping material are folded under the package by bottom-folding arms. The overlapping ends of the sheet of wrapping material are then sealed together.

During each cycle of the main camshaft, one package is wrapped. The wrapping material, which is in the form of a roll of a continuous web, is fed through the nip of two rolls and is cut to proper length by means of a rotary shear knife. The sheet of wrapping material is then moved to a position over the opening of the folding table by means of rollers and/or belts. Normally, the sheet of wrapping material is stopped by a metal finger so that it is centrally positioned over the opening in the folding table when the article is to be wrapped is raised through the opening. These machines operate satisfactorily with sheets of relatively stiff materials such as waxed paper, cellophane, and the like but do not operate satisfactorily with sheets or films of thermoplastic resinous wrapping materials. These sheets, due to their limpness, will not maintain proper alignment as they are moved in the wrapping machine because the continuously moving rollers and/or belts cause the film to wrinkle, bunch up, and cock. In an attempt to overcome these defects, the use of suction conveyor belts was tried, using a pair of perforated belts passing over two suction chambers that were located at opposite lateral edges of the sheet. While this method solved the problem of conveying the sheet in unwrinkled condition, it aggravated the problem of stopping the film in the proper position since a mechanical stopping device located at the forward edge of the sheet of wrapping material did not prevent the rear edge from continuing in its forward movement. The use of a valve to cut off the suction when the sheet of wrapping material was in the proper position did not work because of the time required to bring the pressure in the suction chambers up to atmospheric pressure.

This invention provides means adapted properly to convey and position a sheet of soft, supple thermoplastic wrapping material on a machine of this type, as described further in connection with the accompanying drawings, of which:

FIGURE 1 is a schematic representation of the essential components of the film-feeding mechanism of an automatic wrapping machine,

FIGURE 2 is a perspective view of the apparatus of this invention,

FIGURE 3 is a perspective view partially in section of a suction chamber of the apparatus of this invention,

FIGURE 4 is a perspective view of the suction stop plate of the apparatus of this invention, and

FIGURE 5 is a view of the suction stop plate through the section 5—5 of FIGURE 4.

Referring to FIGURE 1, a roll 11 of sheet wrapping material 12 on a core 10 is fed through rotating nip rolls 13 and 14 and over a stationary knife blade 15. The speed of rotation of the nip rolls 13 and 14 in relation to the speed of rotation of a rotary knife blade 16 determines the length of the sheet that is cut and this speed is set so that the blade automatically cuts the proper length of sheet that is required for wrapping the article that is to be wrapped. The cut sheet is moved forward to the wrapping position by means of a pair of perforated belts 18 which are driven by rollers 17. A suction chamber 19 is used to hold the sheet to the belt. Idler rolls (not shown) may also be used to press the cut sheet against the belt. The article 39 that is to be wrapped and the platform 40 that is to be raised into a position above the belt 18 are also represented in FIGURE 1.

FIGURE 2 shows the cut sheet 29 of wrapping material on the perforated belts 18 in position 38 above the article 39 that is to be wrapped. Air is exhausted continuously from a conduit 22 which is connected to the suction chambers 19 by means of conduits 21 and thereby creates a suction at the slots 35 on the top surface of the suction chambers 19 (see FIGURE 3). Compressed air is charged into the conduit 23. The movement of the compressed air into the conduit 25 and beyond is controlled by a solenoid valve 24 which is actuated by a microswitch 32 to which it is connected by wires 33. The microswitch is, in turn, actuated by a protrusion on a cam 31 on the main camshaft 30 of the wrapping machine. The cam 31 is positioned on the shaft 30 so that the solenoid valve 24 opens when the sheet 20 reaches the wrapping position as shown. The compressed air enters the suction chambers through conduits 26 and counteracts the effect of the vacuum in these chambers, thereby allowing the belt to slidably move under the sheet 20. At the same time, the compressed air creates a suction at the holes 29 in the suction stop plate 28, thereby preventing the sheet from moving forward, this suction stop plate 28 being disposed adjacent the trailing end of the sheet 20.

The slots 35 in the suction chamber 19 which are represented in FIGURE 3 are located so as to correspond with the lines of the perforations in the belt 18. Conduit 26, which supplies the compressed air to the suction chamber, continues inside and extends throughout the full length of the suction chamber. Holes 34 are provided in the conduit 26 so as to direct the compressed air upwardly through the slots 35.

FIGURES 4 and 5 show the construction of the suction stop plate 28 which consists essentially of a hollow box that is open at its bottom 38, which has openings 29 in its top surface, and whose side walls 36 taper inwardly toward its bottom. Compressed air entering the plate through the conduit 27 is released and forced downwardly through a slot 37 in the conduit and out of the stop plate through its bottom 38 as shown by the arrow. The tapering side walls 36 of the suction stop plate cause a lowering of the pressure or suction to be created at the holes 29, as a result of the Bernoulli effect.

In operation, when the cut sheet 29, which is positively held to the conveyor belts 18 by the suction in the suction chambers 19, reaches the wrapping position, compressed air is charged into conduits 26 and 27, creating a suction at the surface of the suction stop plate and effectively holding the cut sheet, preventing its further forward movement while, at the same time, filling the suction chambers 19 with air and releasing the cut sheet that was
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held to the belts by the suction. The flow of the compressed air is then stopped by the solenoid valve 24 just as the article 39 is raised on the platform 40 and comes into contact with and lifts with the cut sheet from the folding table. At the same time, the suction is reestablished in the suction chambers 19 and the cycle is then repeated.

I claim:

In a wrapping machine including a web-feeding mechanism comprising a pair of continuously movable perforate conveyor belts adapted to pass over the top perforate surfaces of a pair of suction chambers by means of which a sheet of wrapping material can be conveyed to a position above the article that is to be wrapped, the improvements consisting of

(a) a hollow suction stop plate located directly below the position on the machine at which the wrapping of the article with the wrapping material is to begin, the said stop plate having a perforate top surface and an open bottom, whose sides each taper inwardly toward its open bottom, and a conduit inside the plate that has a slot or orifices directed downwardly toward the open bottom, which conduit is adapted to produce a suction at the top surface of the plate upon the injection of compressed air therethrough as the result of the Bernouilli effect,

(b) conduits in each of the suction chambers, each of which has orifices through which air may be injected into the chambers,

(c) a common conduit connecting the conduits in each of the suction chambers and the conduit in the hollow suction stop plate, and

(d) a valve in the common conduit whose opening and closing is controlled by a solenoid that is actutable by a cam on a main shaft of the machine.

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