

March 16, 1965

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3,173,232

APPARATUS FOR SEALING CLOSURE TAPES TO CONTAINERS

Filed March 7, 1962

4 Sheets-Sheet 1

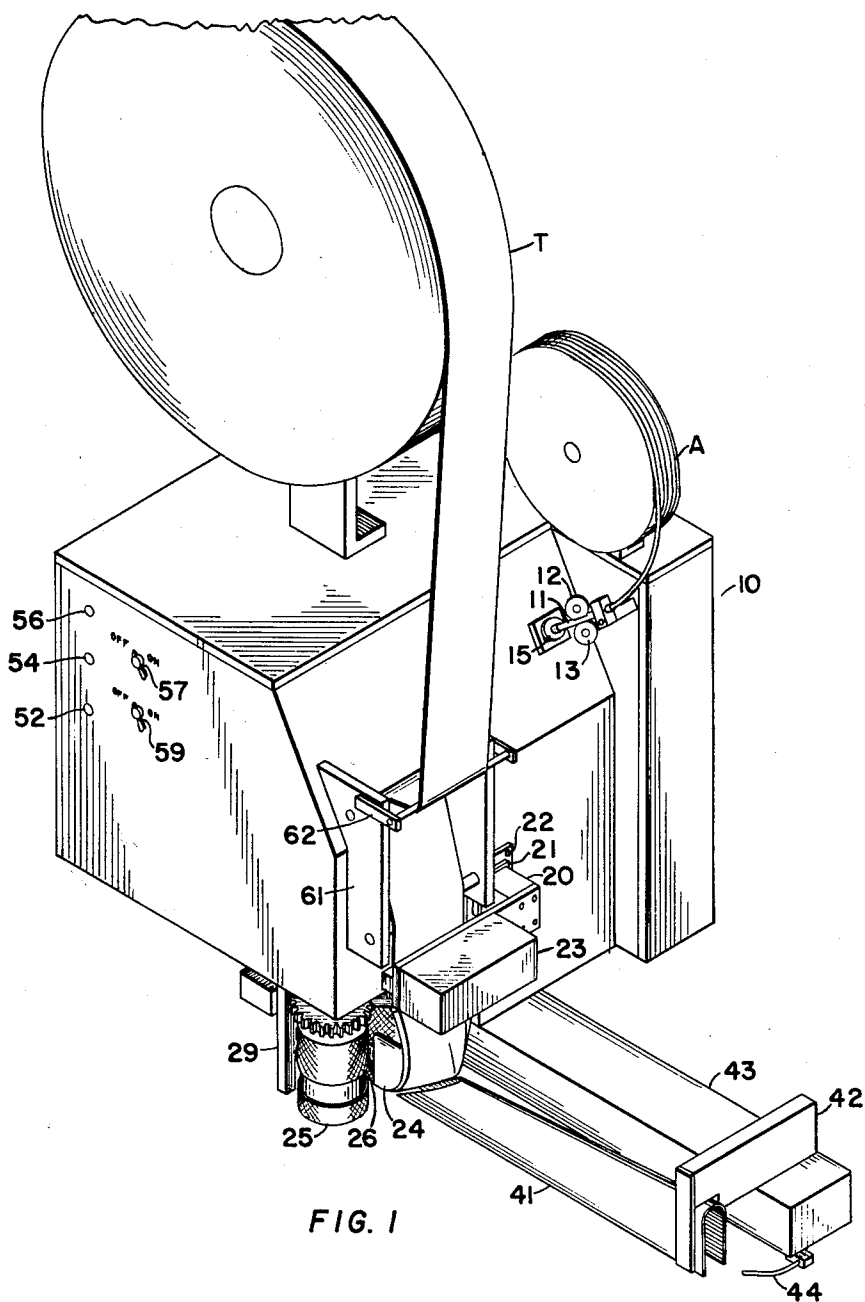


FIG. 1

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4 Sheets-Sheet 2

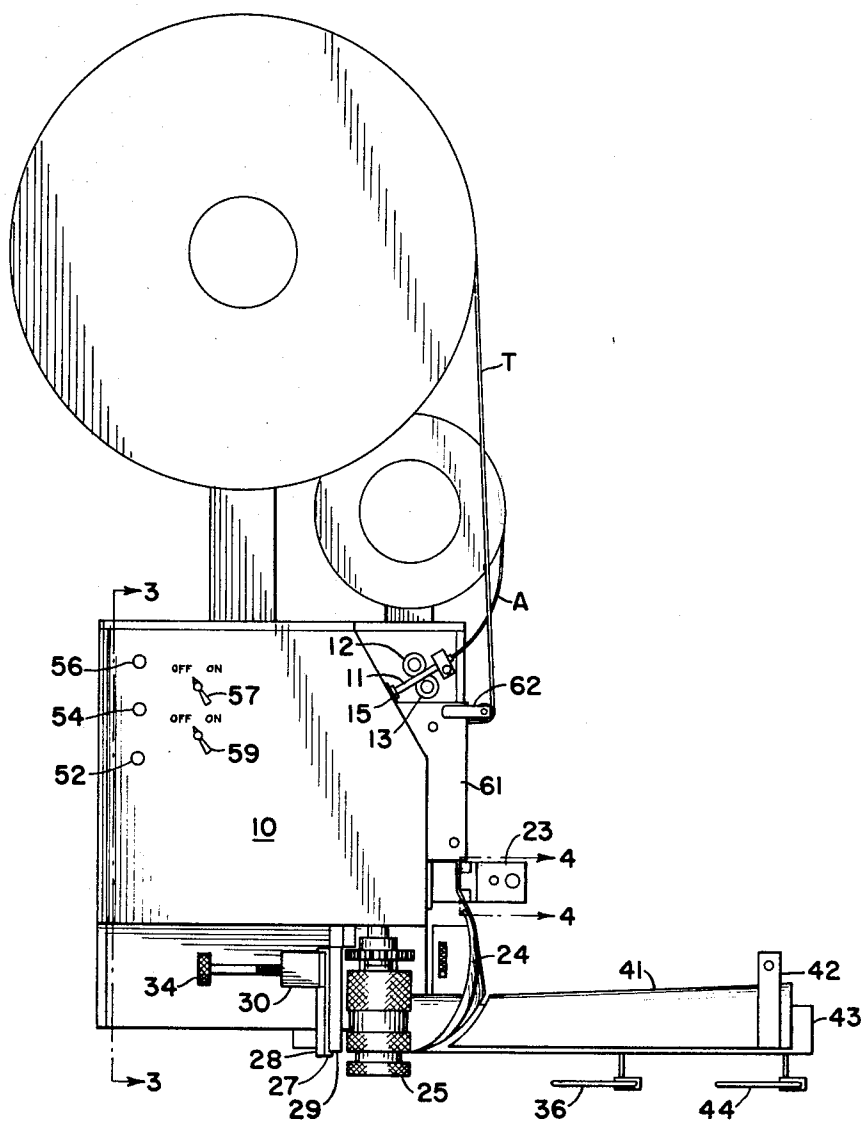


FIG. 2

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4 Sheets-Sheet 3

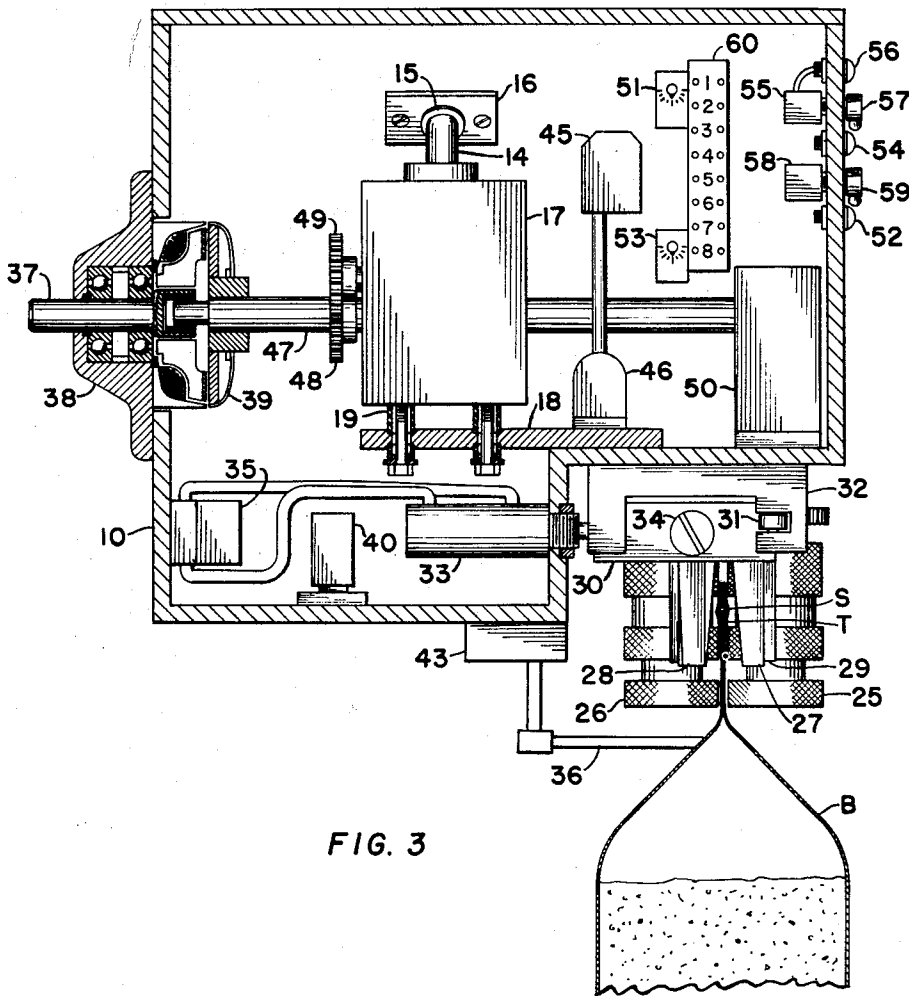


FIG. 3

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4 Sheets-Sheet 4

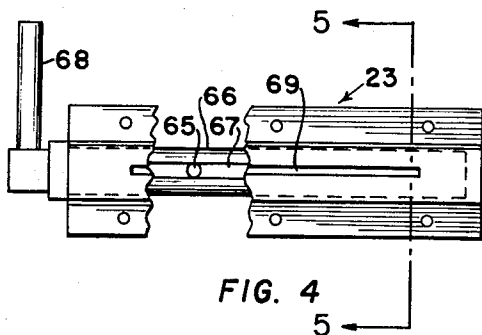


FIG. 4

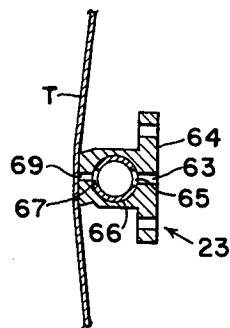


FIG. 5

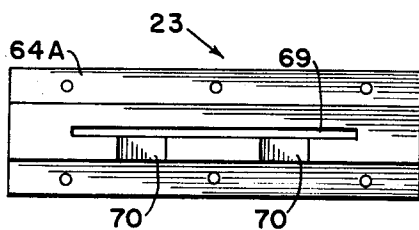


FIG. 6

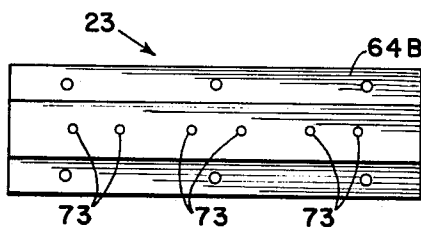


FIG. 9

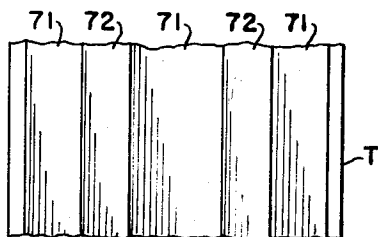


FIG. 7

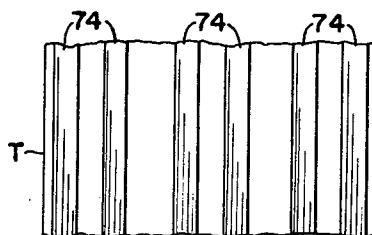


FIG. 10



FIG. 8

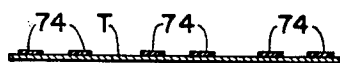


FIG. 11

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## APPARATUS FOR SEALING CLOSURE TAPES TO CONTAINERS

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2 Claims. (Cl. 53-137)

My invention relates to a method of and apparatus for applying to a tape a hot melt adhesive, in particular a thermoplastic type of adhesive, and thereafter applying the adhesive coated tape to containers to seal them. Ordinarily, the tape is folded over to bracket or straddle the end edges at the mouths of bags made of sheet material, for example multiwall paper bags, after they have been filled.

It is now common practice to package numerous pulverulent or granular materials, such as flour, sugar, salt, powdered milk, cement, commercial fertilizer, etc., in large flexible walled bags or containers of paper or other materials, usually of 100 lbs. or more capacity. To close and seal the open tops of such bags to assure the formation of a strong, leaktight, closure capable of withstanding rough handling and treatment in transit, the walls of the open bag tops are usually pressed into flatwise relation and sewn together by a row of stitches. Particularly with certain materials, such as finely powdered or hygroscopic materials, it is essential to apply a tape which will seal the needle holes against leakage of the contents of the bag, seepage of moisture into the bag or infestation of materials therein by insects. For example, ammonium nitrate fertilizer is very hygroscopic and it is essential to keep moisture out by sealing completely bags containing it.

In addition, ammonium nitrate is an explosive when mixed with oil and, in packaging it, careful precautions must be taken to prevent its fumes from entering a control box in which electrical contacts are made and broken, with resultant danger of sparking and explosion. Ammonium nitrate fumes are also very corrosive to iron, steel and other materials and exposed metallic parts of equipment subjected to such fumes must be made of non-corrosive material, such as aluminum or stainless steel.

It is a common practice to secure the end edges of multiwall bags by the use of a sewn seam and then to adhere a tape bracketing the end of the bag in a position to seal not only the end edges of the bag, but also the stitch holes at the line of stitching. So far as known, all of the various ways which have heretofore been proposed for securely sealing with tape the ends of bags with sewn closures, have had certain recognized shortcomings. For example, one method has been to glue a folded-over tape onto the end of the bag, after sewing the seam, by adhesives which will dry in due course, but the glued tape will tend to become displaced before the glue dries or sets. Another common practice has been to dip the whole end of the tape and sewn closure in wax or the like, but this generally results in a somewhat unsightly appearance and the wax may become cracked or abraded away and does not penetrate well in under the tape to seal same securely to the bag. Other proposals have been made to apply a folded-over tape, of thermoplastic material for example, and then pass the bag in between a pair of co-operating heated pressure rollers in an attempt to press and seal the tape in position, but this method affords only a momentary opportunity for heating the outside surfaces of the tape and the tape tends to insulate against heating the actual surfaces which should be adhered and sealed together, that is, the outer surface of the paper of the bag walls and the inner surfaces of the tape.

One object of my invention is to provide a method and apparatus which are suitable for use in sealing a tape over

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the stitching of a bag by applying adhesive to the tape in molten form, folding the tape and applying it over the stitching, applying pressure to obtain a fiber tearing seal instantly while the adhesive is still hot and then cutting the tape.

Another object is to provide a simple machine which is compact in size and can either be adapted to existing bag filling equipment or be used as a separate machine by using a motor drive attachment and support stand, no additional operator being required in either case.

A further object of the invention is to provide a machine that requires no preheat section for heating the tape and no long pressure section after the tape is applied over the stitched area of the bag.

Still another object is to provide a machine that is resistant to corrosives, particularly to ammonium nitrate.

A still further object of the invention is to provide a machine equipped with a quick-change knife to minimize interference in production.

Other objects and advantages of the invention will be apparent from the following description, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of one embodiment of a machine made in accordance with this invention;

FIG. 2 is a side elevation of the machine illustrated in FIG. 1;

FIG. 3 is a vertical sectional view, with some parts broken away, on the line 3-3 of FIG. 2, a multi-walled bag being shown as single-walled, for clarity of illustration;

FIG. 4 is an enlarged detail view, partly broken away, of an adhesive applying nozzle, as seen on the line 4-4 of FIG. 2;

FIG. 5 is a cross sectional view on the line 5-5 of FIG. 4;

FIG. 6 shows a modified form of the nozzle illustrated in FIG. 4;

FIG. 7 is a surface view of a tape coated with adhesive from the nozzle shown in FIG. 6;

FIG. 8 is an end view of the coated tape shown in FIG. 7;

FIG. 9 shows another modified form of nozzle;

FIG. 10 is a surface view of a tape coated with adhesive from the nozzle shown in FIG. 9; and

FIG. 11 is an end view of the coated tape shown in FIG. 10.

Referring now to the drawings, the construction and operation of one embodiment of a machine made in accordance with this invention are as follows:

A closed casing or housing 10 is cast and all other exposed parts are made preferably of aluminum or stainless steel, with the exception of Teflon (polytetrafluoroethylene) insulators and seals. The casing and other exposed parts may also be made of other noncorrosive materials. The casing is maintained, in a manner not shown, under an air pressure of about 2 p.s.i. in order to prevent ammonium nitrate fumes, for example, from entering the housing and corroding the metal therein or creating danger of an explosion. A rope type hot melt adhesive A enters a feed tube 11 (FIGS. 1 and 2) and is fed by two feed wheels 12 and 13 into an inlet tube 14 (FIG. 3) which is insulated by a Teflon insulator and seal 15, retained by a block 16. The adhesive then enters a commercial melting and extruding unit 17 in which the adhesive is melted and forced out under pressure. The adhesive is heated to a temperature of 400° to 500° F., depending upon the materials to be bonded. For example, polyethylene requires a high temperature, while paper does not. The melting unit is supported by a simple bracket 18, insulated by eight heat-resistant insulators 19. The melted adhesive passes from the melting unit through a nozzle support 20 (FIG. 1), insulated and

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sealed by a Teflon insulator 21 retained by a block 22. The adhesive next passes through an applying nozzle 23 (FIGS. 1 and 2), described in detail hereinafter, and is extruded onto a continuous tape T.

The adhesive coated tape is folded double by a 90° short folder 24 (FIGS. 1 and 2), being applied over the top, abutting, edges of a bag B, such as a multi-walled paper bag, which edges have been stitched together, over the stitching S of the bag. The tape is then sealed onto the bag by unheated pressure rolls 25 and 26. The sealed bag then passes a two-piece cut-off knife 27 and 28 (FIGS. 2 and 3), which cuts the tape to a neat edge, usually with a 1/2" to 3/4" ear projecting from one side of the bag.

The knife blade 27 is stationary and is supported by a bracket 29. The knife blade 28 is movable and is supported by a knife retaining block 30 (FIGS. 2 and 3) which, in turn, is slidable between two roller or ball bearings 31 supported by a bracket 32. The knife blades 27 and 28 are of the self-sharpening type and can be quickly replaced, in a manner not shown, the length of time usually required for such a change being two minutes. A cylinder 33 has a piston actuated by compressed air connected to the retaining block 30 to reciprocate the retaining block and thereby the movable knife 28. Spring pressure is applied to the knife 28 to assure smooth cutting operation, the degree of spring pressure being adjustable by a pressure regulating screw 34. The air cylinder 33 is controlled by a commercial four-way valve 35 actuated by a micro-switch, not shown, controlled by a micro-switch lever 36 (FIGS. 2 and 3). The unit is powered from a parent machine or motor drive attachment, not shown, through a drive shaft 37 (FIG. 3) supported by a bearing housing 38 and driving a Warner electric clutch 39. Power for the clutch is supplied by a Warner unit 40.

When a bag B leaving a stitcher enters a bag guide 41 (FIGS. 1 and 2), supported by a shaft 42 through a micro-switch housing 43, a micro-switch, not shown, is actuated by a lever 44 to cause the Warner clutch 39 to engage and also to operate a three-way valve 45 (FIG. 3), thereby operating an air cylinder 46 that opens the valve of the nozzle 23 to apply adhesive. When the electric clutch 39 is engaged, a shaft 47 is rotated, driving a sprocket 48 which, in turn, drives a sprocket 49, thus placing the melting and extruding unit 17 in operation. At the same time, the shaft 47 supplies power to the pressure rolls 25 and 26 through a right-angle drive 50.

A thermostat 51 controls the melting unit 17 and is connected to a pilot light 52. Another thermostat 53 controls the adhesive applying nozzle 23 and is connected to a pilot light 54. A line switch 53 is a double-pole single-throw toggle and is connected with a pilot light 56 and actuated by a lever 57 (FIGS. 1 and 2). Another switch 58 is used only when equipped with motor drive to furnish current to the motor and is actuated by a lever 59. 60 is a simple terminal strip using the number code.

The position of the tape T is controlled by a tape guide assembly 61 and the tension of the tape is controlled by a tensioning mechanism 62.

Details of possible embodiments of the adhesive applying nozzle 23 are illustrated in FIGS. 4 through 11. Melted adhesive flowing under pressure through the nozzle support 20 enters the nozzle 23 through an opening 63 in a nozzle body 64 and passes through apertures 65 into the interior of a rotary valve 66. The adhesive passes outwardly from the valve 66 through a long aperture 67. A valve operating lever 68, attached to the rotary valve 66, controls the angular position of the valve and thereby the extent of registry of the apertures 65 with the opening 63 and of the aperture 67 with an extruding orifice or slit 69 through the outer surface or face plate of the nozzle body 64. The position of the lever 68 is controlled by the air cylinder 46 (FIG. 3), in a manner not shown. The slit or orifice 69 may suitably be

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about 0.020" in width and its length is determined by the width of the tape to be coated, being normally about 1/4" shorter than the width of the tape. As shown in FIG. 5, the tape T passes tightly over the surface of the nozzle body 64 in contact with the outer surface or face plate to which the extruding orifice 69 opens. The thickness of the layer of adhesive applied to the tape T is controlled by the rate of rotation of the shaft of the melting and extruding unit 17 (FIG. 3). Each rotation of the shaft meters a predetermined amount of adhesive through the extruding orifice 69 of the nozzle. For example 96 revolutions of the shaft of the melting and extruding unit 17 per 100 feet of 2 1/8" tape may apply to the entire surface of the tape adhesive approximately 0.0015" thick. If an adhesive thickness on the tape of 0.0030", i.e., double the thickness just mentioned, is desired, the number of revolutions of the shaft of the melting and extruding unit 17 would simply be doubled, to 192 per 100 feet of tape. In order to vary the overall thickness of the coating of adhesive on the tape, it is not necessary to increase or to decrease the width of the extruding orifice 69.

Where a full coverage of the tape with a variation across the tape of thickness of the adhesive is desired, such a result can be achieved, as illustrated in FIGS. 6, 7, and 8. Thus, areas 70 can be milled in the outer surface or face plate of the nozzle body 64A to a depth of approximately 0.0040". The resulting pattern of adhesive applied to the tape T would be thin in the areas designated by 71 and thick or heavy in the areas 72, the latter being positioned to cover the stitching S.

As illustrated in FIGS. 9, 10 and 11, a further modified nozzle body 64B may be used, in which the extruding orifice 69 is omitted and replaced by a plurality of holes 73 drilled through the face plate of the nozzle body. The device shown in FIG. 9 will produce 6 strips of adhesive 74, as shown in FIGS. 10 and 11. The holes 73 may suitably be about 0.062" in diameter.

For protection of the contents of a bag against moisture, the tape is coated completely from edge to edge by using a nozzle body 64 or 64A, as illustrated in FIGS. 4 and 6. For protection against leakage or sifting out of the contents, the tape may need to be coated only partially, as illustrated in FIGS. 9-11, or may be given a thicker coating over the stitching area, as shown in FIGS. 6-8.

Various other modifications may be made in the face plate of the nozzle body 64 to give the user any pattern of adhesive he may need from full coverage of the tape down to coverage of any portion of it.

The method and apparatus were designed principally for use on filled bags, but may also be used in the manufacture of bags. For example, a rough tape may be attached near the open edges of bags in order to strengthen the edges for stitching or to prevent polyethylene bags from slipping in feed dogs.

This method and apparatus differ from the known heat seal method in that uncoated tape is used, and adhesive is extruded onto the tape in molten form. The tape is then folded over the stitching on a filled bag by means of a short folder and pressure is applied by a set of pressure rolls while the adhesive is still hot. An instant bond is made at the point of pressure and the tape is cut off directly behind the pressure rolls, thus separating the filled bags from each other. Only one pressure point is required.

The presently known heat seal method uses a pre-coated tape and requires a long heating section to bring the coating on the tape to a molten form so that it may be sealed. The tape folder is also heated and it is usually necessary for the pressure rolls to be heated. Such an operation will give considerable trouble when it is necessary to stop, in that scorching of the tape will occur in the heated section, which normally requires a high temperature. In my invention, no heating of the tape, of the bag or of the pressure rolls is required. In-

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stead, the hot melt thermoplastic adhesive alone is heated to a suitable temperature.

Another presently known method of sealing a tape over the stitching of bags is the use of wet or liquid adhesives applied cold to an uncoated tape, which then passes through a folding device and is placed over the stitching. A series of pressure rolls is required to make a seal and several minutes elapse before a good seal is obtained. The wet adhesive is undesirable in that it requires a daily clean-up of the equipment and is quite a mess in general.

In use of my invention, a bond is made instantly, in a fraction of a second. Upon leaving the machine, the sealed bags can at once be stored, loaded on trucks or otherwise handled. In contrast, use of either heat sealing or wet adhesive sealing requires considerable time to effect a bond and use of latex sealing requires a considerable drying time. A more consistent seal can be achieved use of a thermoplastic adhesive, as in my invention, than with heat seal methods. The properties of thermoplastic adhesive are such that dusty atmosphere, such as is prevalent in packaging powdery materials, does not affect the quality of the bond obtained. Moreover, use of my invention is less expensive than heat seal methods.

My invention is the only method known to me which is comparable to heat sealing in the speed of sealing and cooling for the same quality of seal. In some operations, higher production speeds can be attained with use of my invention than with use of heat seal methods. The maximum speed in filling bags is usually 22 bags per minute and the method and apparatus of my invention can easily more than keep up with such a speed.

Better temperature control over the adhesive is possible with my invention than with use of heat seal methods. In use of my invention, the faster the sealing operation is carried out the better, because the adhesive has less time to cool before it is sealed by the pressure of the unheated rolls. By contrast, in use of ordinary heat seal methods, the coating on the tape is activated by heating the tape in the folder and in the pressure rolls.

It will be apparent to those skilled in the art that various changes may be made in the invention, without departing from the spirit and scope thereof, and therefore the invention is not limited by that which is shown in the drawings and described in the specification, but only as indicated in the appended claims.

I claim:

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1. Apparatus for fastening tape to bags comprising means for melting a thermoplastic adhesive, means for continuously supplying a strip of tape, means for extruding the melted adhesive onto the tape including

an adhesive applying nozzle having

a face plate thereon with spaced holes therein through which the adhesive is applied to the tape in spaced strips,

means for guiding a bag longitudinally of the end edges thereof,

means for guiding the tape with its adhesive coating in contact with the end edge of the bag and pressure rolls for pressing the tape into sealing engagement with the wall surface of the bag end.

2. Apparatus for sealing flattened end closures of bags comprising

means for heating to between 400° and 500° F. and melting a thermoplastic adhesive,

a source for continuously supplying a strip of closure tape,

means for extruding the melted adhesive onto the tape including

an adhesive applying nozzle having

a face plate thereon with an extruding slit therethrough, the face plate having at least one recessed area therein to provide a thickened layer of adhesive over a portion of the bag,

means for guiding a bag longitudinally of the end edges thereof,

means for folding the tape with its adhesive coating straddling the bag end edges,

pressure rolls for pressing the folded-over sides of the tape into sealing engagement with the opposite wall surfaces of the bag ends and

means to clip the tape to separate the bag from the source of tape supply.

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