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3,290,854

PLASTIC COVERED WIRE BAG TIE AND METHOD OF CLOSING

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2 Sheets-Sheet 1

FIG. 1

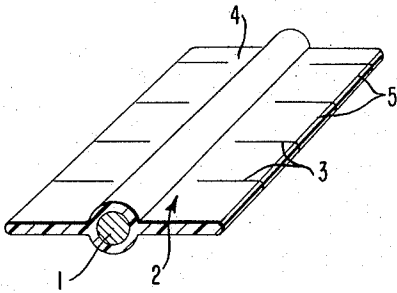


FIG. 2

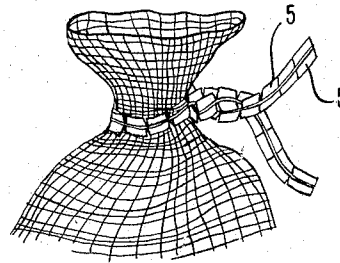
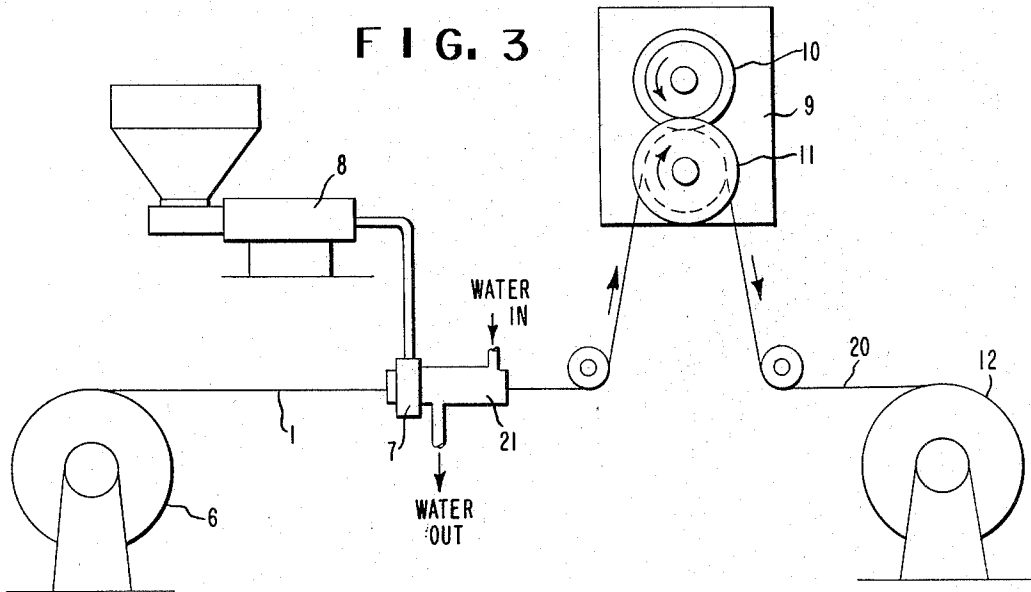


FIG. 3



PLASTIC COVERED WIRE BAG TIE AND METHOD OF CLOSING

FIG. 4

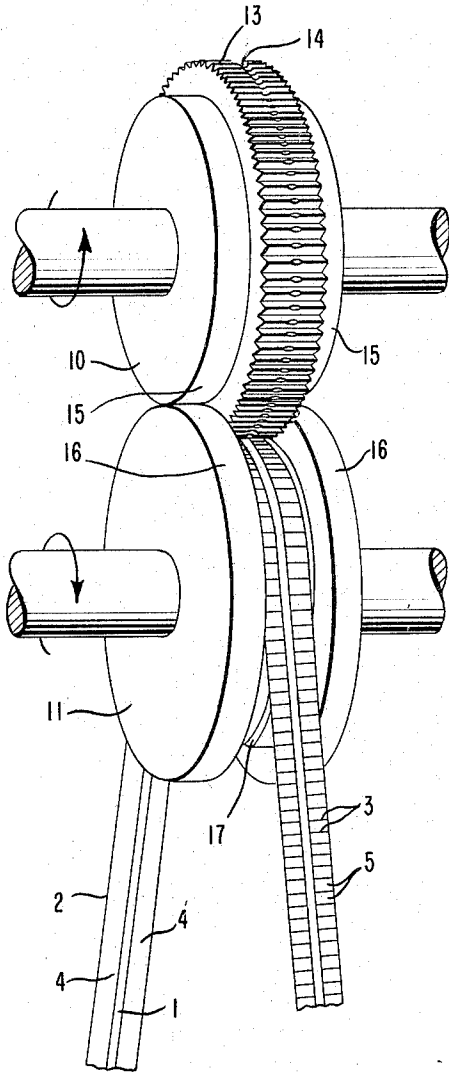


FIG. 5

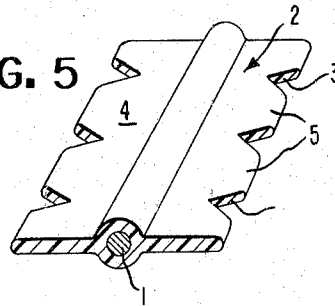


FIG. 6

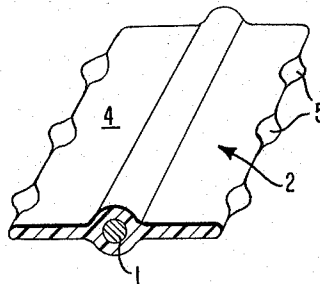


FIG. 7

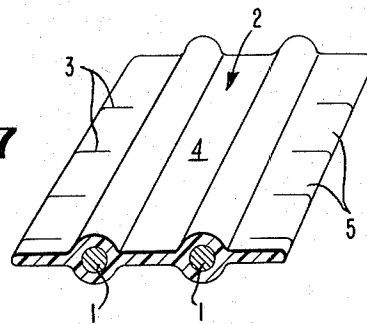
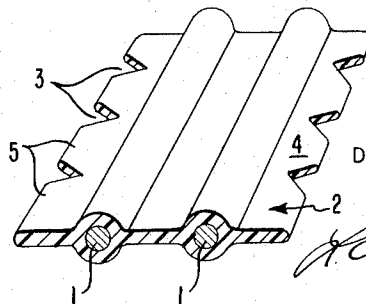


FIG. 8



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PLASTIC COVERED WIRE BAG TIE AND
METHOD OF CLOSING

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 9 Claims. (Cl. 53-14)

This invention relates to plastic covered wire ties having improved tying characteristics and which are particularly adapted for sealing plastic and open mesh type bags.

There are a great variety of techniques and devices used to seal all types of bags. For plastic bags, thermally fusing the open end of the bag provides an excellent closure from the standpoint of strength, cost and ease of fabrication. However, in many instances due either to the nature of the material being packaged or the structure of the bag, heat sealing is unacceptable, principally where it is necessary to reclose the bag to store unused contents such as baked goods or fresh produce. Normally, to open a heat sealed bag, the user must either cut or tear the bag to such an extent that it is difficult to reclose.

In the case of open mesh type bags, which usually are made of paper, plastic or natural or synthetic fiber, heat sealing is either impossible because of the bags' composition or impractical because the net-like structure does not lend itself to this sealing technique. Consequently, the bag neck is gathered and tied with a variety of closure devices ranging from adhesive-coated tabs and bands of tape to staples and snap on type tabs. All of these require special handling and costly ingredients and, as in the case of heat sealing, are difficult to open and are not intended for reuse. Open mesh type bags, such as those made of "Vexar" plastic (polyethylene or polypropylene) netting, have gained wide acceptance among fresh produce packagers; however, because some of the bag's contents often become bruised as a result of mishandling and thus appear unsightly to the customer, the retailer is forced to downgrade the item for quick sale.

A reusable closure would afford a simple solution to the above problems for the bag could be opened, the needed portion of the contents removed or the bruised contents replaced, and the bag reclosed with a minimum of time and effort.

One type of closure means used in the packaging industry is wire tie similar to that shown in U.S. Patent 2,371,357. This tie is simply a small diameter iron wire laminated with the aid of suitable adhesive between narrow strips of paper. Although the device is simple, inexpensive and relatively easy to fabricate, the paper strip tears easily and the wire tends to slip free even when loosely twisted. Exposed, the wire not only poses a hazard to the customer but also tends to injure the product. In some cases, the paper and adhesive constituents have been replaced with strips of pliable plastic laminated together. The plastic tie being slightly stronger overcomes the drawback of the paper tie in many light-duty applications; however, these deficiencies reoccur when the device is applied for heavier duty as on open mesh bags. In addition, the low coefficient of friction of the plastic material causes the tie to slip apart. Consequently, the tie must be tightly twisted a great many times usually resulting in breaking down the plastic and causing the wire to either strip away from the plastic or break under excess tension.

According to this invention there is provided a tough, pliable, plastic coated wire tie having greatly improved holding power, which resists delamination and can be inexpensively fabricated in large quantities. This wire

tie is further characterized by its ability to seal a great variety of bags, including open mesh types, and to reseal such bags after they have been opened.

The wire tie of this invention comprises at least one continuous strand of malleable wire extending longitudinally of and encased within a ribbon of flexible thermoplastic material having serrated edges. To provide maximum adhesion between the ribbon and wire strand and thus maximum tie strength, particularly when the tie is twisted, the ribbon is extruded about the wire as opposed to being formed by laminating two layers of plastic together with the wire therebetween. For ease in manufacture and flexibility of use, the serrations on the tie's edges preferably extend its entire length. For the same reasons, these serrations generally will be uniformly spaced along the tie.

As referred to herein, the "edges" of the ribbon are the two continuous, longitudinal surfaces which define the ribbon's width as opposed to its length or thickness, and when it is stated that these edges are "serrated," it is meant that they are provided with series of closely spaced disconformities which either reduce the ribbon's width at various points, e.g., slits or notches, or increase its width, e.g., finger- or ear-like projections. Preferably, the dimensions of the tie will be such that it can be employed in conventional bag closing machines.

The wire tie of this invention is best described with reference to the accompanying drawings, in which:

FIGURE 1 shows a preferred embodiment of the improved wire tie.

FIGURE 2 shows the embodiment of FIGURE 1 in a twisted condition on an open mesh type bag.

FIGURE 3 is a schematic arrangement of the mechanisms for manufacturing the improved wire tie.

FIGURE 4 is a perspective view of the serrating mechanism of FIGURE 3.

FIGURE 5 shows a single strand wire tie with notched edges.

FIGURE 6 shows a single strand wire tie with dimpled edges.

FIGURES 7 and 8 are dual strand versions of FIGURES 1 and 5.

In FIGURE 1, the preferred embodiment, the tie is shown composed of a single strand of wire 1 enclosed within a ribbon 2 of thermoplastic material. Wire 1 is of a suitable malleable metal, preferably soft annealed iron about 26 gauge diameter, and ribbon 2 is approximately $\frac{3}{16}$ inch wide and .005 to .007 inch thick on each side of the wire 1. Although any flexible thermoplastic material may be utilized for ribbon 2, including polyvinyl resins, polyvinyl chloride, polyvinyl alcohol, polyvinyl acetate and copolymers of such materials, polystyrene and various cellulose esters, materials which bond tightly to the wire, such as the polyamides, e.g., "Zytel 34" nylon resin, and the types of polyethylene disclosed in Canadian Patent 655,298, are preferred.

Ribbon 2 is serrated by providing it with a series of uniformly spaced slits 3 which extend inwardly from each of its edges and through flat surfaces 4 to a point short of wire 1, thereby defining a series of discrete projections 5 on each edge of the tie. In the preferred embodiment, these slits are about $\frac{1}{8}$ inch apart and extend inwardly to a point just short of wire 1.

As shown in FIGURE 2, when the tie is placed around the neck, i.e., the gathered open end, of an open mesh bag such as one made of "Vexar" plastic netting and then twisted, projections 5 not only interlock with each other but also entangle with the mesh thereby preventing the tie from slipping off the neck of the bag.

The tie preferably is mass produced by a high speed extrusion process which involves processing the two components through an extruder mechanism similar to the

type shown in U.S. Patent 2,973,552 to Downing et al. As shown schematically in FIGURE 3, bare wire 1 from a supply spool 6 is fed into one input of an extruder 7, while molten polymer is fed through a second input from a conventional melt feeder mechanism 8. The two components are combined under pressure in the extruder and forced through a specially apertured die into a water-cooled quench tank 21 where the plastic is solidified before emerging into the atmosphere. At this point the wire tie 20 is either wound on large spools and stored for later processing or fed directly over suitable guide rolls into a serrating mechanism 9, which comprises a rotary cutter 10 and a backup wheel 11 both made of a tool steel alloy. The cutter 10 and wheel 11 are suitably journaled in conventional bearing supports (not shown) and are driven by an electric motor (not shown). After its edges are serrated, the wire tie 20 is wound on suitable spools 12 for shipment.

FIGURE 4 is a closeup view of serrating mechanism 9 processing a length of wire tie 20. The cutter 10 is equipped with a plurality of evenly spaced cutting edges 13 which are machined with an open groove 14 which provides clearance for wire 1. Accurate alignment of cutting edges 13 with respect to the backup wheel 11 is maintained by means of shoulder 15 rolling against shoulder 16. These shoulders are proportioned to permit cutting edges 13 to penetrate surfaces 4 to a depth equivalent to the thickness of ribbon 2. A second groove 17 in backup wheel 11 provides clearance for the underside half of wire 1 so that only surfaces 4 are subjected to engagement with the cutting edges 13.

It will be seen that many variations of the serrated wire tie can be formed with the above apparatus simply by altering the configuration of the cutting edges 13. Some practical examples of these variations are illustrated in FIGURES 5 through 8, wherein numerals 1 through 5 designate the same elements as above. In FIGURE 5, the serrations are provided by a series of V-shaped notches 3. FIGURE 6 shows a series of shallow dimples pressed into the edges of the tie, e.g., by a heated rotary die. Heat and pressure from the die cause the plastic to extrude and form serrated edges having projections 5.

FIGURES 7 and 7 show dual strand versions of the ties of FIGURES 1 and 5, respectively. Dual strand ties can be serrated by modifying the assembly of FIGURE 3 so that cutter 10 and wheel 11 both have dual clearance grooves, one to accommodate each strand of wire.

As is readily seen from the foregoing, the serrated wire tie of this invention offers numerous advantages. Because of their relatively simple configuration, they are easily produced continuously in great quantities relatively inexpensively and with a minimum of investment. Fur-

thermore, the serrations in the tie provide added gripping edges which produce superior holding power and twistability, the latter permitting use of tougher, stiffer polymeric materials which exhibit good bonding characteristics with the strand or strands of wire. In addition, the configuration of the serrations is such that the wire tie can be utilized in conventional bag closing machines.

I claim:

1. A wire tie comprising at least one continuous strand of malleable wire extending longitudinally of and encased within a ribbon of flexible thermoplastic material having serrated edges.

2. A wire tie of claim 1 wherein there are two of said strands.

3. An open mesh bag closed at its normally open end with a wire tie of claim 1.

4. A wire tie comprising a single continuous strand of malleable wire extending longitudinally of and encased within a ribbon of flexible thermoplastic material having serrated edges.

5. A wire tie of claim 4 wherein said ribbon is extruded about said strand.

6. A wire tie of claim 4 wherein the serrated edges are provided by a series of evenly spaced slits along the entire length of the ribbon.

7. A wire tie of claim 4 wherein the serrated edges are provided by a series of evenly spaced notches along the entire length of the ribbon.

8. A wire tie composed of at least one continuous strand of malleable wire extending longitudinally of and encased within an extruded ribbon of flexible thermoplastic material having uniformly serrated edges.

9. A method of closing an open mesh bag which comprises gathering the bag at its normally open end, wrapping a length of wire tie of claim 1 around the gathered portion of the bag and twisting the ends of the tie together thereby causing the projections defined by said serrations to interlock with each other and entangle with said mesh.

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