Method for manufacturing draw string bags

Method for manufacturing draw string bags comprising the steps of providing a plastic material, extruding the plastic material to a longitudinal tubular foil (2), cutting (104) longitudinally at least two strips (10, 11) from said tubular foil, thereby providing a U-profiled foil (3) having two legs with an inner side (16), an outer side (17) and a free cut edge (18), leading (106) the at least two strips on either outer side of said legs adjacent the free cut edge, folding (108) the foil adjacent the free cut edges over said strips to form hems (8) and sealing the hems (8) to form tubular channels (19) in which the strips extend, thus forming draw strings (9), and sealing (110) transversely the U-profiled foil to provide a plurality of bags.
Description

The present invention relates to a method for manufacturing draw string bags, particularly draw string garbage bags, comprising the steps of providing a plastic material, extruding the plastic material to a longitudinal tubular foil and cutting longitudinally at least two strips from said tubular foil, thereby providing a U-profiled foil having two legs with an inner side, an outer side and a free cut edge.

Such a method is known from US 3,196,757 in which hems with draw string access means are formed at bag mouth forming margins, the hems being sealed to the body of the bag to form tubular channels enclosing continuous draw strings, generally in the form of ribbons of a suitable material. In one particular embodiment according to US 3,196,757 the draw strings may be formed by cutting thin ribbons of the web material from the bag mouth. In this embodiment a tubular foil with a W-shaped pleat is slit to form a folded web with a hem at each edge by cutting away a bottom portion of the W-shaped pleat, and a draw string with a U-profiled shape is formed from said bottom portion.

The known method is, however, disadvantageous in that the process used to form said draw string is very complicated to implement, particularly in a continuous process.

Thus, the object of the present invention is to provide a method for manufacturing draw string bags which method is considerably easier to implement in a continuous bag manufacturing process.

This object is according to the invention achieved by a method of the abovementioned type, which method comprises the further steps of leading the at least two strips to either outer side of said legs adjacent the free cut edge, folding the foil adjacent the free cut edges over said strips to form hems and sealing the hems to form tubular channels in which the strips extend, thus forming draw strings, and sealing transversely the U-profiled foil to provide a plurality of bags.

Such a method provides for considerably easier implementation in that performing the operations necessary to form a hem and a draw string on the outside of the legs of the U-shaped foil provides for considerably more space for manoeuvring folding and cutting tools as compared to the prior art, in which the hem and draw string forming operations necessarily must be performed in the space delimited within the foil, which in present manufacturing facilities would at best be highly complicated.

According to a particularly preferred embodiment of the invention the method further comprises the step of sealing said strips to form tubular draw strings, whereby the draw strings thus formed are provided with additional strength, and thus perform better when closing a bag.

According to another embodiment of the invention the method said sealing of said strips is performed by cutting said strips with a sealing knife, whereby the cutting and the sealing of the strips may be performed simultaneously.

According to another particularly preferred embodiment of the invention the method further comprises the step of twisting said strips to form twisted draw strings, whereby the draw strings are provided with further strength.

According to another preferred embodiment of the invention the method further comprises the step of punching at least one hole or at least one perforation in the material of said foil, to provide for pulling said draw string when closing a bag, which provides for easy access to the draw string when it is desired to close a bag.

According to a preferred embodiment of the method said plastic material is a polyolefin, such as a polypropylene or a polyethylene, this material being particularly convenient and easy to manipulate in a method according to the invention.

According to a particularly preferred embodiment of the method according to the invention a continuous line of draw string bags are produced, each two bags being separated by a weakened line, thereby providing a method resulting in a row of bags that may be rolled up to form rolls of bags each containing a desired number of bags and being ready for shipping.

According to another particularly preferred embodiment of the invention the method is performed as an in-line method, thereby providing a particularly convenient and time saving method for producing draw string bags.

Furthermore, according to the invention a draw string bag comprising a U-shaped plastic foil providing a closed bottom, an open end and two sealed sides, a hem formed by folding and sealing the foil at said open end onto itself, and a draw string placed in said hem, wherein said hem is placed externally on said U-shaped plastic foil, and wherein said draw string is formed by at least two strips of the material of said U-shaped plastic foil is provided.

Thereby a draw string bag is provided in which hem and draw string may be formed in a considerably simpler way as forming hem and draw string on the outside of the legs of the U-shaped foil provides for considerably more space for performing the necessary folding and cutting operations as compared to the prior known art.

According to a particularly preferred embodiment the draw string is a tubular draw string, whereby the draw string is provided with additional strength, and thus perform better when closing the bag.

According to another particularly preferred em-
bodiment the draw string is twisted, whereby the draw string is provided with further strength.

According to another particularly preferred embodiment the draw string comprises one or more substantially orthogonal welds, whereby the draw string is provided with further strength.

According to a preferred embodiment the bag further comprises at least one hole or at least one perforation in the material of said foil, said hole or said perforation being adapted for pulling said draw string when closing a bag, thereby providing a bag with easy access to the draw string when it is desired to close it, the bag thus being more convenient to use for the end user.

According to another preferred embodiment the tubular plastic foil is a polyolefin, such as a polypropylene or a polyethylene, this material providing for particularly well functioning bags.

The invention will now be described in further detail based on a non-limiting exemplary embodiment, and with reference to the schematic drawings. In the drawings,

Fig. 1 shows a section of longitudinal tubular foil with indication of four method steps,

Figs. 2A - 2E show cross sectional view of the foil in Fig. 1 as indicated by lines Ia-Ia to Ie-Ie, respectively, showing the outcome of different method steps,

Figs. 3A and 3B are view similar to fig. 2E, but showing two other embodiments of the draw string of a bag according to the invention, and

Figs. 4 - 6 show schematic side views of three different bags according to the invention.

With reference to fig. 1 an embodiment of a method for manufacturing draw string bags, and particularly draw string garbage bags, according to the invention is shown. The illustration features the main steps of the method according to the invention.

When producing a draw string bag using the inventive method the following steps are preferably performed. First, a plastic material is provided, generally in the form of granulate. This step is not shown in the figures.

In principle any suitable plastic material being suitable for processing into a thin, flexible and strong foil may be used. Preferably the plastic material may be heat welded. Preferably the plastic material is a polyolefin, such as a polypropylene or a polyethylene, where suitable polyethylenes comprise high density (HD) polyethylene, low density (LD) polyethylene and linear low density (LLD) polyethylene. Alternatively the material may be a biologically degradable plastic or a bioplastic. Next the plastic material is extruded into a thin tubular plastic foil by the use of a suitable extrusion process. Such extrusion processes are as such well known in the art. An exemplary cross section of an extruded tubular foil is shown in fig. 2A showing the tubular foil as flattened as would likewise be the case during the manufacturing process. In step 104, cf. fig. 2B, at least two strips 10, 11 are cut longitudinally, i.e. parallel with the direction of feed indicated by arrow 15 in fig. 1 of the foil, from the tubular foil 2, whereby a U-profiled foil 3 having two legs each comprising an inner side 16 an outer side 17 and a free cut edge 18 is provided - cf. fig. 2C.

The cutting process of step 104 is preferably performed using a sealing knife, such as for instance a so called slit sealer, which is a knife that may be heated on one or both sides to perform simultaneous cutting and sealing of a plastic foil. Referring to fig. 2B two sealing knives are used in the preferred embodiment of the inventive method. The sealing knives are represented by lines indicating a first 20 and a second 21 sealing knife respectively. In the embodiment indicated in figs. 2A - 2E the first sealing knife 20 is insulated on the side facing towards strip 11 and heated on the side facing towards strip 10, while the second sealing knife 21 is insulated on both sides (hence the second sealing knife 21 might in this embodiment in principle be substituted with a suitable ordinary knife), thus providing the draw string 9 shown in fig. 2C and 2D having a U-shaped cross section.

Alternatively, in another preferred embodiment, the first sealing knife 20 is heated on both sides, while the second sealing knife 21 is heated on the side facing towards strip 10 and insulated on the side facing opposite strip 10. This configuration would provide a draw string 9 with a tubular cross section as shown on fig. 3A. Such a draw string would have the benefit of increased strength as compared to the previously described draw string with a U-shaped cross section. It should be noted that in principle any combination of heated and insulated sides of the two sealing knives 20, 21 is feasible as long as one condition is fulfilled, namely that the side of the second sealing knife 21 facing opposite string 10 should always be insulated to ensure that the opening formed between the free cut edges 18 of the bag is not sealed.

In an alternative embodiment the draw string 9 may comprise one or more substantially longitudinal, reinforcing welds (not shown) that are preferably placed in a distance form the edge of the draw string. Such a reinforcing weld may e.g. be punctual, linear with interruptions or continuous, and is preferably provided by means of a heated wheel that is lead across the draw string 9. Such a wheel, that may be heated, may also be used as an alternative to the above mentioned sealing knives, particularly when the wheel additionally is adapted to be able to cut. Alternatively the reinforcing welds may be transversal or extend inclined or diagonally across the draw string 9.

Next, in step 106 the two strips 10, 11 are lead on either outer side 17 of the legs of the U-profiled foil 3 adjacent the free cut edges 18 (cf. fig. 2C).

Another preferred draw string configuration is shown in fig. 3B featuring a twisted draw string 9. The twisting of the draw string 9 may with advantage, whether the draw string 9 be tubular or U-shaped in cross section, be performed by twisting the two strips 10, 11 during step...
106 as a part of the step of leading the strips 10, 11 on either outer side 17 of the legs of the U-shaped foil 3. Such a twisting is another way of increasing the strength of the draw string 9.

[0029] Following step 106 the foil adjacent the free cut edges 18 is in step 108, cf. also fig. 2D, folded over the strips 10, 11 to form hems 8. The hems 8 are subsequently in step 110, cf. also fig. 2E, sealed to form tubular channels 19 in which the strips 10, 11 extend, the strips thus forming draw strings 9.

[0030] During or preferably before step 104 the tubular foil 2 is as shown in fig. 1 provided with holes 12 for, during use of the final bag, pulling the draw string when it is desired to close the bag. Such holes 12 are generally punched in the foil along its longitudinal axis, i.e. the direction indicated by arrow 15 of fig. 1, of the foil in regular intervals, thus providing at least one hole for each final draw string bag. As an alternative to such holes 12, the foil 2 may be provided with perforations (not shown) serving the same general purpose by facilitating access to the draw string. Such perforations may in principle be provided to the plastic foil at any point in the manufacturing process, but are preferably provided prior to or during step 104 or alternatively at some point during or after step 110.

[0031] Finally the U-profiled foil 3 is in an un-illustrated step sealed transversely, i.e. substantially perpendicular to the direction of feed indicated by arrow 15 in fig. 1, in suitable intervals to provide a plurality of bags of a desired width. Thus, the depth of the bags is consequently determined by the diameter of the initially extruded tubular plastic foil 2. Furthermore the transverse sealing may be provided with a weakened line, such as for instance a row of perforations, separating each two bags, such that a continuous line of draw string bags may be produced.

[0032] The method according to the invention may be performed as an off-line method, i.e. performing the initial extrusion and the subsequent profiling of the extruded foil (steps 104 - 110 plus abovementioned final steps) separately, for instance by winding the extruded foil on a roll and providing a profiling machine with the thus produced roll of foil. However, in the most preferred embodiment, the method is performed as an in-line method, thus performing the whole manufacture from extrusion to final bags on one production line.

[0033] Turning to figs. 4, 5 and 6 three different configurations of draw string bags 1, preferably draw string garbage bags, according to the invention are shown. Each of the bags 1 comprises a U-shaped plastic foil 3 with a closed bottom 4, an open end 5 and two sealed sides 6, 7. Each bag 1 furthermore comprises a hem 8 being formed by folding and sealing the foil 3 onto itself at the open end 5. A draw string 9 is placed in the hem 8 of each bag 1. The hem 8 is placed externally on the U-shaped plastic foil 3, and the draw string 9 is formed by at least two strips of the material of said U-shaped plastic foil 3. The draw string 9 may, as described above, in preferred embodiments be tubular and/or twisted.Usually each bag comprises at least one hole 12 adjacent the open end 5 intended for pulling the draw string 9 when the end user desires to close the bag 1.

[0034] The difference between the bags 1 shown in figs. 4, 5 and 6 lies in the positioning of the holes 12. The bag 1 shown in fig. 4 comprises one hole 12 positioned substantially middways between the sealed sides 6, 7. This embodiment is the least preferred of the embodiments shown. The bag 1 shown in fig. 5 also comprises one hole 12, but in this embodiment the hole is positioned adjacent the sealed side 7 such that the hole 12 is intended to extend with one part, preferably half, of its cross section on the bag 1 shown in fig. 5 and the other part, preferably other half, on a bag adjacent the bag 1 at the sealed side 7. Obviously the hole 12 might as well have been placed adjacent the opposite sealed side 6. In the third embodiment shown in fig. 6 the hole 12 in the bag 1 is placed similar to that in fig. 5, only there is provided a hole 12 at each sealed side 6, 7.

[0035] In an alternative the hole 12 may be placed in a distance form the open end 5, such that a piece, e.g. of 0,5 to 1,5 cm, of the sealed side 6 or 7 separate the hole 12 and the open end 5. Thereby is provided an improved guidance of the draw string 9 through the hole 12 when pulling the draw string 9.

[0036] In all three cases, but particularly in the embodiments of figs. 5 and 6, the hole or holes 12 may be substituted for perforations serving the same purpose as the hole(s) 12 by allowing the area delimited by the perforations to be torn off to provide access to the draw string 9 for closing the bag 1. Such perforations may for instance be a straight or curved row of perforations.

[0037] As a further albeit less preferred possibility also the draw string 9 may be perforated along the same lines as the perforations substituting the holes 12, thus enabling provision of the perforations during or after the abovementioned step 110 (for instance simultaneously with providing the abovementioned transverse sealing with a weakened line) of the method according to the invention. In this way the part of the draw string 9 extending within the area delimited by the row of perforations may also be torn off when tearing off said area delimited by the perforations. This latter possibility is mostly usable in the embodiments shown in fig. 5 and 6.

[0038] It should be noted that the above description of preferred embodiments is merely an example, and that the skilled person would know that numerous variations are possible without departing from the scope of the claims.

Claims

1. Method for manufacturing draw string bags comprising the steps of:

   providing a plastic material,
   extruding the plastic material to a longitudinal
tubular foil (2), cutting (104) longitudinally at least two strips (10, 11) from said tubular foil (2), thereby providing a U-profiled foil (3) having two legs with an inner side (16), an outer side (17) and a free cut edge (18), characterized in leading (106) the at least two strips on either outer side of said legs adjacent the free cut edge, folding (108) the foil adjacent the free cut edges over said strips to form hems (8) and sealing the hems to form tubular channels (19) in which the strips extend, thus forming draw strings (9), and sealing (110) transversely the U-profiled foil to provide a plurality of bags.

2. Method according to claim 1, characterized in that it further comprises the step of sealing said strips (10, 11) to form tubular draw strings (9).

3. Method according to claim 2, characterized in that said sealing of said strips (10, 11) is performed by cutting said strips with a sealing knife (20, 21).

4. Method according to any of the above claims, characterized in that it further comprises the step of twisting said strips (10, 11) to form twisted draw strings (9).

5. Method according to any of the above claims, characterized in that it further comprises the step of providing the strips (10, 11) with one or more substantially longitudinal welds to provide for strengthening of the draw strings (9).

6. Method according to any of the above claims, characterized in that it further comprises the step of punching at least one hole (12) or at least one perforation in the material of said foil to provide for pulling said draw string (9) when closing a bag.

7. Method according to any of the above claims, characterized in that said plastic material is a polyolefin, such as a polypropylene or a polyethylene.

8. Method according to any of the above claims, characterized in that a continuous line of draw string bags are produced, each two bags being separated by a weakened line.

9. Method according to any of the above claims, characterized in that it is performed as an in-line method.

10. A draw string bag (1) comprising a U-shaped plastic foil (3) providing a closed bottom (4), an open end (5) and two sealed sides (6, 7), a hem (8) formed by folding and sealing the foil at said open end onto itself, and a draw string (9) placed in said hem, characterized in that said hem (8) is placed externally on said U-shaped plastic foil (3), an in that said draw string (9) is formed by at least two strips (10, 11) of the material of said U-shaped plastic foil (3).

11. Bag according to claim 10, characterized in that the draw string (9) is a tubular draw string.

12. Bag according to claim 10 or 11, characterized in that the draw string (9) is twisted.

13. Bag according to any of claims 10 to 12, characterized in that the draw string (9) comprises one or more substantially longitudinal welds.

14. Bag according to any of claims 10 to 13, characterized in that it further comprises at least one hole (12) or at least one perforation in the material of said foil, said hole or said perforation being adapted for pulling said draw string (9) when closing a bag (1).

15. Bag according to any of claims 10 to 14, characterized in that the tubular plastic foil (2) is a polyolefin, such as a polypropylene or a polyethylene.
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The present search report has been drawn up for all claims.

**Place of search**
Munich

**Date of completion of the search**
12 November 2009

**Examiner**
Sundqvist, Stefan
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