United States Patent [19]

Naito

[11] E Re. 28,959

[45] Reissued Sept. 14, 1976

[54] **APPARATUS AND METHOD FOR MANUFACTURING TUBING FOR RECLOSABLE BAGS**

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[22] Filed: **Sept. 30, 1975**

[21] Appl. No.: **618,142**

Related U.S. Patent Documents

Reissue of:

[64] Patent No.: **3,543,379**
Issued: **Dec. 1, 1970**
Appl. No.: **662,344**
Filed: **Aug. 22, 1967**

U.S. Applications:

[62] Division of Ser. No. 89,540, Feb. 15, 1961, Pat. No. 3,340,116.

[52] **U.S. Cl.** ..... **29/450;** 29/200 B; 29/235; 29/238; 29/453

[51] **Int. Cl.**[2] **B23P 11/02**

[58] **Field of Search** ..... 29/400, 450, 200 R, 29/453, 200 B, 200 P, 235, 455; 24/201 S, 201 C; 156/92, 251; 138/114, 115

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Attorney, Agent, or Firm—Hill, Gross, Simpson, Van Santen, Steadman, Chiara & Simpson

[57] **ABSTRACT**

Extruding tubular bag material having interlocking profiles thereon and guiding the profiles together flattening the tube and interlocking the profiles.

11 Claims, 17 Drawing Figures

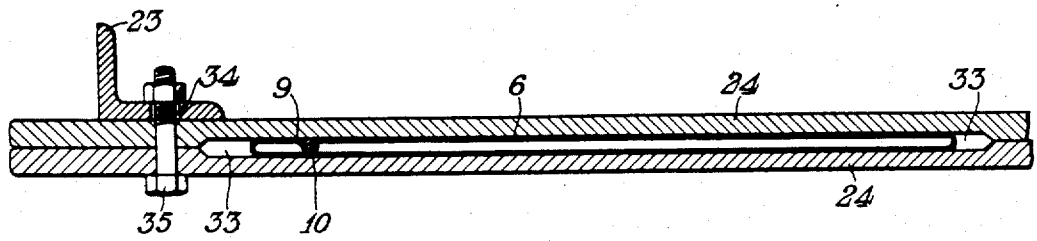


Fig. 1

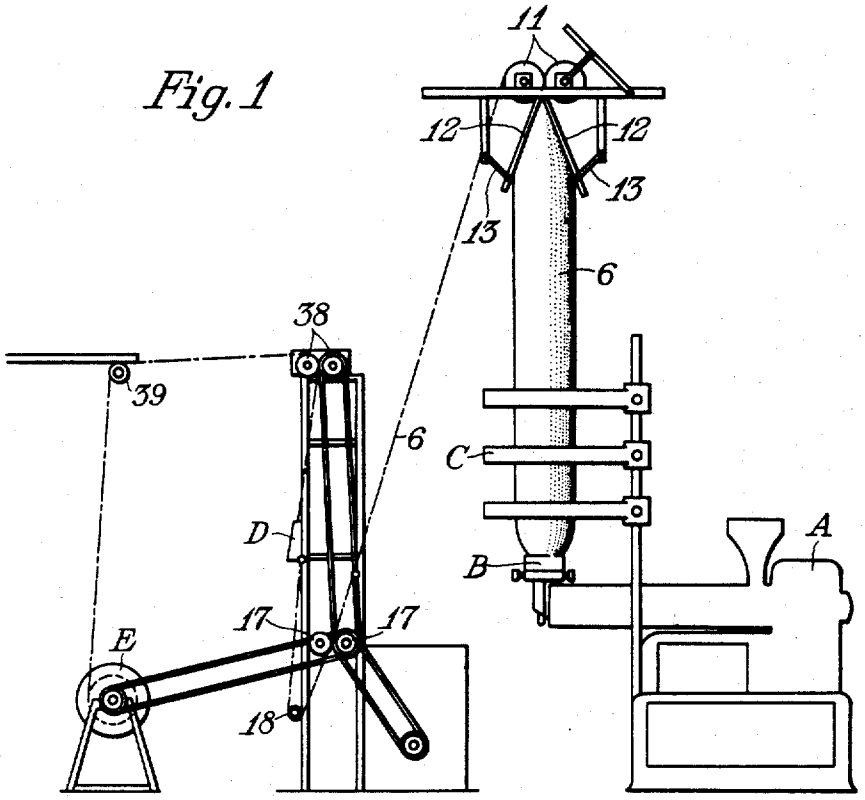


Fig. 3

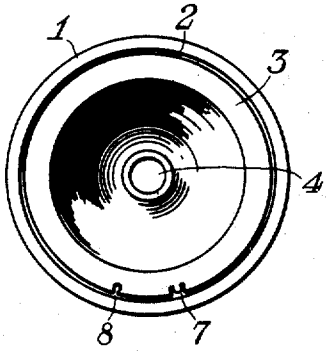
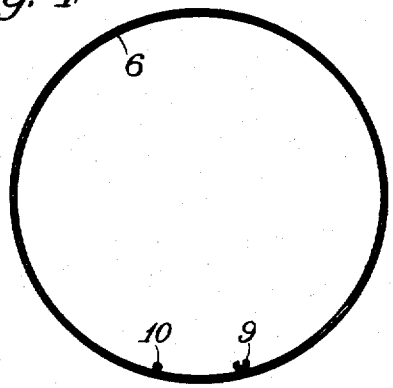


Fig. 4



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Fig. 7

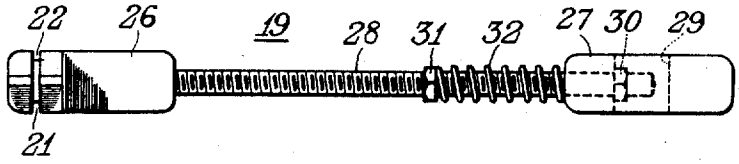


Fig. 2

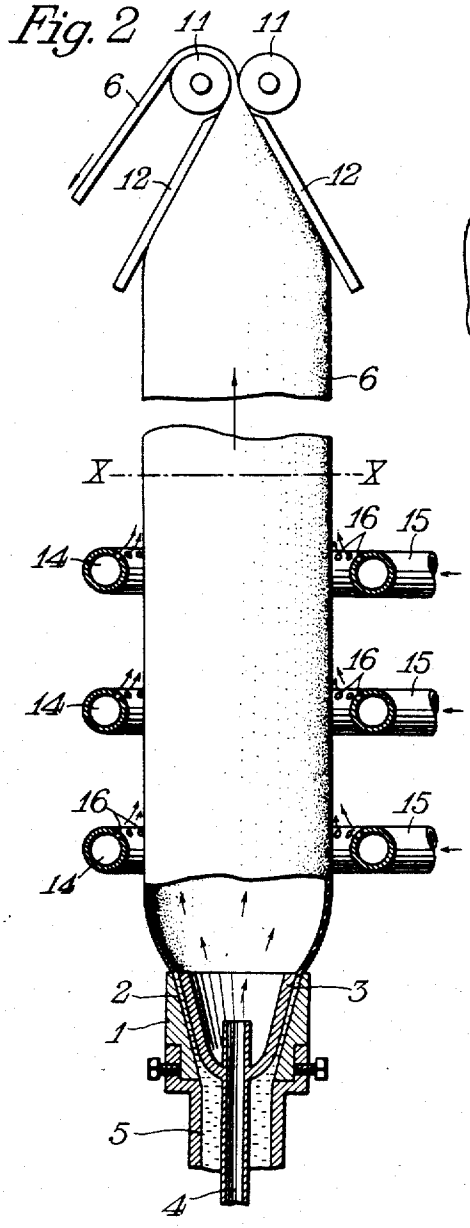
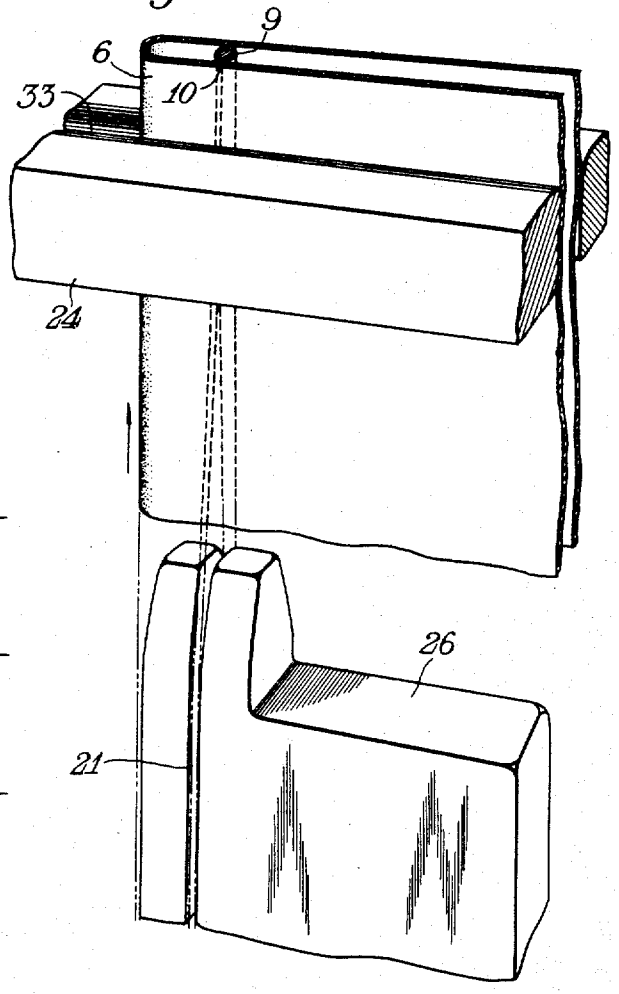


Fig. 5



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Fig. 6

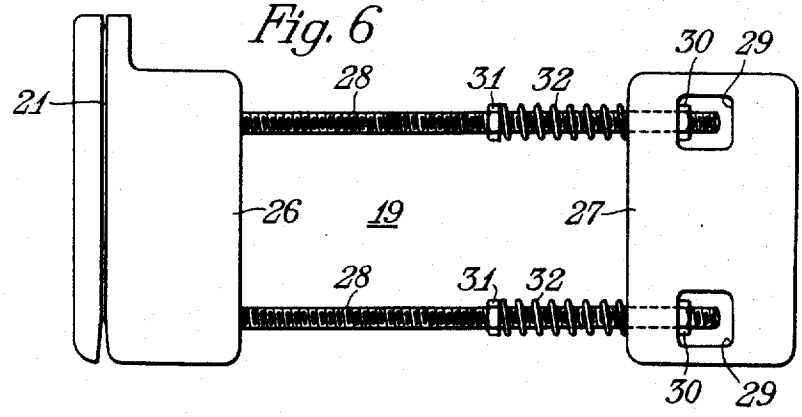
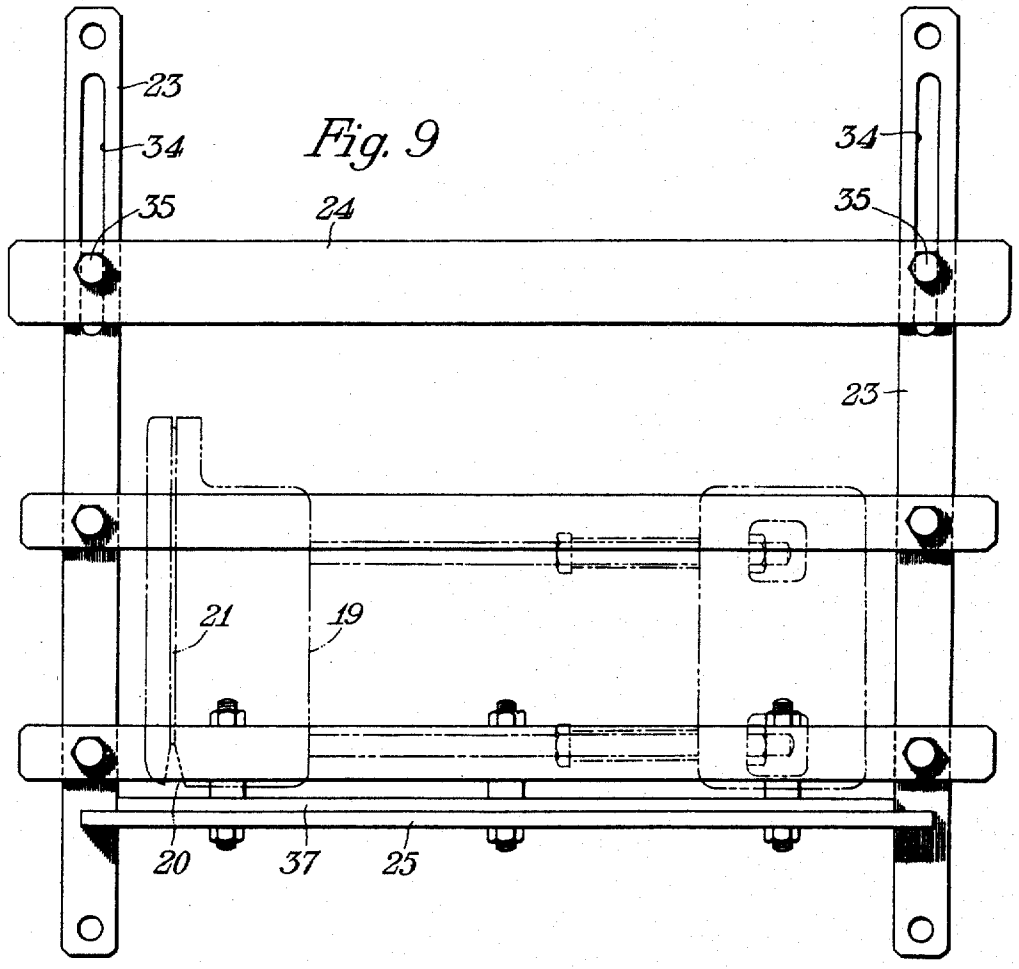


Fig. 9



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Fig. 8

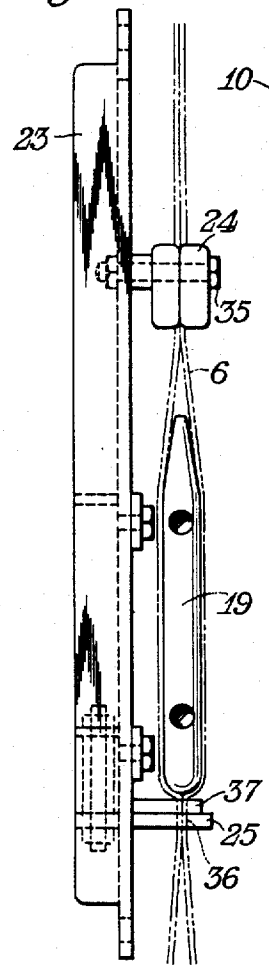


Fig. 11

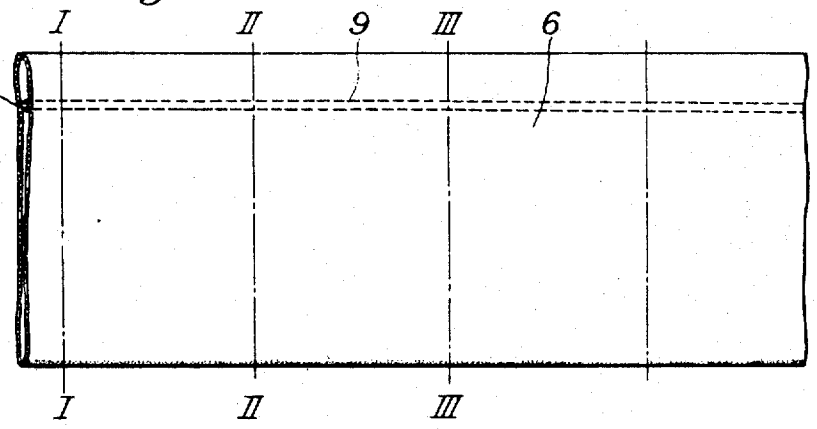
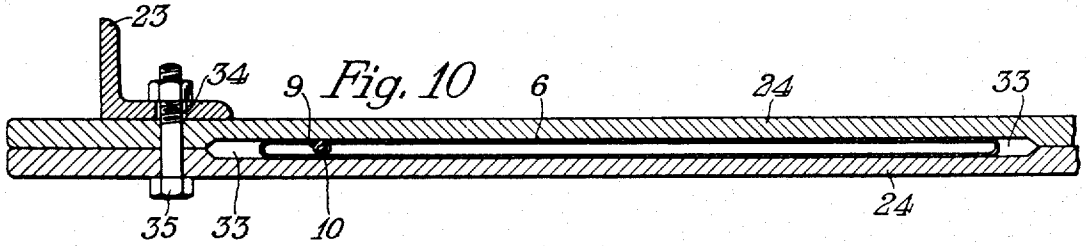


Fig. 10



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Fig. 12

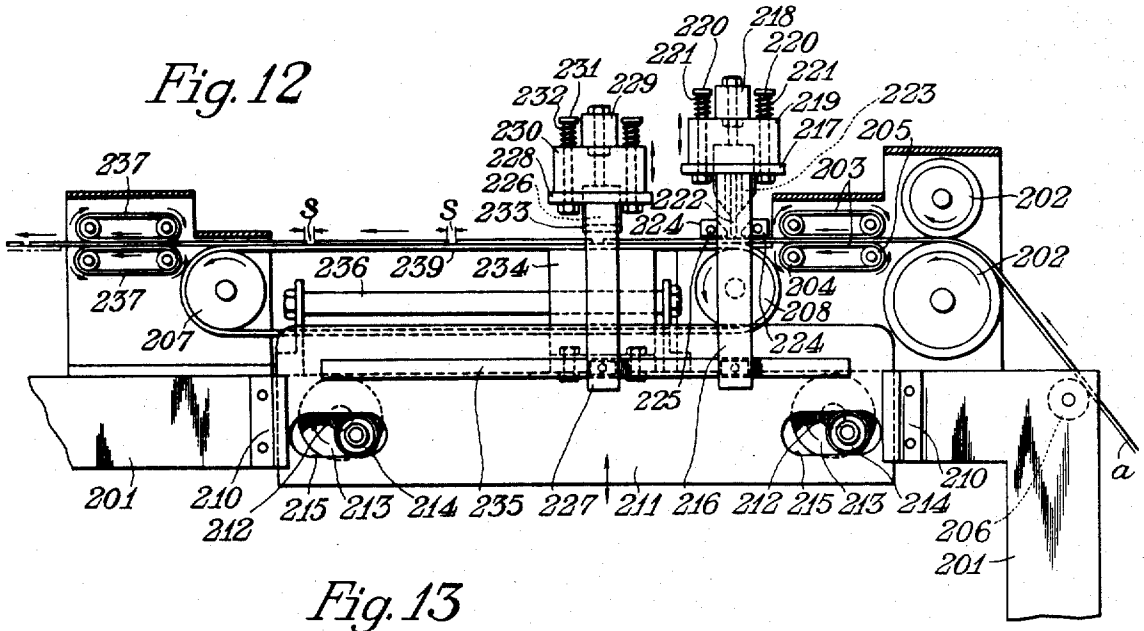


Fig. 13

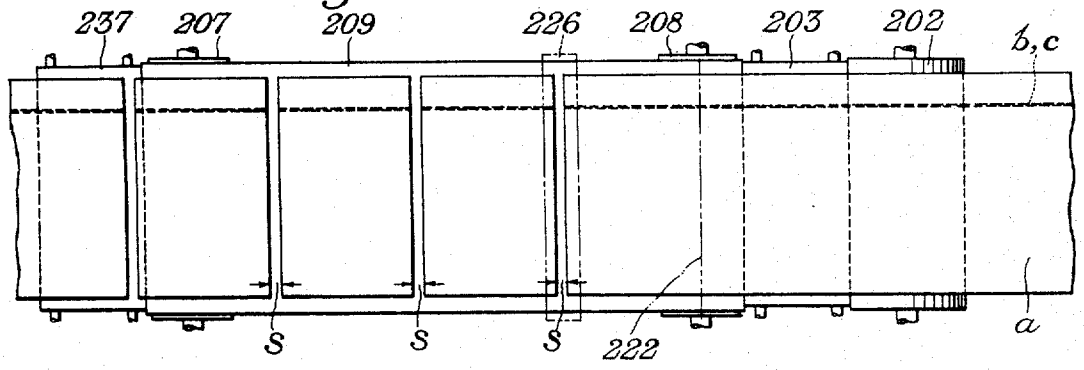
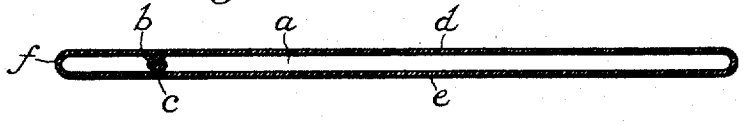


Fig. 14



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Fig. 15

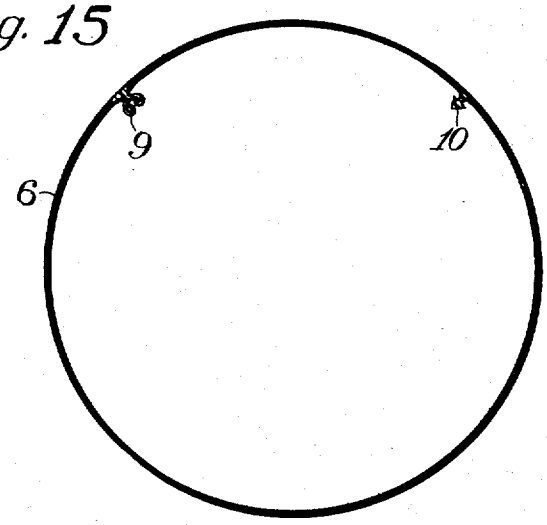


Fig. 16

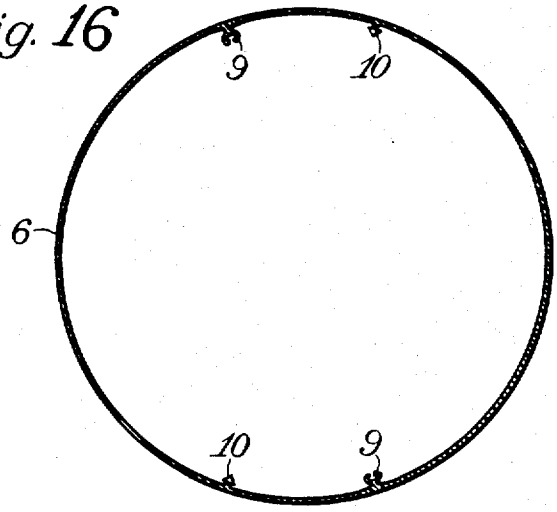
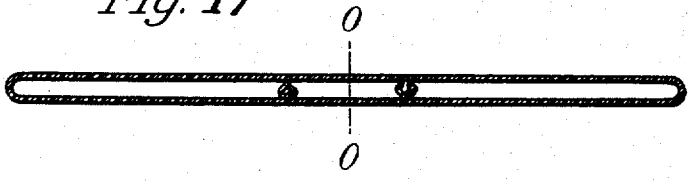


Fig. 17



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APPARATUS AND METHOD FOR MANUFACTURING TUBING FOR RECLOSABLE BAGS

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

CROSS REFERENCES TO RELATED APPLICATIONS

This application is a division of my copending application Ser. No. 89,540, filed Feb. 15, 1961, now Patent No. 3,340,116.

BACKGROUND OF THE INVENTION

This invention relates to a method and apparatus for manufacturing plastic tubes for making bags. The tubes have shaped profiles integral with the plastic material on the inner surface thereof with the profiles being shaped so as to form a male rib and a female rib-receiving groove which are occlusive with respect to each other so as to form a reclosable bag from the tubing.

In making the tubular bag material it is molded into a long continuous tube obtained by extruding from an extruding die head under heated state through an extrusion gap in the die head. The die head is shaped to provide the profiles on the inner surface thereof integral with the plastic material of the tube. The tube is distended so that the walls do not touch by air within the tube and cooling means such as air blown surrounding the tube is provided to cool the tube body. The tube is then flattened by means of a pair of rolls.

In accordance with the present invention, the tube is then guided for interengaging the rib and groove profiles preferably in a continuous action as the flattened bag is received from the extruding and cooling apparatus.

The bag material which is now flat and maintaining its occluded state can be finished into individual bags by cutting followed by sealing the cut edges. In actual practice, however, owing to the necessity of accomplishing printing of such as trademarks, trade names, etc. on the bag surface, the bag material that has been formed in a flat and continuous state, as described hereinabove, is first wound up on a reel, transferred to the printing step where after printing it is rewound on the reel and thereafter cut and the cut edges simultaneously sealed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation showing an apparatus which continuously molds a bag material, occludes the male and female ribs thereof and while flattening the same into a flat belt-like shape winds it up;

FIG. 2 is a detailed front elevation in section of that section which continuously molds the bag material;

FIG. 3 is a top plan view of a mold section;

FIG. 4 is a cross-sectional view of the bag material taken along lines X—X of FIG. 2;

FIG. 5 is an explanatory view showing that section for engaging the occludent means;

FIG. 6 is a front elevation of a guide for aligning the male and female ribs;

FIG. 7 is a top plan view of the above;

FIG. 8 is a side elevation showing the relationship between the above guide and that section for engaging the occludent means;

FIG. 9 is a front elevation illustrating the above relationship;

FIG. 10 is a top plan view in section of that section for engaging the occludent ribs;

FIG. 11 is a top plan view showing the bag material subsequent to its having been occluded;

FIG. 12 is a front elevation showing an apparatus for forming individual bags from tubing;

FIG. 13 is a top plan view showing the conveyor mechanism of FIG. 12;

FIG. 14 is an enlarged sectional view of a bag;

FIG. 15 is an enlarged sectional view showing a modification of the rib and grooves;

FIG. 16 is a cross-sectional view showing the bag material with two sets of ribs and grooves; and

FIG. 17 is a sectional view showing the material of FIG. 16 in its flattened form.

In FIG. 1, A is the synthetic resin extruder; B, the mold which serves as the extrusion outlet; C, the cold air discharge section; D, the engaging section; and E, the windup reel.

While the extruder A is constituted such that the synthetic resin material is extruded under a heated state, and it is possible to use one that is of a conventional structure, the extrusion outlet which serves as the mold B, as shown in FIG. 2, consists of a combination of an inverted truncated cone-shaped outer mold 1 and a core 3 such that a narrow annular extrusion opening or gap is formed therebetween. In the central bottom part of the core 3, an air inlet tube 4 is provided, while the bottom part of the outer mold 1 constitutes an introductory cavity 5 which communicates with the extruder A from which the synthetic resin is extruded and delivered via said introductory cavity 5 to the aforesaid extrusion gap 2. As shown in FIG. 3, there are formed molding grooves or profiles 7 and 8 in the outer surface of the core 3 communicating with the extrusion gap 2 for forming integrally with the bag body 6 the male and female ribs 10 and 9 for occlusive use.

Directly above this mold B there is provided a pair of delivery or pinch rolls 11, 11 disposed in lateral fashion facing each other for clasping and delivering in a flat state the tubular bag body 6 that is extruded from the mold. And the apparatus is constituted such that, in the meantime, air is blown in small amounts into the tubular bag body 6 from the bottom through the aforesaid air inlet tube 4, and with the top part of the bag body 6 being held together by means of the delivery rolls 11, 11, the bag body 6 is swelled and maintained in a tubular shape. Below the rolls 11, 11 there is provided a pair of guide plates 12, 12 facing each other in roof fashion whereby the shoulder portion of the bag body 6 swelled into a tubular shape is guided and is gradually pressed flat as shown in FIG. 2 and passes between the rolls 11, 11. These guide plates 12, 12 are provided respectively with adjusting rods 13, 13 by which the angle of inclination of these guide plates are controlled.

At that part of the apparatus where the tubular bag body 6 ascends, a cold air discharge section C is provided. As illustrated in FIG. 2, several tiers of air supply pipes 14 are provided annularly surrounding the periphery of the tubular bag body 6, and the air is appropriately supplied to the annular pipes 14 from communicating pipes 15 and issues from numerous orifices 16 provided in the inner periphery of each of the air sup-

ply pipes **14** is blown against the outer surface of the bag body **6** to remove heat from the freshly molded film and thus cool the same.

The bag body **6** which leaves the delivery rolls **11, 11,** as shown in FIG. **1,** after passing through such as intervening guide rollers **17, 17** and **18** advances upward and is guided to the section for engaging the occludent ribs **9** and **10** which also may be termed rib and groove elements, the female rib has a groove therein for releasably interlockingly receiving the rib element. This section for engaging the occludent ribs D is constituted as shown in FIGS. **8, 9** and **10,** and in first passing the end of the bag body **6** through this section, an aligning means or guide **19** is first of all inserted into the mouth of the tube where it is held therein. As is clear from FIGS. **5** to **9,** the guide **19** is a device which is relatively flat whose sides are boat-shaped and having guide grooves **21, 22** which extend longitudinally along both sides thereof in the direction of the advance of the bag body wherein the male and female ribs fit in respectively from the wide mouth **20** at the bottom of guide **19** and travel therealong. If possible, the device preferably should be of suitable weight so that it will reside in the bag body **6** while maintaining to a certain extent its desired position by means of its own weight without hindering however the advance of said bag body **6.** However, on account of the fact that the guide **19** is disposed in a position between a pair of engaging plates **24** and a retaining plate **25** mounted to the machine frame **23,** even if its own weight is light, when disposed near the engaging plates **24,** its position may be maintained in general at its proper place due to its relative position with respect to the engaging plates **24.** Furthermore, if necessary, it is also possible to control the position of the guide **19** by providing at a position near its wedge-shaped portion at its top a pair of rollers rotating in an opposite direction to the direction of advance of the bag body **6** and in light contact with the outer surface of said bag body **6.** Or alternatively, the utilization of magnetism is another possibility.

While the structure of the guide **19,** as illustrated, consists of a combination having at its one end a plate **26** having guide grooves **21, 22** and at the other end a plate **27** connected by a pair of stud bolts **28** having screwed at one of their ends nuts **30** in a passage **29** formed in the latter plate **27** to which the stud bolts have been fitted as to extend therein, and springs **32** are provided on the stud bolts between the plate **27** and another pair of nuts **31** screwed to the middle portion of the stud bolts whereby the distance between the two plates **26** and **27** are regulated so as to adapt the above distance to conform with the width of the bag body **6,** this regulating mechanism is not necessarily indispensable to the guide.

While rib and groove aligning means within the tube are illustrated as a preferred embodiment, it will be recognized from the description that an aligning means positioned outside of the tube acting to guide the rib and groove into alignment may be used.

The male and female ribs of the bag body **6** are guided to the proper position by means of the guide grooves **21, 22** of this guide **19** and their positions brought in register. And as the bag body **6** advances, by being pressed from both of its sides as it proceeds through the narrow gap **33** formed between the pair of engaging plates **24,** the male and female ribs **9, 10** are made to engage with accuracy. These engaging plates **24** are mounted as to be easily attachable or detachable by means of bolts **35** in long openings **34** in the machine frame **23.** On the other hand, the retaining plate **25** has a long groove **36** just sufficient for the free passage of the flat bag body **6** therethrough, and above said retaining plate a buoyant bed **37** consisting of such as felt or soft rubber for absorbing the shocks should the guide **19** make up-and-down oscillating movements.

Since the bag body **6** which has thus passed through the gap **33** of the engaging plates **24** is flat with the male and female elements being in positive engagement, it is very convenient as the top and bottom edges can be accurately determined when cut across at the lines such as I—I, II—II and III—III, as shown in FIG. **11.** It is also suitable when printing is to be applied to its surface since the misalignment in the print positions will not occur. The bag body **6,** thus molded into a flat belt-like shape, may be immediately transferred to the bag manufacturing steps to be described hereinafter. In actual practice, however, since in most cases, printing of such as trademarks, trade names, etc. are accomplished, it is perhaps convenient to first wind up the bag material in this state by guiding the same to a windup reel E after passing over, as appropriate, the guide rollers **38, 38** and **39.**

In the hereinabove-described apparatus, the cross-sectional shape of the male and female ribs, suitable for occlusion of the bag body **6,** can be obtained by suitably designing the configuration of the molding grooves **7, 8.** The cross-sectional shape of these female and male ribs **9, 10** may be suitably determined in accordance with the uses to which the bags are to be put. For example, as shown in FIG. **15,** for a container to be used for fine powders, the ribs may be so formed so that the labial section of the female rib **9** is turned inward along the length of the rib while the male rib **10** is formed arrowheaded. In addition, regardless of the shapes of the male and female ribs, when two sets thereof are formed facing each other, as illustrated in FIG. **16** and subsequently cut along line O—O midway between the two when the bag body has been flattened as in FIG. **17,** two bags are obtainable at the same time. Needless to say, in this case the guide **19** to be used for occluding the ribs will be provided with guide grooves suitable for guiding the two sets of ribs simultaneously causing the occlusion thereof.

The bag body that has been molded as described hereinbefore is then processed further in the following manner. First, by using a guide the male and female ribs that have been formed integrally in the bag body are occluded, than after flattening, to the surface of the bag body is imparted, if required, the desired printing and thereafter by using an apparatus to be described hereinafter the bag body is cut into the individual bag and simultaneously therewith the cut edges of the bags are heat sealed. The apparatus for accomplishing the cutting and heat sealing of the bags is illustrated in FIG. **12** et seq. in which: **201** is the machine frame, **202** are a pair of superposed delivery rollers disposed at one end of the machine frame, while **203** are a pair of superposed belts which by means of a pair of rollers **204, 205** disposed longitudinally travel at a rate equal to the peripheral speed of the rollers **202.** The flat belt-shaped bag body **6** that is to be cut is conducted via a guide roller **206** to between the superposed delivery rollers **202** while their male and female ribs **9, 10** are being maintained in an occludent state, and then by being further passed between the superposed belts **203** the

delivery of the bag body is achieved continuously at a constant speed.

In a position forward of this belt **203**, rollers **207, 208** are disposed longitudinally, around which an endless conveyor belt **209** is mounted. The tip of the bag body **6** which is delivered forth, as described hereinbefore, is made to be transferred smoothly from the belt **203** to the radially moving part of the conveyor belt **209**. The surface of this conveyor belt **209** by being imparted a layer of such as, for example, silicon rubber is maintained so that the bag body does not stick to the surface of the conveyor belt as a result of operations such as cutting and heat sealing. In addition, by suitable determination of the rotating speed of the rollers **207 208**, the rate of travel of the conveyor belt **209** is made to be greater than that of the bag body **6**. Underneath the conveyor belt **209** there is provided an elevator rack **211**, which is held to the machine frame **201** by means of guide members **210** as to be capable of up-and-down movements. And by connecting this elevator rack with the delivery roller **202** through cooperatively coupled fore-and-aft rollers **214** mounted on their respective crank plates **213** provided on axles **212**, which rollers **214**, in turn are loosely fitted in elongated openings **215** of said elevator rack **211**, this elevator rack is made to rise and fall with each rotation of the aforesaid axles **212**. To this elevator rack **211** standards **216** are provided, and to a retaining plate attached to the top of said standards wing pieces **219** of a horizontal bar **218** are mounted. Two pairs of bolts **220** are freely fitted piercing the horizontal bar **218** and its wing pieces **219**, and by intervening springs **221** between the head of the bolts **220** and the wing pieces **219**, the horizontal bar **218** is coupled with the standards **216**. Thus, when the blade **222** mounted in the horizontal bar **218** is to cut the bag body **6**, the standards **216** that are held by the elevator rack **211** compresses the springs **221** and through the intervention of the bolts **220** descend somewhat more than the blade **222** as to result in the blade edge being strongly pressed in contact with the bag body **6** on account of the resilience of the spring **221**. This blade **222** is disposed in the transfer section of the bag body **6**, that is, in the neighborhood directly above the rear roller **208** of the conveyor belt **209**, and its body proper is at all times heated to a suitable temperature by electrothermic means. For this purpose, an electrothermic means **223** is provided, which makes possible simultaneously with the cutting of the bag body the heat sealing of the cut edges. Further, also for the purpose of holding that portion along both sides of the line of cut and cooling the edges at the time of heat sealing and cutting, disposed on both sides of the edge of the blade **222** and separated therefrom by narrow gaps are provided a pair of pressure pieces provided for purpose of cooling capable of moving in unison with the blade **222**. Water pipes **225** are connected respectively to these pressure pieces **224** for feeding cold water from one side and discharging the heated water to the other side. A pressure plate **226** is provided forward of the blade **222** at a distance equivalent to the width of one bag, the mounting of said pressure plate **226** being accomplished exactly as in the case of the aforesaid blade means. By means consisting of standards **277**, a retaining plate **228**, a horizontal bar **229**, wing pieces **230**, bolts **231** and springs **232** the pressure plate is mounted resiliently. It is desirable to provide at the lower face of the pressure plate **226** a cushion **233** such as of silicon rubber that does not stick to the cut portions of the bag material. Also, a wooden platen **234** is provided contiguous to the inner side of the conveyor belt **209** opposite the pressure plate. This pressure plate **226** and the platen **234** are so constituted as to be adjustable with regard to their positions in accordance with the width of the bag. In case of the pressure plate **226**, this is made possible by providing for the lateral movement of the standards **227**, which support the pressure plate **226**, along a guide rail **235** of the elevator rack **211** and for securing the above standards at any optional position. On the other hand, the platen **234** can be adjusted as to its position by a lateral movement of the platen along a guide bar **236** mounted in the machine frame. Further, **237** are a set of superposed belts that have been provided forward of the conveyor belt **209** and have been provided for the purpose of removing the bags that have been conveyed by the conveyor belt **209**.

In the hereinbefore described apparatus, when the delivery rollers **202** are rotated, since simultaneously with the travel of the belts **203, 237** and the conveyor belt **209**, which cooperate therewith, the axles **212** rotate and the elevator rack **211** is caused to make up-and-down movements, if the bag body **6** is introduced to the delivery rollers **202** and between the belts **203**, the bag body **6** is fed forward at a predetermined speed, and its tip is transferred to the top of the conveyor belt **209**. Then, as the elevator rack **211** approaches the final stages of its descending movement, momentarily the traveling bag body is pressed down by the pressure pieces **224** provided for purpose of cooling and since simultaneously the bag body **6** is pressibly contacted with the blade **222**, the bag body is cut by means of burning action at the line of contact of the blade while simultaneously the cut edges are closed by heat sealing at the cut edges of the top film and the bottom film. Instantly thereafter the pressure pieces **224** are provided for purpose of cooling and the blade **222** makes an ascending movement. Thus, since the pressing and cutting of the bag body **6** is completed almost instantaneously, even if in the meantime the bag body material is being continuously fed, as a matter of fact, there is no trouble caused at all. In addition, the fused material that adheres to the blade edge being burned up by itself and disappearing, the repeated use of the blade without further ado is possible without the attendance of any trouble.

When the continuous belt-like material is in this manner cut into predetermined widths starting at one end and the cut edges thereof are heat sealed, as a result of the fact that a unit width of a bag body leaves the bag body material and is placed independently upon the top of the conveyor belt **209**, the cut edges become spaced apart automatically from each other for an S distance. Then, during the descent of the elevator rack **211** the cut and heat sealed edges are pressed between the pressure plate **226** descending from the top and the platen **234** disposed on the underside of the conveyor belt. Thus, inasmuch as it would be inconvenient to have unsatisfactorily heat sealed portions around that portion which is somewhat thicker than the other portions on account of the male and female ribs **9, 10** being located inside the bag body at this point, in order to preclude the possibility of such unsatisfactorily heat sealed portions to occur, pressure is applied to ensure the maintenance of a state of positive adherence of the cut edges. The bags which have been thus produced after being removed one by one from one end of the

apparatus via the belts **237** and collected together are ready for use.

In using these bags, by cutting the bags at the top f and opening up the engagement of the male and female ribs, the bag is ready to be filled with whatever it is to be filled with. After the bags are filled the male and female ribs **9, 10** are again occluded, and if necessary, the mouth which was opened by cutting may be again sealed using a heat sealer.

While the invention has been described with particular reference to specific embodiments, it is to be understood that it is not to be limited thereto, but that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

I claim as my invention:

1. A mechanism for joining rib and groove shaped plastic interlocking mating profiles within a continuous tube of plastic material wherein the profiles are constructed so that the rib is interlockingly received within the groove profiles when the profiles are pressed together, comprising,

means for advancing the tube axially along a path,

joining means applying opposed forces to the outer surfaces of the tube forcing the profiles together, and

aligning means in advance of said joining means aligning the opposed profiles so that the rib profile is in registry with the groove profile.

2. A mechanism for joining rib and groove shaped plastic interlocking mating profiles within a continuous tube of plastic material wherein the profiles are constructed so that the rib is interlockingly received within the groove profiles when the profiles are pressed together, comprising,

means for advancing the tube axially along a path,

opposed pressing means applying forces to the outer surface of the tube for forcing the profiles together, and

a guiding means by which the profiles are aligned so that the rib profile is in registry with the groove profile being located within the tube ahead of said pressing means.

3. The method of joining rib and groove shaped plastic mating profiles within a closed continuous tube wherein the profiles are constructed so that the rib interlockingly receives the groove profile when the profiles are pressed together, comprising,

advancing the tube relatively axially,

applying opposed forces to the outer surfaces of the tube forcing the profiles together,

and aligning the profils in advance of applying said forces so that the rib profile is in registry with the groove profile.

4. The method of joining rib and groove shaped plastic mating profiles within a closed continuous tube wherein the profiles are constructed so that the rib interlockingly receives the groove profile when the profiles are pressed together, comprising,

advancing the tube relatively axially,

applying opposed forces to the outer surfaces of the tube forcing the profiles together, and

guiding said profiles from within the tube to aligned mating positions in advance of applying said forces so that the rib profile is in registry within the groove profile.

5. A mechanism for joining rib and grooved shaped plastic interlocking mating profiles within a continuous tube of plastic material wherein the profiles are constructed so that the rib is interlockingly received within the groove profiles when the profiles are pressed together, in accordance with claim **1**, wherein said aligning means includes a member having recesses for receiving the profiles and maintaining them in alignment.

6. A mechanism for joining rib and groove shaped plastic interlocking mating profiles within a continuous tube of plastic material wherein the profiles are constructed so that the rib is interlockingly received within the groove profiles and the profiles are pressed together, in accordance with claim **1**, wherein said path is vertical and said aligning means includes a guiding member within the tube guiding said profiles.

7. A mechanism for joining rib and groove shaped plastic interlocking mating profiles within a continuous tube of plastic material wherein the profiles are constructed so that the rib is interlockingly received within the groove profiles and the profiles are pressed together, in accordance with claim **1**, wherein said aligning means includes a guide having grooves for receiving the profiles and a plate spaced from the guide with adjustable spacing means therebetween to adjust the distance between the guide and plate and maintain the tube in a flattened condition.

8. A mechanism for joining rib and groove shaped plastic interlocking mating profiles within a continuous tube of plastic material wherein the profiles are constructed so that the rib is interlockingly received within the groove profiles when the profiles are pressed together, in accordance with claim **1**, wherein said advancing means flattens the tubes at a first location in advance of the aligning means with the profiles substantially in alignment before reaching said aligning means.

9. A mechanism for joining rib and groove shaped plastic interlocking mating profiles within a continuous tube of plastic material wherein the profiles are constructed so that the rib is interlockingly received within the groove profiles when the profiles are pressed together, in accordance with claim **5**, wherein said recesses have a wider portion first receiving the profiles and taper to a more narrow portion for positioning the profiles.

10. A mechanism for joining rib and groove shaped plastic interlocking mating profiles within a continuous tube of plastic material wherein the profiles are constructed so that the rib is interlockingly received within the groove profiles when the profiles are pressed together and wherein the tube and the profiles are integrally formed of one piece and the profiles are within the tube, comprising, *a die for extruding a tube*,

means for advancing the tube axially *from the die*, and means *positioned after the die* joining and interlocking said profiles within the tube *while advancing the tube from the die*.

11. A mechanism for joining rib and groove shaped plastic interlocking mating profiles within a continuous tube of plastic material wherein the profiles are constructed so that the rib is interlockingly received within the groove profiles when the profiles are pressed together, in accordance with claim **1**, wherein said aligning means is located within the interior of the tube.

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