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METHOD FOR BLOW MOLDING TUBULAR CONTAINER

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(57) Claim

1. A method for blow-molding at least one tube shaped container from a parison that has been extruded by an extruder, which comprises:

introducing blow air into the parison through a blow air inlet to shape the container, and forming a discharge outlet for discharging the blow air through an end region of the container longitudinally spaced from an opposite end region through which the blow air enters the container from the blow air inlet; and

continuing the introduction of the blow air into the container through the blow air inlet.

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(81) 指定国
AT (欧州特許), AU, BE (欧州特許), CA, CH (欧州特許),
DE (欧州特許), DK (欧州特許), ES (欧州特許), FR (欧州特許),
GB (欧州特許), GR (欧州特許), IE (欧州特許), IT (欧州特許),
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(54) Title : METHOD FOR BLOW MOLDING TUBULAR CONTAINER

(54) 発明の名称 チューブ容器のブロー成形方法

(57) Abstract

A method for blow molding a tubular container comprising the steps of blowing blow air into a parison to shape a tubular container (3), forming discharging ports (32) in that part of an unnecessary portion of a wall surface of the tubular container located opposite to a blow-in port (33) for blow air, and continuing to supply blow air so as to shorten cooling time for a molded piece after blow molding and to efficiently mold molded pieces superior in dimensional accuracy.

(57) 要約

この発明は、チューブ容器のブロー成形方法に関するものであって、パリソン内にブローエアを吹込むことによってチューブ容器（３）が賦形され、ブローエアの吹込口（３３）と反対側に位置するチューブ容器の不要部分の壁面の一部に排出口（３２）を形成し、引き続きブローエアを供給することによって、ブロー成形後の成形品の冷却時間を短縮するとともに、寸法精度の優れた成形品を効率よく成形することを可能にするものである。

S P E C I F I C A T I O N

METHOD FOR BLOW-MOLDING TUBE CONTAINER

Technical Field

This invention relates to a method for blow-molding a tube container and, more particularly, to a blow-molding method which enables one to shorten the time for cooling moldings immediately after being blow-molded and to effectively produce moldings having good dimensional accuracy.

Prior Art

In molding a tube container from a thermoplastic resin according to blow molding technique, it has been conducted to pierce the upper portion of a parison having been melt extruded from an extruder with a blow nozzle for introducing blow air, and blow a compressed air into the parison through the nozzle, or to introduce a compressed air into the parison from the upper portion or lower portion in the axial direction to thereby press the parison against the wall of a mold for shaping a closed-end cylindrical container, followed by cooling the container, taking it out of the mold, and cutting the lower portion thereof to produce a tube container.

The thus molded tube container is engaged with a cap, and the capped tube container is fed to a filling machine. Then, the tube container is filled with contents through the cut portion, and the cut end is sealed. The resulting tube containers are then brought to the market.

Japanese Examined Patent Publication No. S59-3260 discloses a blow molding method for producing hollow containers, in which nip-pressing plates located at the upper position of a split mold for holding a softened parison are not directly in contact with each other but are formed partly with a space therebetween, the nip-pressing plates co-work to nip the parison, the thus-sealed parison is pierced at its side wall

with a blow nozzle, blow air is continuously fed through the blow nozzle to shape a hollow container, then the space portion of said nip-pressing plates are broken by the pressure of blow air to form a discharge outlet through which the pressing fluid filling the mold is discharged.

As another conventional process for blow molding a hollow container such as a tube container, blow air introduced through a blowing inlet presses the softening-state parison against the wall of the mold to shape a tube container, then is discharged through a discharge outlet formed above the blow nozzle-pierced portion. However, since the molded tube container has a long and narrow form with a closed end, the blow air is discharged before suficiently flowing within the tube container. Therefore, the blow air used for shaping the tube container does not flow but remains in the lower portion of the container. Thus, subsequent cooling of the wall of the tube container is mainly conducted by circulating cooling water in the mold in contact with the tube container.

However, this method requires a considerably long time for cooling the shaped tube container still kept at an elevated temperature to such a degree that the mold can be opened. Thus, there arises a problem in view of molding efficiency.

That is, in conventional blow molding method for producing a tube container, cooling of the shaped moldings have been conducted only by cooling the mold, and nothing has been taken into consideration for enhancing cooling efficiency. In addition, although manner of piercing the wall of a parison with a blow nozzle and shape of an air-introducing inlet have been studied, no attention has been paid to how the blow air introduced through the nozzle can most effectively shape and cool the molding (tube contaier).

Advantageously, the present invention may provide a method for blow molding a tube container, in which the blow air introduced into the tube container will circulate therein even after shaping of the tube container to rapidly cool the tube container.

SUMMARY OF THE INVENTION

The present invention relates to a method for blow molding a tube container, which comprises forming a discharge outlet for discharging blow air simultaneously with, or immediately after, shaping of the tube container in an unnecessary lower portion of the tube container to be cut off after molding, to thereby discharge successively introduced blow air.

In an aspect of the present invention there is provided a method for blow-molding at least one tube shaped container from a parison that has been extruded by an extruder, which comprises:

introducing blow air into the parison through a blow air inlet to shape the container, and forming a discharge outlet for discharging the blow air through an end region of the container longitudinally spaced from an opposite end region through which the blow air enters the container from the blow air inlet; and

continuing the introduction of the blow air into the container through the blow air inlet.

Typically, the discharge outlet is formed in the end region of the container through which the blow air is discharged. That end region of the container will also usually be removed from the container and discarded.

As to the manner of introducing blow air, either horizontally blowing type in which the wall of a parison having been extruded from an extruder is pierced with a blow nozzle for introducing blow air or vertically blowing type in which blow air is introduced in the axial direction of the parison,

i.e., in the downward or upward direction.

The discharge outlet is preferably formed in the tube container simultaneously with or after shaping of the tube container. However, it may be formed during shaping or, for the reason of mechanical timing, some time after shaping.

The discharge outlet may be formed by the blow air bursting through the container at a position aligned with a passageway formed in the mold in which the container is shaped and which extends from an interior region of the mold to an exterior region of the mold, or by piercing the container with a piercing member from outside the mold.

In the case of conducting the blow molding of the present invention in a horizontally blowing manner, another similar discharge outlet may be formed in the vicinity of or above the blow nozzle-pierced portion after forming a discharge outlet in part of the lower wall of the portion of tube container to be cut off.

The thus formed discharge outlet serves to effectively cool the portion in the vicinity of the blow nozzle-pierced portion.

Brief description of the drawings

Fig. 1 is a schematic view illustrating one embodiment of the blow molding method of the present invention in which a tube container is blow molded in a horizontally blowing manner.

Fig. 2 is a schematic view illustrating another embodiment of the blow molding method of the present invention in which a tube container is blow molded in a vertically blowing manner.

Fig. 3 is a schematic view illustrating a tube container in a state of being shaped by the blow molding method of the present invention and having a discharge outlet for blow air.

Fig. 4 is a schematic view illustrating a tube container formed by conventional blow moldng method.

Figs. 5 and 6 are schematic view illustrating a blow moldng method of the present invention for forming two tube

containers using a two-cavity mold.

Detailed Description of Preferred Embodiments of the Invention

A first technical feature of the present invention is to form a discharge outlet for blow air in the lower part of the portion to be cut off after shaping of a tube container, simultaneously with or immediately after the blow air filling the mold to shape the tube container.

Since the discharge outlet controls discharge of the blow air filling the tube container, the blow air does not stay inside the mold after formation of the tube container but circulates inside the tube container to rapidly cool the hot tube container.

Another technical feature of the present invention is that, after formation of the discharge outlet, introduction of the blow air is continued.

Continuous introduction of the blow air enables the blow air to effectively move within the tube container before being discharged, which serves to rapidly cool the tube container still in a hot state.

Therefore, combination of the above-described two technical features serves to more effectively conduct rapid cooling of the tube container.

This point is described in more detail below. The introduced blow air instantly descends toward the bottom of the tube container to reach the bottom. When the blow air reaches the bottom, the softening-state material is shaped in conformity with the shape of the mold and, at the same time or slightly later than that, a discharge outlet is formed in part of the wall of lower portion to be cut off after molding, through which the blow air filling the mold is discharged. The discharge of the blow air permits smooth movement of continuously introduced blow air to thereby rapidly cool the tube container.

In blow molding of the tube container, a closed-end,

tube-like container is first formed and, after taking the molding out of a mold, the lower part of the container is cut off to form an opening through which its contents are loaded. Upon shaping of the tube container, however, the introduced blow air is discharged out through the discharge outlet formed in the vicinity of or above the blow nozzle-pierced portion almost without circulation inside the container, particularly toward the bottom. Thus, cooling of the container, particularly cooling of the lower part thereof, by the blow air is not conducted, and the cooling is conducted only by the cooled mold in contact therewith.

Therefore, it takes a long period of time for the molded container to be cooled, leading to deteriorated molding efficiency.

According to the method of the present invention, a large amount of the blow air introduced through a blow nozzle moves toward the bottom, a discharge outlet is formed in part of the lower wall of the container to be cut off, and this discharge outlet accelerates circulation of the blow air inside the tube container and permits uniform and rapid cooling of the whole tube container. Thus, tube containers can be blow molded with high molding efficiency.

In Fig. 1, a blow air introduced through a blow air inlet 33 formed by piercing the upper portion of a parison with a blow nozzle 1 presses the softening-state parison against the surface of a mold to shape a tube container 3. In the present invention, a discharge outlet 32 is formed in part of the wall located lower than the position 31 along which the container will be cut after completion of the molding. As has been described hereinbefore, this discharge outlet 32 is preferably formed by breaking through the tube container at the particular portion of the wall below the cutting line 31 utilizing the pressure of blow air. However, it may be formed by piercing the wall with a needle-like member from outside the mold.

Since this discharge outlet controls discharge of the

blow air inside the container, the blow air does not stay inside the container but smoothly circulates to rapidly cool the tube container. Said discharge outlet 32 may be formed either in the side wall or the bottom of the tube container, with lower wall being preferred.

Additionally, in Fig. 1, description of tube container is made by reference to a one-cavity mold but, as is chown in Figs. 5 and 6, the method of the present invention can similarly be applied to a two-cavity mold wherein two tube containers shown in Fig. 1 are to be molded in a vertical and symmetrical state with the bottom connecting to each other or with the unnecessary portions in the neck direction connecting to each other.

That is, in the case shown by Fig. 5, an intermediate unnecessary portion between two tube containers connecting to each other in a top-to-top manner is pierced with a blow nozzle to form a blowing inlet 33, whereas discharge outlets 32 may be formed outside the portions in the bottom direction located upward and downward to be cut off. In the case shown by Fig. 5, the discharge outlets may be formed in the vicinity of the top of each tube container, i.e., in the upper or lower portion to be cut off after shaping of the tube container.

In conventional blow molding methods, most of the blow air introduced through the upper portion of a parison once comes into contact with the wall opposite to the blowing inlet, then moves downward and upward but, upon shaping of a tube container, migration of blow air in the downward direction stops and breaks a thin portion located in the vicinity of or above the blow nozzle-pierced portion to form a discharge outlet 34, through which blow air is discharged. That is, blow air is discharged at this time, and hence circulation of blow air in the downward direction scarcely takes place. Thus, cooling of the molded tube container is conducted only by the mold in contact with the body of the container, resulting in seriously decreased cooling efficiency.

On the other hand, in the method of the present invention, blow air is discharged through a discharge outlet 32 formed in part of the wall below the cutting position 31 in the course of or after shaping of the tube container. Therefore, blow air introduced from above does not stay but effectively circulates before being discharged, thus tube container 3 being rapidly cooled.

The discharge outlet to be formed in part of the lower wall below the cutting line will be described in detail below.

One or more passageways (41 and 41') connecting to the cavity are formed in one or more positions of the mold 4 for molding a tube container located below the cutting line, and a wall portion of shaped tube container corresponding to the opening or openings is broken through by the pressure of continuously fed blow air, and the broken portion forms a discharge outlet 32 functioning to control discharge of blow air.

As has been described hereinbefore, the discharge outlet 32 may be forcibly formed by piercing from outside of the passageways 41 and 41' with a needle member (not shown) instead of breakage from inside by the pressure of blow air. The needle member may be of an injection needle shape with a hollow core conncecting to the outside of the mold or may be of a solid needle. In the case of using an injection needle-type member, the blow air is discharged out of the mold through its hollow portion. In the case of usng a solid needle member, the blow air is discharged through a hole formed by drawing out the needle member after piercing the wall of the container with it.

The horizontally blowing type blow nozzle 1 to be used in the present invention is not limited to that shown by Fig. 1 as to the structure, but blow nozzles having a blow air-introducing inlet located at the central portion of the nozzle or nozzles having blow air-introducing inlets in vertical two directions or in 4 directions (vertical and horizontal) may properly be used.

For instance, as is shown in Fig. 2, a vertical blowing type blow nozzle which introduces blow air from above in the axial direction of a parison may also be used.

In the horizontally blowing type blow molding method shown in Fig. 1, an upper wall portion of a parison is pierced with blow nozzle 1, and the blow air-introducing inlet is located at about the center inside the parison, thus blow air being introduced in a horizontal direction into the parison. In the vertically blowing type blow molding method shown in Fig. 2, blow air is introduced in the axial direction of the parison, i.e., upward or downward.

In both blow molding methods, the parison is shaped into a tube container in conformity with the shape of the mold when blow air is introduced into the softening-state parison and, at this point, a discharge outlet 32 is formed in the wall in contact with a passageway 41 formed in the mold and located below the cutting line. Upon formation of the discharge outlet 32, the blow air filling the container is discharged, and hence the blow air effectively circulates within the container even after shaping of the container to contribute to rapid and uniform cooling of the shaped container.

However, the discharge outlet 32 is intended to cause air flow for moving the blow air within the tube container and not intended to discharge the whole blow air inside the tube container. Most of the blow air inside the tube container is discharged through the blowing inlet 33 formed upon piercing with the blow nozzle 1, simultaneously with rapid backward movement of the blow nozzle 1 at the completion of the introduction of blow air. Only at this point, the pressure within the tube container is restored to the atmospheric pressure. Additionally, discharge of blow air is also conducted through an opening (not shown) connecting to the blow nozzle.

As has been described in detail, the present invention permits blow air to effectively circulates within the tube

container, and blow molding cycle can be markedly shortened by using the opening left after backward movement of the blow nozzle as a main discharge outlet. Such advantage can be obtained only by forming the aforesaid discharge outlet 32 below the cutting line 31 located at the lower portion of the tube container.

Example

Advantages of the present invention of blow molding a tube container are now described in more detail by reference to the following example.

Additionally, conditions under which the average temperature in thicknesswise direction becomes 39.1 ℃ when blow molding conditions of 23 C in blow air temperature, 14 ℃ in the surface temperature of the mold, and 9.5 seconds in cooling time are employed as in the conventional blow molding are taken as standard conditions.

Experiments of molding the same shaped moldings were conducted using the same materials and changing part of the blowing conditions to determine conditions for cooling the moldings to the average temperature of 39.1℃ in the thickness wise direction.

The blow nozzle used in the experiments had a blow air-introducng inlet of 1.0 ø, and3) and the diameter of the discharge outlet formed below the cutting line was 0.7 ø. A discharge outlet formed by the backwaid movement of the blow nozzle after completion of blowing was 2.0 ø. Thus, discharge outlets of 0.7 ø and 2.0 ø functioned after completion of the blowing.

According to this experiment, when blow molding was conducted under the same conventional conditions, the average temperature in the thicknesswise direction became 39.1 in 6.5 seconds.

That is, the blow molding method of the present invention shortens the molding cycle by 32 % (100 - 6.5/9.5x100) in

comparison with the conventional blow molding method.

As is clear from the above results of the experiments, according to the present invention, blow air is instantly introduced and is allowed to rapidly circulate throughout the molding, and the blow air introduced with pressure is rapidly discharged, thereby blow molding cycle being markedly shortened.

Therefore, the constitution of the present invention that a large amount of blow air is fed and, after shaping, a discharge outlet is formed in an unnecessary portion of the wall of shaped container to thereby allow blow air to effectively circulate inside the molding has a remarkable technical significance.

Advantages of the Invention:

As has been described in detail, according to the present invention, a discharge outlet is formed in part of the wall of a tube container below a cutting position, said tube container being shaped by introducing blow air, the blow air is then discharged through the discharge outlet to thereby allow the blow air to effectively circulate along the inside surface of the molding, and an opening left after backward movement of the blow nozzle functions as a main discharge outle to instantly discharge the compressed air inside the molding. As a result, the molding can be cooled uniformly and rapidly.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for blow-molding at least one tube shaped container from a parison that has been extruded by an extruder, which comprises:

introducing blow air into the parison through a blow air inlet to shape the container, and forming a discharge outlet for discharging the blow air through an end region of the container longitudinally spaced from an opposite end region through which the blow air enters the container from the blow air inlet; and

continuing the introduction of the blow air into the container through the blow air inlet.

2. A method according to claim 1, wherein the discharge outlet is formed in the end region of the container through which the blow air is discharged.

3. A method according to claim 2, wherein the end region of the container through which the blow air is discharged is to be removed from said container.

4. A method according to any one of claims 1 to 3, wherein the blow air is introduced into the parison through the blow air inlet using a blow-air nozzle, and wherein the blow air nozzle has a plurality of openings for introducing the blow air into the parison in upward, downward, rightward and leftward directions, respectively.

5. A method according to any one of claims 1 to 3, wherein the blow air inlet is formed by piercing the parison with a blow air nozzle substantially co-axially with or parallel to a longitudinal axis of the parison, and wherein the blow air is introduced into the parison through the blow air nozzle.

6. A method according to any one of claims 1 to 3, wherein the blow air inlet is formed by piercing the parison with a blow air nozzle substantially perpendicularly to a longitudinal axis of the parison, and wherein the blow air is introduced into the parison through the blow air nozzle.

7. A method according to any one of claims 1 to 5, wherein the discharge outlet is formed in a bottom wall of the container.

8. A method according to any one of claims 1 to 4 or 6, wherein the discharge outlet is formed in a side wall of the container.

9. A method according to any one of claims 1 to 8, wherein the discharge outlet is formed by the blow air bursting through the container as a result of blow air pressure.

10. A method according to any one of claims 1 to 8, wherein the container is shaped in a mold having a passageway extending from an interior region of the mold to an exterior region of the mold, and wherein the discharge outlet is formed by the blow air bursting through the container at a position aligned with the passageway.

11. A method according to any one of claims 1 to 8, wherein the discharge outlet is formed by piercing the container with a piercing member.

12. A method according to any one of claims 1 to 8, wherein the container is shaped in a mold and the discharge outlet is formed by piercing the container with a piercing member through an opening formed in the mold.

13. A method according to any one of claims 1 to 12, wherein two containers are molded in a bottom-to-bottom configuration, and wherein the blow air inlet is formed in a top said end region of one of the containers and the discharge outlet is formed in a top said end region of the other said container.

14. A method according to any one of claims 1 to 12, wherein two containers are molded in a top-to-top configuration and the blow air inlet is formed between the two containers, and wherein the discharge outlet is formed in a bottom said end region of one of the containers and a further discharge outlet for discharging the blow air is formed in a bottom end region of the other said container.

15. A method according to claim 14, wherein the blow air inlet is formed in a linking portion of the parison linking the two containers together, and wherein the linking portion and both bottom said end regions of the containers are to be removed and discarded.

16. A method for blow-molding a tube shaped container substantially as hereinbefore described with reference to the Example or any of Figures 1 to 6.

Dated this 18th day of June 1996

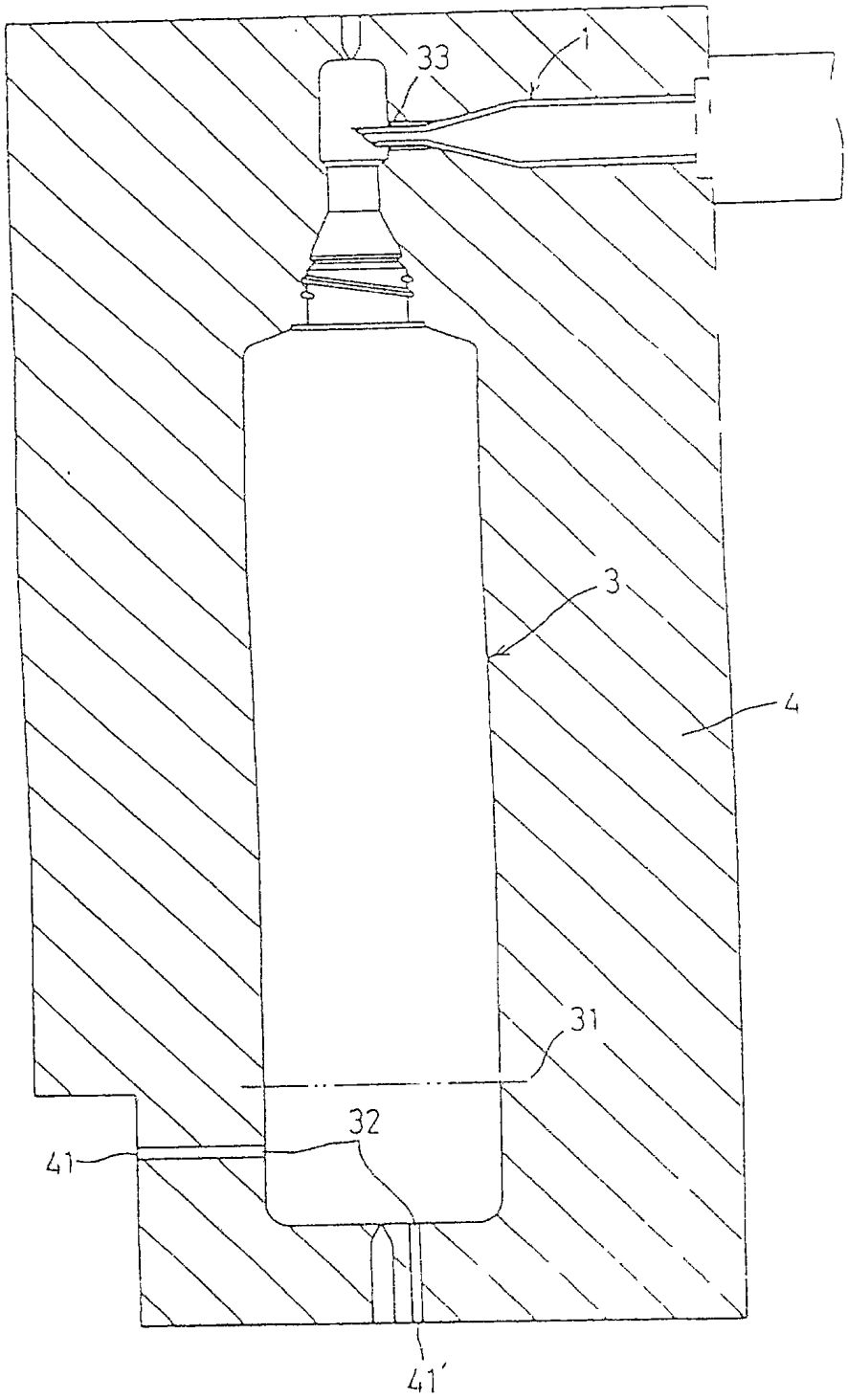
TOYO SEIKAN KAISYA, LTD.

By their Patent Attorneys

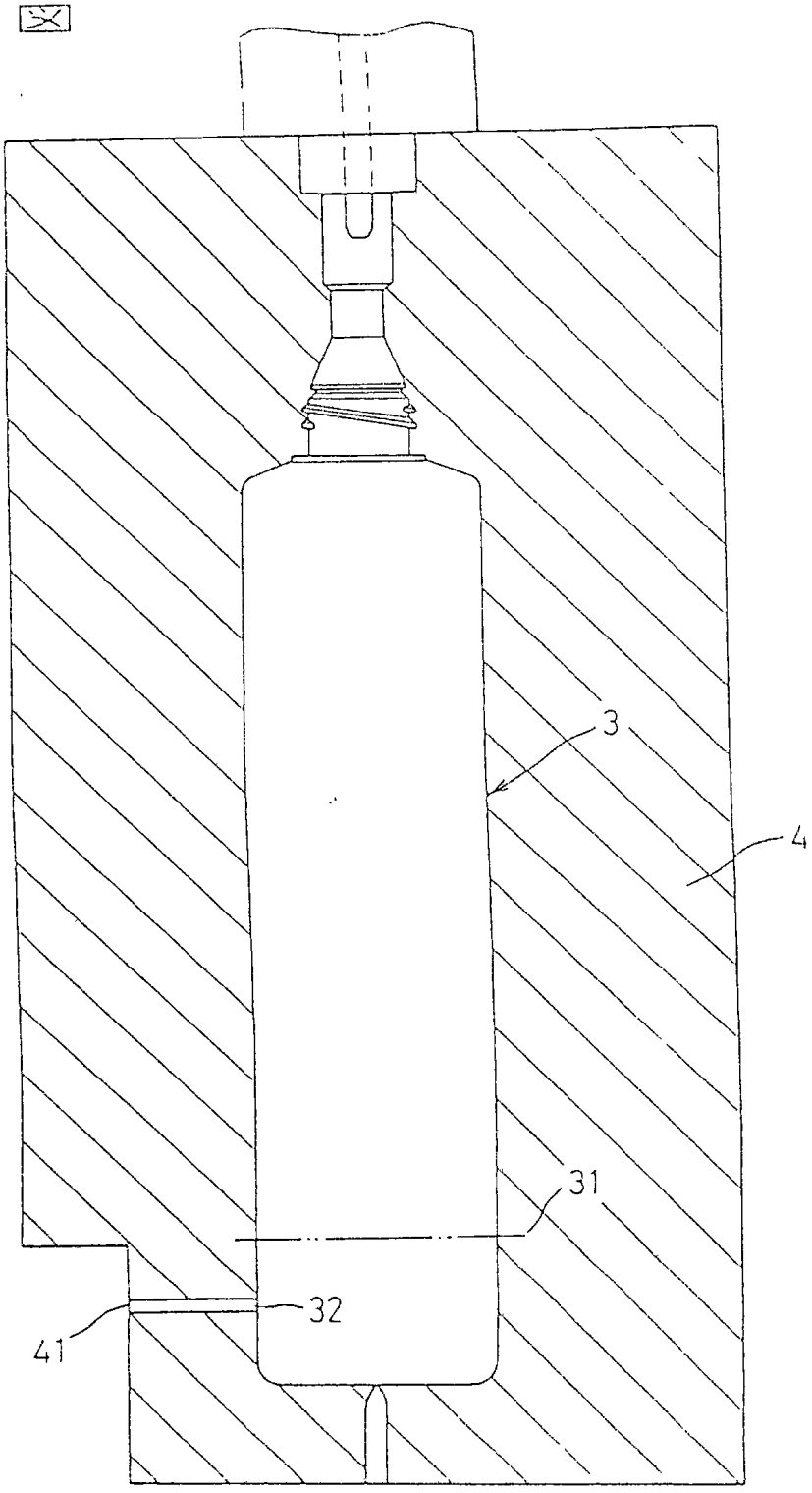
GRIFFITH HACK & CO

29557/92

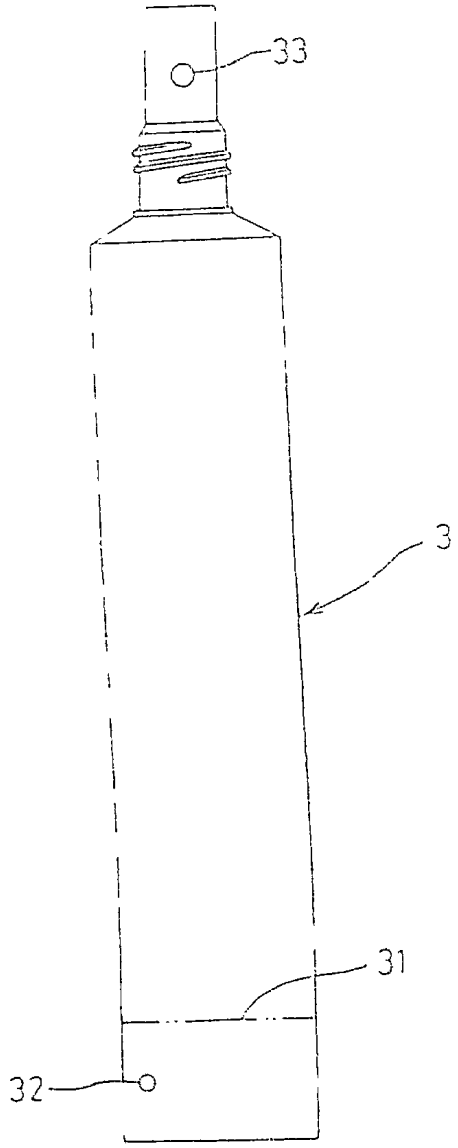
第 1 図



第 2 図



第 3 図



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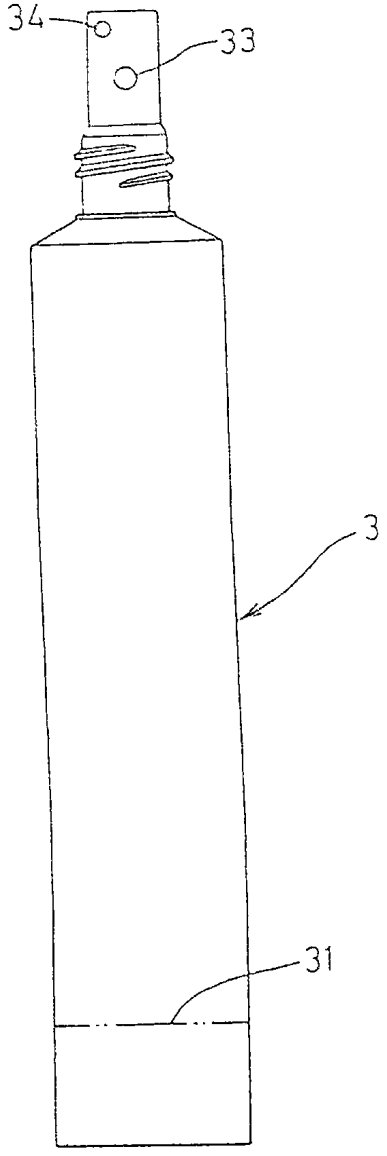
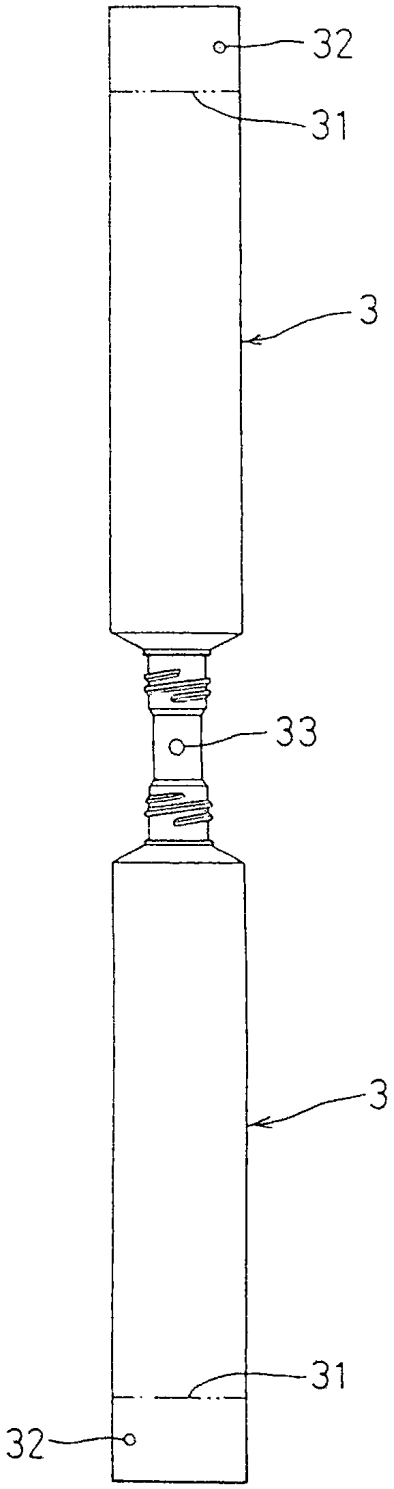
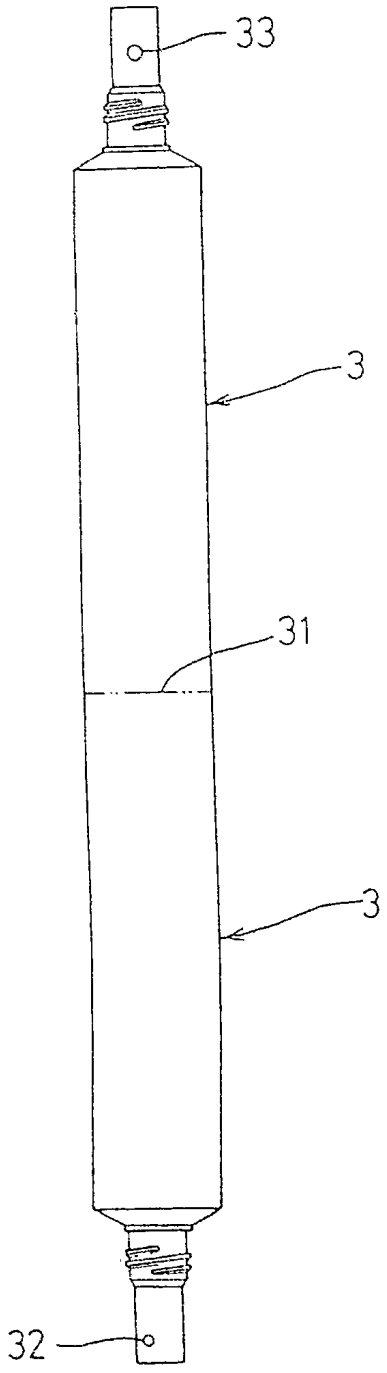


第 5 図



第 6 図



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP92/01504

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl^5 B29C49/58, 49/60, 49/62, 49/64, 49/04//B29L22:00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl^5 B29C49/58, 49/60, 49/62, 49/64, 49/04, B29L22:00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1955 - 1992
Kokai Jitsuyo Shinan Koho 1971 - 1992

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, A, 60-120031 (Nissan Motor Co., Ltd.), June 27, 1985 (27. 06. 85), Line 3, lower left column to line 15, lower right column, page 2, Fig. 1 (Family: none)	1-11
A	JP, B2, 63-26687 (Yoshino Kogyo K.K.), May 31, 1988 (31. 05. 88), Claim; line 19, left column to line 11, right column, page 2, Figs. 1 to 4 (Family: none)	1-11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
February 4, 1993 (04. 02. 93)	February 23, 1993 (23. 02. 93)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

国 際 調 査 報 告

国際出願番号 PCT/JP 92 / 01504

A. 発明の属する分野の分類（国際特許分類（IPC））

Int. Cl⁵ B29C49/58, 49/60, 49/62, 49/64, 49/04
/B29L22:00

B. 調査を行った分野

調査を行った最小限資料（国際特許分類（IPC））

Int. Cl⁵ B29C49/58, 49/60, 49/62, 49/64, 49/04,
B29L22:00

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報 1955－1992年
日本国公開実用新案公報 1971－1992年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

C. 関連すると認められる文献

引用文献のカテゴリー*	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
A	JP, A, 60－120031（日産自動車株式会社）, 27. 6月. 1985（27. 06. 85）, 第2頁左下欄第3行－右下欄第15行及び第1図（ファミリーなし）	1－11
A	JP, B2, 63－26687（株式会社 吉野工業所）, 31. 5月. 1988（31. 05. 88）, 特許請求の範囲, 第2頁左欄第19行－右欄第11行及び第1－4図（ファミリーなし）	1－11

☐ C欄の続きにも文献が列挙されている。

☐ パテントファミリーに関する別紙を参照。

* 引用文献のカテゴリー
「A」特に関連のある文献ではなく、一般的技術水準を示すもの
「E」先行文献ではあるが、国際出願日以後に公表されたもの
「L」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）
「O」口頭による開示、使用、展示等に言及する文献
「P」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献
「T」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの
「X」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの
「Y」特に関連のある文献であって、当該文献と他の1以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの
「&」同一パテントファミリー文献

国際調査を完了した日
04. 02. 93

国際調査報告の発送日
23.02.93

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様式PCT/ISA/210（第2ページ）（1992年7月）