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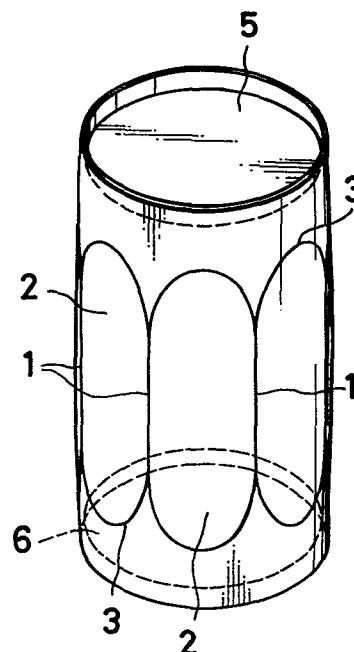
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54 **Paper container for holding high-temperature liquid and method for filling the container with the liquid and sealing the same.**

57 A paper container for holding a high-temperature liquid is provided which has a cylindrical body consisting mainly of a paper sheet. A thermoplastic synthetic resin layer is formed on at least the inner surface of the body. Openings at the upper and lower ends of the body are closed. The body has at least linear creases (1) extending toward the openings, and, as needed, arc-shaped or slanted linear creases (3) extending continuously from the upper and lower ends of adjacent linear creases (1). A method for filling the container with the high-temperature liquid and sealing it is also provided wherein the side surfaces (2) of the container defined by the creases (1, 3) are uniformly pressed toward the central axis of the body from commencement of filling the container with the high-temperature liquid to sealing of the container with a lid (5), forming the body into a polygonal prism before cooling.



Background of the Invention

1. Field of the Invention

The present invention relates to a paper container for holding a high-temperature liquid such as juices and wines which are to be circulated at ambient temperature, and to a method for filling the container with contents and sealing it. The paper container of the present invention comprises a cylindrical body consisting mainly of a paper sheet, on at least an inner surface of which is formed a thermoplastic synthetic resin layer; and a lid plate and a bottom plate which are formed to seal openings at the upper and lower ends of the body and each of which comprises a paper sheet, a thermoplastic synthetic resin sheet, a metal foil layer or a laminated body thereof.

2. Description of the Prior Art

In a container having a cylindrical body consisting mainly of a paper sheet, when the container is filled with high-temperature contents and is then cooled, the internal pressure is reduced and the body is recessed inward due to the pressure difference between inside and outside the container. In order to solve this problem, the following proposals have been conventionally made:

(i) U.S. Patent No. 3,394,840

A technique is disclosed for sealing, at the outer end of the container, a closing device with flexibility as a means for preventing deformation of the container

due to the pressure difference. Although this technique can prevent the deformation satisfactorily for a small container, it fails to do so for a large container. In the case of a large container, the closing device (lid) cannot absorb all the deformation and the container is recessed into an irregular shape.

(ii) Japanese Patent Application No. 46419/78 (Patent Laid-Open No. 54-140688)

A flexible backing member as a means for preventing deformation of the container due to the pressure difference is arranged along the inner surface of a tubular body. The backing member is fixed at both ends of the tubular body and is left unfixed along its intermediate length. Therefore, the backing member can deform inward independently of the tubular body. However, since a gap is defined between the tubular body and the backing member, the cooling characteristics of the contents after high-temperature filling are not good. Furthermore, the backing member may become separated from the tubular body upon inward deformation, but this may not be confirmed from the outside.

Summary of the Invention

It is an object of the present invention to provide a container comprising a cylindrical body which consists mainly of a paper sheet, on at least an inner surface of which is formed a thermoplastic synthetic resin layer, and openings at both ends of which are closed and to

provide a method for filling the container with contents and sealing it, wherein deformation of the body into an irregular shape due to the pressure difference established after filling the container with high-temperature contents such as juices or wines and cooling is prevented. In the container of the present invention, at least a plurality of linear creases extend toward the openings, and, as needed, arc-shaped or slanted linear creases extend continuously from the upper and lower ends of adjacent linear creases. From the commencement of filling the container with the high-temperature contents to the time of sealing it with a lid, body portions between the creases are uniformly pressed toward the central axis of the body, forming the body into a polygonal prism shape before cooling.

Brief Description of the Drawings

Fig. 1 is a developed view of a first embodiment of a body of a container according to the present invention;

Fig. 2 is a developed view of a second embodiment of a body of a container according to the present invention;

Fig. 3 is a perspective view of a first embodiment of a container according to the present invention;

Fig. 4 is a cross-sectional view of a body before filling;

Figs. 5 to 8 are views showing an apparatus for

filling the container of the present invention with high-temperature contents, in which Fig. 5 is a side view showing the state before the body is pressed, Fig. 6 is a cross-sectional view of the same, Fig. 7 is a side view showing the state of pressing the body, and Fig. 8 is a cross-sectional view of the same;

Fig. 9 is a perspective view showing the state after the contents filled into the container of the present invention are cooled; and

Fig. 10 is a cross-sectional view of the same.

Detailed Description of the Preferred Embodiments

The present invention provides a paper container for holding a high-temperature liquid and a method for filling the container with the high-temperature liquid wherein the openings at the upper and lower ends of the cylindrical container have circular sections while the body has a polygonal section.

In a conventional cylindrical container consisting mainly of paper, when the container is filled with a heated liquid such as a juice and is then cooled, a negative pressure is established inside the container. Therefore, the side surfaces of the container are recessed inward into an irregular shape. In order to solve this problem, it has been proposed to use paper tubes for the containers. However, satisfactory results are not obtained with these measures and the manufacturing cost becomes high.

In accordance with the present invention, the side surfaces of the container have a polygonal section.

When the negative pressure is established within the body after filling the contents, the container may not
5 deform into an irregular shape.

The preferred embodiment of the present invention will now be described with reference to the accompanying drawings. In a paper container for holding a liquid according to the present invention, linear creases 1
10 extend in a cylindrical body to define dihedral angles. Arc-shaped or slanted linear creases 3 extend continuously from both ends of the creases 1. These creases 1 and 3 together define polygon side surfaces 2.

More specifically, as shown in Fig. 1, the
15 creases 1 which define the dihedral angles of a polygon extend linearly for a suitable length. The arc-shaped or slanted linear creases 3 for regular deformation are formed continuously from both ends of the creases 1, that is, at the upper and lower parts of the polygon
20 side surfaces 2. The creases 3 may be discontinuous at the tops thereof. An adhering part 4 is formed at one or both ends of the developed body; the adhering parts 4 at both ends of the developed body have contiguous creases 3. The adhering parts 4 are adhered to form a
25 body of cylindrical shape. In the same manner as in the case of forming a bottom to a paper cup or the like, a bottom 6 as shown in Fig. 2 is adhered. After filling

the container with a heated soft drink or the like, the container is sealed with a lid 5 consisting mainly of an aluminum foil layer.

5 In a container of the present invention as described above, a negative pressure is established inside after the container is filled with the heated contents and is sealed and cooled. However, only the polygon side surfaces 2 shown in Fig. 2 deform inward; the original shape of the container is substantially
10 maintained by the dihedral angle parts. Thus, the container is defined by the regularly deformed side surfaces 2 and the creases 1 and 3. The negative pressure of the container is moderated by the regular inward deformation of the polygon side surfaces 2, so
15 that the outer shape of the container may not deform irregularly.

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A method for filling the container of the present invention with a high-temperature liquid will now be described.

20 Figs. 5 to 8 show an apparatus for filling the container of the present invention with a liquid. The apparatus comprises a container holder 8 with a recess 7 of the same shape and dimensions as those of a cylindrical container C having the creases 1, and press
25 rollers 9 which are arranged around the container C and which number the same as the side surfaces of the container defined by the creases 1. Each press roller 9

is rotatably mounted on the upper end of a lever 11 which is, in turn, pivotal about a support 10 arranged mid-way down the outer wall of the container holder 8. A roller 14 is arranged at the lower end of the lever 11 and is in contact with a vertically movable annular cam 13 which has an inclined surface 12 formed at the lower part of the outer surface of the container holder 8. Openings 15 which number the same as the press rollers 9 are formed in the wall of the container holder 8 so that the press rollers 9 may be able to move toward and away from the body of the container C.

The filling method will now be described in detail with reference to the apparatus as described above. The container C with the creases 1 and 3 is placed within the recess 7 of the container holder 8. Since the cam 13 is located at the lower position, the press rollers 9 are withdrawn and the body is still in a cylindrical shape. When the container begins to be filled with a liquid at a high temperature (e.g., 90°C) such as a juice or wine, the cam 13 begins to be raised by an air cylinder (not shown). Then, the rollers 14 are brought into contact with the inclined surface 12 of the cam 13 to pivot the levers 11 inward (toward the body of the container) about the supports 10. The press rollers 9 at the top ends of the levers 11 then press the side surfaces 2 of the container C defined by the creases 1 and 3. This pressing procedure is continuously

performed during the ascending movement of the cam 13 which is synchronous with the ascending movement of the container C from the time of filling the container with the liquid to the time of completing adhesion of the lid (not shown). Thus, as shown in Fig. 10, the side surfaces 2 of the body are pressed inward to the positions indicated by 2' by 2 to 3 mm. A prism body (of a heptagonal section in this embodiment) having the creases 1 as dihedral angle parts is formed (Figs. 9 and 10).

Since the container of the present invention has the configuration as described above, the negative pressure inside the container after filling the container with the liquid and cooling may not result in an irregular deformation of the body, owing to the creases defining the dihedral angles. The body only deforms regularly at the side surfaces defined by the creases. Therefore, the container of the present invention has a good appearance, increasing the commercial value of the product. Furthermore, if the container is made of a laminated body including an Al or PE film, the container can withstand storage over a long period of time and allows vending by an automatic vending machine. The present invention thus provides a paper container for holding a high-temperature liquid which is relatively inexpensive.

With a conventional container wherein the body is

not pre-pressed as in the case of the container of the present invention, the same force of the negative pressure acts upon every part of the container.

Therefore, the container may not have a regular
5 polygonal sectional shape. However, with the container of the present invention, the side surfaces 2 of the body are uniformly pressed inward by the press rollers to have a polygonal sectional shape from the commencement
10 of filling the container with the contents to the time of adhering the lid. Thus, after the container is filled with the contents and cooled, the side surfaces 2 and the creases deform differently as a result of the negative pressure inside the container. Therefore, the container of the present invention will have a regular
15 polygonal sectional shape.

According to the present invention, the body of the container deforms regularly as a result of the suction force resulting from the pressure difference between
20 inside and outside the container upon cooling the high-temperature liquid contents. Therefore, a special lid need not be used; a general lid (a paper sheet, a metal layer, a thermoplastic synthetic resin film or a laminated body thereof) which is not required to have a structure to absorb deformation due to pressure
25 difference may be used.

What is claimed is:

1. A paper container for holding a high-temperature liquid, comprising a cylindrical body consisting mainly of a paper sheet, on at least an inner surface of which
5 is formed a thermoplastic synthetic resin layer and which has closed openings at upper and lower ends, wherein said container further comprises at least a plurality of linear creases which extend toward said openings.

10

2. A container according to claim 1, wherein said container further comprises arc-shaped creases which continuously extend from upper and lower ends of adjacent ones of said linear creases.

15

3. A container according to claim 1, wherein said container further comprises slanted linear creases which extend continuously from upper and lower ends of adjacent ones of said linear creases.

20

4. A method for filling a container according to any one of claims 1 to 3 with the high-temperature liquid and sealing said container, wherein body portions between said creases are uniformly pressed toward a
25 central axis of said body from commencement of filling said container with the high-temperature liquid to sealing of said container with a lid, whereby said body is formed into a polygonal prism before cooling.

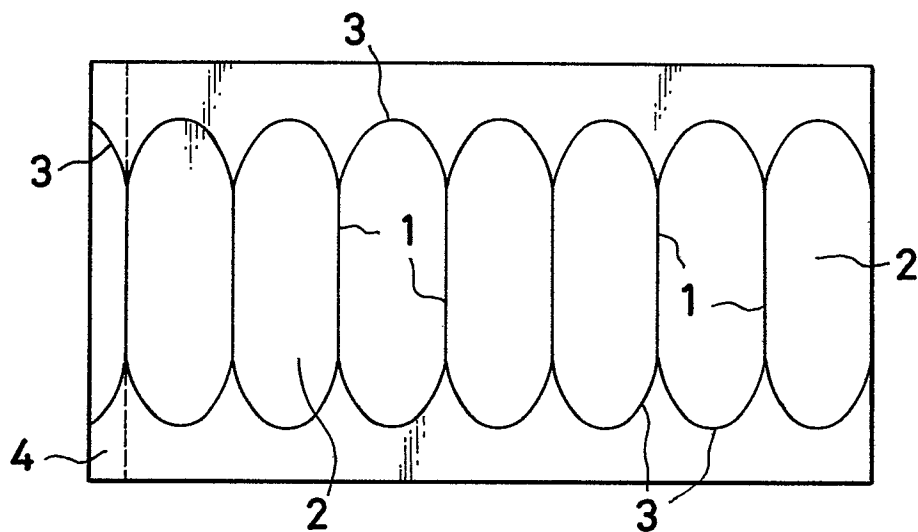


FIG. 1

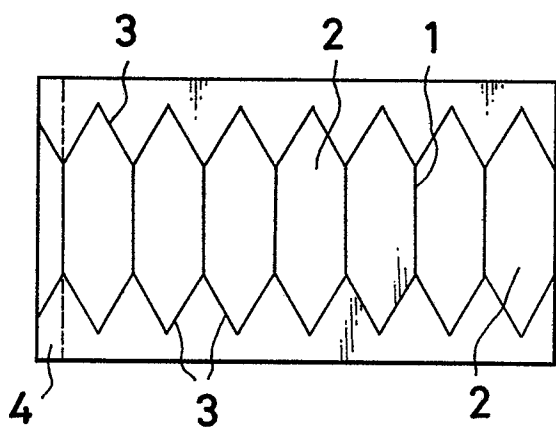


FIG. 2

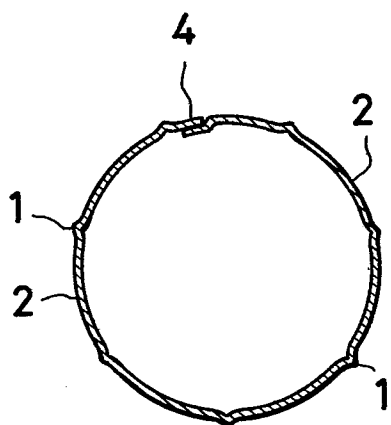


FIG. 4

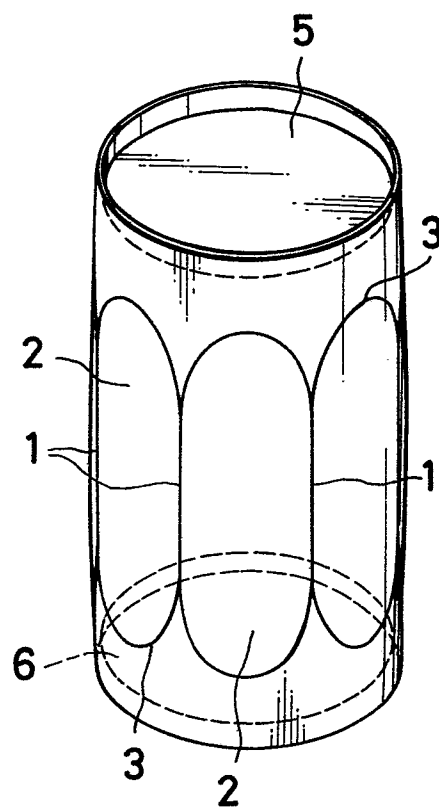


FIG. 3

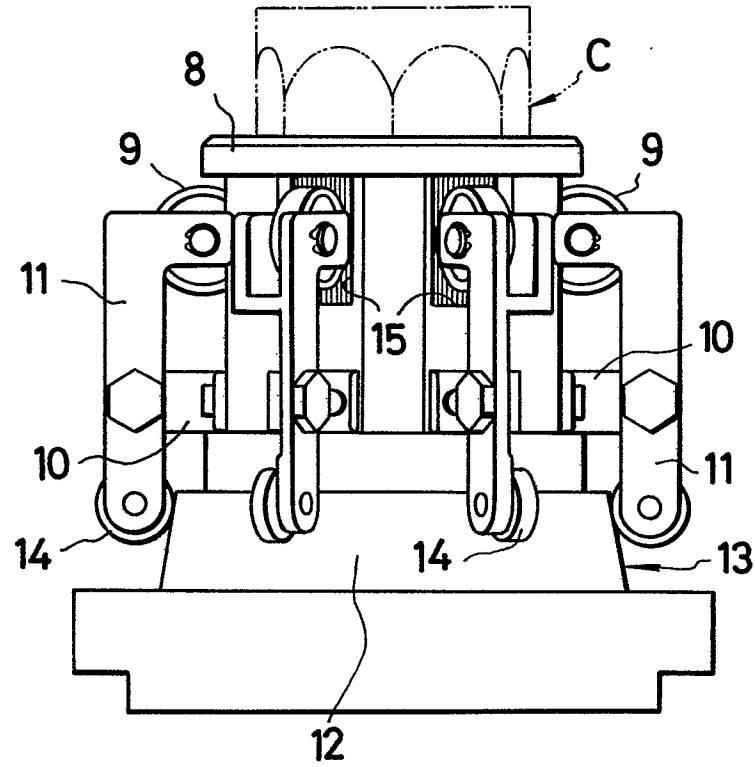


FIG. 5

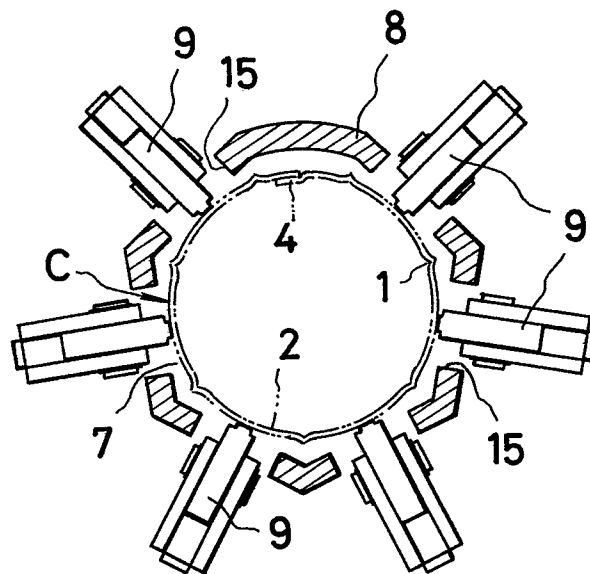


FIG. 6

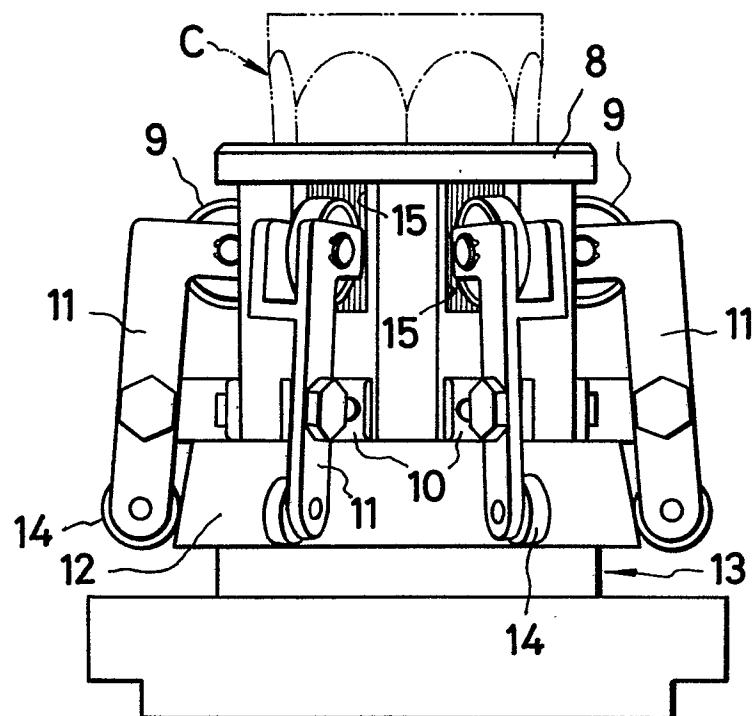


FIG. 7

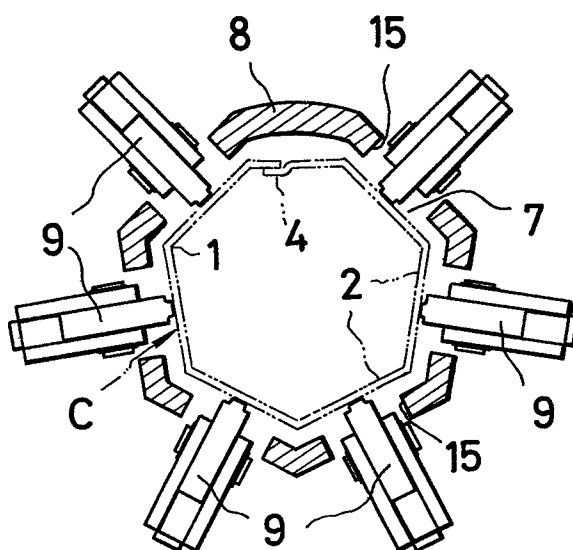


FIG. 8

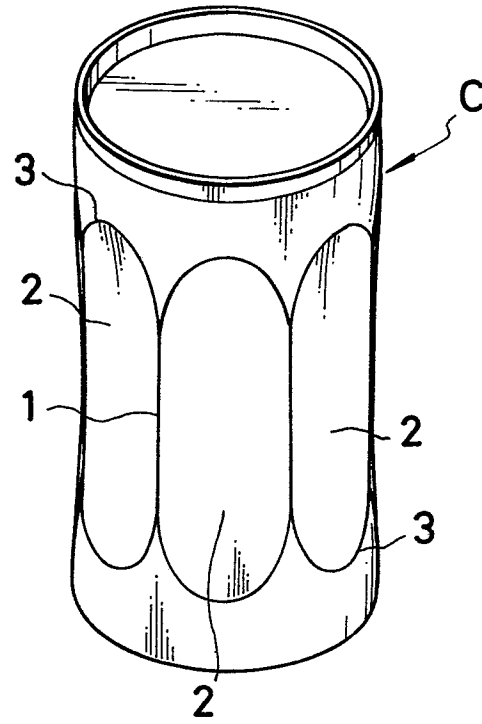


FIG. 9

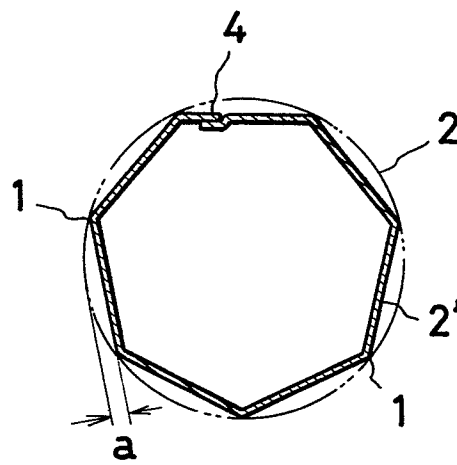


FIG. 10



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	US - A - 3 459 028 (BIJVOET) * Totality, especially fig. 1 * --	1,2	B 65 D 3/08 B 65 B 3/04
A	US - A - 3 032 254 (WILSON) * Fig. 3 * --	3	
A	FR - A - 2 170 779 (JOHN WADDINGTON LTD) * Fig. 2, 5, 7, 13 * & GB-A-1 381 975 --	3	
A	US - A - 3 103 089 (ALLEN) * Totality * --	4	
A	CH - A - 483 990 (INTERSTABELLA AG) * Fig. 6; column 6, lines 14-16 * --	4	
D,A	US - A - 3 394 840 (PECCI et al.) --		
D,A	JP - A - 54-140 688 -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl. ³)
			B 65 D 3/00 B 65 D 5/00 B 65 D 8/00 B 65 D 23/00 B 65 B 3/00 B 65 B 7/00 B 65 B 51/00 B 67 C 3/00
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons
			&: member of the same patent family, corresponding document
X The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 29-09-1982	Examiner CZUBA