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D E C I S I O N
of 17 March 2003

Case Number: T 0727/02 - 3.2.7

Application Number: 96921199.4

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Title of invention:
A method of preparing glass cartridges

Applicant:
Pharmacia Aktiebolag

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"

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Case Number: T 0727/02 - 3.2.7

D E C I S I O N
of the Technical Board of Appeal 3.2.7
of 17 March 2003

Appellant: Pharmacia Aktiebolag
S-11287 Stockholm (SE)

Representative: Elwe, Magnus
Pharmacia AB
Patent Department
11287 Stockholm (SE)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 15 February 2002 refusing European patent application No. 96 921 199.4 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: A. Burkhart
Members: P. A. O'Reilly
E. Lachacinski

Summary of Facts and Submissions

I. The appellant (applicant) filed an appeal against the decision of the Examining Division to refuse the European application No. 96 921 199.4.

II. The Examining Division held that the subject-matter of independent method claim 1 lacked an inventive step and that of the independent device claim 20 lacked novelty.

The most relevant prior art document is:

D1: WO-A-9 511 051

III. The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of claims 1 to 19 according to the main request filed on 25 June 2002 or on the basis of claims 1 to 19 according to the first auxiliary request filed on 25 June 2002, or on the basis of claims 1 to 19 filed as second and third auxiliary requests respectively with letter of 17 February 2003.

IV. The independent claim of the main request reads as follows:

"1. A method of plastically forming an axially extended zone of the interior surface of a hollow glass tube heated to its forming temperature comprising the following subsequent steps:

a) bringing the hollow glass tube and a generally cylindrical embossing mandrel, having a number of ridges along its circumference, connected to a driving shaft together in order to obtain a predetermined start

position for the mandrel inside said hollow glass tube;

c) bringing the embossing mandrel and the interior surface of the glass into contact with said zone;

d) providing a relative rolling off motion between the said mandrel and the said tube, while plastically forming said zone of the glass tube while creating depressions in the tube, the rolling off motion comprising (i) rotating the mandrel around the longitudinal axes of the mandrel and the tube, (ii) rotating the mandrel around its longitudinal axis and rotating the tube its longitudinal axis, or (iii) rotating the tube around the longitudinal axes of the tube and the mandrel;

e) producing more depressions around the interior periphery of said tube than the number of ridges on the mandrel; and

f) separating the formed glass tube and the embossing mandrel."

Claim 1 of the first auxiliary request differs from claim 1 of the main request in that feature d) has been modified to read:

"d) providing, **by careful control and selection of the rotary speed of said mandrel and/or said tube**, a relative rolling off motion between the said mandrel and the said tube, while plastically forming said zone of the glass tube while creating depressions in the tube, the rolling off motion comprising (i) rotating the mandrel around the longitudinal axes of the mandrel and the **fixed** tube, (ii) rotating the mandrel around

its longitudinal axis and rotating the tube its longitudinal axis, or (iii) rotating the tube around the longitudinal axes of the tube and the **fixed** mandrel;"

(changes compared to the main request are indicated in bold)

Claim 1 of the second auxiliary request differs from claim 1 of the first request in that feature c) has been renumbered as feature b) and a new feature c) has been added. In addition feature d) has been changed. The amended features c) and d) read as follows:

"c) **applying a supporting device having an extension at least corresponding to said zone to the glass tube from the outside**;

d) providing, by control and selection of the rotary speed of said mandrel and/or said tube, a relative rolling off motion between the said mandrel and the said tube, while plastically forming said zone of the glass tube while creating depressions in the tube, the rolling off motion comprising (i) **driving** the mandrel around the longitudinal axes of the mandrel and the fixed tube, **the mandrel performing a controlled planetary motion**, (ii) **driving** the mandrel around its longitudinal axis and rotating the tube its longitudinal axis, or (iii) rotating the tube around the longitudinal axes of the tube and the fixed mandrel;"

(changes compared to the first auxiliary request are indicated in bold)

Claim 1 of the third auxiliary request differs from claim 1 of the second request in that feature a) has been amended to read as follows:

"a) bringing the hollow glass tube and a generally cylindrical embossing mandrel, having a number of ridges along its circumference **and having a largest diameter at least half of the interior diameter of the unprocessed glass tube**, connected to a driving shaft together in order to obtain a predetermined start position for the mandrel inside said hollow glass tube;"

(changes compared to the second auxiliary request are indicated in bold)

IV. The appellant argued in written and oral submissions essentially as follows:

(i) With regards to the novelty of claim 1 of the main request the features d) and e) of this claim are not disclosed in document D1.

The document does not disclose a controlled rotating of the mandrel. Rather, the mandrel is rotated by friction with the surface of the glass tube so that feature d) is not disclosed.

Also, due to glass flow after the mandrel has formed a depression the position of the depression can change. This has the result that the number of depressions formed is not necessarily more than the number of ridges on the mandrel. Feature e) is therefore also not disclosed.

(ii) With regards to the inventive step of claim 1 of the main request the feature e) is a result of the fact that the rotation of the mandrel is controlled and not just due to friction as in the prior art. The feature would not be achieved when the rotation of the mandrel was due to friction with the glass. There is no indication in document D1 for the skilled person to use a controlled rotation of the mandrel so that the skilled person would not arrive at the feature.

(iii) The extra features of claim 1 of the first auxiliary request distinguish the claim further from the disclosure of document D1. A control and selection of the rotary speed is not possible in the method disclosed in the document as the rotation is due to friction. Also, fixing the glass tube or the mandrel respectively further increases control. This is not suggested in the document.

(iv) The extra features of claim 1 of the second auxiliary request are advantageous over the disclosure of document D1. The glass tube could be heated from its interior. In this case a support would not be necessary at the embossing zone. This form of heating however is complicated to put into practice. By providing a support for the exterior of the tube at the embossing zone it is possible to heat the tube from the exterior and then to support the softened tube. The exterior of the tube can then be cooled by the contact with the external support which will provide a better temperature gradient through the wall of the tube.

(v) The extra features of claim 1 of the third auxiliary request are advantageous over the disclosure of document D1. The skilled person would normally not make the diameter of the mandrel too large as then it is more difficult to move the mandrel into the interior of the tube without at the same time touching the wall of the tube. The skilled person would also want to keep down the contact time between the mandrel and each part of the interior wall of the tube as the contact cools the glass. The glass only has the right temperature for being formed during a short length of time and it should not be unnecessarily cooled. A smaller diameter of the mandrel has a shorter contact time and this would be preferred. However, it has been found that the larger mandrel diameter does not have the expected problem due to a longer contact time with the mandrel since the glass needs a longer contact time in order to have sufficient time to flow into the desired shape.

The most similar situation to the present case is that presented in planetary gears. In planetary gears the diameter of the inner gear wheel is generally small so the skilled person would be inclined to follow that situation and provide a small diameter for the mandrel.

Reasons for the Decision

Main request

Novelty

1.1 Document D1 discloses:

"a method of plastically forming an axially extended zone of the interior surface of a hollow glass tube heated to its forming temperature comprising the following subsequent steps:

a) bringing the hollow glass tube and a generally cylindrical embossing mandrel, having a number of ridges along its circumference, connected to a driving shaft together in order to obtain a predetermined start position for the mandrel inside said hollow glass tube;

c) bringing the embossing mandrel and the interior surface of the glass into contact with said zone;

d) providing a relative rolling off motion between the said mandrel and the said tube, while plastically forming said zone of the glass tube while creating depressions in the tube, the rolling off motion comprising (i) rotating the mandrel around the longitudinal axes of the mandrel and the tube;

and

f) separating the formed glass tube and the embossing mandrel."

Contrary to the view of the appellant the Board is of

the opinion that alternative (i) of feature d) of claim 1 is disclosed in document D1. On page 5, lines 1 to 5 of document D1 it is stated that the interior of the barrel (i.e. tube) is embossed "by means of a rotating embossing tool which works on the heat softened material of the barrel". Further, on page 13, lines 11 to 17 it is stated that a wheel "is rolled around the circumference of the interior wall of the place of the bypass. The wheel will then emboss the interior wall with the desired pattern." In the view of the Board these disclosures clearly indicate an active rotation of the embossing tool as the tool is moved around the interior of the tube, in particular because the tool is described as "a rotating embossing tool". The appellant has argued that in the application in suit the tool is actively rotated whereas in the prior art device the tool is merely moved around the inside of the barrel and the rotation is caused by friction with the barrel. The Board cannot agree with this view however since the document on the one hand does not mention any friction engagement, but on the other hand does mention a rotating embossing tool. Alternative (i) of feature d) is therefore disclosed in document D1. However, alternatives (ii) and (iii) of feature d) are not disclosed in document D1.

In the opinion of the Board feature e) of claim 1 is not disclosed in document D1. The diameter of the embossing wheel known from document D1 is less than the interior diameter of the barrel. This will not necessarily however produce more depressions than the number of ridges since flow of the softened glass as the wheel is rolled round the interior can lead to circumferential movement of a depression after its impressing. This circumferential movement may result in

the distance between the depressions differing from the distance between the ridges on the wheel. The result of this movement could be that the number of depressions does not exceed the number of ridges as required by feature e).

The appellant has not argued that any of the other features of claim 1 are not disclosed in document D1.

1.2 The Board therefore concludes that claim 1 **in alternative (i)** is distinguished from the disclosure of document D1 by feature e) and is therefore novel.

Inventive step

2.1 Closest prior art

The closest prior art is represented by document D1 which discloses all the features of claim 1 in alternative (i) except for feature e) whereby more depressions are produced around the interior periphery of said tube than the number of ridges on the mandrel.

2.2 Problem to be solved

According to the appellant the problem to be solved by the distinguishing feature is to provide a better control of the embossing process which would result in more depressions being produced around the interior periphery of said tube than the number of ridges on the mandrel.

2.3 Solution to the problem

The Board is not satisfied that the problem stated by

the appellant is solved by the distinguishing feature of claim 1. The number of depressions formed in the interior wall of the tube relative to the number of ridges on the mandrel will depend in particular on the relative diameters of the mandrel and the interior wall of the glass tube. The smaller the relative size of the mandrel the larger will be the excess number of depressions formed during a single movement of the mandrel about the interior wall. Thus, feature e) may be the result of the relative sizes of the mandrel and interior wall of the tube and not the result of better control of the embossing process. The appellant has thus not indicated a problem which is actually solved by the distinguishing feature. The Board itself is unable to identify a problem solved by this feature.

2.4 The provision of the distinguishing feature is obvious for the following reasons:

As already stated above feature e) may simply result from the relative sizes of the mandrel and interior wall of the tube. If there were no flow of the softened material of the interior wall then there would always be more depressions than ridges, as the mandrel must have a smaller diameter than the interior wall of the tube in order to perform the required rolling motion. If there is flow then the number of depressions formed will be less than if there were no flow. Even in the case of material flow the number of depressions formed is still a function of the relative sizes of the mandrel and interior wall of the tube. The feature e) has no direct relationship to the product formed by the method and the appellant has admitted this. The feature e) therefore has no inventive significance and its provision falls within the ambit of the persons

skilled in the art.

2.5 Therefore, the subject-matter of claim 1 of the main request does not involve an inventive step in the sense of Article 56 EPC.

First auxiliary request

3.1 The first auxiliary request adds to claim 1 of the preceding request the feature that the tube and/or mandrel have their speeds carefully controlled and selected and that in alternatives (i) and (iii) the tube and mandrel respectively are fixed.

3.2 The skilled person when implementing the teaching of document D1 to provide a rotating embossing tool would always have to select the speed of the mandrel and thereafter control the speed. Also, since it is disclosed in document D1 that the embossing tool works on a tube it is clear that the tube must be kept fixed to allow this working. In the opinion of the Board therefore the extra features of claim 1 of the first auxiliary request are implicitly disclosed in document D1 and thus do not provide an inventive step in the subject-matter of claim 1.

3.3 Therefore, the subject-matter of claim 1 of the first auxiliary request does not involve an inventive step in the sense of Article 56 EPC.

Second auxiliary request

4.1 This request essentially adds to claim 1 of the preceding request the feature that there is a supporting device which supports at least the zone that

is being embossed of the tube. In addition, the wording of feature d) has been amended. However, in the view of the Board this amendment does not change the nature of the motion being described but merely attempts to use clearer language. Thus, in the view of the Board alternative (i) of feature d), as amended in this request, is also disclosed in document D1.

4.2 With regard the provision of the supporting device the skilled person when implementing the teaching of document D1 would have to provide a support for the glass tube in order that the embossing tool may work on the tube. The embossing of the tube requires that the glass of the tube be softened. Clearly, glass in a softened state could lose its shape. In the opinion of the Board therefore the skilled person would recognise that the glass tube must preferably be supported at this point to avoid deformation of the tube.

The appellant argued that the support could function to affect the thermal flows from the glass tube and provide a better heat gradient through the wall of the tube. However, the claim does not specify the material of the support. If the support were formed of heat conductive material then it could increase the outward heat flow compared to the heat flow without a support. On the other hand, if the support were formed of heat insulating material then it could decrease the outward heat flow compared to the heat flow without a support. Thus, in the absence of the thermal properties of the material of the support being specified no conclusions can be drawn regarding the effects of the support on thermal flows.

4.3 Therefore, the subject-matter of claim 1 of the second

auxiliary request does not involve an inventive step in the sense of Article 56 EPC.

Third auxiliary request

5.1 This request adds to claim 1 of the preceding request the feature that the mandrel has a largest diameter at least half of the interior diameter of the unprocessed glass tube.

5.2 The skilled person when implementing the teaching of document D1 would have to decide upon the size of the mandrel for the particular glass tube. If the mandrel has a very small diameter then it will have to be rotated many times in order to roll completely round the interior wall of the tube. This could lead to an extended treatment time and to the cooling of the interior wall of the tube before the embossing process is complete. An extended treatment time is also less economic. In addition, a small mandrel is inherently incapable of producing larger depressions in the interior wall of the tube because of its small size. These considerations would lead the skilled person to choose a larger mandrel. Nevertheless, the mandrel cannot be too large as then it will not be able to work on the interior wall of the tube. According to the appellant the value of at least a half as specified in the claim has in itself no particular significance other than to exclude particularly small mandrels. The Board therefore concludes that the skilled person would wish to provide the mandrel as large as possible and this would include providing a mandrel with its largest diameter at least half the interior diameter of the glass tube as specified in the claim.

The appellant has argued that the situation here is equivalent to planetary gears and that for planetary gears the inner gear wheel is normally small. It may first be remarked that even in planetary gears there is no absolute requirement for the inner gear wheel to be small. In general in the case of gears the relative sizes of the gear wheels is chosen purely to determine the gear ratio. Moreover, in the case of planetary gears both wheels already have a fixed number of teeth which are chosen for the particular gear ratio desired. In the present case however no gear ratio is involved and the depressions on the inner wall are actually being created. The Board is thus of the opinion that the situation is not at all comparable with that of planetary gears. Moreover, such a comparison would not lead the skilled person to be convinced that a small mandrel is mandatory.

The appellant has further argued that the skilled person would have been prejudiced against larger diameter mandrels because of their longer contact time with the glass and consequent cooling problems. It should first be noted that no proof of such a prejudice was offered. Moreover, the skilled person would not consider that the longer contact time definitely would cause a problem, but rather that it might cause a problem. If a skilled person considers that there might be a problem with a particular measure then this would not prevent a skilled person from trying the measure if there were other desirable advantages with the measure. The skilled person would then try the measure whilst paying particular attention to the possible disadvantage and ascertaining whether the possible disadvantage actually occurs. In the present case the skilled person would find out that the possible

disadvantage indeed does not occur.

5.3 Therefore, the subject-matter of claim 1 of the third auxiliary request does not involve an inventive step in the sense of Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Spigarelli A. Burkhart