



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
21.05.2014 Bulletin 2014/21

(51) Int Cl.:
C12M 1/24 ^(2006.01) **C12Q 1/68** ^(2006.01)
B01L 7/00 ^(2006.01)

(21) Application number: **11869318.3**

(86) International application number:
PCT/CN2011/077085

(22) Date of filing: **12.07.2011**

(87) International publication number:
WO 2013/007021 (17.01.2013 Gazette 2013/03)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

• **TENG, Pinghua**
Taichung City
Taiwan 407 (CN)

(71) Applicant: **GeneReach Biotechnology Corp.**
Taichung City 407, Taiwan (TW)

(74) Representative: **Viering, Jentschura & Partner**
Patent- und Rechtsanwälte
Kennedydamm 55 / Roßstrasse
40476 Düsseldorf (DE)

(72) Inventors:
• **SU, Cheng**
Taichung City
Taiwan 407 (CN)

(54) **CONTAINER FOR NUCLEIC ACID AMPLIFICATION REACTION**

(57) The present invention provides a container for a nucleic acid amplification reaction, comprising a capillary (100) and a heat conduction sleeve (200). The heat conduction sleeve (200) is tightly fitted on the outer side of the capillary (100) for heating the capillary (100) evenly when heat is transferred to the heat conduction sleeve (200), so that the capillary (100) is heated evenly. In this way, the speed of the nucleic acid amplification reaction is increased.

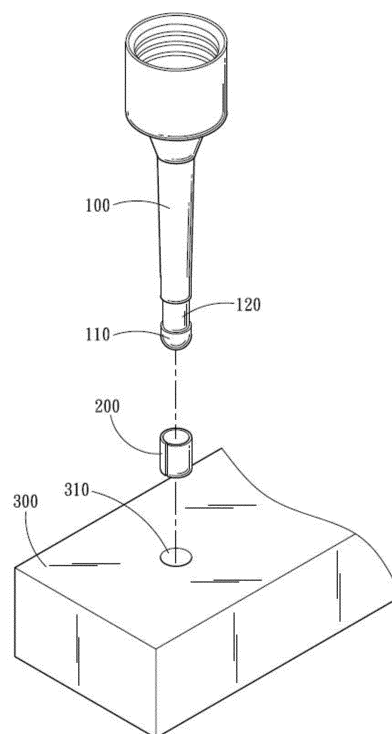


FIG. 2

Description

RELATED APPLICATIONS

[0001] The application claims priority to Taiwan Application Serial Number 99135105, filed October 14, 2010, which is herein incorporated by reference.

BACKGROUND

Technical Field

[0002] The present disclosure relates to nucleic acid amplification reaction. More particularly, the present disclosure relates to a container for nucleic acid amplification reaction.

Description of Related Art

[0003] The nucleic acid amplification reaction is a scientific technique in molecular biology to amplify a single or a few copies of a particular deoxyribonucleic acid (DNA) sequence by repeating the same procedure with particular polymerases. The common techniques such as polymerase chain reaction (PCR), reverse transcription polymerase chain reaction (RT-PCR), and real-time polymerase chain reaction (real-time PCR) all belong to nucleic acid amplification reaction techniques.

[0004] The PCR is used to amplify a particular DNA. The RT-PCR is used to amplify a particular DNA, which is copied by a template, complementary DNA (cDNA), wherein the cDNA is reverse transcribed from a Ribonucleic acid (RNA). The real-time PCR, also called quantitative PCR, is used to amplify and simultaneously quantify a targeted DNA, wherein the methods for quantification are fluorescent probe and dyes. Therefore, the fundamental skill of the nucleic acid amplification reactions is PCR.

[0005] Furthermore, some skills presented lately also belong to nucleic acid amplification reactions, such as rolling circle amplification (RCA), loop mediated amplification (LAMP), nucleic acid sequence based amplification (NASBA), and three way junction (TWJ).

[0006] About PCR, the Initialization step is used for mixing and heating DNA templates, primers, and a buffer solution to the reaction temperature about 90°C for disrupting the hydrogen bonds between two single-stranded DNA templates. The second step is used for cooling the reaction temperature to about 50°C for annealing the primers and the single-stranded DNA template. The final step is used for holding the temperature at about 70°C for extending the primers. The particular DNA is copied by repeating the above procedure.

[0007] The types of the apparatus for the nucleic acid amplification reaction are classified according to the prices. The cheap type includes a container, such as a tube or a capillary, and two heaters. The two heaters are respectively disposed on the two ends of the container.

One heater heats the container to about 90°C, and the other heats the container to about 50°C. The solution convection in the container takes place because of the density difference of the solution at the two ends of the container, wherein the density difference is caused by the temperature difference between the two ends. The DNA and the primers is circulated through the container and heated from 90°C to 50°C circularly for performing the nucleic acid amplification reaction.

[0008] The heater is made of a metal block. The block has a groove for receiving the end of the container, and the shape of the groove is similar to the end of the container. However, the groove does not match with the container. It means that the groove has some protrusions and indentations when the end of the container is received in the groove. Therefore, the edge of the protrusions and the indentations do not touch the container and conduct heat to the container. Thus, the container is not heated evenly. The reaction rate of the nucleic acid amplification reaction will be reduced.

SUMMARY

[0009] According to one embodiment of the present disclosure, a container for nucleic acid amplification reaction includes a capillary and a conduction sleeve. The conduction sleeve tightly surrounds the capillary for heating the capillary evenly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Fig. 1 is a three-dimensional view of a container according to one embodiment of the present disclosure.

Fig. 2 is an explosive view of the container of Fig. 1. Fig. 3 is a cross-sectional view viewed along line 3-3 of Fig. 1.

DETAILED DESCRIPTION

[0011] In the following detailed description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are schematically shown in order to simplify the drawings.

[0012] Fig. 1 is a three-dimensional view of a container according to one embodiment of the present disclosure. Fig. 2 is an explosive view of the container of Fig. 1. The container includes a capillary 100 and a conduction sleeve 200. The conduction sleeve 200 tightly surrounds on the capillary 100.

[0013] Fig. 3 is a cross-sectional view viewed along line 3-3 of Fig. 1. The conduction sleeve 200 tightly sur-

rounds one end 110 of the capillary 100, wherein the end 110 is close, and the other end 120 is open. In use, the conduction sleeve 200 absorbs the heat from a heater 300, and the heat is conducted to the capillary 100. The nucleic acid amplification reaction is performed in the capillary 100 when the temperature of the end 110 is about 90°C controlled by the heater 300 and the temperature of the other end 120 is about 50°C controlled by the environment. For instance, the temperature of the end 110 is about 90°C, and the room temperature is lower than 50°C. Therefore, the other end 120 dissipates the heat to the environment for controlling the temperature to about 50°C. Furthermore, the room temperature is controlled by a thermostat system (not shown).

[0014] The heat is evenly conducted from the conduction sleeve 200 to the capillary 100 because of the conduction sleeve 200 tightly surrounding the capillary 100. Furthermore, the capillary 100 is separated from the heater 300 and heated by the conduction sleeve 200. Therefore, the capillary 100 is heated evenly for increasing the reaction rate of the nucleic acid amplification reaction.

[0015] As shown in Fig. 2, the capillary 100 includes an annular groove 130. The annular groove 130 is positioned at the end 110 for receiving and positioning the conduction sleeve 200. The conduction sleeve 200 is a clip, and the inner diameter of the conduction sleeve 200 is less than or equal to the outer diameter of the capillary 100. Thus, the conduction sleeve 200 expands and snaps into the annular groove 130 of the capillary 100. In detail, the conduction sleeve 200 is a circlip. Furthermore, the conduction sleeve 200 also is a sleeve, and the inner diameter of the conduction sleeve 200 is equal to the outer diameter of the capillary 100. Thus, the conduction sleeve 200 encircles the annular groove 130 of the capillary 100 tightly. In detail, the conduction sleeve 200 is an expansion sleeve. Particularly, all of the inner side of the conduction sleeve 200 touches the outside of the capillary 100, no matter what the conduction sleeve 200 is a clip or a sleeve.

[0016] The capillary 100 is made of plastic. In detail, the capillary 100 is made of polycarbonate (PC). The conduction sleeve 200 is made of metal. In detail, the conduction sleeve 200 is made of iron. The material of the capillary 100 and the conduction sleeve 200 not only correspond to the standard of the heat-resistant and the strength, but also reduce the price.

[0017] All the features disclosed in this specification (including any accompanying claims, abstract, and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0018] Any element in a claim that does not explicitly state "means for" performing a specified function, or "step for" performing a specific function, is not to be interpreted as a "means" or "step" clause as specified in 35 U.S.C.

§ 112, 6th paragraph. In particular, the use of "step of" in the claims is not intended to invoke the provisions of 35 U.S.C. § 112, 6th paragraph.

Claims

1. A container, comprising:
 - a capillary (100); and
 - a conduction sleeve (200) tightly surrounding the capillary (100) for heating the capillary (100) evenly, wherein the conduction sleeve (200) absorbs the heat from a heater (300).
2. The container of claim 1, wherein the conduction sleeve (200) is a sleeve.
3. The container of claim 2, wherein the conduction sleeve (200) is a clip.
4. The container of claim 1, wherein the conduction sleeve (200) is a circlip.
5. The container of claim 1, wherein the capillary (100) is made of plastic.
6. The container of claim 5, wherein the capillary (100) is made of polycarbonate.
7. The container of claim 1, wherein the conduction sleeve (200) is made of metal.
8. The container of claim 7, wherein the conduction sleeve (200) is made of iron.
9. The container of claim 1, wherein the capillary (100) comprises an annular groove (130) positioned at one end (110) of the capillary (100) for receiving and positioning the conduction sleeve (200).

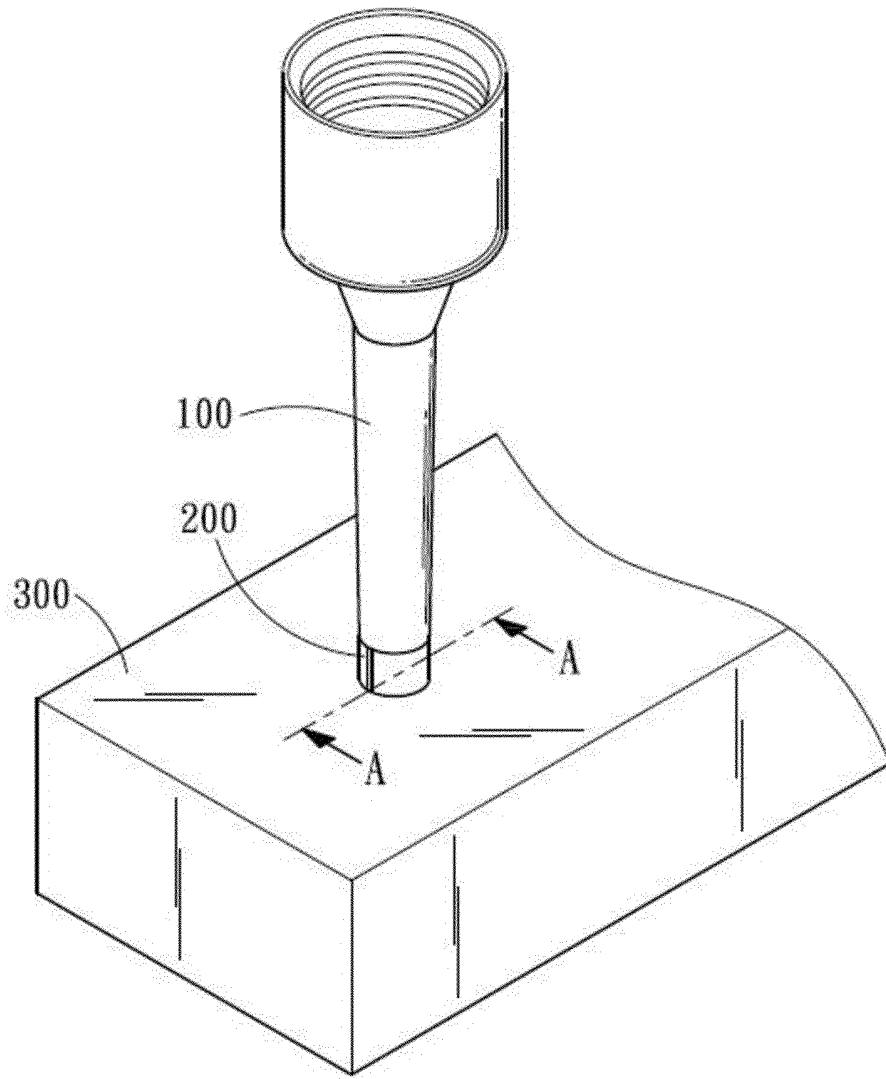


FIG. 1

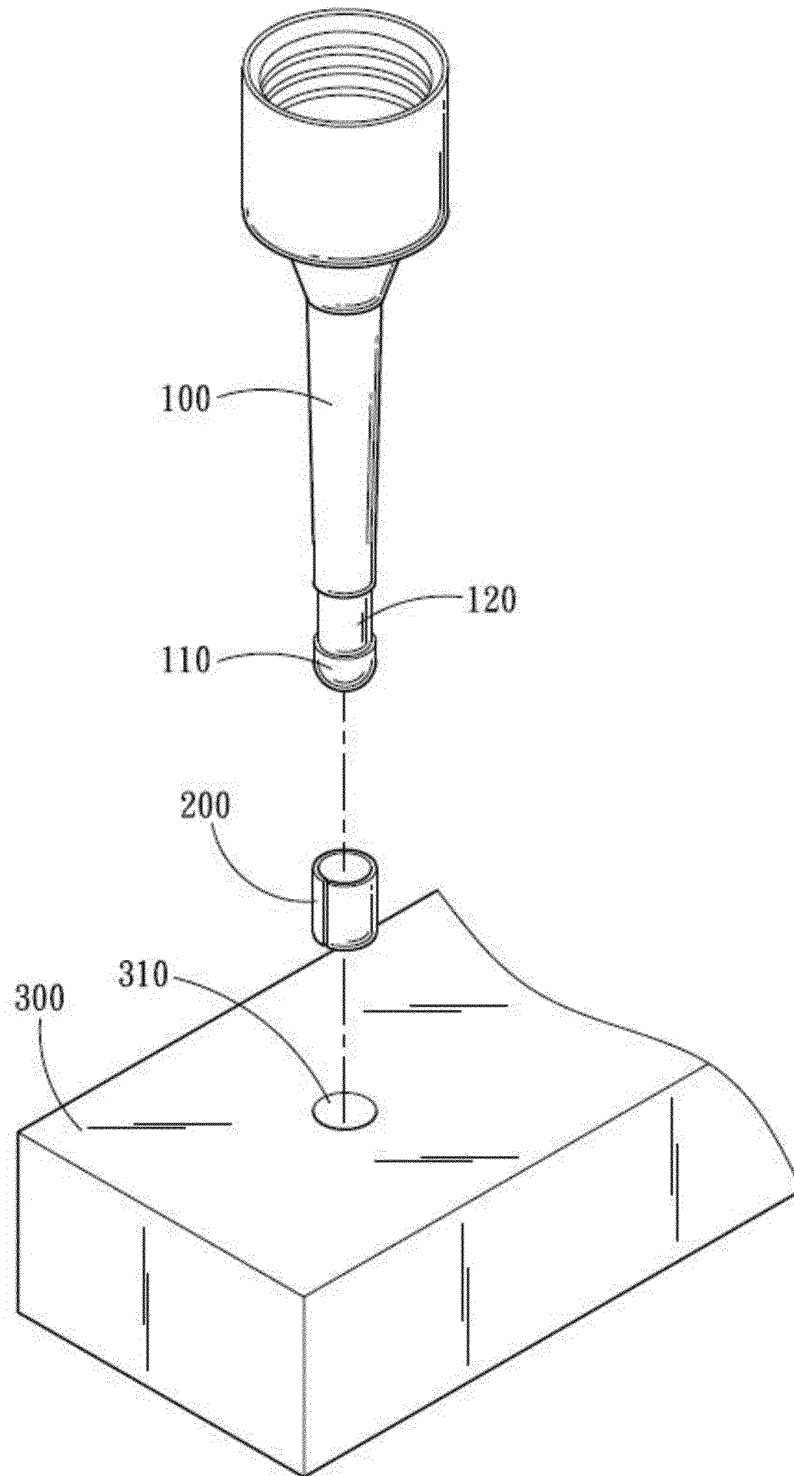


FIG. 2

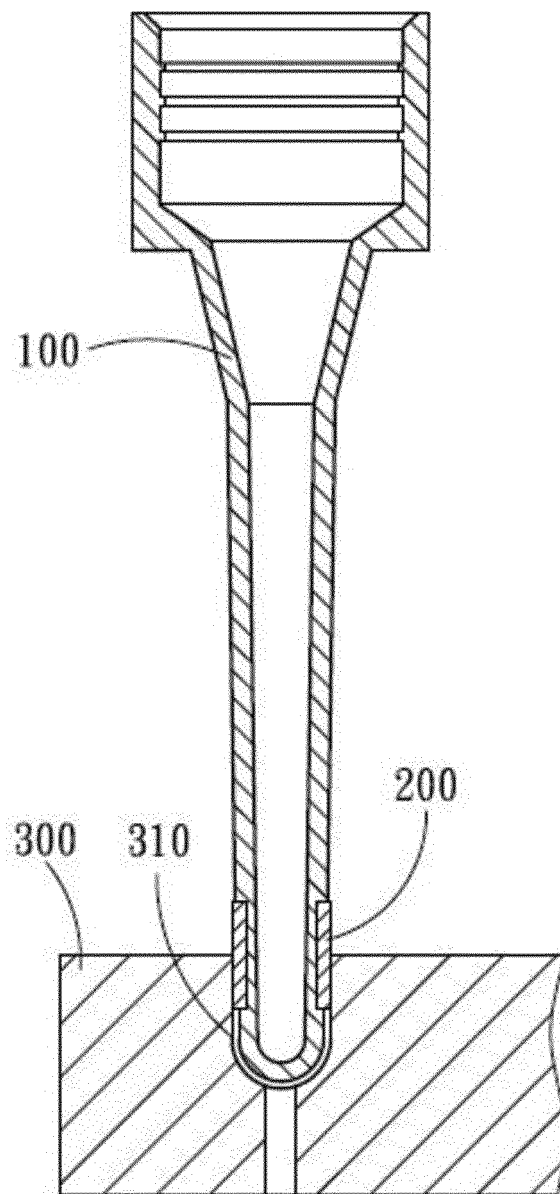


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2011/077085

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

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)

IPC: C12Q; C12M; B01L

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

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

See the extra sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN1245449 A (UK SEC FOR DEFENCE) 23 Feb. 2000 (23.02.2000) see the whole document, especially claims 1-9, 18, 23, and the abstract	1-9
X	CN101855017 A (ENIGMA DIAGNOSTICS LTD) 06 Oct. 2010 (06.10.2010) see the whole document, especially claims 1-8, 29-31, description, paragraphs [0022], [0107], figure 1, and the abstract	1-9
A	CN2464731 Y (XING, Junfen) 12 Dec. 2001 (12.12.2001) see the whole document	1-9

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:	
“A” document defining the general state of the art which is not considered to be of particular relevance	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
“E” earlier application or patent but published on or after the international filing date	“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
“O” document referring to an oral disclosure, use, exhibition or other means	“&” document member of the same patent family
“P” document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 23 Mar. 2012 (23.03.2012)	Date of mailing of the international search report 05 Apr. 2012 (05.04.2012)
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer WU, Yongqing Telephone No. (86-10) 62411103

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2011/077085

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN1245449 A	23.02.2000	WO9824548 A1	11. 06.1998
		ZA9710608 A	26. 08.1998
		AU5060698 A	29. 06.1998
		GB2334904 A	08. 09.1999
		EP0942781 A1	22. 09.1999
		SK75199 A3	10. 12.1999
		CZ9902013 A3	12. 01.2000
		BR9713851 A	29. 02.2000
		MX9905216 A1	01. 10.1999
		AU728343 B	04. 01.2001
		NZ336056 A	26. 01.2001
		HU0002537 A2	28. 12.2000
		GB2334904 B	11. 04.2001
		KR20000057407 A	15. 09.2000
		JP2001509256 A	10. 07.2001
		US2001049134 A1	06. 12.2001
		RU2177830 C2	10. 01.2002
		US2002028165 A1	07. 03.2002
		US6436355 B1	20. 08.2002
		TW555856 A	01. 10.2003
		IL130279 A	20. 06.2004
		EP1520625 A2	06. 04.2005
		CN1115199 C	23. 07.2003
		EP0942781 B1	26. 10.2005
		DE69734457 E	01. 12.2005
		ES2252778 T3	16. 05.2006
		DE69734457 T2	06. 07.2006
		KR100546236 B1	26. 01.2006
		CA2273840 C	06. 02.2007
		INDEL9703416 A	26. 10.2007
		JP4044619 B2	06. 02.2008
		CZ299691 B6	22. 10.2008
		MX258442 B	04. 07.2008
		IN220111 B	11. 07.2008
CN101855017 A	06.10.2010	WO2009019454 A1	12. 02.2009
		AU2008285464 A1	12. 02.2009
		CA2694837 A1	12. 02.2009
		EP2185284 A1	19. 05.2010

Form PCT/ISA /210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2011/077085

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
		JP2010535469 A	25. 11.2010
		US2010297707 A1	25. 11.2010
		INDELNP201001038 E	13. 08.2010
CN2464731 Y	12.12.2001	none	

Form PCT/ISA/210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2011/077085

Continuation of: CLASSIFICATION OF SUBJECT MATTER

C12M 1/24 (2006.01) i

C12Q 1/68 (2006.01) i

B01L 7/00 (2006.01) i

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

DWPI; SIPOABS; CPRSABS; CNKI; PUBMED and keywords: CAPILLARY, HEAT, PCR, POLYMERASE CHAIN REACTION, AMPLIFICATION, etc.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- TW 99135105 [0001]