(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 870 664 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.12.2007 Bulletin 2007/52

(51) Int Cl.:
F42B 3/24 *(2006.01)* *F42B 4/04* *(2006.01)*

(21) Application number: **07425293.3**

(22) Date of filing: **21.05.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(71) Applicant: **Di Blasio Elio Fireworks**
64100 Contrada Caprafico (TE) (IT)

(72) Inventor: **Di Blasio, Elio**
64100 Contrada Caprafico,
Teramo (IT)

(74) Representative: **Iannone, Carlo Luigi et al**
Barzanò & Zanardo Roma S.p.A.
Via Piemonte 26
00187 Roma (IT)

Remarks:
The references to the figure 4 are deemed to be deleted (Rule 43 EPC 1973).

(54) Safety plug for a firework and firework comprising such a safety plug

(57) The invention concerns a firework (100), comprising a wrapping (130), an internal active substance (110) as well as a safety plug (120, 120', 120") that closes an aperture of said wrapping and to which a triggering matchcord (104) is connected, characterised in that said safety plug comprises a delay fuse and further comprises:
- a closing surface of said aperture of the firework (100);
- a through-hole (125), suitable to let the triggering matchcord (140) pass through;
the delay fuse (125) being constituted by the chamber of said through-hole, wherein the triggering matchcord (140) is fixable by means of suitable fixing and sealing means.

The invention further concerns a safety plug with mechanical delay fuse to be used in such a firework.

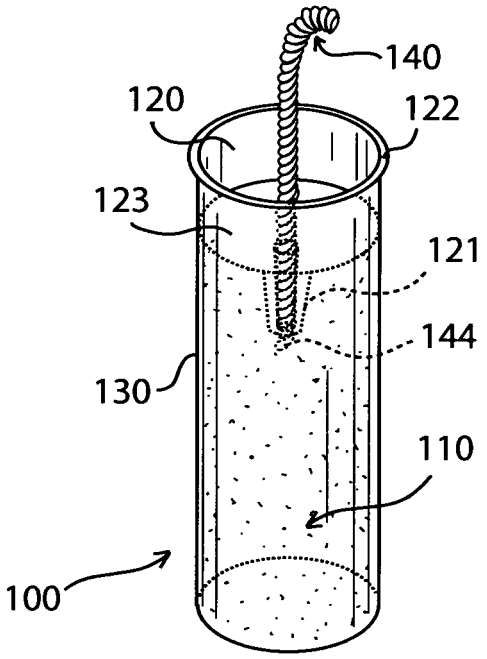

Fig. 3

EP 1 870 664 A1

Description

[0001] The present invention concerns a firework comprising a safety plug provided with mechanical delay fuse, and safety plug with mechanical delay fuse to be used in such a firework.

[0002] More in detail, the invention concerns a firework with a safety plug provided with "mechanical" delay fuse, i.e. that does not make use of active material such as that of traditional delay fuses, increasing the safety in the use of the same fireworks. The invention concerns specifically also such a safety plug.

[0003] Fireworks are known with delay fuses using active chemical substances, as in EP 00257032, US 3113519, US 3895577. Such a firework type, to the knowledge of the Applicant, is the sole that is today known and legally used (there are on sale also fireworks which do not use any type of delay).

[0004] In the following, for the sake of clarity, we will make specific reference to a firecracker, it must be however clear from now on that this is not intended to limit in any way the invention to this particular choice of firework, being possible to utilise the invention with many other fireworks such as for example the "rendini" i.e. small firecracker without matchcord used as a component of larger fireworks.

[0005] Making reference to figure 1 of the prior art, the traditional firecracker 10 is constituted by an elongated container 14 (usually a cylinder) in which it is placed the active material 12 and by a matchcord 13 that serves for the triggering of said active material. The matchcord 13 is connected to the delay fuse 11. Even the delay fuse is composed by a material which is considered as active.

[0006] The problems connected to such a device type (firecracker or other type) are mainly two.

[0007] The first is determined by the fact that the law provides a maximum limit of active material that a producer can hold and that can be transported with separate shipping, therefore the productivity cannot be increased because of transportation costs, as well as because of the impossibility of producing higher amounts of products.

[0008] The second is the low safety that one has firecrackers (and with fireworks in general), which can not explode while they are held in the hand, without the explosion provoking wounds.

[0009] Both the problems are directly due to the delay fuse, which on one hand is counted as active material, and on the other hand causes the firecracker to explode in unforeseeable points and in a widespread manner.

[0010] It is object of the present invention to provide a firework which solves totally or partially the problems of the prior art.

[0011] It is further specific object of the present invention a safety plug for a firework to be used in the same and that solves totally or partially the problems of the prior art.

[0012] It is subject-matter of the present invention a firework, comprising a wrapping, an internal active substance as well as a safety plug that closes an aperture of said wrapping and to which a triggering matchcord is connected, characterised in that said safety plug comprises a delay fuse and further comprises:

- a closing surface of said aperture of the firework;
- a through-hole, suitable to let the triggering matchcord pass through;

the delay fuse being constituted by the chamber of said through-hole, wherein the triggering matchcord is fixable by means of suitable fixing and sealing means.

[0013] Preferably according to the invention, the dimension of said through-hole, at the end of the safety plug facing the interior of the firework, is close to the dimension of the triggering matchcord, whilst the dimension of the through-hole on the opposite side is sensibly larger then the triggering matchcord, so as to be able to receive a suitable quantity of gluing material that constitutes said fixing and sealing means.

[0014] 3. Preferably according to the invention, said triggering matchcord (140) is fixed by hot gluing.

[0015] Preferably according to the invention, the safety plug comprises a main hollow body presenting a lower base and an upper edge, as well as a spout connected to said lower base on the side facing the interior of the firework, the spout and said lower base being crossed by said through-hole.

[0016] Preferably according to the invention, the safety plug comprises a disk, to the side of the disk facing the interior of the firework being fixed and spout, the disk and the spout being crossed by said through-hole, being fired provided means for fixing said disk to the firework.

[0017] Preferably according to the invention, the safety plug comprises a body hollow or full with the form of a frustum of cone, with a through-hole, said body being at least partially inserted in the firework, being further provided means for fixing said body to the firework.

[0018] Preferably according to the invention, said fixing means are constituted by interference fins which interfere the internal surface of the firework.

[0019] Preferably according to the invention, the firework is a firecracker with a cylindrical body, said plug presenting a circular cross-section and being inserted in said cylindrical body, closing it from outside.

[0020] It is further specific subject-matter of the present invention a plug with delay fuse for a firework, comprising:

- a closing surface of an aperture of the firework;
- a through-hole, suitable to let a triggering matchcord pass;

the delay fuse being constituted by the chamber of said through-hole, wherein the triggering matchcord is fixable by means of suitable fixing and sealing means.

[0021] Preferably according to the invention, the dimension of said through-hole, at the end of the safety

plug which is orientable towards the interior of the firework, is close to the dimension of the triggering matchcord, whilst the dimension of through-hole on the opposite side is sensibly larger than the triggering matchcord so as to be able to receive a suitable quantity of gluing material which constitutes said fixing and sealing means.

[0022] Preferably according to the invention, the plug is constituted by a material suitable for the hot gluing of said triggering matchcord.

[0023] Preferably according to the invention, the plug comprises an hollow body presenting a lower base and an upper edge, as well as a spout connected to said lower base on the side orientable towards the interior of the firework, the spout and said lower base being crossed by said through-hole.

[0024] Preferably according to the invention, the plug comprises a disk fixable to the end of the firework, on the side of the disk orientable towards the interior of the firework being fixed a spout, the disk and the spout being crossed by said through-hole, being further provided means for fixing said disk to the end of the firework.

[0025] Preferably according to the invention, the plug comprises a body hollow or full with the form of a frustum of cone, with a through-hole along its principal axis, said body being at least partially insertable in the firework, being further provided means for fixing said disk to the end of the firework.

[0026] Preferably according to the invention, said fixing means are constituted by interference fins which interfere with the internal surface of the firework.

[0027] Preferably according to the invention, the plug presents a circular cross-section and is insertable in a firework with cylindrical body, or in that it is applicable to the outside of the same, for example by screwing, gluing, or interference.

[0028] The invention will be now described by way of illustration but not by way of limitation, making reference to refer the embodiments and with particular reference to the figures of the enclosed drawings, wherein:

- figure 1 shows a firecracker according to the prior art;
- figure 2 shows a preferred embodiment of a safety plug according to the invention;
- figure 3 shows an example of firecracker according to the invention, utilising the safety plug of figure 2;
- figure 4 shows a further example of firecracker according to the invention, utilising the safety plug of figure 2;
- figure 5 shows a different embodiment of this safety plug according to the invention;
- figure 6 shows a further representation of the safety plug of figure 5;
- figure 7 shows a further different embodiment of the safety plug according to the invention.

[0029] In the figures of the drawings, equal references are used for indicating equal elements.

[0030] In figure 2 it is shown the safety plug 120 that, according to the invention, among other things, substitutes the delay fuse of the prior art.

[0031] According to the example of figure 2, the safety plug has a cylindrical body 123 with an upper edge in relief 122 and a lower spout 121. Such a spout 121 presents a through-hole 125 for inserting a triggering matchcord (shown on the following figures). The body 123 is hollow, with a base 124 whereon the spout 121 connects directly, the base being bored for the same reason.

[0032] Such a safety plug is placed, with reference to figure 3, at an end of the firecracker, and the walls of the body 123 interfere with the cylinder 130 which forms the external wall of the firecracker itself, thus fixing such a safety plug to the cylinder itself. The upper edge 122 of the safety plug plays as abutment that hinders the deeper insertion of the safety plug 120. The matchcord 140 is inserted in the safety plug through the through-hole 125.

[0033] The end 144 of the matchcord is fixed to the hole of the spout 121, which constitutes an actual delay fuse, so that the firecracker will explode exactly at the internal ends of the matchcord, a position that is well determinable by using the device according to the invention. In such a way, by suitably dimensioning the height of such safety plug (or more precisely of such a delay fuse), one determines the delay of explosion of the firecracker and the triggering position of the explosive material.

[0034] In such a way, if one holds the firecracker at the end opposite to that where the safety plug is applied, one will not wound oneself even if the firecracker explodes in the hand.

[0035] In figure 4, it is shown the case in which the cylindrical wrapping 130 is filled in only partially with the active substance 110, and the matchcord extends much far away the spout 121, in order to allow the triggering.

[0036] In order to regulate the height of the active substance that can be used, this time in a known way, there is a spacing element (not shown) at the opposite end of the safety plug according to the invention (opposite base of the cylinder).

[0037] The fact of avoiding the use of the delay fuse allows to economise on the costs of the preparation process of the same, in addition to the fact that the materials of which is made weight upon, on average, for the 50% of the total amount of the active principles. This allows, in turn, to be able to hold and transport more product units, increasing the turnover for the individual firms.

[0038] Moreover, with the device according to the invention, one obtains a firecracker that diminishes very much the risk of hurting oneself during the use, advantage which is certainly not inferior to those already shown.

[0039] The form of the safety plug 120 according to figure 2 is only one of possible forms for such a device. Indeed, according to figure 5, it is for example possible a form 120' constituted by a disk 122' and a spout 121'. In figure 7 instead, the form of the safety plug 120" is that a frustum of cone. The hole is through and oriented al-

ways preferably along the principal axis.

[0040] In both these cases one needs, contrary to the first embodiment, fixing means (not shown) to the cylindrical body of the firecracker, because the walls of the safety plug cannot exert a pressure on said cylindrical body. For example, the fixing means can be constituted by fins that exert such a pressure (cf. Figure 6 in the case of embodiment with disk and spout).

[0041] The matchcord can be restrained into the hole of the spout or even glued to it, for example by hot gluing.

[0042] The hollow models of the safety plug allows to save material, on one hand, and, on the other hand, to obtain an element which subsequently to the explosion does not belong sufficient inertia to wound persons or things.

[0043] The dimension of the safety plug is much variable. Indeed, one can even eliminate the spout, renouncing to the delay, owing to the shorter length of the matchcord, however enjoying the advantage of a well-determined triggering point.

[0044] Or alternatively, one can make the whole device longer in order to bring the point of the spout much in depth. In this case, any safety connected to the triggering point cannot be present, because the triggering point can result being close to the hand that holds the firecracker, but, as compensation, the triggering delay is large thanks to the internal larger length of the matchcord.

[0045] The preferred embodiments have been above described and some modifications of this invention have been suggested, but it should be understood that those skilled in the art can make variations and changes, without so departing from the related scope of protection, as defined by the following claims.

Claims

1. Firework (100), comprising a wrapping (130), an internal active substance (110) as well as a safety plug (120, 120', 120") that closes an aperture of said wrapping and to which a triggering matchcord (104) is connected, **characterised in that** said safety plug comprises a delay fuse and further comprises:

   - a closing surface of said aperture of the firework (100);
   - a through-hole (125), suitable to let the triggering matchcord (140) pass through;

   the delay fuse (125) being constituted by the chamber of said through-hole, wherein the triggering matchcord (140) is fixable by means of suitable fixing and sealing means.

2. Firework according to claim 1, **characterised in that** the dimension of said through-hole (125), at the end of the safety plug (120, 120', 120") facing the interior of the firework (100), is close to the dimension of the triggering matchcord (140), whilst the dimension of the through-hole (125) on the opposite side is sensibly larger then the triggering matchcord (140), so as to be able to receive a suitable quantity of gluing material that constitutes said fixing and sealing means.

3. Firework according to claim 2, **characterised in that** said triggering matchcord (140) is fixed by hot gluing.

4. Firework according to any claim 1 to 3, **characterised in that** the safety plug (120, 120', 120") comprises a main hollow body (123) presenting a lower base (124) and an upper edge (122), as well as a spout (121) connected to said lower base (124) on the side facing the interior of the firework (100), the spout (121) and said lower base (124) being crossed by said through-hole (125).

5. Firework according to any claim 1 to 3, **characterised in that** the safety plug (120, 120', 120") comprises a disk (122'), to the side of the disk (122') facing the interior of the firework (100) being fixed and spout (121'), the disk and the spout (121') being crossed by said through-hole (125), being fired provided means for fixing said disk (122') to the firework (100).

6. Firework according to any claim 1 to 3, **characterised in that** the safety plug (120, 120', 120") comprises a body (123') hollow or full with the form of a frustum of cone, with a through-hole (125), said body (123') being at least partially inserted in the firework (100), being further provided means for fixing said body (123') to the firework (100).

7. Firework according to claim 5 or 6, **characterised in that** said fixing means are constituted by interference fins which interfere the internal surface of the firework.

8. Firework according to any claim 1 to 7, **characterised in that** it is a firecracker with a cylindrical body, said plug presenting a circular cross-section and being inserted in said cylindrical body, closing it from outside.

9. Plug (120, 120', 120") with delay fuse for a firework, comprising:

   - a closing surface of an aperture of the firework (100);
   - a through-hole (125), suitable to let a triggering matchcord (140) pass;

   the delay fuse being constituted by the chamber of said through-hole (one under 25), wherein the triggering matchcord (140) is fixable by means of suit-

able fixing and sealing means.

10. Plug according to claim 9, **characterised in that** the dimension of said through-hole (125), at the end of the safety plug (120, 120', 120") which is orientable towards the interior of the firework (100), is close to the dimension of the triggering matchcord (140), whilst the dimension of through-hole (125) on the opposite side is sensibly larger than the triggering matchcord (140) so as to be able to receive a suitable quantity of gluing material which constitutes said fixing and sealing means.

11. Plug according to claim 9 or 10, **characterised in that** it is constituted by a material suitable for the hot gluing of said triggering matchcord (140).

12. Plug according to any claim 9 to 11, **characterised in that** it comprises an hollow body (123) presenting a lower base (124) and an upper edge (122), as well as a spout (121) connected to said lower base (124) on the side orientable towards the interior of the firework (100), the spout (121) and said lower base (124) being crossed by said through-hole (125).

13. Plug according to any claim 9 to 11, **characterised in that** it comprises a disk (122') fixable to the end of the firework (100), on the side of the disk (122') orientable towards the interior of the firework (100) being fixed a spout (121'), the disk and the spout (121') being crossed by said through-hole (125), being further provided means for fixing said disk (122') to the end of the firework (100).

14. Plug according to any claim 9 to 11, **characterised in that** it comprises a body (123') hollow or full with the form of a frustum of cone, with a through-hole (125) along its principal axis, said body (123') being at least partially insertable in the firework (100), being further provided means for fixing said disk (122') to the end of the firework (100).

15. Plug according to claim 13 or 14, **characterised in that** said fixing means are constituted by interference fins which interfere with the internal surface of the firework.

16. Plug according to any claim 9 to 15, **characterised in that** it presents a circular cross-section and is insertable in a firework with cylindrical body, or **in that** it is applicable to the outside of the same, for example by screwing, gluing, or interference.

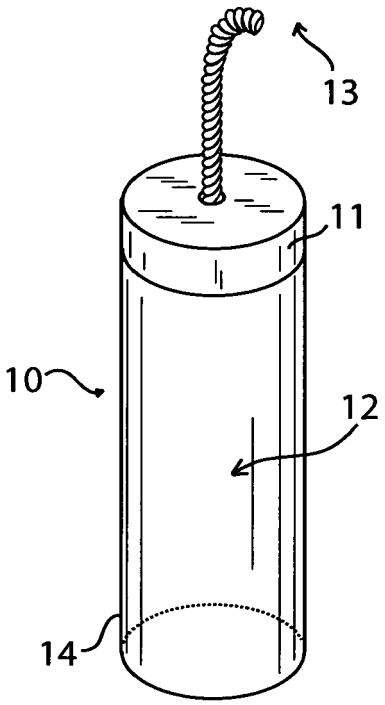

Fig. 1

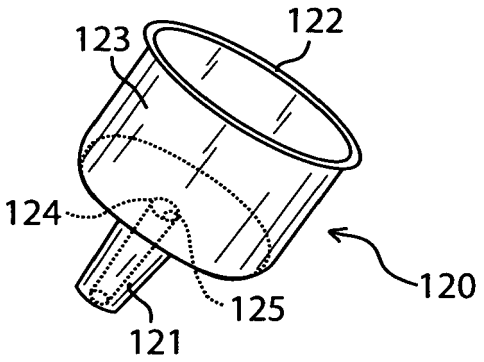

Fig. 2

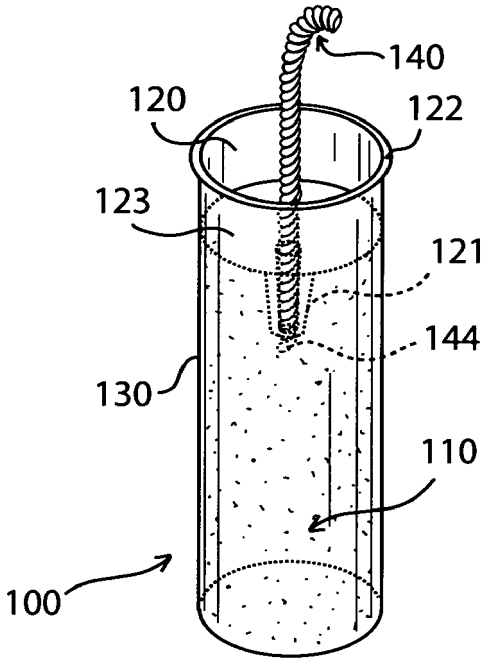

Fig. 3

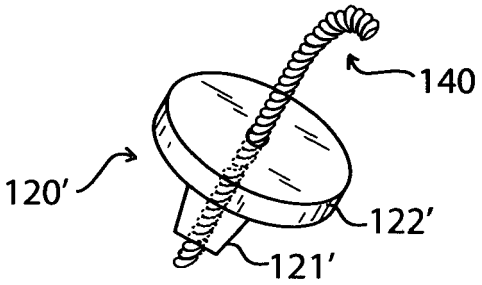

Fig. 5

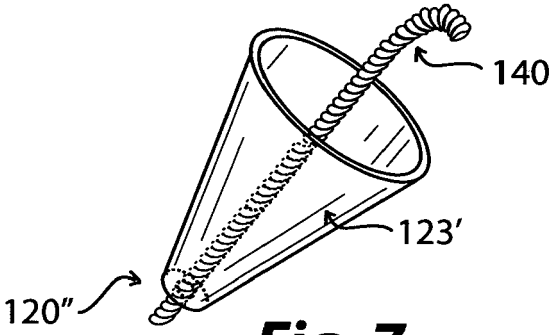

Fig. 7

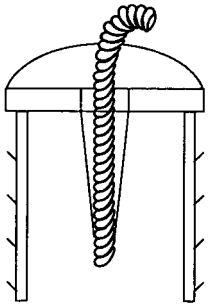

Fig. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 42 5293

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 1 563 379 A (KOHN) 1 December 1925 (1925-12-01) * page 1, right-hand column, line 107 - page 2, left-hand column, line 14 * * page 2, right-hand column, line 71 - line 79; figures 1,2,4,6 * -----	1,2,5,6, 8-10,13, 14,16	INV. F42B3/24 ADD. F42B4/04
X	US 1 886 407 A (KOHN) 8 November 1932 (1932-11-08) * page 2, left-hand column, line 10 - line 30 * * page 2, right-hand column, line 99 - line 106; figures 1,2 * -----	1,3,5,8, 9,11,13, 16	
X	US 1 792 246 A (RUTTER ET AL.) 10 February 1931 (1931-02-10) * the whole document * -----	1,6,9,14	
A	DE 24 52 080 A (PYROTECHNISCHE FABRIKEN HANS MOOG - H. NICOLAUS) 6 May 1976 (1976-05-06) * page 4, line 11 - page 5, line 11; figures 1-3 * -----	4,12	TECHNICAL FIELDS SEARCHED (IPC) F42B F42D
A	WO 96/11374 A (ICI AUSTRALIA) 18 April 1996 (1996-04-18) * page 8, line 27 - page 9, line 29; figures 4a,4b,5a,5b,5c * -----	7,15	
A	DE 24 33 289 A (DEUTSCHE SEMPERIT) 18 December 1975 (1975-12-18) -----		
A	SE 466 222 B (NORABEL) 13 January 1992 (1992-01-13) -----		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 October 2007	Giesen, Maarten

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 42 5293

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

03-10-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1563379 A	01-12-1925	NONE	
US 1886407 A	08-11-1932	NONE	
US 1792246 A	10-02-1931	NONE	
DE 2452080 A	06-05-1976	NONE	
WO 9611374 A	18-04-1996	CA 2201862 A1	18-04-1996
		US 6112666 A	05-09-2000
		ZA 9508278 A	09-04-1996
DE 2433289 A	18-12-1975	BE 829863 A1	01-10-1975
		CH 581820 A5	15-11-1976
		FR 2288964 A1	21-05-1976
		IT 1038539 B	30-11-1979
		NL 7505769 A	08-12-1975
		NO 751947 A	05-12-1975
		SE 7506297 A	05-12-1975
SE 466222 B	13-01-1992	FI 912439 A	22-11-1991
		NO 911914 A	22-11-1991
		SE 9001811 A	22-11-1991

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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

- EP 00257032 A **[0003]**
- US 3113519 A **[0003]**
- US 3895577 A **[0003]**