

COMMONWEALTH OF AUSTRALIA

SPRUSON & FERGUSON

PATENTS ACT 1952

DECLARATION IN SUPPORT OF A CONVENTION
APPLICATION FOR A PATENT

In support of the convention application made for a patent for an invention
entitled:

An Impact Fuse Having Fore-Bore Safety

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.... Federal Republic of Germany

do solemnly and sincerely declare as follows:

1. I am/~~We are~~ authorised by Nico-Pyrotechnik Hanns-Jürgen Diederichs GmbH & Co.KG, the applicant for the patent to make this declaration on its behalf.
2. The basic application as defined by Section 141 of the Act was made in Federal Republic of Germany on 16 August 1988 by Nico-Pyrotechnik Hanns-Jürgen Diederichs GmbH & Co.KG
3. Willi Lübbers, of Lauenburger Str. 4, Hubertushof, D-2077 Grande, Federal Republic of Germany, is the actual inventor of the invention and the facts upon which the applicant is entitled to make the application are as follows:- Nico-Pyrotechnik Hanns-Jürgen Diederichs GmbH & Co.KG is entitled by Contract of Employment between the inventor as employee and Nico-Pyrotechnik Hanns-Jürgen Diederichs GmbH & Co.KG as employer, as a person who would be entitled to have the patent assigned to it if a patent were granted upon an application made by the inventor.
4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

DECLARED at Trittau this 9th day of July 1990

H. Diederichs
Signature of Declarant(s)

(Managing Director)

TO: THE COMMISSIONER OF PATENTS
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(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 616792

(54) Title
PERCUSSION FUSE WITH PROTECTION AGAINST PREMATURE DETONATION WITHIN THE CANNON

International Patent Classification(s)
(51)^e **F42C 015/24 F42C 001/04**

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(56) Prior Art Documents
US 4723490
US 3995556
FR 989525

(57) Claim

1. An impact fuse with fore-bore safety for a projectile, comprising;

an impact fuse,

a percussion needle extending generally in the direction of flight of the projectile and stationarily disposed within the impact fuse,

an impact body being slideably mounted to the percussion needle,

an annular track defined between an external surface of the impact body and an internal surface of the impact fuse, the track comprising stepped annular surfaces generally parallel to the percussion needle, the surfaces being interconnected by tapered annular ramp portions, and

a blocking sphere located within the track, the blocking sphere being adapted to be positively deflected along the track so as to provide means by which a fore-bore safety distance may be adjusted.

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40583 / 89

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PCT NUMBER PCT/DE89/00533

PCTINTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE
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F42C 15/24, 1/04

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P 38 27 785.9 16. August 1988 (16.08.88) DE(71) Anmelder (für alle Bestimmungsstaaten ausser US): NICO-
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(81) Bestimmungsstaaten: AU, JP, KR, US.

Veröffentlicht

Mit internationalem Recherchenbericht.

(54) Title: PERCUSSION FUSE WITH PROTECTION AGAINST PREMATURE DETONATION WITHIN THE CAN-
NON

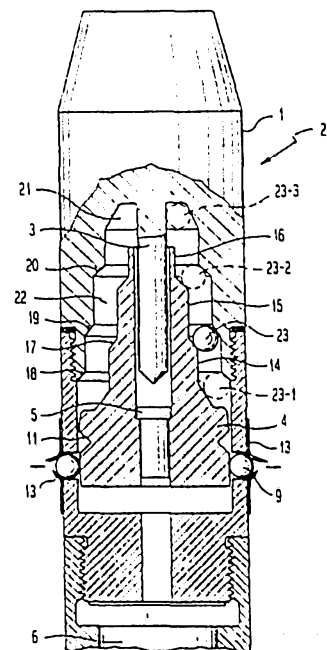
(54) Bezeichnung: AUFSCHLAGZÜNDER MIT VORROHRRSICHERHEIT

(57) Abstract

A proximity fuse (2) with protection against premature detonation of a projectile (1) within the cannon has a firing pin (3) fixed to the fuse and a percussion body (4) that slides in the direction of flight and is provided with a firing cap (5), as well as a track for a blocking ball (23) arranged between the percussion body and the inner wall of the projectile housing. When the blocking ball prematurely hits an obstacle in its track (22), it is blocked between a shoulder (18, 19, 20) of the inner wall of the housing and a ramp (17) in a groove (14, 15, 16) that is adjacent to the percussion body (4), preventing premature detonation. In order to allow definite distances to be set for which protection against premature detonation within the cannon is ensured, the track (22) for the blocking ball (23) is stepped, so that the blocking ball (23) can be blocked at several places within the fuse (2) between the shoulders (18, 19, 20) and the ramps (17) of different grooves (14, 15, 16).

(57) Zusammenfassung

Die Erfindung bezieht sich auf einen Abstandszünder (2) mit Vorrohrsicherheit für ein Geschöß (1), mit einer zünderfest angeordneten Zündnadel (3) und einem ein Anzündhütchen (5) enthaltenden, in Flugrichtung gleitend gelagerten Schlagkörper (4) sowie mit einer Laufbahn für eine Sperrkugel (23) zwischen Schlagkörper und Innenwand des Geschößgehäuses, die bei vorzeitigem Auftreffen auf ein Hindernis in ihrer Laufbahn (22) zwischen einer Schulter (18, 19, 20) an der Gehäuseinnenwand und einer Rampe (17) einer Nut (14, 15, 16) am Schlagkörper (4) eingeklemmt wird und dadurch eine Zündung verhindert. Um für die Vorrohrsicherheit definierte Distanzen einstellen zu können, wird gemäß der Erfindung vorgeschlagen, die Laufbahn (22) für die Sperrkugel (23) stufenförmig auszubilden, so daß die Sperrkugel (23) an mehreren Orten innerhalb des Zünders (2) zwischen Schultern (18, 19, 20) und Rampen (17) unterschiedlicher Nuten (14, 15, 16) eingeklemmt werden kann.



AN IMPACT FUSE WITH FORE-BORE SAFETY

The invention relates to an impact fuse with fore-bore safety.

Such a fuse is known from German Patent 24 26 838. A percussion
needle stationary in the fuse has associated therewith an impact body
5 which is guided to slide in the projectile's direction of flight and
bears a percussion cap. This impact body is locked in the positions of
transport and firing in the fuse casing with the aid of locking spheres
which move out of their position of locking after the firing and, hence,
release the impact body. When the projectile hits a target, the impact
10 body under the influence of its inertia slides toward the percussion
needle, whereby the percussion cap is detonated. In order to prevent
unintentional detonation in the immediate vicinity of the point of
firing, in the impact body there is provided a groove forwardly opening
in the direction of flight, with at least one blocking sphere supported
15 therein. Facing the open end of the groove there is disposed a shoulder
stationary in the fuse, with an adjacent space accommodating the sphere.
During the acceleration upon firing the projectile, the blocking sphere
is pressed onto the bottom of the groove. After the impact body has been
released as the projectile emerges from the barrel, the acceleration of
20 firing ceases. The projectile is slowed down by air resistance. Due to
the influence of the initial acceleration, the sphere, which does not
experience such air resistance, moves in its track toward the shoulder
and then enters into a retaining space. The time span required by the
sphere for this process can be adjusted by appropriately dimensioning the
25 track. In the event that the projectile hits an obstacle within the
region of fore-bore safety, the impact body shoots toward the percussion
needle but the blocking sphere is jammed between the impact body and the
shoulder so that detonation is prevented. Detonation can occur only when
the blocking sphere has finally entered its retaining space.

30 The distance of fore-bore safety which can be attained with this
proximity fuse is in the range of one meter or slightly more. True, this
distance can be adjusted by extending the track, but this can be effected
only very imprecisely due to friction of the sphere between the groove
and the cylinder housing.

35 The problem underlying the invention is to create an impact fuse of
the type under consideration, which makes it possible to increase the



fore-bore safety distance and to set it in dependable fashion to well-defined values.

Accordingly, there is disclosed herein an impact fuse with fore-bore safety for a projectile, comprising;

- 5 an impact fuse,
 a percussion needle extending generally in the direction of flight of the projectile and stationarily disposed within the impact fuse,
 an impact body being slideably mounted to the percussion needle,
 an annular track defined between an external surface of the impact
10 body and an internal surface of the impact fuse, the track comprising stepped annular surfaces generally parallel to the percussion needle, the surfaces being interconnected by tapered annular ramp portions, and a blocking sphere located within the track, the blocking sphere being adapted to be positively deflected along the track so as to provide means
15 by which a fore-bore safety distance may be adjusted.

Typically, the track for the blocking sphere stepped, wherein the sphere is positively deflected around the steps and, hence, the fore-bore safety distance can be adjusted. Owing to the deflection of the blocking spheres at the individual shoulders, the sphere's movement in the course
20 of time from the initial position to the retaining space can be very precisely determined.

A preferred form of the present invention will now be described by way of example with reference to the accompanying drawings, wherein:

Fig. 1 is a cross section of a projectile's nose comprising a
25 proximity fuse according to the invention;

Fig. 2 is a cross section of the projectile's nose comprising the proximity fuse in the blocked position.

In the nose of a mortar practice cartridge 1 there is mounted an impact fuse 2 comprising a percussion needle 3 stationary in the fuse and
30 an impact body 4 in which a percussion cap 5 for detonating a smoke detonator 6 shown only schematically is inserted. The impact body 4 is mounted to slide in the enclosing casing of the projectile and provided with a head 7 tapering in steps toward the front. In this head 7 there is provided a central bore 8 into which the percussion needle 3
35 protrudes. In the region adjacent the casing of the projectile, the impact body 4 is retained by two blocking spheres 9 which enter into bores 10 penetrating the casing and into recesses 11 on the impact

body 4. The projectile 1 is housed in a cartridge case 12, with a readily destroyed cover 13, e.g., a foil of plastic, paper or metal, situated between the cartridge case 12 and the blocking spheres 9.

Head 7 of impact body 4 has neighbouring annular surfaces 14, 15 and 16 separated by ramps 17. The inner wall of the projectile casing is shaped to be approximately parallel to this step structure, with an inwardly pointing shoulder 18 provided at the open end of the first annular groove 14, another shoulder 19 provided at the open end of the second annular groove 15, and a shoulder 20 provided at the open end of the annular groove 16. This shoulder 20 is followed by a retaining space 21. The free space between the head 7 of the impact body and the inner projectile wall forms a track 22 for a locking sphere 23.

When mortar practice cartridge 1 is fired, cartridge case 12 stays in the discharge means but does not damage cover 13. Locking sphere 23 is pressed onto the bottom of the first groove 14, as shown in Figure 1. When the projectile has left the mortar, the air resistance has a braking effect on the projectile but not on the blocking sphere 23. The latter travels on its track 22 toward retaining space 21 while the projectile is in flight, even in the case of a steep flight path. Blocking sphere 23 reaches retaining space 21 after the projectile has travelled about 15 m. When, subsequently, the projectile hits a target, impact body 4 rushes forward on impact, pressing the two locking spheres 9 out of their recesses 11 and flinging them out into the air by destroying cover 13. Impact body 4, which is now released, hits with the percussion cap on the tip of the percussion needle 3 so that the backward blast jet can ignite the smoke-blast charge 2.

However, if the projectile 1 hits an obstacle still during the time span within which blocking sphere 23 travels over its track 22, impact body 4 likewise shoots forward yet the blocking sphere 23 is clamped between a shoulder on the inner wall of the casing and a ramp 17 on the head 7 of the impact body. The solid lines of Figure 2 denote a position in which the sphere is blocked between the second shoulder 19 and the ramp 17, between annular grooves 14 and 15. The positions of the annular grooves and of the shoulders can be chosen so that, for example, such a position of blocking arises when the projectile hits an obstacle at a distance of about 5 - 8 m from the muzzle of the mortar. A blocking position of the blocking sphere between the first shoulder 18 and the

- 4 -

ramp of the groove 14 is denoted by 23-1, which groove becomes effective at a distance of about 1 m before the muzzle. The blocking position of the blocking sphere, denoted by the dashed lines 23-2, becomes effective at a distance of about 8 - 12 m before the muzzle of the mortar.

- 5 Detonation is possible only when the blocking sphere is situated inside the retaining space 21, i.e., after a flight path of more than 12 m, as indicated by 23-3 in Figure 2.

TMS/28731



The claims defining the invention are as follows:

1. An impact fuse with fore-bore safety for a projectile,
comprising;

an impact fuse,

5 a percussion needle extending generally in the direction of flight
of the projectile and stationarily disposed within the impact fuse,
an impact body being slideably mounted to the percussion needle,
an annular track defined between an external surface of the impact
body and an internal surface of the impact fuse, the track comprising
10 stepped annular surfaces generally parallel to the percussion needle, the
surfaces being interconnected by tapered annular ramp portions, and
a blocking sphere located within the track, the blocking sphere
being adapted to be positively deflected along the track so as to provide
means by which a fore-bore safety distance may be adjusted.

15 2. The impact fuse of claim 1 wherein said tapered portions taper
inwardly towards the direction of flight of the projectile.

3. The impact fuse of claim 1 or claim 2 wherein the impact body
is provided with a bore within which the percussion needle is guided.

20 4. An impact fuse substantially as hereinbefore described with
reference to the accompanying drawings.

DATED this TWENTIETH day of AUGUST 1991

Nico-Pyrotechnik Hanns-Jurgen Diederichs GmbH & Co. KG

Patent Attorneys for the Applicant
SPRUSON & FERGUSON

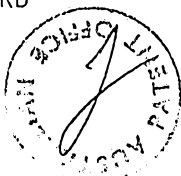


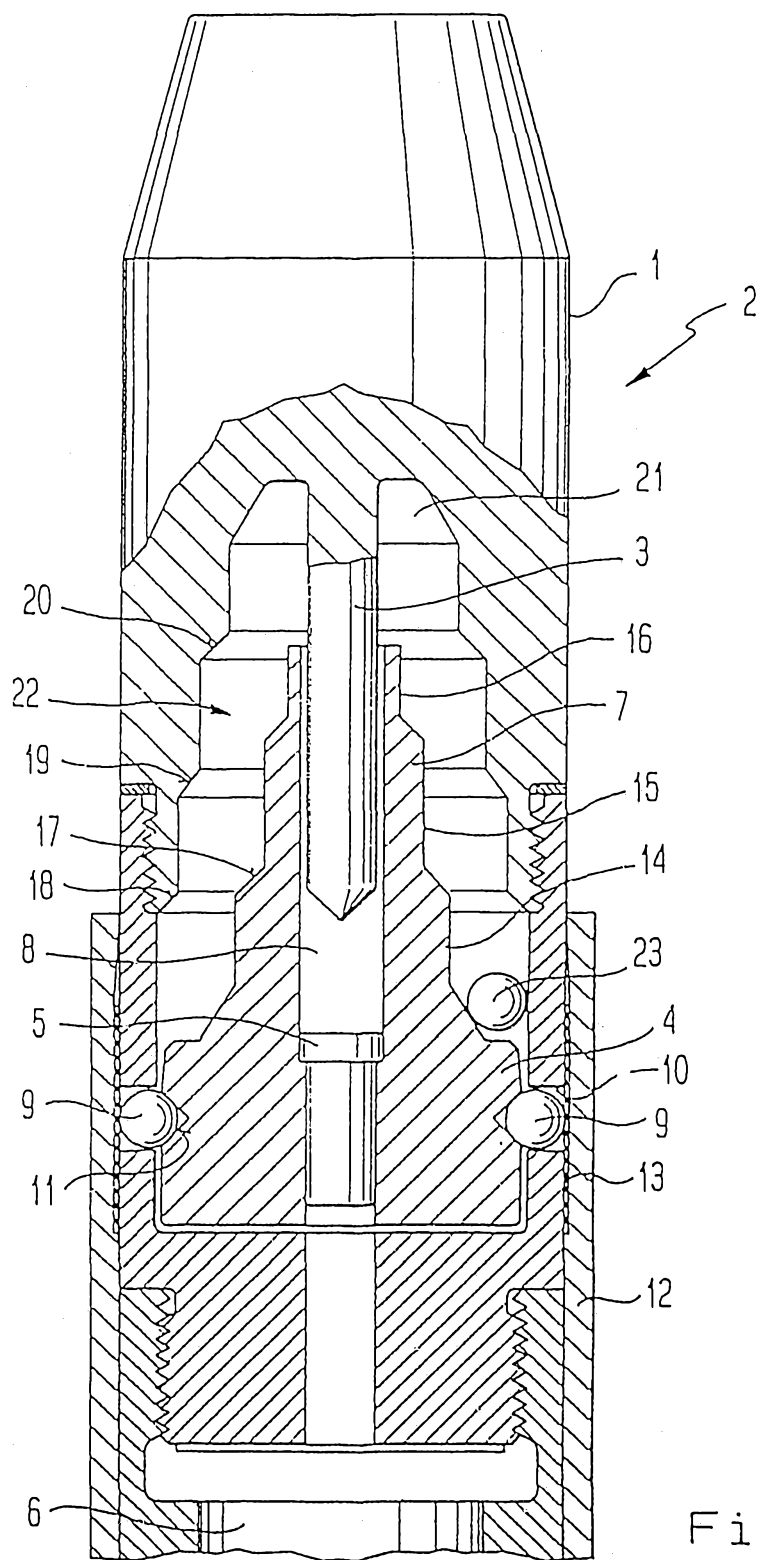
A b s t r a c t

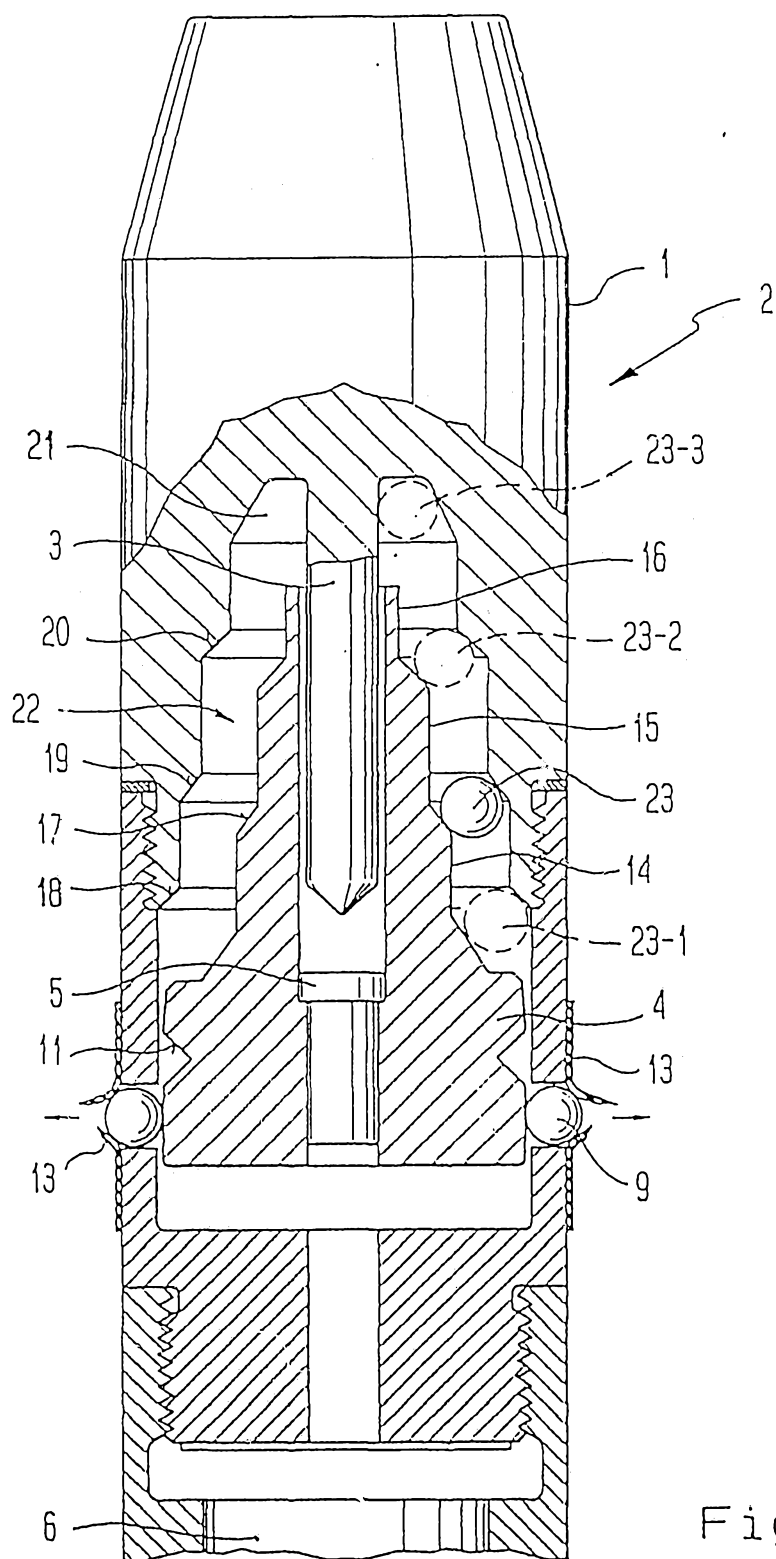
The invention relates to a proximity fuse (2) with fore-bore safety for a projectile (1), comprising a percussion needle (3) arranged in a stationary position in the fuse, an impact body (4) which encloses a percussion cap (5) and is mounted to slide in the direction of the projectile's path of flight, and a track for a blocking sphere (23) between the impact body and the inner wall of the fuse casing, which blocking sphere, upon premature impact on an obstacle, is clamped on its track (22) between a shoulder (18, 19, 20) on the inner wall of the casing and a ramp (17) of a groove (14, 15, 16) on the impact body (4) and, hence, prevents detonation. In order to facilitate the adjustment of well-defined distances of fore-bore safety, it is proposed, in accordance with the invention, to give the track (22) for the blocking sphere (23) the shape of steps so that the blocking sphere (23) can be clamped at a plurality of places inside the fuse (2), between shoulders (18, 19, 20) and the ramps (17) of various grooves (14, 15, 16).

Figure 2.

231z/JRB







INTERNATIONAL SEARCH REPORT

International Application No PCT/DE 89/00533

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl.⁵ F 42 C 15/24, F 42 C 1/04

II. FIELDS SEARCHED

Minimum Documentation Searched *

Classification System | Classification Symbols

Int.Cl.⁵ | F 42 C

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched *

III. DOCUMENTS CONSIDERED TO BE RELEVANT *

Category * | Citation of Document, ** with indication, where appropriate, of the relevant passages ** | Relevant to Claim No. **

A	FR, A, 989525 (ROSSELET) 10 September 1951, see page 1, left hand column, paragraphs 3 and 4; right hand column, paragraphs 2-4 and 9; page 2, left hand column, paragraphs 1-8, right hand column, paragraphs 10 and 11; page 3, left hand column, paragraphs 1-4; right hand column, paragraph 8; figures 1-7	1
A	BE, A, 475670 (ENERGA) 30 September 1947, see page 3, lines 1-6; page 11, lines 3-32; page 12, lines 1-9; figures 1-7, 8-10	1,5
A	FR, A, 690879 (PANTOFLICEK) 26 September 1930, see page 1, lines 1-37; page 2, lines 12-73; page 4, lines 16-37; figures 1-5, 11	1
A	DE, A, 2426838 (NICO-PYROTECHNIK) 2 January 1976, see page 6, figures 1-4 (cited in the application)	1

* Special categories of cited documents: **

"A" document defining the general state of the art which is not
considered to be of particular relevance

"E" earlier document but published on or after the international
filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or
other means

"P" document published prior to the international filing date but
later than the priority date claimed

"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

"X" document of particular relevance: the claimed invention
cannot be considered novel or cannot be considered to
involve an inventive step

"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 docu-
ments, such combination being obvious to a person skilled
in the art.

"A" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

2 November 1989 (02.11.89)

Date of Mailing of this International Search Report

12 December 1989 (12.12.89)

International Searching Authority

European Patent Office

Signature of Authorized Officer

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.

DE 8900533
SA 30483

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 28/11/89
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A- 989525		BE-A- 488825 CH-A- 279334 GB-A- 677901 US-A- 2650541	
BE-A- 475670		BE-A- 510153 CH-A- 264011 CH-A- 268198 CH-A- 289732 DE-C- 850418 DE-C- 877573 DE-C- 892871 FR-A- 954538 GB-A- 620875 GB-A- 711928 LU-A- 31364 NL-C- 69639 NL-C- 82408 NL-B- 168600 US-A- 2595757 US-A- 2778310	
FR-A- 690879		FR-E- 40639	
DE-A- 2426838	02-01-76	BE-A- 829689 CH-A- 595611 JP-A- 50159200 SE-C- 427875 SE-A- 7506186 US-A- 3995556	15-09-75 15-02-78 23-12-75 18-08-83 05-12-75 07-12-76

ANHANG ZUM INTERNATIONALEN RECHERCHENBERICHT ÜBER DIE INTERNATIONALE PATENTANMELDUNG NR.

DE 8900533

SA 30483

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben.

Die Angaben über die Familienmitglieder entsprechen dem Stand der Datei des Europäischen Patentamts am 28/11/89

Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

Im Recherchenbericht angeführtes Patentdokument	Datum der Veröffentlichung	Mitglied(er) der Patentfamilie	Datum der Veröffentlichung
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		GB-A- 677901	
		US-A- 2650541	

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		CH-A- 264011	
		CH-A- 268198	
		CH-A- 289732	
		DE-C- 850418	
		DE-C- 877573	
		DE-C- 892871	
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		GB-A- 711928	
		LU-A- 31364	
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		NL-C- 82408	
		NL-B- 168600	
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		US-A- 2778310	

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		JP-A- 50159200	23-12-75
		SE-C- 427875	18-08-83
		SE-A- 7506186	05-12-75
		US-A- 3995556	07-12-76

Für nähere Einzelheiten zu diesem Anhang : siehe Amtsblatt des Europäischen Patentamts, Nr.12/82