Abstract: A multilingual external defibrillator is operable by a rescuer during a rescue to select one of several available languages for prompting. Following issuance of a first prompt in the default language, a second prompt is issued in a second language which instructs the user to actuate a specified control of the defibrillator to select the second language for prompting. If the user responds by actuating the specified control within a predetermined period of time following the second prompt, the defibrillator switches subsequent prompts in the second language. Alternatively and optionally, if the user successfully performs the action instructed by the first prompt, the defibrillator continues to issue subsequent prompts in the first language. If the user inadvertently switches to the second language, the user is optionally given an additional period of time to actuate a control of the defibrillator to revert to prompting in the first language.
This invention relates to an external defibrillator whose language of operation can be easily changed when the defibrillator is deployed for use.

Sudden cardiac arrest ("SCA") most often occurs without warning, striking people with no history of heart problems. It is estimated that more than 1000 people per day are victims of sudden cardiac arrest in the United States alone. SCA results when the electrical component of the heart no longer functions properly causing an abnormal sinus rhythm. One such abnormal sinus rhythm known as ventricular fibrillation ("VF") is caused by abnormal and very fast electrical activity in the heart. As a result, the heart fails to adequately pump blood through the body. VF may be treated by applying an electric shock to a patient's heart through the use of a defibrillator. Defibrillators include manual defibrillators, automatic or semi-automatic external defibrillators ("AEDs"), and defibrillator/monitor combinations. The shock from the defibrillator clears the heart of abnormal electrical activity (in a process called "defibrillation") by producing a momentary asystole and an opportunity for the heart's natural pacemaker areas to restore normal rhythmic function. However, quick response after the onset of VF is critical because there is an increased likelihood that a patient will not be resuscitated or will suffer irreversible brain damage when the heart has not been pumping blood for more than a few minutes.

In the past defibrillators were exclusively used in hospitals and by emergency medical personnel with extensive training in the use of defibrillators and the resuscitation of individuals stricken with SCA. But over the last several years defibrillators have become more portable and have begun moving into the hands of individuals who initially make contact with a person suffering from VF but who have little or no formal medical training. AEDs are now available for purchase in the United States by anyone. As a result, equipment that was once available only in the hospital environment and operated by medically trained personnel is now being used in non-hospital environments by police officers, flight attendants and security guards, to name a few, as part of a first-line action in the administration of first aid. The benefit of making this equipment available is that it is more likely that a victim of SCA will receive the life-saving shock within the first few
critical minutes of VF. Of course, with little or no medical training, the individuals who first make contact with a patient need to be instructed on the use of the defibrillator to deliver shock therapy while they are using it for rescue. These defibrillators are often designed to operate nearly automatically and with little user intervention, often providing voice and text prompts to a medically untrained user on the operation of the defibrillator. Providing voice and text prompts for a user on the operation of a defibrillator reduces the amount of time necessary for the user to review protocols or operating instructions prior to using the defibrillator. Thus, a medically untrained individual first on the scene of an SCA incident can administer therapeutic shock to a patient in a short period of time.

As previously discussed, currently available external defibrillators often display instructions, status information or other information to assist the defibrillator operator on the operation of the defibrillator. Some external defibrillators announce such information audibly through a speaker, either in addition to displaying information or instead of displaying information. In areas where more than one language is commonly spoken, not necessarily with equal proficiency, there is a need to have a defibrillator that adapts the language of the aural prompts in response to the user’s indication of language proficiency. This need is especially acute for defibrillators which are deployed in public areas, where there is no prior knowledge of which language a rescuer might speak. There are a number of locales where the need for a multilingual defibrillator is especially acute. The southern United States, for example, has a large number of people who speak exclusively English or exclusively Spanish. French Canada also has a population which may speak exclusively English or exclusively French. In Europe, many European languages coexist in a small area, increasing the likelihood of a rescuer who speaks a different language than the language set up on the defibrillator.

As a result, external defibrillators have been developed that can provide audible instructions and information on the operation of the defibrillator in different languages. These defibrillators are pre-programmed with audible instructions for more than one language from which audible instructions for one language are selected. Selection of the language in which the audible instructions and information are provided is typically made
prior to deployment of the defibrillator during setup of the unit through button controls on
the front panel of the defibrillator or through user responses to defibrillator prompts that are
made during the operation of the defibrillator. See, for example, US Pat. 6,154,673
(Morgan et al.) and US Pat. 6,611,708 (Morgan et al.)

While audible instructions on the operation of a defibrillator may be available
from the defibrillator in different languages, the selection process for choosing which one
of the languages in which to receive audible instructions can be distracting to a layperson
rescuer, and also takes time to do. During a high stress rescue, any additional time or
attention away from the task of applying rapid defibrillation to a patient only reduces the
chance of success. Therefore, there is a need for a multilingual defibrillator in which the
language for instruction can be selected quickly and with little interference with the rescue
of the patient. It is further desirable to be able to recover quickly if the rescuer makes an
unwanted language choice.

The present invention is directed to a multilingual defibrillator capable of
providing audible and/or visual prompts for the operation of the defibrillator in one of
several language choices. A defibrillator is programmed to operate in a first (default)
language. At the outset of the rescue the rescuer is prompted in a second language to take
an action, such as pressing a button on the defibrillator, to select the second language for
prompting. If the rescuer takes the specified action the defibrillator continues the rescue in
the second language. If the rescuer does not take the specified action within a
predetermined time period the rescue continues in the default language. In accordance with
a further aspect of the present invention, the user is given an opportunity to revert to the
default language if the second language was inadvertently selected.

In the drawings:

Figure 1 is a perspective view of an external defibrillator according to an
embodiment of the present invention.

Figure 2 is a flowchart of a procedure for selecting the language of a
defibrillator in accordance with the principles of the present invention.
[012] Figure 4 is a more detailed block diagram of a defibrillator constructed in accordance with the present invention.

[013] Figure 5 is a more detailed flowchart of a procedure for selecting the language of a defibrillator in accordance with the principles of the present invention.

[014] Figure 6 is a perspective view of an AED constructed to operate in accordance with a further aspect of the present invention.

[015] Figure 7 is a flowchart of a process for correcting an inadvertent language selection in accordance with the present invention.

[016] Several examples of implementations of a defibrillator in accordance with the present invention are described below. In one embodiment an AED is provided with a default language and one alternate language. When the rescue begins, the AED issues a first prompt in the default language. During the following delay period awaiting operator response, an aural instruction issues in a second language, which directs the user to press a button to switch the remaining rescue prompts to the second language. If the button is not pressed, the rescue continues in the default language. In another embodiment an AED is provided with a multi-function information button, which is activated for language selection only during appropriate portions of the rescue. The information button may be lighted to show that it is active. In another embodiment the AED issues an instruction in the second language to press any button of the defibrillator to continue the rescue in the second language. This instruction is given at a time when the user is not being prompted to actuate a button of the defibrillator, such as immediately after a prompt in the default language to open the electrode pad packaging.

[017] Figure 1 illustrates one example of an external defibrillator of the present invention, in which an alternate language selection is enabled in an external defibrillator. This embodiment minimizes the distraction of selecting a second language for the vast majority of users who will retain the default language during rescue. Thus, delay in defibrillation is reduced, and the possibility of rescue error introduced by the language
selection feature is minimized. In Figure 1, an AED 10 is shown in a polymeric case 12 comprised of an upper case half 12a and a lower case half 12b. The AED 10 has an on/off button 14, a shock button 18, a multi-function information button 16, and an operating mode key slot 34. For defibrillation, a pair of electrodes (not shown) is connected to the AED 10 via an electrode socket 22. In this example the AED 10 also has an LCD display 20.

In this example, AED 10 is activated by the user for a rescue by first depressing on/off button 14. An initial aural prompt from speaker 26 begins the rescue. The initial aural prompt may be in the default language, e.g., English, prompting the user to begin rescue by, for example, "removing clothes from patient's chest", or a similar command relating to the particular rescue protocol to be followed. During the subsequent pause for user response, AED 10 issues a command in the alternate language, e.g., Spanish, such as "for [the alternate language], press the information button". The AED then activates information button 16, which begins to flash. If the user responsively presses information button 16, the rescue proceeds with prompts given in the alternate language. If no user response is detected prior to a time-out period, the rescue continues in the default language. Optionally, if a proper user response to the first default language rescue command is detected by AED 10, the rescue continues in the default language. For example, if the initial prompt is "plug electrode connector into the electrode socket" and the AED detects that the electrode connector has been plugged into the socket, the AED will produce all subsequent prompts in the first language, recognizing that the user comprehended the first language prompt and properly carried out the action instructed.

User selection of the alternate language can be input via other means as well, such as with a language key (not shown) inserted into the key slot 34, or by plugging a special set of language-specific electrodes into the socket 22, or by depressing a dedicated language selection key 28. Instead of using the preferred aural prompts, an implementation of the present invention can also or alternatively issue visual prompts on the display 20.

Figure 2 illustrates one sequence of steps for selecting a defibrillator language in accordance with the present invention. In step 50 the rescuer turns on the defibrillator by
depressing the on/off button 14. At step 52 the defibrillator prompts the user in a second language to press a button to select the second language for prompting. After issuing this instruction the defibrillator waits for a time-out period 54 during which a response to the language selection instruction will be acknowledged by a selection. One possibility is that the user presses the button during the time-out period as indicated by step 56. In that case the defibrillator issues all subsequent prompts in the second language at 60 and the rescue continues. Alternatively the user does not press the button at 58 and prompts continue after the time-out period ends and 62. In this case the rescue continues with prompts issued in the first language.

[021] Figure 3 is a functional block diagram of a defibrillator system 200 constructed in accordance with the present invention. The defibrillator system 200 includes an energy source 134 to produce voltage or current pulses. A controller 220 operates an energy delivery system 219 to selectively connect and disconnect energy source 134 to and from a pair of electrodes 216 connected to the defibrillator system 200 through an electrode interface 214. The electrodes 216 can be adhesively attached to a patient 218 to provide electrotherapy to the patient. The defibrillator system 200 may be a manual external defibrillator or an AED.

[022] Controller 220 performs a protocol using information from an instruction generator 222. The instruction generator 222 includes a first memory 224 such as FLASH, EEPROM, ROM or RAM containing software code used to generate visual and/or audible instructions. The instruction generator 222 further includes a second memory 226 for storing software files for various languages in which audible instructions for the operation of the defibrillator 200 are available. In alternative embodiments, the instruction generator 222 may also include a gate array or other control logic. In other embodiments, the first and second memories 224 and 226 are included in a single memory device.

[023] The instructions are delivered to the rescuer via an instruction output 228 which, in the embodiment shown in Figure 1, consists of a visual image generator 20 and an audible sound generator 26. The visual image generator 20 displays, among other things, visual prompts to a user as either written or graphic representations. The visual image
generator 20 may be, for example, a conventional liquid crystal (LCD) display. A second audible sound generator 30 is provided which emits tones such as rhythmic tones with a rate to guide the delivery of CPR compressions. The audible sound generator 26 provides audible commands in a language selected from the software files of the various language files stored in the second memory 226. Audible commands include verbal commands directing the user in the operation of the defibrillator 200.

[024] Activation of the visual image generator 20 and the first and second audible sound generators 26 and 30 is controlled by the controller 220 in response to the information received from the instruction generator 222. The controller 220 and the instruction generator 222 determine the language of the defibrillator instructions provided from the audible sound generator 224. Additionally, user input 236 may interact with the instruction generator 222 to select the desired language for the defibrillator operating instructions. In the embodiment shown in Figure 1, the user input 136 is a button which interacts with the instruction generator 222 via controller 220. In alternative embodiments the user input may interact directly with the instruction generator 122.

[025] Figure 4 is a detailed block diagram of an external defibrillator 100 constructed in accordance with the present invention. In this implementation defibrillator control functions are divided among a microprocessor unit (MPU) 102, an application-specific integrated circuit (ASIC) 104 and a system monitor 106.

[026] MPU 102 performs program steps according to software instructions provided to it from a memory 114 which may comprise one or more of EPROM, RAM and flash ROM memory. MPU 102 controls the operation of certain system LEDs through an LED control circuit 110, including an LED associated with the shock button 18 and the LED associated with a Do Not Touch (shock warn) indicator 324. MPU 102 also receives system status information as shown by block 112, temperature information from the interior of the case 12 from a temperature sensor (not shown), and a signal from a sensor when training pads are plugged into the connector 22. The training pad sensor can be a magnetic sensor associated with connector 22 which senses the field of a small magnet integrated into the connector of a training electrode pad set. The MPU is also responsive to a signal from a
key sensor associated with slot 34 when a mode key is inserted into slot 34 to switch the operation of the AED unit to a pediatric rescue protocol or a language selection key is inserted into the slot to select a specific language as discussed above.

ASIC 104 implements the memory map to system memory 114. ASIC 104 is clocked by a clock 107 and also controls a speaker 26 which delivers audible instructions during use of the AED. ASIC 104 can actuate a relay within the shock delivery and ECG front-end system 124 in response to actuation of the shock button 18 by a user during treatment. ASIC 104 will actuate an LED associated with the information button to signal to the user that information is available and can be accessed by depressing the information button 16. The ASIC also provides the interface to the IR (infrared) data port 24 through which new program information can be loaded into the AED unit and rescue data can be communicated to another data storage or analysis system.

System monitor 106 performs automatic self-tests of the AED and its components. The system monitor 106 controls a status LED 15 to indicate that the self-tests are showing proper system operation, and activates beeper 30 to provide an audible alert when the system is not operating properly. Details of suitable self-tests may be found in US Pat. 5,879,374, to Powers, et al. for "External Defibrillator with Automated Self-Testing Prior to Use," the specification of which is incorporated herein by reference. System monitor 106 is also the defibrillator's interface with the on/off switch 14, the information button 16, and a sensor associated with connector 22 which signals the connection of a specific type of electrode pads 137 to the AED unit. System monitor 106 controls a power management subsystem 132 to provide power to operate system components from power supply 134 and to provide energy to the shock delivery system's capacitor(s) for a therapeutic shock during treatment. System monitor 106 also interfaces with the defibrillator's ECG front end 124, enables the shock delivery system to deliver a shock in response to detection of a patient ECG pattern requiring treatment (and actuation of the shock button 18), and controls delivery of the shock to electrode pad connector 22 in response to shock delivery status information (e.g., patient impedance) obtained prior to or during delivery of the shock. Further information regarding this last function may be found
in US Pat. 5,735,879 to Gliner et al. for "Electrotherapy Method for External Defibrillators," and US Pat. 5,607,454, to Cameron et al. for "Electrotherapy Method and Apparatus," the specifications of which are incorporated herein.

[029] Figure 5 is a flowchart illustrating a detailed procedure for selecting the language of a defibrillator in accordance with the principles of the present invention. At step 50 the rescuer activates an AED to begin a rescue by, for instance, turning on the defibrillator with the on/off button 14. At 64 an initial rescue instruction is issued to the rescuer in a first language, such as "removing clothes from patient's chest". A second prompt is then issued at 52 in a second language, instructing the user to select use of the second language by depressing a language selection button. This button may be a multi-function input such as information button 16, or a dedicated language selection button 28. At 66 the language selection button is activated so that depression of the button will cause a language selection. The language selection button may also be highlighted to the rescuer by causing it to illuminate or blink on and off at this time. The system then monitors the button at 68 for language selection.

[030] At 70, if the second language is selected, the AED continues the rescue at 72 by issuing subsequent prompts in the second language. As the AED is monitoring the language selection button it also monitors (if possible) for a response by the rescuer to the initial instruction which was issued in the first language. If the response is detected at 74, the language selection button is disabled at 76 for language selection and the rescue continues with prompts given in the first language. If a proper response to the first instruction is not received, the AED continues to monitor the active language selection button until the period for language selection terminates at 80. If the period has not timed out monitoring for language selection continues at 68, but if the period does time out without a language selection the language selection button is disabled at 76 and prompts continue in the first language at 78.

[031] Figure 6 illustrates an AED 300 constructed in accordance with the principles of the present invention in which a multi-function button is used for language selection and a correct response to the first instruction will end the language selection period and continue
the rescue in the initial (default) language. The AED 300 is housed in a rugged polymeric case 12 which protects the electronic circuitry inside the case and also protects the layperson user from shocks. Attached to the case 12 by electrical leads are a pair of electrode pads. In this example the electrode pads are in a sealed in a cartridge 314 located in a recess on the top side of the AED 300. The electrode pads are accessed for use by pulling up on a green-colored release handle 316 which allows removal of a plastic cover over the electrode pads. A small ready light 318 informs the user of the readiness of the AED for a rescue. In this example the ready light blinks after the AED has been properly set up and is ready for use. The ready light is on constantly when the AED is in use, and the ready light is off when the AED needs attention.

[032] Below the ready light 318 is an on/off button 14. The on/off button is pressed to turn on the AED for use. To turn off the AED a user holds the on/off button down for one second or more. An information button 16 flashes when information is available for the user or the information button is available for language selection. The user depresses this multi-functional button to access the available information and can depress it during the timed period for language selection as illustrated in the previous flowchart. A caution light 324 blinks when the AED is acquiring heartbeat information from the patient and lights continuously when a shock is advised, alerting the rescuer and others that no one should be touching the patient during these times. Interaction with the patient while the heart signal is being acquired can introduce unwanted artifacts into the detected ECG signal. A shock button 18 is depressed to deliver a shock after the AED informs the rescuer that a shock is advised. An infrared port 24 on the side of the AED is used to transfer data between the AED and a computer. This data port find used after a patient has been rescued and a physician desires to have the AED event data downloaded to his or her computer for detailed analysis. A speaker 26 provides voice instructions to a rescuer to guide the rescuer through the use of the AED to treat a patient. A beeper 30 is provided which "chirps" when the AED needs attention such as electrode pad replacement or a new battery.

[033] In use, after the user turns on the AED 300, an initial prompt is issued which instructs the rescuer in a first language to "pull up on green handle [316] to release the
electrode cartridge." Immediately thereafter a second prompt is issued in a second language to "depress the flashing information button [16] to select [the second language]." If the rescuer responds to the first prompt (issued in the first language) by pulling up the handle 316, the AED continues to issue prompts in the first language, recognizing that the rescuer responds correctly to an instruction in the first language. The AED can detect that handle 316 was pulled by, for instance, a spring-loaded switch located below the handle or at the handle hinge which opens or closes automatically when the handle 316 is pulled up. However if the rescuer responds to the second prompt by depressing the flashing multi-function information button to select the second language, the AED issued subsequent prompts in the second language. If neither of these events occurs and the period for language selection times out, the AED continues the rescue in the first language and reissues the first prompt (and, optionally, the second prompt) until the rescuer pulls up the handle 318 to access the electrode pads (or selects the second language).

[034] In accordance with a further aspect of the present invention, it is also possible to enable the rescuer to revert to the first (default) language if the second language was inadvertently selected. Following the change to the second language at 72 (Figure 5), a prompt may be issued in the first (default) language at 91a, instructing the rescuer to "depress the flashing information button [16] to continue in [the first language]." As shown at 82 in Figure 7, prompts will continue in the selected second language but the language selection (information) button is activated for a period of time to allow it to be depressed for a return to prompting in the first language. The AED monitors for reversion to the first (default) language at 84, but if the language reversion period times out at 90 without depression of the button, the rescue continues at 92 with prompts in the second language. However, if the button is depressed at 86 to revert to the first language, the AED reverts to the first language at 88 and disables the language selection button at 76. Prompting then continues in the first language.

[035] Referring back to the description of the AED of Figure 6, one scenario in which reversion may be necessary is as follows. Suppose that the rescuer was fluent in the first language but not the second, and responded to the first prompt in the first language by
correctly pulling the handle 316 to release the electrode pad cartridge 314. While doing this, the AED would issue the language change prompt in the second language. However, the rescuer, being otherwise engaged with releasing the electrode pad cartridge, may not hear this prompt or, if heard, may not understand it. The rescuer might then see that the information button is flashing and, thinking that this is a signal that the AED wants to issue useful information, depresses the information button. However, the information button may still be in the language selection period and the flashing is indicating the button for language selection, not information. The AED would thus be inadvertently switched to the second language. But a prompt to return to the first language and the sequence of Figure 7 will enable the rescuer to quickly revert to the first language (or a rescuer fluent in the second language to continue with the rescue) with little time lost.

Variations of the foregoing will readily occur to those skilled in the art. For instance, the defibrillator may operate with more than just a first and second language, for instance. The present invention may in those circumstances be implemented to enable selecting from more than one alternate language choice. As another example, the user control which the user is instructed to actuate to select the alternate language may comprise several or even all of the user controls of the defibrillator. For instance the user may be instructed to press any button on the defibrillator to select the alternate language for subsequent prompting. The defibrillator would then respond to the depression of any button during the language selection period by selecting the alternate language.
CLAIMS

1. An external defibrillator for delivering electrotherapy to a patient, comprising:
   a memory storing data representative of instruction information related to operation of the defibrillator in a first language and a second language;
   a controller coupled to the memory to selectively retrieve the data representative of the instruction information in the first language or the second language;
   an output device coupled to the controller which issues prompts in a selected language;
   a control sequence, operable by the controller, which causes the controller and the output device to issue a prompt in a second language instructing a user to select the second language by operating a specified user control of the defibrillator,
   wherein operation of the specified user control within a predetermined period of time causes the controller and the output device to issue subsequent prompts in the second language.

2. The external defibrillator of claim 1 wherein the output device comprises a speaker and wherein the prompt comprises an aural prompt.

3. The external defibrillator of claim 2 wherein the first language comprises a default language for the defibrillator; and
   wherein the control sequence is further operable to cause the controller and the output device to issue a first prompt in the first language instructing the user to perform an action.
4. The external defibrillator of claim 3, wherein performance of the action causes the controller and the output device to issue subsequent prompts in the default language.

5. The external defibrillator of claim 1 wherein the specified user control of the defibrillator comprises a multi-functional control which is used for another function in addition to language selection.

6. The external defibrillator of claim 5 wherein the multi-function control is activated for language selection during the predetermined period of time.

7. The external defibrillator of claim 6 wherein the multi-function control is highlighted during the predetermined period of time.

8. The external defibrillator of claim 7 wherein the predetermined period of time immediately follows the issuance of the prompt in the second language.

9. The external defibrillator of claim 1 wherein the specified user control of the defibrillator further comprises a user control which is used only for language selection.

10. The external defibrillator of claim 1 wherein, following operation of the specified user control to cause the controller and the output device to issue subsequent prompts in the second language, the specified user control is responsive to user manipulation to cause the controller and the output device to issue subsequent prompts in the first language.
11. The external defibrillator of claim 10, wherein the specified user control is responsive to user manipulation for a second predetermined period of time to cause the controller and the output device to issue subsequent prompts in the first language.

12. The external defibrillator of claim 11, wherein the control sequence is further operable, following operation of the specified user control to cause the controller and the output device to issue subsequent prompts in the second language, to cause the controller and the output device to issue a prompt in the first language instructing the user to select the first language by operating the specified user control.

13. A method of selecting one of a plurality of available languages for prompting by an external defibrillator comprising:

   turning on the defibrillator;

   issuing a prompt by the defibrillator in a second language instructing a user to select the second language by operating a specified user control of the defibrillator; and

   using the second language for prompting in response to operating of the specified user control of the defibrillator within a predetermined period of time.

14. The method of claim 13, further comprising:

   issuing a first prompt in a first language instructing the user to perform an action.

15. The method of claim 14, further comprising:

   issuing subsequent prompts in the first language following performance of the action.
16. The method of claim 13, further comprising:

enabling the specified user control for language selection during the predetermined period of time,

wherein the specified user control is operable for a use other than language selection during another period of time.

17. The method of claim 13, further comprising:

following selection of the second language by operation of the specified user control, enabling the specified user control for selection of a first language.

18. The method of claim 17, further comprising:

issuing a prompt by the defibrillator in the first language, in conjunction with enabling the specified user control for selection of the first language, to select the first language by operating the specified user control.

19. The method of claim 17 wherein the specified user control is enabled for selection of the first language for a second predetermined period of time.

20. The method of claim 1, wherein the output device comprises at least one of an audio speaker and a visual display.
FIG. 3
# A. CLASSIFICATION OF SUBJECT MATTER

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)

A61N

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 practical, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<td>WO 2006/016288 A (KONINKL PHILIPS ELECTRONICS NV [NL]; HALSNE ERIC [US])</td>
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* Further documents are listed in the continuation of Box C.  

* See patent family annex.

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| * 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 |
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| '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 |
| 'S' document member of the same patent family |

Date of the actual completion of the international search: 15 February 2008

Date of mailing of the international search report: 26/02/2008

Name and mailing address of the ISA/

Scheffler, Arnaud

International application No

PCT/IB2007/054500
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