Title: AUTOMATIC APPLICATOR, PARTICULARLY FOR INSULIN

Abstract: An automatic applicator particularly for insulin, more particularly for multiple injection application of set doses of a medicine from an exchangeable container, comprising a body housing (1) connected to a housing (3) of an exchangeable container (3,1) with a medicine, particularly insulin, expelled by a piston connected to a plunger (6) and displaced linearly by means of a leading and blocking driving unit driven via a double clutch unit by a tensioning spring (17) situated in the body housing (1), tensioned by a rotary hand-dose-setting ring (5) also via a double clutch unit, wherein a leading and blocking driving unit is activated by a trigger unit (4) and a displaceable indicating cylinder (14) is situated on the tensioning spring holder (13), according to the present invention characterised in that the double clutch unit comprises a clutch plate (9) coupled co-axially with a body of the ratchet plate (8) and coupled with paws (8,4) having catches (8,2) meshed disengagingly with a gear ring (7,1) of a driving nut (7).
Automatic applicator, particularly for insulin

The field of the invention

The present invention concerns an automatic applicator for liquid pharmaceutical preparations, particularly for insulin, more particularly for multiple injection application of set doses of a medicine from an exchangeable container, for example for the self-application of insulin by diabetes patients.

The state of art

The European patent EP 0 338 806 B1 (Holman and Marchall) teaches a syringe comprising a body, a dose-setting device in the form of a rotary cap or ring mounted on the body and capable of being moved to a selected set position where a latch is arranged to retain the setting device in hat set position, the movement of the setting device being accompanied by straining of a spring, which, when the latch is released, provides the force for expelling the set dose, characterised by means arranged to release the latch, which causes the return of the setting device to an original position to drive a plunger through a one-way clutch to expel the set dose; and by a quick pitch screw thread arrangement capable of transforming rotation of the setting device into linear movement of the plunger.

Also Polish patent application P 341 395 teaches a syringe for distribution of set doses of a medicine from a cartridge containing the amount of the medicine sufficient to prepare several treatment doses, comprising a housing, a piston rod having noncircular cross-section and an external screw thread, a piston rod drive arrangement comprising two elements, i.e. piston rod leaders and a nut with an internal screw thread corresponding to the piston rod external screw thread, as well as a dose-setting mechanism comprising non-self-blocking screw thread connection, along which an injection push-button is unscrewed from the nearer housing end, causing rotation of the dose-setting element. This syringe is characterised in that between the nut and the piston rod leaders there is unidirectional coupling enabling the rotation of both these parts in one direction but not in the opposite direction, wherein the allowed rotation is the only one, by means of which the piston rod is moved in the circumferential direction in the syringe. The coupling is designed in such way that the initial resistance, sufficient to resist the torque exerted on the coupling by setting a dose, has to be overcome to allow rotation.
The main disadvantage of the known devices is lack of the precisely controlled reduction of the erroneously set an overly big dose.

The above discussed syringe for manual application of a medicine requires from a patient the manual adjustment of the pressure force on the injection push-button, which defines the speed of the injection. This causes additional stress and discomfort at application. An additional disadvantage is a complex arrangement to transform the linear displacement of the injection push-button into the linear displacement of the piston rod by means of the rotary movement of the nut. Other disadvantages of a syringe for an application of a medicine using a tensioned spring comprise the lack of an indicator device, failure prone construction of the trigger device, which does not ensure a reliable nut blocking, and the lack of an external leader for the tensioned spring.

**Aims of the invention**

The main aim of the present invention concerning an automatic applicator particularly for insulin, more particularly for multiple injection application of set doses of a medicine from an exchangeable container, is to ensure a capability of the precisely controlled reduction of the erroneously set an overly big dose, preserving an automatic stressless application of the medicine.

The second aim of the invention is to ensure an external leader for the tensioned spring.

The third aim of the invention is to ensure a reliable nut blocking, by means of a reliable construction of a trigger device, preserving an automatic application of the medicine.

The fourth aim of the invention is to ensure an indicator device, preserving an automatic application of the medicine.

**The summary of the invention**

The main goal of the present invention has been achieved by an automatic applicator particularly for insulin, more particularly for multiple injection application of set doses of a medicine from an exchangeable container, comprising a body housing connected to a housing of an exchangeable container with a medicine, particularly insulin, expelled by a piston connected to a plunger and displaced linearly by means of a leading and blocking driving unit driven via a double clutch unit by a tensioning spring situated in the body housing, tensioned by a rotary hand-dose-setting ring also via a double clutch unit, wherein a leading and blocking driving unit is activated by a
trigger unit and a displaceable indicating cylinder is situated on the tensioning spring holder. According to the present invention the said automatic applicator is characterised in claim 1 in that the double clutch unit comprises a clutch plate coupled co-axially with a body of the ratchet plate and coupled with pawls having catches meshed disengagingly with a gear ring of a driving nut.

The novel construction of the double clutch unit, in the form of a positive clutch combined with a unidirectional and reversible ratchet coupling, enables the precisely controlled reduction of the erroneously set an overly big dose, preserving an automatic stressless application of the medicine.

Advantageously the clutch plate is rigidly connected to the clutch sleeve rigidly connected to the rotary hand-dose-setting ring by means of a plug, and the body of the ratchet plate is rigidly connected to the tensioning spring holder, which allows for slackless transmission of the rotary movement of the rotary hand-dose-setting ring to the tensioning spring holder.

Advantageously the clutch plate is coupled co-axially with the body of the ratchet plate by means of, advantageously, three ratchet plate body tongues situated in bean shaped clutch plate cuts. Such connection allows for a slight mutual displacement of coupled elements, within the range defined by the length of the bean shaped clutch plate cuts, while rotating anti-clockwise the rotary hand-dose-setting ring. Additionally, the clutch plate is coupled co-axially, advantageously, with three pawls of the ratchet plate by means of three pawl tongues placed in the oblique grooves of the clutch plate. Such connection allows for the precise, controlled disengaging of the catches meshed with the gear ring of the driving nut.

The second goal of the present invention has been achieved by an automatic applicator variant wherein the tensioning spring is mounted, from the needle side, in the tensioning spring holder having the form of a sleeve casing rigidly connected to the body of the ratchet plate, wherein, advantageously, the tensioning spring is mounted, from the rotary hand-dose-setting ring side, in a spring blocking rigidly connected with the body housing.

Besides, advantageously, the leading and blocking driving unit comprises a plunger rod leading and blocking disc and a driving nut separated by a disengaging spring. This enables hand backing of the plunger by screwing it into the nut, in such way that it protrudes slightly from the housing and allows the new container, e.g. with insulin, to be inserted.
Advantageously, the plunger rod leading and blocking disc is blocked at the body housing gear ring, to which it is pressed by the sleeve casing of the exchangeable insulin container, ensuring its reliable positioning at application.

The third goal of the present invention has been achieved by an automatic applicator variant, in which the trigger unit constitutes a two-element trigger with a key displaced in the body housing groove and with lower driving nut blocking gear ring fixed to both trigger elements. Such construction ensures reliable blocking of the driving nut at its all circumference.

Advantageously, the two-element trigger, from the rotary hand-dose-setting ring side, is deflected from the body housing and is provided with friction notches on its external surface, which ensures its ergonomic performance and non-slippery application.

The fourth goal of the present invention has been achieved by an automatic applicator variant, in which the displaceable indicating cylinder, situated on the tensioning spring holder, is mounted slidingly, co-axially, in the tensioning spring holder groove and has a screw groove on its external surface mated with the internal screw thread of the body housing. Such construction provides for the dosage scale, displaced suitably at the dose-setting, to be well visible through a dose-setting inspection window, wherein it is possible to extend the scale even to 60 units.

**Description of the drawings**

The present invention has been presented in detail, in the advantageous example of its embodiment, in the drawings, where

Fig. 1 presents the longitudinal section of the automatic applicator, without an exchangeable container and its casing,

Fig. 2 presents the longitudinal section of the automatic applicator, with an exchangeable container and its casing mounted,

Fig. 2a presents the cross-section A-A of the automatic applicator from the Fig. 2,

Fig. 2b presents the cross-section B-B of the automatic applicator from the Fig. 2,

Fig. 3 presents the automatic applicator in the exploded axonometric end projection,

Fig. 4 presents the double clutch unit of the automatic applicator in the exploded axonometric end projection, and
Fig. 5 presents pictorially the cross-section B-B of the automatic applicator from the Fig. 2, showing the positioning of the elements of the double clutch unit in the six chosen settings, during the rotary movement of the rotary hand-dose-setting ring.

**The embodiment of the invention**

The general construction of the automatic applicator according to the present invention is shown in the drawings Fig. 1, 2, 2a, 2b and 3, wherein, as stated above, Fig. 1 presents the longitudinal section of the automatic applicator, without an exchangeable container and its casing, Fig. 2 presents the longitudinal section of the automatic applicator, with an exchangeable container and its casing mounted, Fig. 2a presents the cross-section A-A of the automatic applicator from the Fig. 2, Fig. 2b presents the cross-section B-B of the automatic applicator from the Fig. 2 and Fig. 3 presents the automatic applicator in the exploded axonometric end projection.

As shown in the figures 1, 2, 2a, 2b and 3, an automatic applicator for liquid pharmaceutical preparations, particularly for insulin, more particularly for multiple injection application of set doses of a medicine from an exchangeable container, comprises the body housing 1, connected to the housing 3 of the exchangeable container 3.1 with a medicine, comprising a rubber piston. The double sided needle 3.2 is screwed onto the housing 3, in such a way as to allow puncturing of the rubber membrane of the exchangeable container 3.1 and an insulin injection. The transparent housing 3 is provided with the masking cover 18 having two windows 3.3, enabling the visual monitoring of the insulin consumption. The needle is protected by the protection cap 2, adapted also to be pressed onto the rotary hand-dose-setting ring 5. The housing 3 is connected to the body housing 1 by means of a double screw thread of a “twist” type.

The insulin is expelled by the plunger 6 connected to the plunger rod 6.1 linearly displaced by means of the leading and blocking driving unit driven via a double clutch unit by the tensioning spring 17 situated in the body housing 1, tensioned by the rotary hand-dose-setting ring 5 also via a double clutch unit, wherein a leading and blocking driving unit is activated by the trigger unit 4 and the displaceable indicating cylinder 14 is situated on the tensioning spring holder 13.

The double clutch, best seen in the Fig. 4, which presents the double clutch unit of the automatic applicator in the exploded axonometric end projection, comprises the clutch plate 9 coupled co-axially with a body of the ratchet plate 8 and coupled with the pawls 8.4 having catches 8.2 meshed disengagingly with the gear ring 7.1 of a driving nut 7.
The clutch plate 9 is rigidly connected to the clutch sleeve 9.3 rigidly connected to the rotary hand-dose-setting ring 5 by means of the plug 12, and the body of the ratchet plate 8 is rigidly connected to the tensioning spring holder 13, which allows for slackless transmission of the rotary movement of the rotary hand-dose-setting ring 5 to the tensioning spring holder 13.

The clutch plate 9 is coupled co-axially with the body of the ratchet plate 8 by means of the three ratchet plate body tongues 8.1 situated in bean shaped clutch plate cuts 9.1. Such connection allows for a slight mutual displacement of coupled elements, within the range defined by the length of the bean shaped clutch plate cuts 9.1, while rotating anti-clockwise the rotary hand-dose-setting ring 5. Additionally, the clutch plate 9 is coupled co-axially with the three pawls 8.4 of the ratchet plate 8 by means of the three pawl tongues 8.3 placed in the oblique grooves 9.2 of the clutch plate 9. Such connection allows for the precise, controlled disengaging of the catches 8.2 meshed with the gear ring 7.1 of the driving nut 7.

The tensioning spring 17 (see Fig. 1 and 3) is mounted, from the side of the needle 3.2, in the tensioning spring holder 13 having the form of a sleeve casing rigidly connected to the body of the ratchet plate 8, wherein, advantageously, the tensioning spring 17 is mounted, from the side of the rotary hand-dose-setting ring 5, in the spring blocking 11 rigidly connected with the body housing 1.

The leading and blocking driving unit (see Fig. 1 and 3) comprises the plunger rod leading and blocking disc 10 and the driving nut 7 separated by the disengaging spring 16. This enables hand backing of the plunger 6 by screwing it into the nut 7, in such way that it protrudes slightly from the housing and allows the new container 3.1, e.g. with insulin, to be inserted.

The plunger rod leading and blocking disc 10 is blocked at the body housing gear ring 1.1, to which it is pressed by the housing 3 of the exchangeable insulin container 3.1, by tooth like cuts 10.1, ensuring its reliable positioning at application.

The driving nut 7 and the plunger rod 6.1 are connected by means of the square thread 6.3 of the plunger rod 6.1 having a large pitch to enable an appropriate insulin dose application. Additionally, the plunger rod 6.1 comprises at least one leading cut 6.2 to allow for the linear leading of the plunger rod 6.1 in the plunger rod leading and blocking disc 10 by means of at least one key 10.2.

The trigger unit 4 constitutes a two-element trigger 4.2 with a key 4.1 displaced in the body housing groove 1.4 and with the gear ring 4.3, for blocking the lower
driving nut blocking gear 7.2, fixed to both elements of the trigger 4.2. Such
construction ensures reliable blocking of the driving nut 7 at its all circumference.

The two-element trigger 4.2 is, from the side of the rotary hand-dose-setting ring
5, deflected from the body housing 1 and is provided with friction notches 4.4 on its
external surface, which ensures its ergonomic performance and non-slippery
application.

The displaceable indicating cylinder 14 with the scale 14.4, situated on the
tensioning spring holder 13, is mounted slidingly, co-axially, in the tensioning spring
holder groove 13.1 by means of the key 14.1 and has a screw groove 14.2 on its external
surface mated with the internal screw thread 1.3 of the body housing 1. Such
construction provides for the dosage scale 14.4 covering 60 units, displaced suitably at
the dose-setting, to be well visible through a dose-setting inspection window 15 against
the arrow of the dose indicator 1.2. Additionally, the displaceable indicating cylinder 14
comprises the dose-setting end indicator 14.3 in the form of a red dot, collaborating
with the dose-setting end indicator window opening 1.6, provided with the dose-setting
end indicator window 19.

The dose-setting is carried out by turning the rotary hand-dose-setting ring 5
clockwise or anti-clockwise. The currently set dose can be seen on the displaceable
indicating cylinder 14 with the scale 14.4 through the dose-setting inspection window
opening 1.5, provided with the dose-setting inspection window 15. The cylinder 14 is
scaled by every unit and the turning of the rotary hand-dose-setting ring 5 is accompanied
by a characteristic clicking at every unit, corresponding to 0.01 ml of insulin. The dose-
setting can be realised up to a single unit, wherein the scale 14.4 visible through the dose-
setting inspection window 15, stops at any value or between the given dose values, as
indicated by the arrow of the dose indicator 1.2 on the housing 1.

Fig. 5 presents pictorially the cross-section B-B of the automatic applicator from
the Fig.2, showing the positioning of the elements of the double clutch unit in the six
chosen settings, during the rotary movement of the rotary hand-dose-setting ring 5,
during the process of the dose-setting (wherein the upper settings correspond to the
turning of the rotary hand-dose-setting ring 5 clockwise and the three bottom settings
correspond to the turning of the rotary hand-dose-setting ring 5 anti-clockwise). During
the process of the dose-setting, the nut 7 is immobilized by the trigger unit 4. Where the
rotary hand-dose-setting ring 5 is turning clockwise this connection allows only for the
tensioning of the tensioning spring 17. On the other hand, the turning of the rotary hand-
dose-setting ring 5 anti-clockwise causes the slight mutual displacement between the clutch plate 9 and the body of the ratchet plate 8, which in effect causes the three pawl tongues 8.3 to move in the oblique grooves 9.2 of the clutch plate 9, situated in way as to form a plane inclined towards the centre of rotation. Their movement is accompanied by the deformation of the pawls 8.4 towards the centre of rotation until the moment of the disengaging of the catches 8.2 from the gear ring 7.1 of the driving nut 7, which allows for the reverse movement of the whole mechanism. It is also worth remembering that the mechanism is all the time tensed by the tensioning spring 17. After the catches 8.2 have become free, the force of the tensioning spring 17 causes the ratchet plate 8 to move faster than it results from the turning of the rotary hand-dose-setting ring 5 and the straightening of the pawls 8.4, which makes them to engage in another position. The slave movement of mechanism will continue until the operator stops to turn left the rotary hand-dose-setting ring 5. Therefore, by turning of the rotary hand-dose-setting ring 5 in any direction (within the available range) the mechanism is displaced by one dose, with the characteristic click.

During the process of the dose-setting, also the displaceable indicating cylinder 14 is displaced, with the scale 14.4 being an indication of a set dose. The displaceable indicating cylinder 14 with the scale 14.4, is placed on the tensioning spring holder 13, in the form of a sleeve cover, in a way enabling mutual sliding of these elements in the co-axial direction. The movement of these elements caused by the turning of the rotary hand-dose-setting ring 5 is taking form of the co-axial displacement of the cylinder 14 with the scale 14.4, forced by the screw groove 14.2 on its external surface, wherein the cylinder 14 moves by a compound movement along the internal screw thread 1.3 of the body housing 1, disclosing the consecutive numbers on the scale through the dose-setting inspection window 15.

After setting the dose you can actuate the dosing of insulin by pressing the trigger 4.2 in the direction of the needle 3.2. The trigger 4.2 should be pressed throughout the whole time of the insulin application. The protection cap 2, which can be placed onto the rotary hand-dose-setting ring 5, should be removed from the needle 3.2 before pressing the trigger 4.2. The range of the trigger displacement is defined by the displacement of the key 4.1 in the corresponding groove 1.4 in the body housing 1. After pressing the trigger 4.2 the nut 7 is released by the disengagement of the gear ring 4.3, fixed to both elements of the trigger 4.2, and the mechanism starts rotating, driven by the force from the tensioning spring 17. The nut 7 causes the unscrewing of the
plunger rod 6.1 on the square thread 6.3 of the plunger rod 6.1, before the rotation blocked by the plunger rod leading and blocking disc 10 and lead in the plunger rod leading and blocking disc 10 by means of at least one key 10.2 in at least one leading cut 6.2 leading of the plunger rod 6.1.

The plunger 6 acts directly on the piston of the insulin container 3.1, placed in the container housing 3. It causes the injection of insulin from the needle 3.2 mounted on the container housing 3. This action is accompanied by the reverse movement of the whole mechanism to its initial position, i.e. the tensioning spring 17 unwinds, and the cylinder 14 with the scale 14.4 returns to the position “0”. During the process of dosing the rotary hand-dose-setting ring 5 is turning anti-clockwise. The end of the dosing is signalled by the dose-setting end indicator 14.3 in the form of a red dot, seen in the dose-setting end indicator window 19, placed in the dose-setting end indicator window opening 1.6 in the body housing 1. After the appearance of the dose-setting end indicator 14.3 you can release the trigger 4.2. The trigger 4.2 will then automatically return to its initial position urged by the disengaging spring 16 and will again block the nut 7.

In order to replace the insulin container you should unscrew the container housing 3 by turning it anti-clockwise. It is connected to the body housing 1 by means of the double screw thread of a “twist” type. After unscrewing the container housing 3, the whole leading and blocking driving unit, comprising the plunger rod leading and blocking disc 10, the plunger rod 6.1 and the driving nut 7, becomes automatically disengaged by the disengaging spring 16 by means of moving the plunger rod leading and blocking disc 10 co-axially in the direction of plunger. This enables hand backing of the plunger 6 by screwing it into the nut 7 clockwise, in such way that it protrudes slightly from the housing and allows the new container 3.1 with insulin, to be inserted.

Then you should remove the needle 3.2 mounted on the container housing 3 by turning it anti-clockwise, remove the empty container 3.1 by withdrawing it from the housing 3 and install a new container 3.1.

To install a new container 3.1 you should insert it into the container housing 3, which you should place in the body housing 1 by turning it clockwise. Next you should fix a new needle 3.2 and cover it with the protecting cap 2.
The reference list

1 - body housing
1.1 - gear ring
1.2 - dose indicator
1.3 - internal screw thread
1.4 - groove
1.5 - dose-setting inspection window opening
1.6 - dose-setting end indicator window opening
2 - protection cap
3 - container housing
3.1 - container
3.2 - needle
3.3 - insulin consumption window
4 - trigger unit
4.1 - key
4.2 - trigger
4.3 - gear ring
4.4 - notch
5 - rotary hand-dose-setting ring
6 - plunger
6.1 - plunger rod
6.2 - leading cut
6.3 - square thread
7 - nut
7.1 - gear ring
7.2 - blocking gear
8 - ratchet plate
8.1 - (body) tongue
8.2 - catch
8.3 - (pawl) tongue
8.4 - pawl
9 - clutch plate
9.1 - cut
9.2 - groove
9.3 - clutch sleeve
10 - the plunger rod leading and blocking disc
10.1 - tooth like cut
10.2 - key
11 - spring blocking
12 - plug
13 - spring holder
13.1 - spring holder groove
14 - indicating cylinder
14.1 - key
14.2 - screw groove
14.3 - indicator
14.4 - scale
15 - dose-setting inspection window
16 - disengaging spring
17 - tensioning spring
18 - masking cover
19 - dose-setting end indicator window
Patent claims

1. An automatic applicator particularly for insulin, more particularly for multiple injection application of set doses of a medicine from an exchangeable container, comprising a body housing (1) connected to a housing (3) of an exchangeable container (3,1) with a medicine, particularly insulin, expelled by a piston connected to a plunger (6) and displaced linearly by means of a leading and blocking driving unit driven via a double clutch unit by a tensioning spring (17) situated in the body housing (1), tensioned by a rotary hand-dose-setting ring (5) also via a double clutch unit, wherein a leading and blocking driving unit is activated by a trigger unit (4) and a displaceable indicating cylinder (14) is situated on the tensioning spring holder (13), characterised in that the double clutch unit comprises a clutch plate (9) coupled co-axially with a body of the ratchet plate (9) and coupled with pawls (8,4) having catches (8,2) meshed disengagingly with a gear ring (7,1) of a driving nut (7).

2. An automatic applicator according to claim 1, characterised in that the clutch plate (9) is rigidly connected to the clutch sleeve (9,3) rigidly connected to the rotary hand-dose-setting ring (5) by means of a plug (12).

3. An automatic applicator according to claim 1, characterised in that the body of the ratchet plate (8) is rigidly connected to the tensioning spring holder (13).

4. An automatic applicator according to claim 1, characterised in that the clutch plate (9) is coupled co-axially with the body of the ratchet plate (8) by means of, advantageously, three ratchet plate body tongues (8,1) situated in, advantageously, bean shaped clutch plate cuts (9,1).

5. An automatic applicator according to claim 1, characterised in that the clutch plate (9) is coupled co-axially, advantageously, with three pawls (8,4) of the ratchet plate (8) by means of, advantageously, three pawl tongues (8,3) placed in the oblique grooves (9,2) of the clutch plate (9).

6. An automatic applicator according to claim 1, characterised in that the tensioning spring (17) is mounted, from the side of the needle (3,2), in the tensioning spring holder (13) having the form of a sleeve casing rigidly connected to the body of the ratchet plate (8).

7. An automatic applicator according to claim 1, characterised in that the tensioning spring (17) is mounted, from the side of the rotary hand-dose-setting ring (5), in a spring blocking (11) rigidly connected with the body housing (1).
8. An automatic applicator according to claim 1, characterised in that the leading and blocking driving unit comprises a plunger rod leading and blocking disc (10) and a driving nut (7) separated by a disengaging spring (16).

9. An automatic applicator according to claim 8, characterised in that the plunger rod leading and blocking disc (10) is blocked at the body housing gear ring (1.1), to which it is pressed by the container housing (3) of the exchangeable insulin container (2.1).

10. An automatic applicator according to claim 1, characterised in that the trigger unit (4) constitutes a two-element trigger (4.1) with a key (4.1) displaced in the body housing groove (1.4) and with lower driving nut blocking gear ring (4.3) fixed to both elements of the trigger (4.1).

11. An automatic applicator according to claim 10, characterised in that the two-element trigger (4.1), from the side of the rotary hand-dose-setting ring (5), is deflected from the body housing (1) and is provided with friction notches (4.4) on its external surface.

12. An automatic applicator according to claim 1, characterised in that the displaceable indicating cylinder (14), situated on the tensioning spring holder (13), is mounted slidingly, co-axially, in the tensioning spring holder groove (13.1) and has a screw groove (14.2) on its external surface mated with the internal screw thread (1.3) of the body housing (1).
Fig. 4
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. A61M5/315

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)

A61M

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, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of Box C.

See patent family annex.

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Date of the actual completion of the international search: 29 August 2006

Date of mailing of the international search report: 06/09/2006

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Form PCT/ISA/210 (second sheet) (April 2005)
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