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

(11) EP 2 239 366 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.10.2010 Bulletin 2010/41

(21) Application number: **10157171.9**

(22) Date of filing: **22.03.2010**

(51) Int Cl.:
D06F 75/14 *(2006.01)* ***D06F 75/18*** *(2006.01)*
D06F 75/26 *(2006.01)*

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

(30) Priority: **08.04.2009 US 167864 P**

(71) Applicant: **Choi, Lung Wai**
Tokwawan, Kowloon
Hong Kong (CN)

(72) Inventor: **Choi, Lung Wai**
Tokwawan, Kowloon
Hong Kong (CN)

(74) Representative: **Becker Kurig Straus**
Patentanwälte
Bavariastrasse 7
80336 München (DE)

(54) Electric steam iron with a low temperature steam control system

(57) A low temperature steam control system of an electric steam iron includes a low temperature water discharge valve and a high temperature water discharge valve, which may be controlled by a low temperature bi-metal plate and a high temperature bi-metal plate respectively. Each bi-metal plate may include two overlaying metal plates with different thermal expansion coefficients. When the solcplatc is heated by a heating element to a first temperature, the low temperature bi-metal plate can flex and open the low temperature water discharge valve allowing water to flow from a water tank into a vaporization chamber. When the soleplate is further heated by the heating element to a second temperature, the high temperature bi-metal plate can flex and open the high temperature water discharge valve allowing additional water to flow from the water tank into the vaporization chamber.

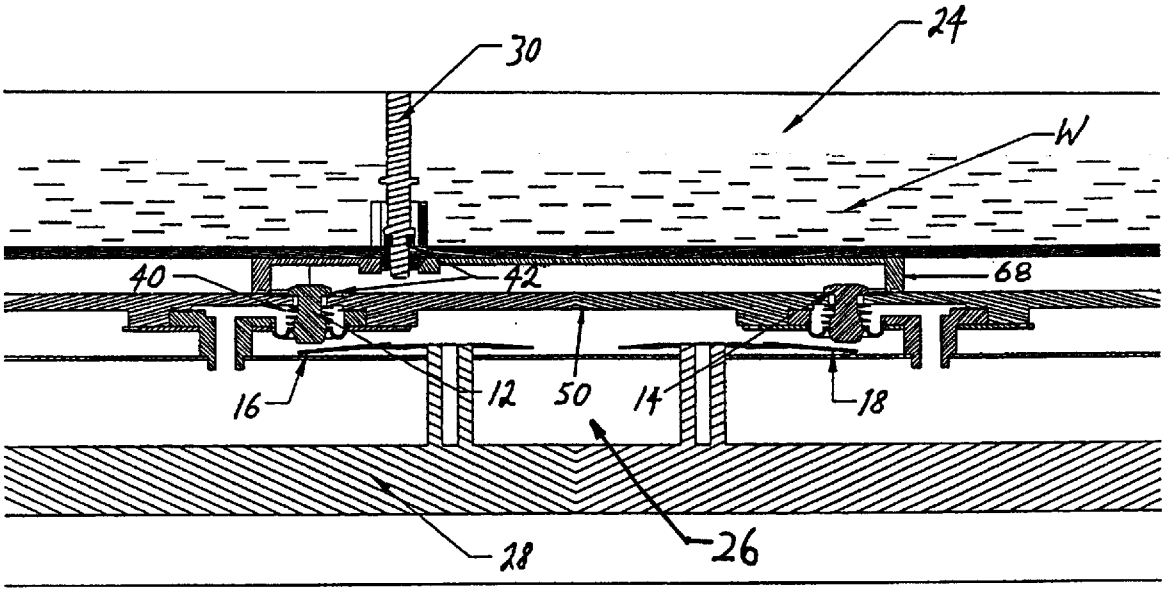


FIG. 2

EP 2 239 366 A1

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority of US Provisional Application No. 61/167,864 filed on April 8, 2009, the entire content of which is hereby incorporated by reference.

FIELD OF PATENT APPLICATION

[0002] The present patent application relates to an electric steam iron with a low temperature steam control system.

BACKGROUND

[0003] Conventional electric steam irons include a water reservoir, a water discharge valve and a vaporization chamber. Water flows from the water reservoir, through the water discharge valve, and into the vaporization chamber. In the vaporization chamber, water is vaporized by the heat from the soleplate. When the soleplate is at a high temperature, steam is generated and escaped through steam holes on the soleplate. However, at a low temperature, as temperature drops, water remaining in the vaporization chamber tends to spill out undesirably from the steam holes during ironing.

[0004] There is a need to provide an improved electric steam iron with a low temperature steam control system to prevent undesirable spilling of water from steam holes at low temperature.

[0005] The above description of the background is provided to aid in understanding the electric steam iron with a low temperature steam control system disclosed in the present patent application, but is not admitted to describe or constitute pertinent prior art.

SUMMARY

[0006] According to one aspect, there is provided a steam iron including:

a soleplate having a plurality of steam vents;
a vaporization chamber provided on the soleplate;
a water tank for supplying water to the vaporization chamber;
first and second valves through which water flows from the water tank to the vaporization chamber;
a first bi-metal plate configured to flex towards and push the first valve open when the soleplate is heated by a heating element to a first temperature, allowing a first volume of water to flow from the water tank into the vaporization chamber and generate a first volume of steam through the steam vents for steam ironing delicate clothing; and
a second bi-metal plate configured to flex towards and push the second valve open when the soleplate is further heated by the heating element to a second temperature, allowing an additional volume of water to flow from the water tank into the vaporization chamber and generate an additional volume of steam through the steam vents for steam ironing non-delicate clothing.

[0007] In one embodiment, the second bi-metal plate flexes away and closes the second valve when the temperature of the soleplate drops to a temperature below the second temperature, and the first bi-metal plate flexes away and closes the first valve when the temperature of the soleplate drops to a temperature below the first temperature.

[0008] In one embodiment, each of the first and second bi-metal plates includes two overlaying metal plates with different thermal expansion coefficients.

[0009] In one embodiment, the steam iron further includes first and second arms fixed to and extending from the first and second bi-metal plates for pushing the first and second valves respectively.

[0010] In one embodiment, each of the first and second valves includes a spring for biasing the valve in a closed position.

[0011] In one embodiment, the first and second valves are seated on a platform mounted between the water tank and the vaporization chamber.

[0012] In one embodiment, the first and the second valves are operable in first and second valve openings respectively on a platform mounted on the vaporization chamber, and the platform is provided with first and second passageways through which water flows from the first and second valve openings to the vaporization chamber.

[0013] In one embodiment, the steam iron further includes a water compartment having a first opening through which water flows from the water tank into the water compartment, and second and third openings in registration with the first and second valve openings respectively through which water flows from the water compartment into the first and second passageways and then into the vaporization chamber..

[0014] In one embodiment, the first and second bi-metal plates are supported on the vaporization chamber.

[0015] In one embodiment, the first temperature is about 100°C.

[0016] In one embodiment, the second temperature is about 140°C.

[0017] In one embodiment, the second bi-metal plate flexes away and closes the second valve when the temperature of the soleplate drops to about 130°C.

[0018] In one embodiment, the first bi-metal plate flexes away and closes the first valve when the temperature of the soleplate drops to about 95 °C.

[0019] In one embodiment, the first volume of steam is generated at a rate of about 2 to 7 g/min. when the temperature of the soleplate reaches about 120°C.

[0020] According to another aspect, there is provided

a steam iron including:

a first valve assembly adapted to allow water to flow from a water tank into a vaporization chamber when a soleplate is heated to a first temperature; and
a second valve assembly adapted to allow additional water to flow from the water tank into the vaporization chamber when the soleplate is further heated to a second temperature.

[0021] In one embodiment, the first and second valve assemblies include:

first and second valves respectively through which water flows from the water tank to the vaporization chamber;
a first bi-metal plate configured to flex towards and push the first valve open when the soleplate is heated by a heating element to the first temperature, allowing a first volume of water to flow from the water tank into the vaporization chamber and generate a first volume of steam through a plurality of steam vents in the soleplate for steam ironing delicate clothing; and
a second bi-metal plate configured to flex towards and push the second valve open when the soleplate is further heated by the heating element to the second temperature, allowing an additional volume of water to flow from the water tank into the vaporization chamber and generate an additional volume of steam through the steam vents for steam ironing non-delicate clothing.

[0022] In one embodiment, the second bi-metal plate flexes away and closes the second valve when the temperature of the soleplate drops to a temperature below the second temperature, and the first bi-metal plate flexes away and closes the first valve when the temperature of the soleplate drops to a temperature below the first temperature.

[0023] In one embodiment, each of the first and second bi-metal plates includes two overlaying metal plates with different thermal expansion coefficients.

[0024] In one embodiment, the steam iron further includes first and second arms fixed to and extending from the first and second bi-metal plates for pushing the first and second valves respectively.

[0025] In one embodiment, each of the first and second valves includes a spring for biasing the valve in a closed position.

[0026] In one embodiment, the first and second valves are seated on a platform mounted between the water tank and the vaporization chamber.

[0027] In one embodiment, the first and the second valves are operable in first and second valve openings respectively on a platform mounted on the vaporization chamber, and the platform is provided with first and second passageways through which water flows from the first and second valve openings to the vaporization chamber.

[0028] In one embodiment, the steam iron further includes a water compartment having an upper opening through which water flows from the water tank into the water compartment, and first and second lower openings in registration with the first and second valve openings respectively through which water flows from the water compartment into the first and second passageways and then into the vaporization chamber.

[0029] In one embodiment, the first and second bi-metal plates are supported on the vaporization chamber.

[0030] In one embodiment, the first temperature is about 100°C.

[0031] In one embodiment, the second temperature is about 140°C.

[0032] In one embodiment, the second bi-metal plate flexes away from the second valve when the temperature of the soleplate drops to about 130°C.

[0033] In one embodiment, the first bi-metal plate flexes away from the first valve when the temperature of the soleplate drops to about 95 °C.

[0034] In one embodiment, the first volume of steam is generated at a rate of about 2 to 7 g/min. when the temperature of the soleplate reaches about 120°C.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] Specific embodiments of the electric steam iron with a low temperature steam control system disclosed in the present patent application will now be described by way of example with reference to the accompanying drawings wherein:

FIG. 1 is a perspective view of an electric steam iron having a low temperature steam control system;

FIG. 2 is a cross sectional view of the low temperature steam control system having two water inlets according to an embodiment disclosed in the present patent application;

FIG. 3 is a cross sectional view of the low temperature steam control system similar to FIG. 2 with one water inlet being opened;

FIG. 4 is a cross sectional view of the low temperature steam control system similar to FIG. 2 with both water inlets being opened;

FIG. 5 is a perspective view of the soleplate showing the mounting of the heating element;

FIG. 6 is a perspective view of the two valves and the two bi-metal plates of the low temperature steam control system;

FIG. 7 is an exploded view of the two valves and the

two bi-metal plates;

FIG. 8 is a perspective view of the steam shaft portion of the low temperature steam control system;

FIG. 9 is a perspective view of the water reservoir of the low temperature steam control system;

FIG. 10 is a perspective view of the water reservoir similar to FIG. 9 with the cap of the water reservoir being removed; and

FIG. 11 is a perspective view of the soleplate showing the mounting of the two bi-metal plates.

DETAILED DESCRIPTION

[0036] Reference will now be made in detail to a preferred embodiment of the electric steam iron with a low temperature steam control system disclosed in the present patent application, examples of which are also provided in the following description. Exemplary embodiments of the electric steam iron with a low temperature steam control system disclosed in the present patent application are described in detail, although it will be apparent to those skilled in the relevant art that some features that are not particularly important to an understanding of the modular tool system may not be shown for the sake of clarity.

[0037] Furthermore, it should be understood that the electric steam iron with a low temperature steam control system disclosed in the present patent application is not limited to the precise embodiments described below and that various changes and modifications thereof may be effected by one skilled in the art without departing from the spirit or scope of the appended claims. For example, elements and/or features of different illustrative embodiments may be combined with each other and/or substituted for each other within the scope of the appended claims.

[0038] FIG. 1 is a perspective view of an electric steam iron having a low temperature steam control system. FIGS. 2, 3 and 4 are cross sectional views of the low temperature steam control system of an electric steam iron according to an embodiment disclosed in the present patent application. The low temperature steam control system may include a low temperature water discharge valve 12 and a high temperature water discharge valve 14. The low and high temperature water discharge valves 12, 14 may be actuated by a low temperature bi-metal plate and a high temperature bi-metal plate generally designated by reference numerals 16 and 18 respectively.

[0039] The low and high temperature bi-metal plates 16, 18 may be supported on an upper wall of a vaporization chamber 26 provided on a soleplate 28. Each bi-metal plate 16, 18 may include two overlaying metal plates with different thermal expansion coefficients. When the low and high temperature bi-metal plates 16, 18 are heated by a heating element 20 mounted on a soleplate 28, as shown in FIG. 5, they can flex in two different directions due to the difference in thermal expansion property.

[0040] As best illustrated in FIGS. 6 and 7, the low temperature bi-metal plate 16 may include two overlaying metal plates 16a, 16b, and the high temperature bi-metal plate 18 may include two overlaying metal plates 18a, 18b. An arm 17 can be fixed to and extending from the metal plate 16a for contacting with and pushing up the low temperature water discharge valve 12. Similarly, an arm 19 can be fixed to and extending from the metal plate 18a for contacting with and pushing up the high temperature water discharge valve 14.

[0041] According to an embodiment disclosed in the present application, the low and high temperature water discharge valves 12, 14 can be seated on a platform 50, which may be mounted between a main water tank 24 and the vaporization chamber 26. Each water discharge valve 12, 14 may be biased to a normally closed position by a spring 40.

[0042] The low and high temperature water discharge valves 12, 14 are operable in first and second valve openings 56, 58 respectively provided on the platform 50. The platform 50 may be provided with first and second passageways 52, 54 through which water can flow from the first and second valve openings 56, 58 into the vaporization chamber 26.

[0043] As depicted in FIGS. 8 to 10, an intermediate water compartment 60 can be provided below the main water tank 24. The intermediate water compartment 60 may include an upper opening 62 through which water can flow from the water tank 24 into the water compartment 60 when a steam shaft 30 is lifted, and first and second lower openings 64, 66 in registration with the first and second valve openings 56, 58 respectively through which water can flow from the water compartment 60 into the first and second passageways 52, 54 and then into the vaporization chamber 26. The first and second lower openings 64, 66 may be formed on a horizontal partition wall 72 mounted on the soleplate 28.

[0044] There are two valve assemblies in the electric steam iron, namely, a low temperature valve assembly and a high temperature valve assembly. The low temperature valve assembly may include the low temperature water discharge valve 12 and the low temperature bi-metal plate 16. The high temperature valve assembly may include the high water discharge valve 14 and the high temperature bi-metal plate 18.

[0045] It is realized that the two valve assemblies are activated by heat. The low temperature bi-metal plate 16 is adapted to flex upwards and push the low temperature water discharge valve 12 open when the temperature at the soleplate 28 reaches about 100°C, and flex downwards and close the low temperature water discharge valve 12 when the temperature at the soleplate 28 drops to about 95 °C.

[0046] In addition, the high temperature bi-metal plate 18 is adapted to flex upwards and push the high temperature water discharge valve 14 open when the temperature at the soleplate 28 reaches about 140°C, and flex downwards and close the high temperature water discharge valve 14 when the temperature at the soleplate 28 drops to about 130°C.

[0047] Details of the operation of the low and high temperature water discharge valves 12, 14 and the low and high temperature bi-metal plates 16 and 18 of the low temperature control system in the electric steam iron will now be described.

[0048] As shown in FIG. 2, when the temperature of the soleplate 28 is below 95°C or when the power is off, both the low and high temperature bi-metal plates 16, 18 flex downwards and close the low and high temperature water discharge valves 12, 14, respectively. Water W in the water tank 24 cannot flow towards the vaporization chamber 26 even when the steam shaft 30 is lifted.

[0049] In FIG. 3, when power is supplied to the heating element 20 and the temperature at the soleplate 28 reaches about 100°C, the low temperature bi-metal plate 18 flexs upwards and pushes the low temperature water discharge valve 12 open, as shown by the arrow. The high temperature bi-metal plate 18 remains at the downward position and the high temperature water discharge valve 14 remains closed. When the steam shaft 30 is lifted up as shown by the arrow in FIG. 3, water W can flow from the water tank 24, through gaps 42 and the low temperature water discharge valve 12, and into a vaporization chamber 26, as illustrated by the arrows. When water enters the vaporization chamber 26, it vaporizes into steam by the heating element 20 on the soleplate 28. Since only one of the two water discharge valves 12, 14 is open, only a relatively small amount of water can flow into the vaporization chamber 26. At this relatively low temperature, water would not be undesirably discharged from steam vents 27 (FIG. 5) of the soleplate 28.

[0050] When the temperature at the soleplate 28 continues to increase and reaches about 120°C, a small amount of steam (7-12g/min) will be discharged from the steam vents 27 of the soleplate 28. This small amount of steam is suitable for ironing delicate clothing made of silk, etc.

[0051] In FIG. 4, when the temperature at the soleplate 28 reaches about 140°C, the high temperature bi-metal plate 18 also flexs upwards and pushes the high temperature water discharge valve 14 open, as shown by the arrow. When the steam shaft 30 is lifted up, water W can flow from the water tank 24, through gaps 42, the low and high temperature water discharge valves 12, 14, and into the vaporization chamber 26, as illustrated by the arrows.

[0052] When water enters the vaporization chamber 26, it vaporizes into steam by the heating element 20 on the soleplate 28. Since both the low and high temperature water discharge valves 12, 14 are opened, a relatively large amount of water can flow into the vaporization chamber 26. At this relatively high temperature, a relatively large amount of steam can be discharged from the steam vents 27 of the soleplate 28 suitable for ironing non-delicate clothing made of cotton, etc.

[0053] When the heating element 20 is turned off and the temperature at the soleplate 28 drops to about 100-120°C, the high temperature bi-metal plate 18 flexs downwards and closes the high temperature water discharge valve 14. The low temperature bi-metal plate 18 still flexs upwards allowing a small amount of water W in the water tank 24 to flow into the vaporization chamber 26. This can avoid the accumulation of excess water in the vaporization chamber 26, and can prevent undesirable discharge or spill of water from the steam vents 27 on the soleplate 28 at a low temperature.

[0054] When the temperature at the soleplate 28 continues to drop to about 95 °C, the low temperature bi-metal plate 18 flexs downwards as well. Both the low and high temperature water discharge valves 12, 14 are closed and no steam or water comes out from the steam vents 27 on the soleplate 28.

[0055] As shown in FIG. 11, the temperature of the soleplate 28 can be measured by a temperature sensor 70 located at the center of the soleplate 28. The temperature at the soleplate 28 can be shown on a display 72 electrically connected to the temperature sensor 70.

[0056] Although it has been shown and described that bi-metal plates 16, 18 are employed to push the valves 12, 14 open, it is understood by one skilled in the art that one may employ other suitable heat-activated valve actuating means such as a combination of temperature sensing means and electro-mechanical valve actuating means, etc.

[0057] While the electric steam iron with a low temperature steam control system disclosed in the present patent application has been shown and described with particular references to a number of preferred embodiments thereof, it should be noted that various other changes or modifications may be made without departing from the scope of the appended claims.

Claims

1. A steam iron comprising:

a soleplate having a plurality of steam vents;
a vaporization chamber provided on the soleplate;
a water tank for supplying water to the vaporization chamber;
first and second valves through which water flows from the water tank to the vaporization chamber;
a first bi-metal plate configured to flex towards and push the first valve open when the soleplate is heated by a heating element to a first temperature, allowing a first volume of water to flow

from the water tank into the vaporization chamber and generate a first volume of steam through the steam vents for steam ironing delicate clothing; and

a second bi-metal plate configured to flex towards and push the second valve open when the soleplate is further heated by the heating element to a second temperature, allowing an additional volume of water to flow from the water tank into the vaporization chamber and generate an additional volume of steam through the steam vents for steam ironing non-delicate clothing.

2. The steam iron as claimed in claim 1, wherein the second bi-metal plate flexes away and closes the second valve when the temperature of the soleplate drops to a temperature below the second temperature, and the first bi-metal plate flexes away and closes the first valve when the temperature of the soleplate drops to a temperature below the first temperature.

3. The steam iron as claimed in claim 1, wherein each of the first and second bi-metal plates comprises two overlaying metal plates with different thermal expansion coefficients.

4. The steam iron as claimed in claim 3, further comprising first and second arms fixed to and extending from the first and second bi-metal plates for pushing the first and second valves respectively.

5. The steam iron as claimed in claim 1, wherein each of the first and second valves comprises a spring for biasing the valve in a closed position.

6. The steam iron as claimed in claim 1, wherein the first and second valves are seated on a platform mounted between the water tank and the vaporization chamber.

7. The steam iron as claimed in claim 1, wherein the first and the second valves are operable in first and second valve openings respectively on a platform mounted on the vaporization chamber, and the platform is provided with first and second passageways through which water flows from the first and second valve openings to the vaporization chamber.

8. The steam iron as claimed in claim 7, further comprising a water compartment having a first opening through which water flows from the water tank into the water compartment, and second and third openings in registration with the first and second valve openings respectively through which water flows from the water compartment into the first and second passageways and then into the vaporization chamber..

9. The steam iron as claimed in claim 1, wherein the first temperature is about 100°C, and the second temperature is about 140°C.

10. The steam iron as claimed in claim 2, wherein the second bi-metal plate flexes away and closes the second valve when the temperature of the soleplate drops to about 130°C, and the first bi-metal plate flexes away and closes the first valve when the temperature of the soleplate drops to about 95 °C.

11. A steam iron comprising:

a first valve assembly adapted to allow water to flow from a water tank into a vaporization chamber when a soleplate is heated to a first temperature; and

a second valve assembly adapted to allow additional water to flow from the water tank into the vaporization chamber when the soleplate is further heated to a second temperature.

12. The steam iron as claimed in claim 12, wherein:

the first valve assembly comprises:

a first valve through which water flows from the water tank to the vaporization chamber; and

a first bi-metal plate configured to flex towards and push the first valve open when the soleplate is heated by a heating element to the first temperature, allowing a first volume of water to flow from the water tank into the vaporization chamber and generate a first volume of steam for steam ironing delicate clothing; and

the second valve assemblies comprise:

a second valve through which water flows from the water tank to the vaporization chamber; and

a second bi-metal plate configured to flex towards and push the second valve open when the soleplate is further heated by the heating element to the second temperature, allowing an additional volume of water to flow from the water tank into the vaporization chamber and generate an additional volume of steam for steam ironing non-delicate clothing.

13. The steam iron as claimed in claim 12, wherein the second bi-metal plate flexes away and closes the second valve when the temperature of the soleplate drops to a temperature below the second temperature, and the first bi-metal plate flexes away and clos-

es the first valve when the temperature of the soleplate drops to a temperature below the first temperature.

14. The steam iron as claimed in claim 12, wherein each of the first and second bi-metal plates comprises two overlaying metal plates with different thermal expansion coefficients.

15. The steam iron as claimed in claim 14, further comprising first and second arms fixed to and extending from the first and second bi-metal plates for pushing the first and second valves respectively.

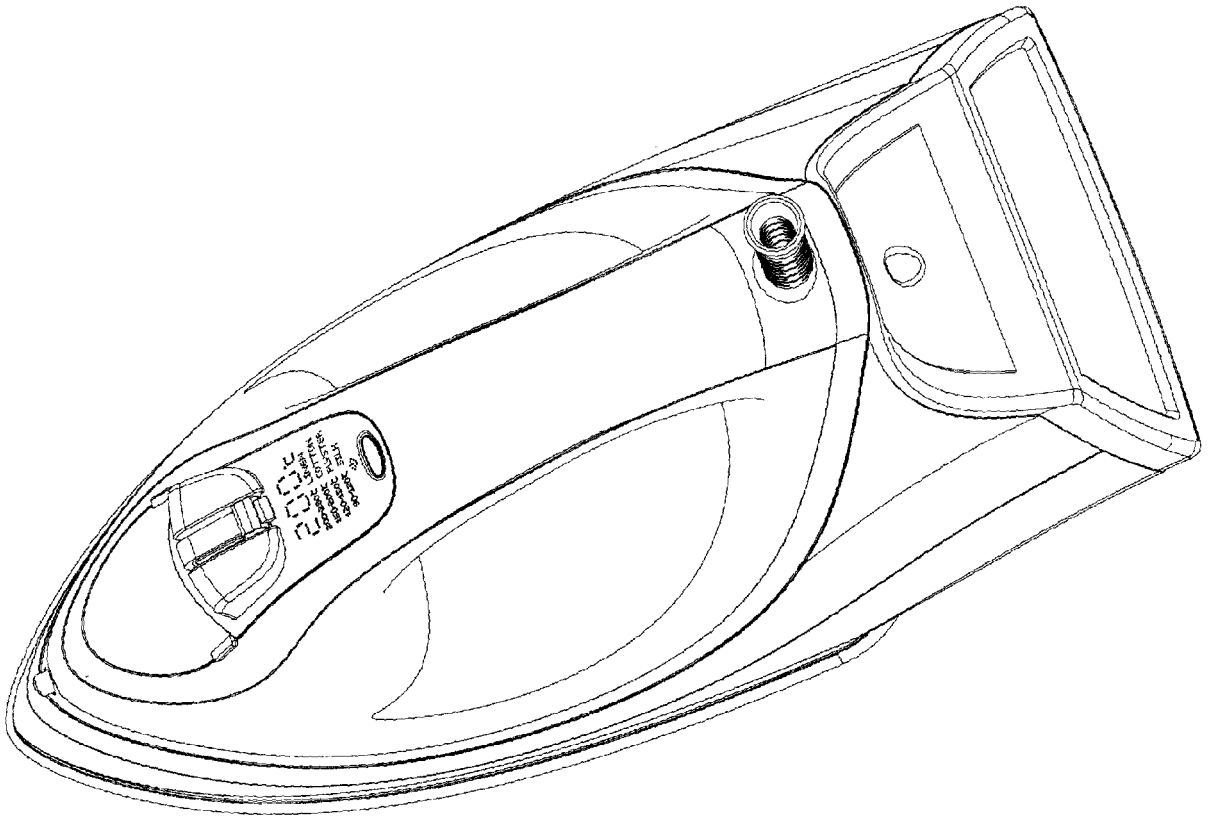


FIG. 1

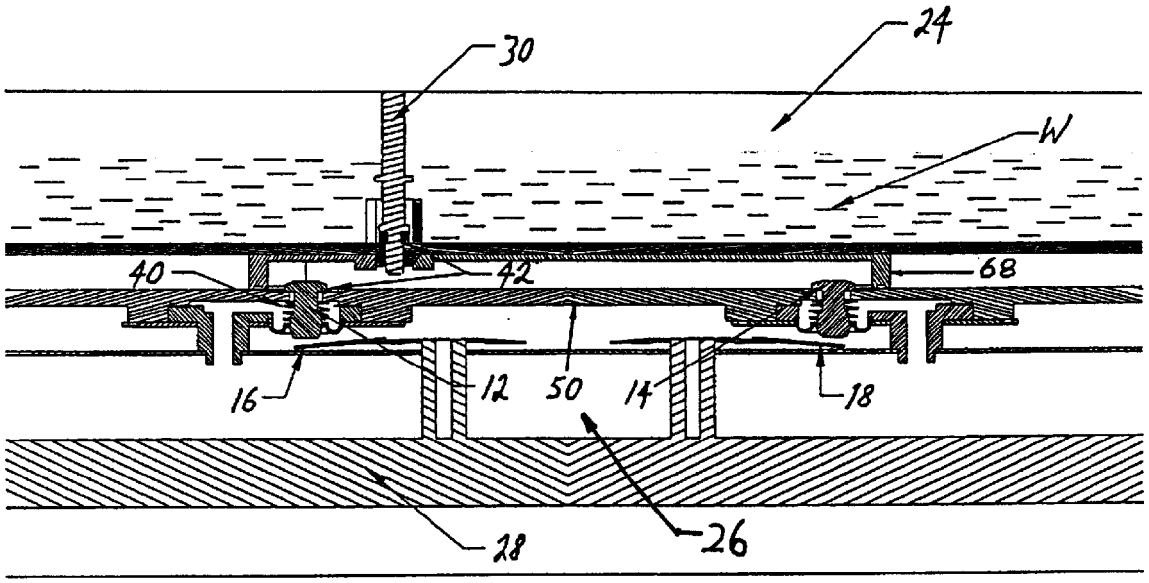


FIG. 2

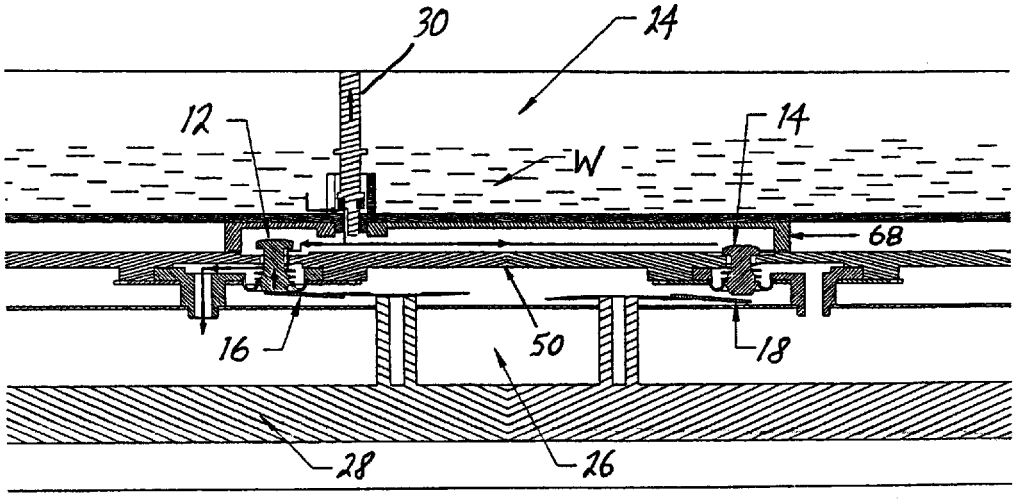


FIG. 3

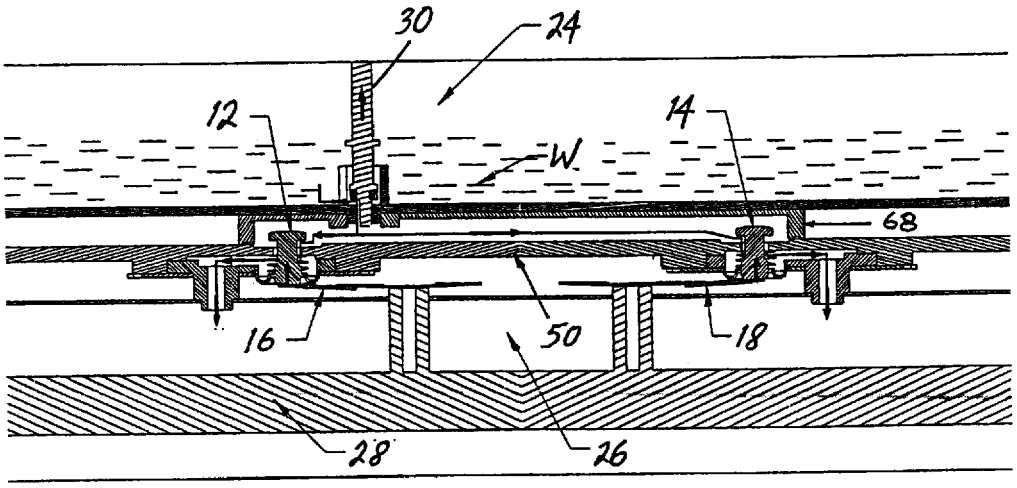


FIG. 4

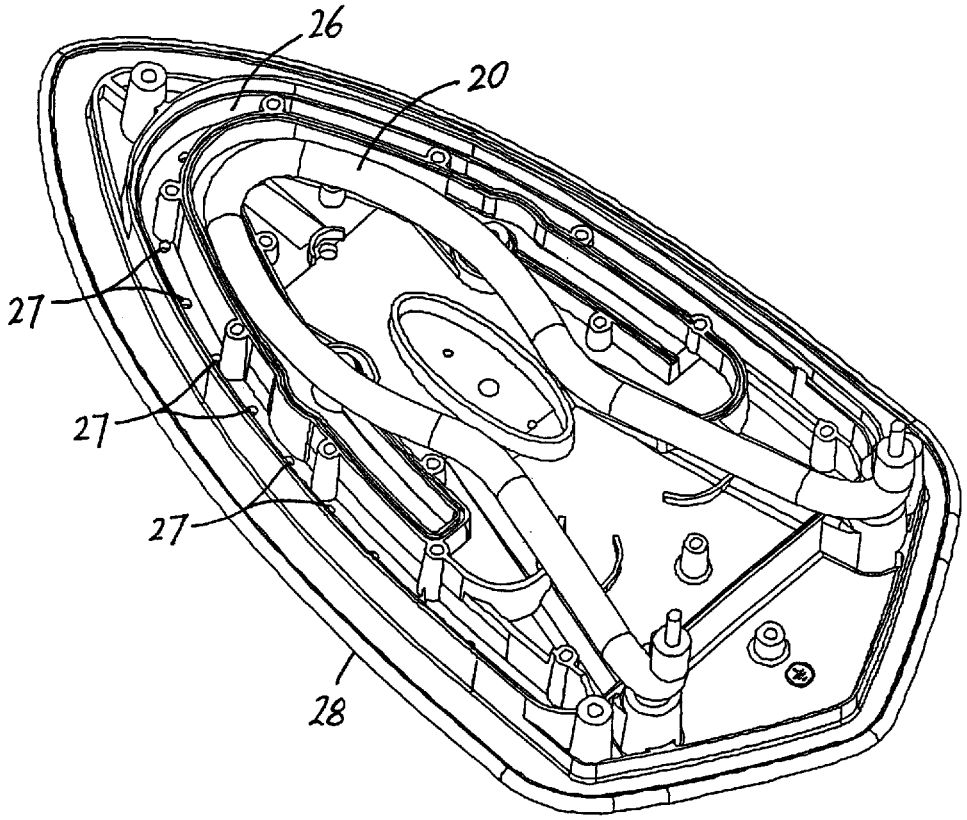


FIG. 5

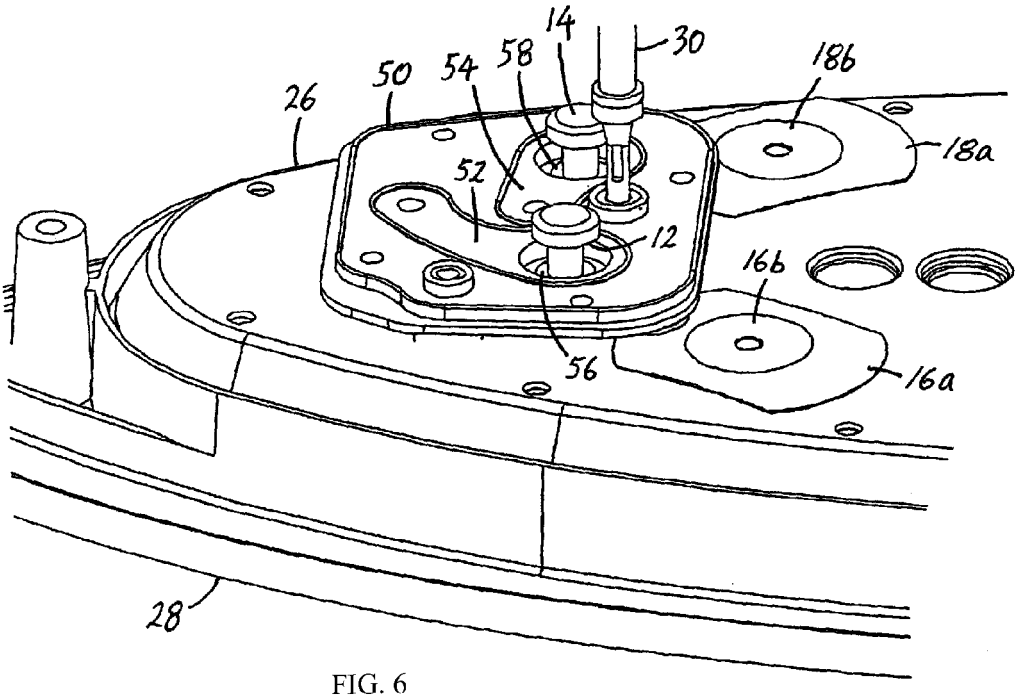

14
30
58
54
50
26
18b
18a
52
12
16b
56
16a
28

FIG. 6

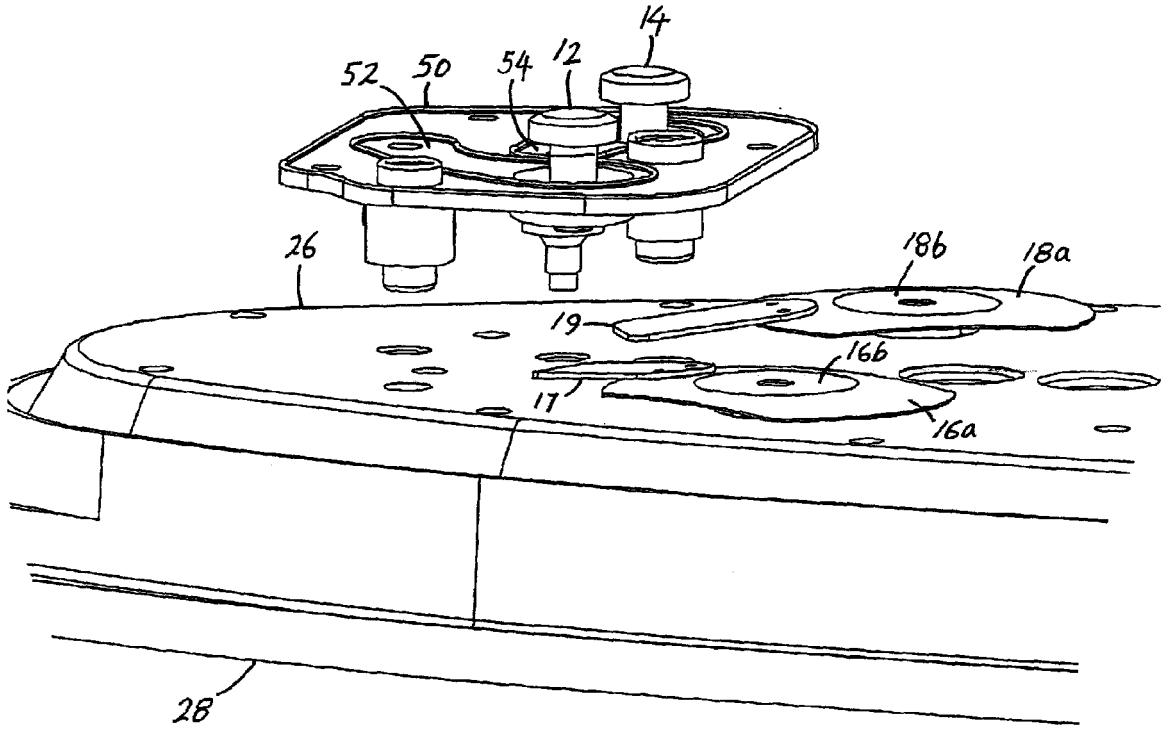

14
52
50
54
12
26
18b
18a
19
16b
17
16a
28

FIG. 7

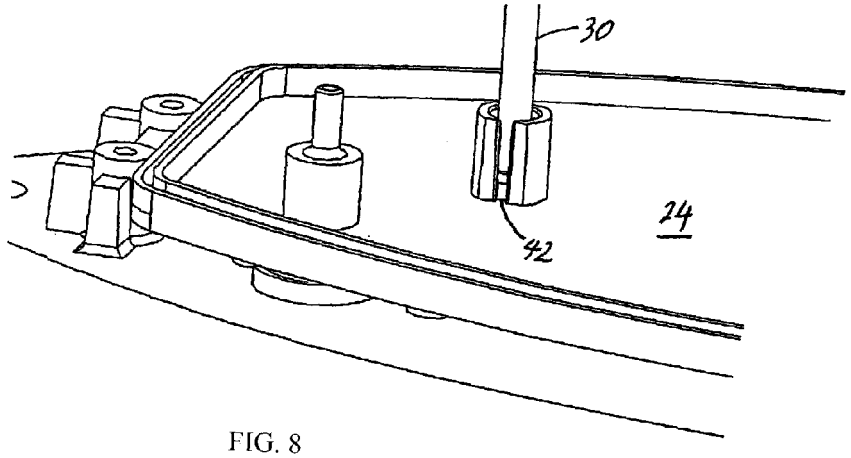


FIG. 8

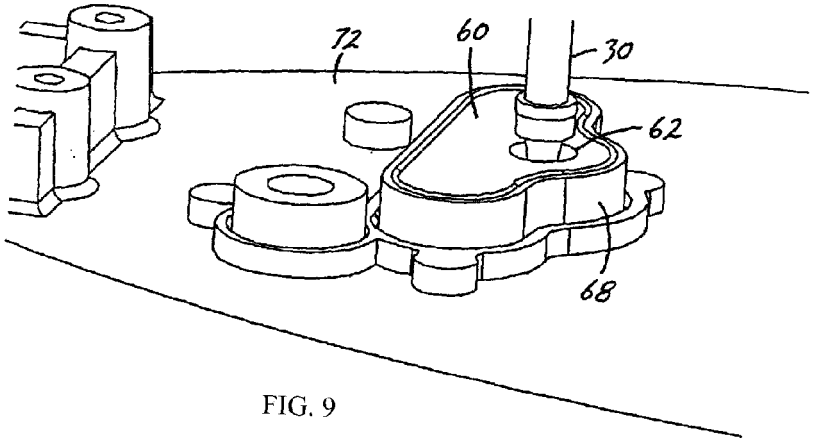


FIG. 9

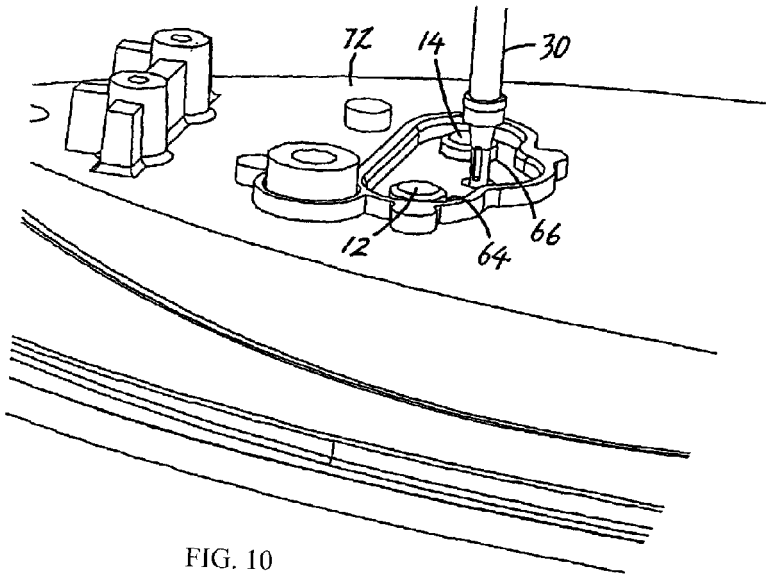


FIG. 10

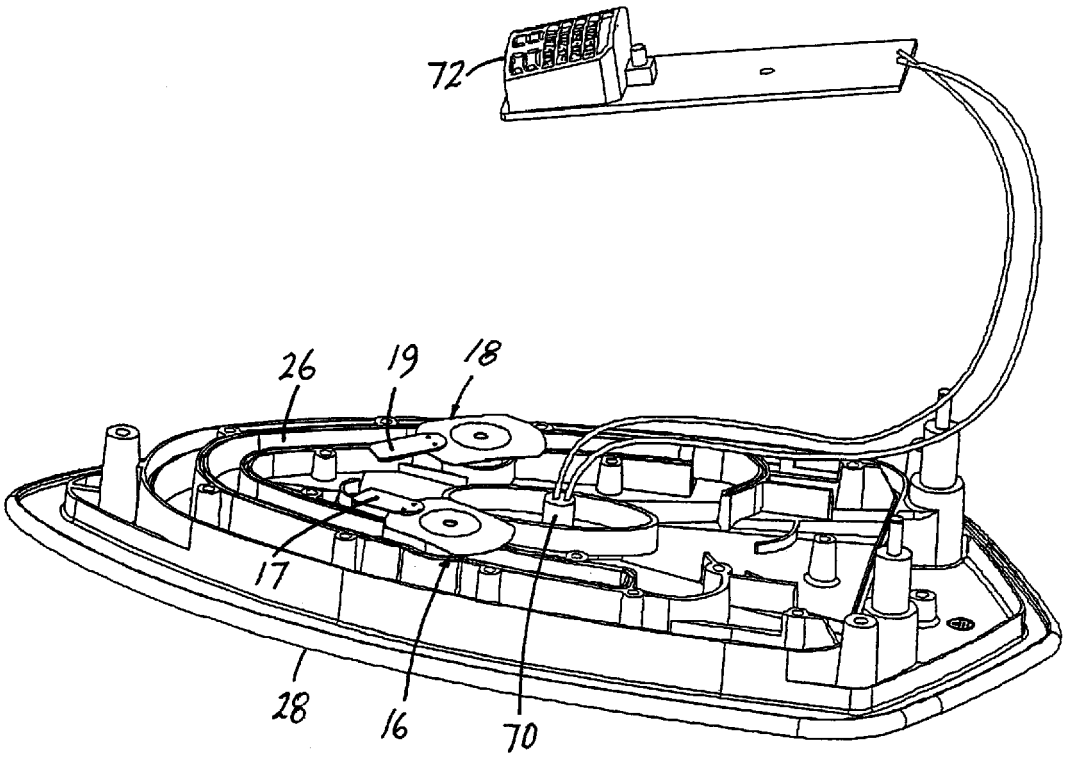


FIG. 11

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 10 15 7171

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	EP 1 837 436 A1 (LI WEN-CHING [TW]) 26 September 2007 (2007-09-26) * the whole document *	1-15	INV. D06F75/14 D06F75/18 D06F75/26
A	US 2009/000161 A1 (WEBER JOCHEN [DE] ET AL) 1 January 2009 (2009-01-01) * paragraphs [0001] - [0008], [0036] - [0055]; figures 1-9 *	1-15	
A	DE 102 25 576 A1 (INTER CONTROL KOEHLER HERMANN [DE]) 8 January 2004 (2004-01-08) * abstract * * paragraphs [0007] - [0011], [0019]; figure 1 *	1-4,9-15	
A	US 4 125 953 A (COLOMBO AMBROGIO) 21 November 1978 (1978-11-21) * column 1, lines 12-31 * * column 2, lines 21-52 * * column 4, line 19 - column 5, line 4 * * column 6, lines 16-21; figure 1 *	1-5, 11-15	
A	EP 0 454 048 A2 (KRUPS FA ROBERT [DE]) 30 October 1991 (1991-10-30) * abstract * * column 3, line 34 - column 5, line 24; figures 1,2 *	1,8-11	TECHNICAL FIELDS SEARCHED (IPC) D06F
A	US 4 197 664 A (GISIGER ERNST [CH] ET AL) 15 April 1980 (1980-04-15) * the whole document *	1,11	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 June 2010	Prosig, Christina

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 10 15 7171

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.

15-06-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1837436 A1	26-09-2007	US 2007220784 A1	27-09-2007
US 2009000161 A1	01-01-2009	CN 101346509 A	14-01-2009
		EP 1966430 A1	10-09-2008
		FR 2895421 A1	29-06-2007
		WO 2007072145 A1	28-06-2007
DE 10225576 A1	08-01-2004	NONE	
US 4125953 A	21-11-1978	AU 506375 B2	20-12-1979
		AU 2705177 A	18-01-1979
		BE 856845 A2	16-01-1978
		BR 7704677 A	04-04-1978
		CA 1053141 A1	24-04-1979
		DD 131391 A5	21-06-1978
		DE 2732119 A1	19-01-1978
		ES 460790 A1	16-05-1978
		FR 2358498 A1	10-02-1978
		GB 1557916 A	19-12-1979
		NL 7613603 A	17-01-1978
		SE 7708178 A	16-01-1978
		ZA 7704231 A	28-06-1978
EP 0454048 A2	30-10-1991	AT 139275 T	15-06-1996
		DE 4012951 A1	31-10-1991
		ES 2087927 T3	01-08-1996
US 4197664 A	15-04-1980	CH 619999 A5	31-10-1980
		DE 2750267 A1	16-11-1978
		ES 464258 A1	01-07-1978
		FR 2390535 A1	08-12-1978
		GB 1552745 A	19-09-1979
		IT 1087286 B	04-06-1985

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

- US 61167864 B **[0001]**