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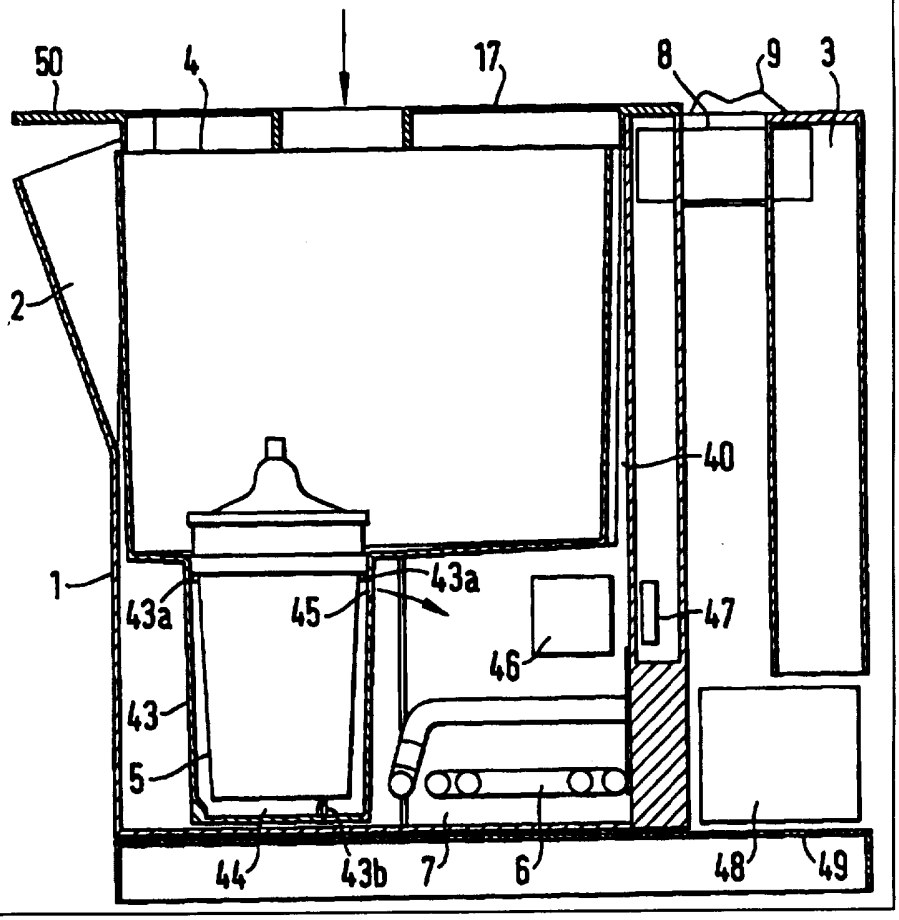
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(54) Title: A KETTLE

(57) Abstract

A jug-type kettle comprises a body (1) of moulded plastics material having a top opening closable by a lid (17), a spout (2), and a handle (3). A hopper (4) is mounted in the upper region of the body (1), the hopper accommodating a filter cartridge (5) which is removably mounted in a cylindrical well (43) formed in the base of the hopper (4) and extending down into the lower region (7) of the body (1). A conventional electric heating element (6) is mounted in the lower region (7) of the kettle body. The hopper (4) and kettle body (1) are shaped such that the lower region (7) communicates with the spout (2) and also with a steam-responsive control (8) mounted in the handle (3). To use the kettle, water is poured into the hopper (4) via the top opening and is constrained to pass through the filter cartridge (5) before entering the lower region (7) to be heated by the heating element (6).



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A KETTLE

This invention relates to a kettle and in particular though not exclusively to an electric kettle of the type commonly known as a jug kettle having a plastics moulded body.

When water is boiled in a kettle particularly of this type, scum and scale are precipitated out of the water especially if the water is hard. This can result in the heating element of the kettle becoming furred with scale which reduces its efficiency, as well as scale and scum being present in the heated water as it is poured out of the kettle which is particularly unpleasant if the water is used for drinking. In order to prevent the latter problem of the heated water which is poured out of the kettle being contaminated, a number of jug kettles are fitted with a fine mesh filter over the spout opening so that heated water in the kettle is constrained to pass through the filter as it is poured out. However, this does not solve the problem of the kettle element becoming furred and only results in all the contaminants being left inside the kettle where they build up each time the kettle is used.

It is therefore an object of the present invention to provide an improved kettle, such as of the jug kettle type, which can remove, or at least greatly alleviate, both of the afore-mentioned problems with existing kettles.

Accordingly, the present invention consists in a kettle comprising a body for containing water to be heated, the body having a top opening closable by a lid, and filter means mounted in said body, said filter means being arranged such that the water is constrained to pass therethrough during its passage into the kettle body via said top opening.

In a preferred embodiment, the kettle body comprises an upper compartment and a lower compartment, and said filter means is mounted between said compartments such that water poured into the upper compartment via said top opening is constrained to pass through the filter means into said lower compartment. The kettle may be provided with an electric heating element located in or adjacent the lower compartment to heat water contained in said lower compartment.

Preferably, the upper compartment is formed by a hopper mounted in the upper region of the interior of the kettle body and the filter means is mounted in the base of the hopper. The hopper may be removable from the kettle body and/or the filter means may be removable from the hopper. This facilitates cleaning of the hopper and enables regular cleaning or replacement of the filter means, as well as the option of using the kettle without the filter means if desired.

The hopper is advantageously shaped to enable water in the lower compartment to be poured out of the kettle through the kettle spout. The kettle may also include control means responsive to steam generated by the heated water to disconnect power to the heating element, and the hopper may be shaped to guide steam from the lower compartment towards the control means.

The filter means may be a demineralising filter comprising a filter cartridge containing a water treatment agent in a granular form which can act on the water flowing through the cartridge. The filter cartridge preferably has spaced-apart water-permeable walls formed, for example, from sintered granular plastics material, between which the water treatment agent is retained.

One problem which may arise if a filter cartridge containing standard granular filter material including ion-exchange resins is used is that the granular material can become overheated due to the heated water and steam in the kettle, which may adversely affect the resins. It may be possible to overcome this problem by using specialised high-temperature granular material, but this would increase the cost of replacement cartridges and would not have the added benefit of being able to use the same type of cartridge in both cold water filter jugs and the kettle.

In order to alleviate this problem, a particularly advantageous arrangement of the present invention includes means for thermally insulating the filter means from heated water in the kettle body. The thermally insulating means may comprise a space formed in the kettle body which surrounds the filter means when mounted in the body and which is arranged to remain filled with relatively cool water during operation of the kettle. Additionally or alternatively, the thermally insulating means may comprise at least one insulating layer of air and/or of thermally insulating material, such as closed cell expanded foam, which surrounds the filter means when mounted in the kettle body. The insulating means may also include a heat-reflective coating surrounding the filter means.

Preferably, the kettle also includes means for controlling the heating of the water in dependence on the rate of flow of the water through the filter means. In this way, boiling of a relatively small amount of water which has initially passed through the filter means, and thus premature operation of the steam-responsive control means, can be prevented. One suitable example of means for controlling the heating comprises a magnetic float provided in the kettle body, the float being arranged to

activate a switch to connect power to the heating element only when the amount of water which has passed through the filter means reaches a predetermined level within the kettle body.

In one embodiment, the kettle includes means for automatically registering each time water enters the kettle body, in order to monitor the usage of the filter means. The lid may include an aperture through which the water can pass to enter the kettle without removing the lid, the aperture being closable by a cover, and the registering means being arranged to register automatically each time the cover is opened.

The invention will now be described by way of example with reference to the accompanying drawings, in which:-

Figure 1 is a schematic vertical section through a kettle according to one embodiment of the invention;

Figure 2 is a schematic vertical section through a kettle according to a second embodiment of the invention;

Figure 3 is a schematic half section - half side view of a filter cartridge which can be used in the kettle shown in Figure 1 or 2;

Figure 4 is a schematic perspective view of a lid which may be used on the kettle shown in Figure 1 or 2;

Figure 5 is an exploded view of the lid shown in Figure 4;

Figures 6 and 7 are respectively a plan and a perspective view of certain components of the lid shown in Figures 4 and 5; and

Figure 8 is a schematic vertical section through a kettle according to a third embodiment of the invention.

Referring firstly to the embodiment shown in Figure 1, a jug-type kettle comprises a body 1 of moulded plastics material having a top opening closable by a lid 17, a spout 2, and a handle 3. A hopper 4 is mounted in the upper region of the body 1, the hopper accommodating a filter cartridge 5 which is removably mounted in a cylindrical well 43 formed in the base of the hopper 4 and extending down into the lower region 7 of the body 1. The cartridge 5 contains a granular filter material and will be described in more detail hereinbelow. The well 43 has an annular seal 43a extending into the well and an aperture 45 is formed in its side wall near the top of the well. A support 43b ensures that a space remains between the cartridge 5 and the base of the well 43. A conventional electric heating element 6 is mounted in the lower region 7 of the kettle body. The hopper 4 and kettle body 1 are shaped such that the lower region 7 communicates with the spout 2 and also with a steam-responsive control 8 mounted in the handle 3. The control 8 is connected to a user-operable switch 9 for switching power to the heating element in a conventional manner. In this way, steam generated by water heated in the lower region 7 is guided up through passage 40 formed between the side walls of the hopper 4 and kettle body 1 to cause the control 8 to disconnect power to the heating element 6 upon its sensing of the steam.

A float 46 incorporating a permanent magnet is mounted for vertical movement in the lower region 7. A normally-open reed switch 47 is housed in the side wall of the kettle body 1 adjacent the float 46 and is electrically connected to a controller 48 for controlling power to the heating element 6.

The illustrated kettle is of the "cordless" type and is removably mounted on a base 49.

To use the kettle, water is poured into the hopper 1, as shown by the larger arrow in Figure 1, and percolates down through the granular filter material contained in the filter cartridge 5. In this way most of the contaminants responsible for scum and scale are removed from the incoming water. The filtered water then passes into the space 44 surrounding the cartridge 5 until the space is filled. The water then flows through the aperture 45, as shown by the smaller arrow, and starts to fill the lower region 7. This causes the float 46 to float up within the kettle body and to close the reed switch 47 by magnetic force when a predetermined level of water is contained in the lower region 7. Power is then supplied to the heating element 6 and the water contained in the lower region 7 of the kettle body is heated until steam rising up the passage 40 activates the control 8 to disconnect the power to the element 6. The heated water can be subsequently poured out of the lower region of the kettle body via the spout 2. The layer of cooler water which remains in the space 44 helps to thermally insulate the cartridge 5 from the heated water and thus to alleviate overheating of the granular filter material contained in the cartridge. Additionally, a heat-reflective coating may be provided on the outer surface of the well 43.

The hopper 4 is advantageously removable from the kettle body 1 to enable the hopper to be more easily cleaned and to enable the kettle to be used without the filter means if desired. The filter cartridge 5 is also removable from the hopper 1 to enable the cartridge to be regularly replaced. The lid 17 also preferably includes a flange 50 which prevents filling of the kettle via the spout 2 and thus by-passing of the filter means.

Figures 2 and 8 show two alternative embodiments of the kettle in which like parts are labelled with like reference numerals with respect to Figure 1. The embodiment of Figure 2 differs from the embodiment of Figure 1 in that a double skin of thermal insulation surrounds the cartridge 5. In this embodiment, the well 43 is provided with inner and outer walls 51, 52 surrounding the cartridge 5 and forming an inner space 44 between the cartridge 5 and inner wall 51 and an outer space 53 between the inner and outer walls 51, 52. A passage 54 is provided to bridge the outer space 53 so that the inner space 44 communicates directly with the lower region 7 of the kettle body. The outer space 53 is made water-tight and may be filled just with air or it may contain a thermally-insulating material such as a closed cell expanded foam. In addition, the inner and/or outer walls 51, 52 may be provided with a heat-reflective coating to reflect heat from the heated water in the lower region 7.

The embodiment shown in Figure 2 operates in the same manner as the embodiment of Figure 1 and the filtered water which fills the inner space 44 flows into the lower region 7 via the passage 54. This second embodiment thus provides additional thermal protection for the granular filter material of the cartridge 5.

In the embodiment of Figure 8, the kettle also has the double skin of thermal insulation surrounding the cartridge 5. However, an alternative passage 54'is arranged vertically in the base of the well 43 and communicates with the lower region 7 of the kettle body via a tortuous or labyrinth water outlet path 55, through which water filtered through the cartridge 5 is constrained to pass before entering the lower region. The location of the passage 54' means that the filtered water flowing out of

the base of the cartridge 5 may not fill the inner space 44. The amount of water remaining in the inner space depends on the rate of flow of water through the cartridge 5 relative to the rate of flow of water through the passage 54' and the outlet path 55.

The tortuous outlet path 55 inhibits inflow of heated water from the lower region 7 into the inner space 44 of the well 43 which would otherwise tend to heat the granular material of the cartridge 5. In addition, the exit of the outlet path 55 faces the spout side of the kettle in order to prevent inflow of heated water when the kettle is tilted to pour water from the lower region 7 out of the spout 2.

Figure 3 shows in more detail the filter cartridge 5 which is of the general type described in our British Patent Publication No. 2255771A. The cartridge comprises a moulded plastics, generally cylindrical container 10, the upper end of which is formed with an encircling projecting rim 11. The filter material of the cartridge 5 contains a water treatment agent 12 in a granular form, such as a mix of ion exchange resins and activated carbon. The granular treatment agent is retained within the container 10 by a base cap 42 and a top cap 13. The top cap has an outer peripheral flange 14, a dome shaped central portion 15 and an integral upstanding spigot 16, and the base cap is flat. The cap 13, 42 are water-permeable and may be made of sintered plastics material, which may be produced by sintering suitably sized plastics granules in a mould which is passed through a microwave oven at a suitable speed to allow the granules to fuse together but to maintain their shape to create an integral but porous structure. In this example, the top cap 13 is of sintered polypropylene and the base cap 42 is of sintered polyethylene.

Figures 4 to 7 illustrate an example of the lid 17 suitable for use on the kettle body 1. This lid incorporates means for automatically monitoring usage of the filter so that the user knows when the filter cartridge needs to be replaced, as described in our co-pending British Patent Application No. 9508096.6.

The lid 17 fits over the kettle body 1 so as to enclose the hopper 4. Towards the end 17a of the lid 17 which is intended to be adjacent the kettle spout, is an aperture 18, and the lid has at its centre a housing 19, which provides a knob to remove the lid from the kettle body and which contains a channel 20 and is closed by a cap 21. The lid 17 also has a peripheral skirt 22 depending from its edge and ensuring a good fit inside the rim of the hopper 4 and kettle, and in the end of the skirt 22 which is intended to be adjacent the kettle handle is provided an opening 23.

A slidable plate 24 has a portion 25 which acts as a cover to close the aperture 18. An elongated portion 26 of the plate 24 extends through the skirt opening 23 and has at its end a user-operable thumb grip 27, which is intended to overlie the upper part of the handle of the kettle.

The plate 24 has a central longitudinal slot 29 which partly extends into the elongated portion 26. A flange 30 extending into the slot 29 and also a vertical lug 31 are provided adjacent the cover portion 25. A resilient member such as a spring 32 rests on the flange 30 and is located in the channel 20 with one end bearing against the lug 31 which protrudes into the channel 30. The other end of the spring 32 bears against the opposite end of the channel 20.

A rotary disc 33 is located below the plate 24, and at the centre of the disc 33 is an axle 34 which extends up through a hole (not shown) in the lid 17, inside the housing 19, and is received in a cylindrical disc holder 35 which allows rotation of the disc 33. Around the periphery of the disc 33 are a plurality of equally spaced teeth 36 which engage with a tooth 37 on the underside of the plate 24 to form a ratchet mechanism. An opposing tooth 38, seen in Figure 6, is provided on the underside of the lid 17 and is arranged to engage with the disc teeth 36 at a position substantially opposite the tooth 37. The upper surface of the disc 33 has markings 39 in any suitable form which can be viewed through a window 41 in the lid 17.

In order to enable water to enter the hopper 4 when the lid is fitted on the kettle body, the aperture 18 is opened by pulling the plate 24 towards the kettle handle, against the bias of the spring 32, by means of the thumb grip 27. As the plate moves, the tooth 37, which engages with the disc teeth 36, rotates the disc 33 clockwise through a preset angle depending on the number of teeth 36 and causes a different marking 39 to be visible through the window 41.

When the thumb grip 27 is released the spring 32 urges the lug 31 and hence the entire plate 24 towards the spout, thereby reclosing the aperture 18 with the cover portion 25. The tooth 37 slides over the sloping face of the tooth 36 with which it is engaged and the opposing tooth 38 prevents any anti-clockwise rotation of the disc 33.

The rotary disc 33 thus registers each time water can enter the hopper 1 via the open aperture 18 and the visible markings 39 on the disc 33 indicate the remaining useful life of the replaceable filter cartridge. In one

example, the rotation of the disc and its markings may be arranged such that one complete revolution of the disc represents the total life of each filter cartridge. The hopper can be filled via the aperture 18 without removing the lid 17, and the kettle can be held by the handle and the aperture can be opened by means of the thumb grip 27 simultaneously with one hand. This enables the hopper 4 to be easily and quickly filled, for example from a running tap, via the aperture 18 with the corresponding usage of the filter cartridge being automatically registered by the rotary disc 33.

The present invention thus provides a kettle which filters incoming water before it is heated or boiled, rather than outgoing water after it has been heated or boiled. This therefore greatly reduces the amount of contaminants in the incoming water which are responsible for the build-up of scum and scale once the water is heated, thereby alleviating the problems associated with existing kettles. The invention also enables a standard filter cartridge commonly used in cold water filter jugs to be used in the kettle without any adverse affects on the cartridge which may be caused by overheating.

Whilst particular embodiments of the invention have been described, various modifications may be envisaged without departure from the scope of the invention. For example, the means for controlling the heating of the water in dependence on the water filtering rate need not comprise a magnetic float. It could alternatively comprise a low power element which slowly heats up the water as the lower region of the kettle body fills, or a position switch having "off", "simmer" and "boil" positions which could be

manually or automatically controlled. The heating element 6 could be electrically controlled to provide a heating profile matching the water flow rate. Alternatively pre-heating could take place, the full power being switched in by a bimetallic strip when a certain temperature is reached, or a delay switch could switch on the heating element after a pre-set initial delay. Other possible water level sensing devices, apart from the magnetic float, include a pressure pad which senses a predetermined volume of water, capacitance plates using the water to make the electrical circuit when the correct level has been reached, a flexible membrane in the base of the kettle body which operates a microswitch, and an optical sensor for sensing the water level.

Level indicators, sight tubes or insert-mounted clear panels could be used to give an external indication of the water level in the hopper and/or the lower region of the kettle body. Where magnetic floats are provided, the level indicators could make use thereof by incorporating a member attracted by the permanent magnet to move within a clear tube. Various controls and heating systems other than that described above, for example a sub-floor heating system, with various methods of attaching the heating element to the kettle body or base, could be incorporated into the kettle. As an alternative to the "cordless" kettle, it could be of the "corded" type. The lid could be made lockable with a sealing fit to prevent water spillage from the hopper.

Other types of filter means could be used as an alternative to the filter cartridge described and illustrated, such as a "tea bag" type pouch containing loose filter media, or replaceable loose filter media contained in the bottom of the hopper. An alternative shape or

construction of the filter cartridge may be used, for example, the caps 13, 42 may be of standard perforated plastics material instead of sintered plastics.

In another embodiment, the return spring 32 of the filter monitoring means may not be used.

CLAIMS

1. A kettle comprising a body (1) for containing water to be heated, the body (1) having a top opening closable by a lid (17), and filter means (5) mounted in said body (1), said filter means (5) being arranged such that the water is constrained to pass there-through during its passage into the kettle body (1) via said opening.

2. A kettle as claimed in claim 1, wherein the kettle body (1) comprises an upper compartment (4) and a lower compartment (7), and said filter means (5) is mounted between said compartments (4,7) such that water poured into the upper compartment (4) via said top opening is constrained to pass through the filter means (5) into said lower compartment (7).

3. A kettle as claimed in claim 2, including an electric heating element (6) located in or adjacent the lower compartment (7) to heat water contained in said lower compartment (7).

4. A kettle as claimed in claim 2 or 3, wherein the upper compartment (4) is formed by a hopper (4) mounted in the upper region of the interior of the kettle body (1) and the filter means (5) is mounted in the base of the hopper (4).

5. A kettle as claimed in claim 4, wherein the hopper (4) is removable from the kettle body (1) and/or the filter means (5) is removable from the hopper (4).

6. A kettle as claimed in claim 4 or 5, wherein the hopper (4) is shaped to enable water in the lower compartment (7) to be poured out of the kettle through the kettle spout (2).

7. A kettle as claimed in claim 4, 5 or 6, including control means (8) responsive to steam generated by the heated water to disconnect power to the heating element (6), the hopper (4) being shaped to guide steam from the lower compartment (7) towards the control means (8).

8. A kettle as claimed in any preceding claim, wherein the filter means (5) is a demineralising filter comprising a filter cartridge (5) containing a water treatment agent (12) in a granular form which can act on the water flowing through the cartridge (5).

9. A kettle as claimed in claim 8, wherein the filter cartridge (5) has spaced-apart water-permeable walls (13,42) formed, for example, from sintered granular plastics material, between which the water treatment agent (12) is retained.

10. A kettle as claimed in any preceding claim, including means (44) for thermally insulating the filter means (5) from heated water in the kettle body (1).

11. A kettle as claimed in claim 10, wherein the thermally insulating means (44,53) comprises a space (44) formed in the kettle body (1) which surrounds the filter means (5) when mounted in the body (1) and which is arranged to remain filled with relatively cool water during operation of the kettle.

12. A kettle as claimed in claim 10 or 11, wherein the thermally insulating means (44,53) comprises at least one insulating layer (53) of air and/or of thermally insulating material, such as closed cell expanded foam, which surrounds the filter means (5) when mounted in the kettle body (1).

13. A kettle as claimed in claim 11 or 12, wherein the thermally insulating means (44,53) includes a heat-reflective coating surrounding the filter means (5).

14. A kettle as claimed in any preceding claim, including means (46) for controlling the heating of the water in dependence on the rate of flow of the water through the filter means (5).

15. A kettle as claimed in claim 14, wherein the means (46) for controlling the heating comprises a magnetic float (46) provided in the kettle body (1), the float (46) being arranged to activate a switch (47) to connect power to the heating element (6) only when the amount of water which has passed through the filter means (5) reaches a predetermined level within the kettle body (1), in order to monitor the usage of the filter means (5).

16. A kettle as claimed in any preceding claim, including means (33) for automatically registering each time water enters the kettle body (1), in order to monitor the usage of the filter means (5).

17. A kettle as claimed in claim 16, wherein the lid (17) includes an aperture (18) through which the water can pass to enter the kettle without removing the lid (17), the aperture (18) being closable by a cover (25), and the registering means (33) being arranged to register automatically each time the cover (25) is opened.

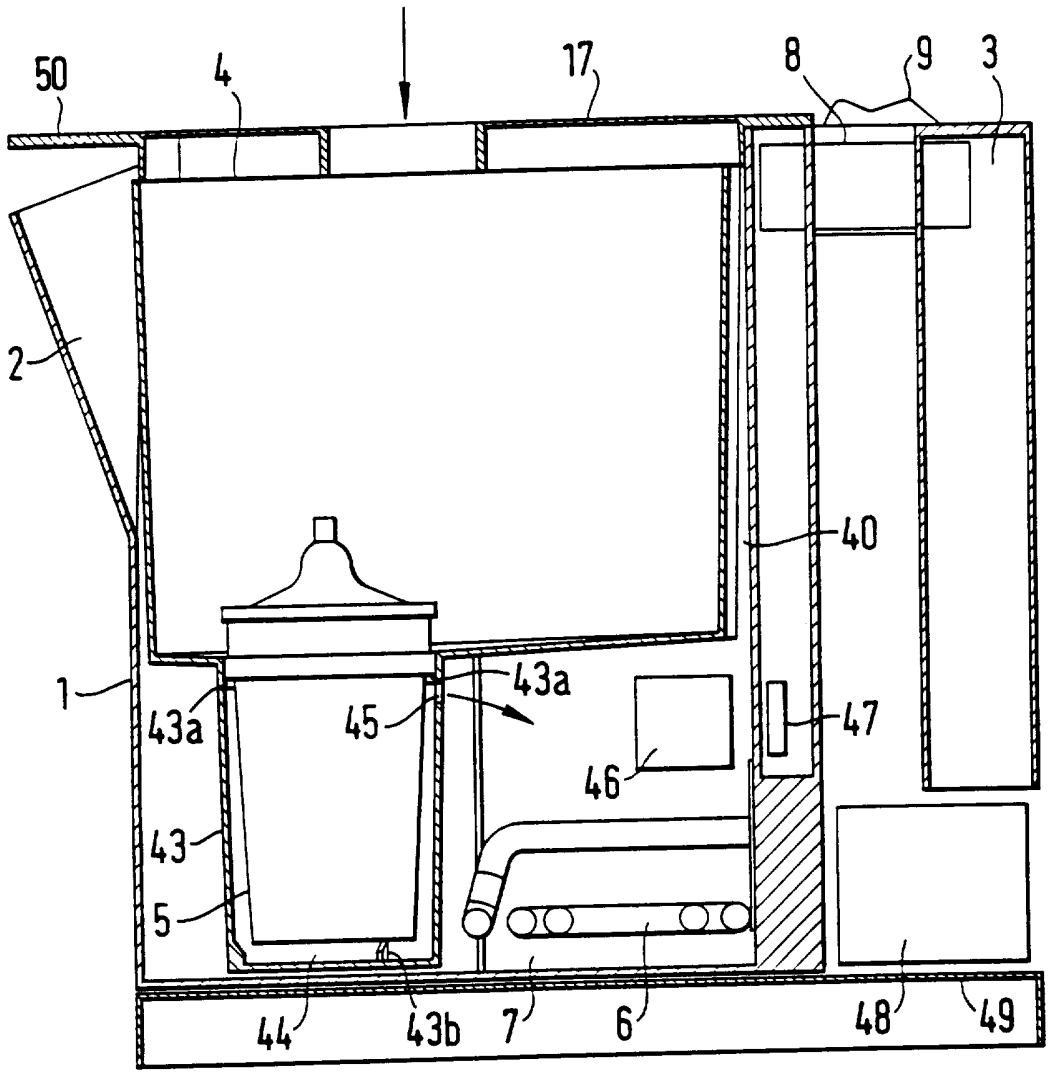


Fig. 1

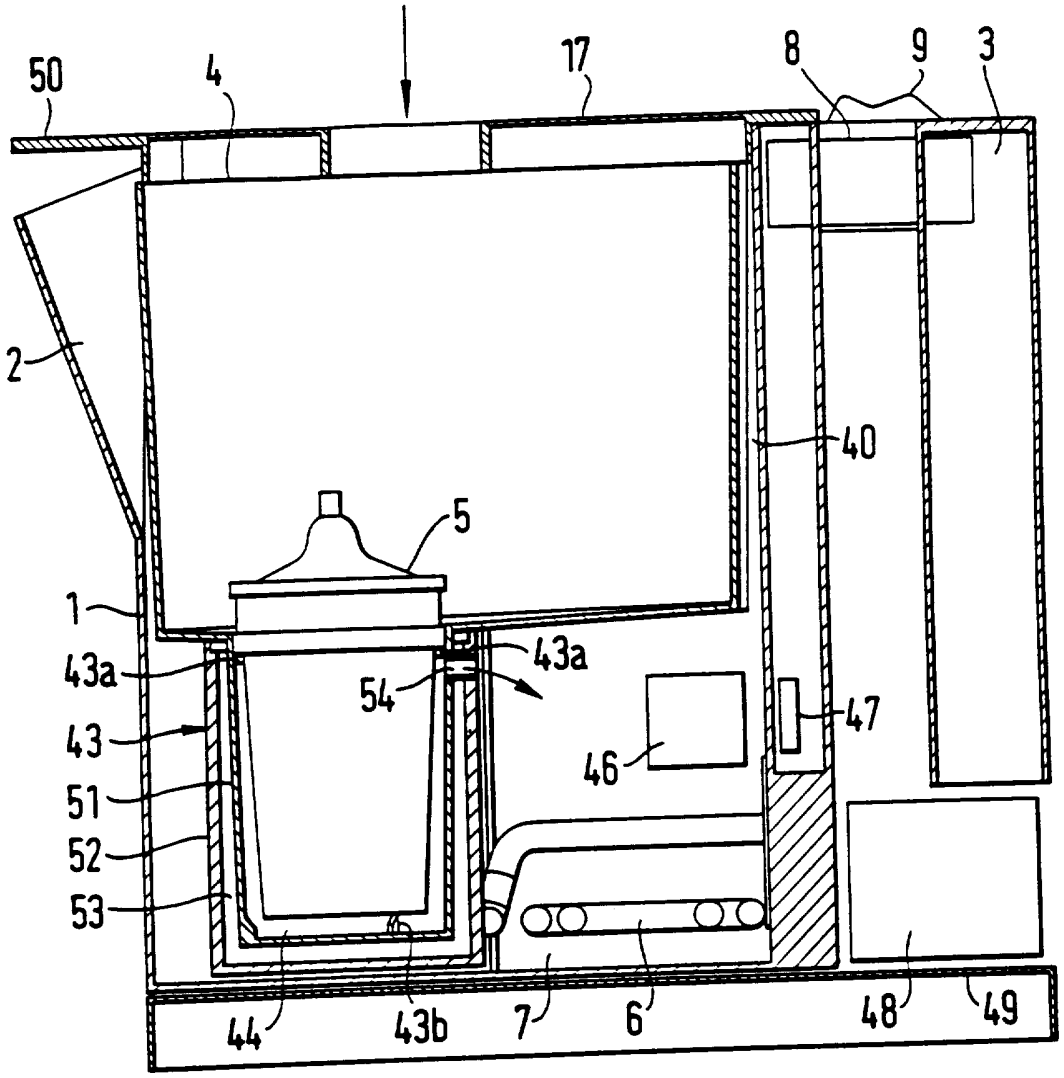


Fig. 2

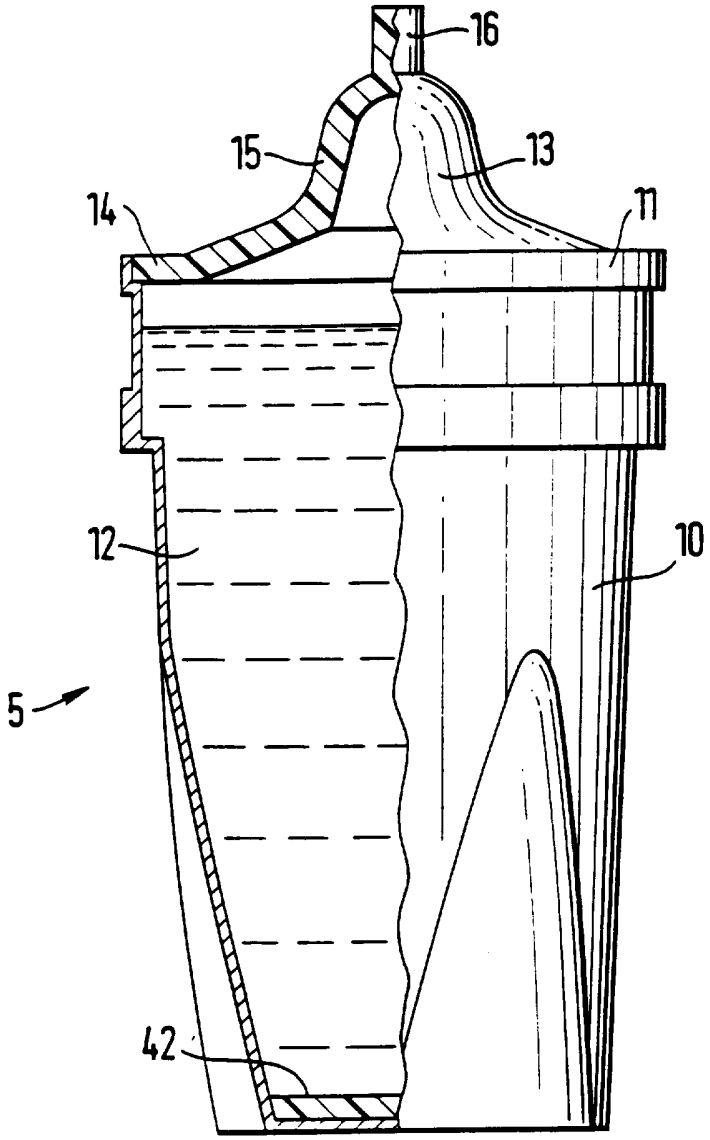


Fig. 3

Fig. 4

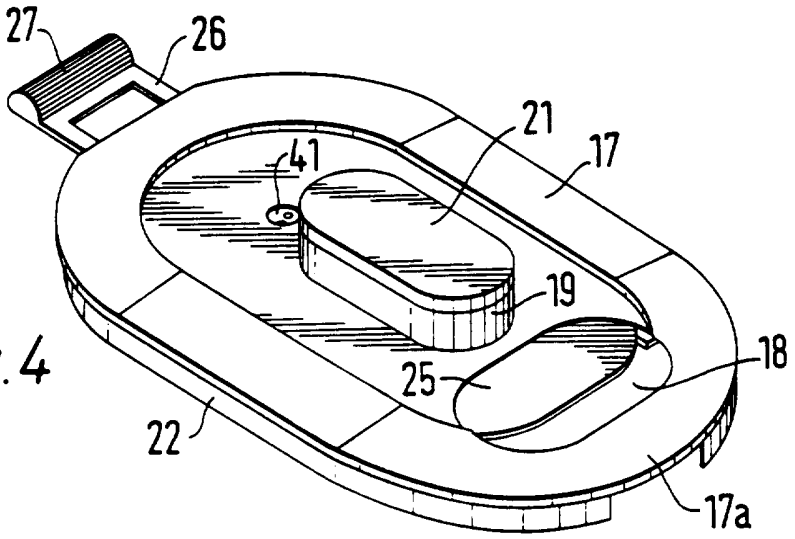


Fig. 6

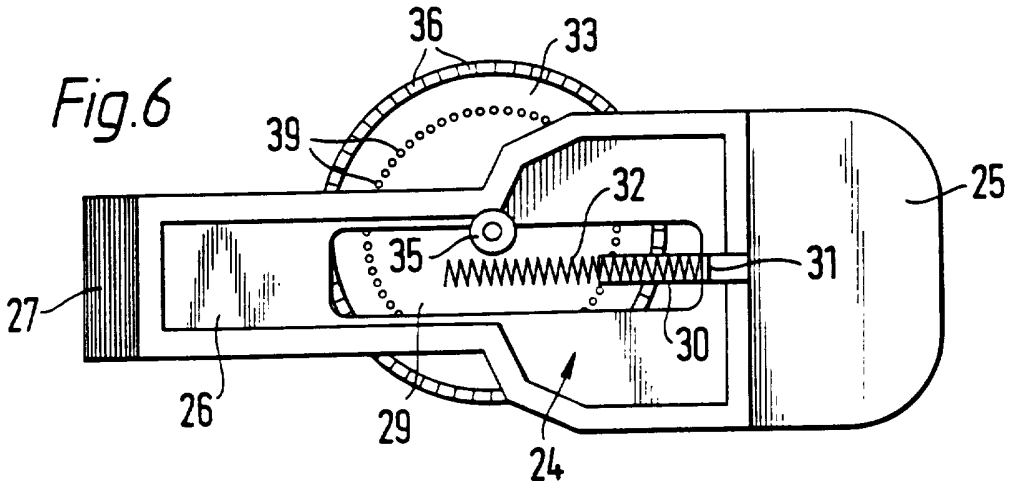


Fig. 7

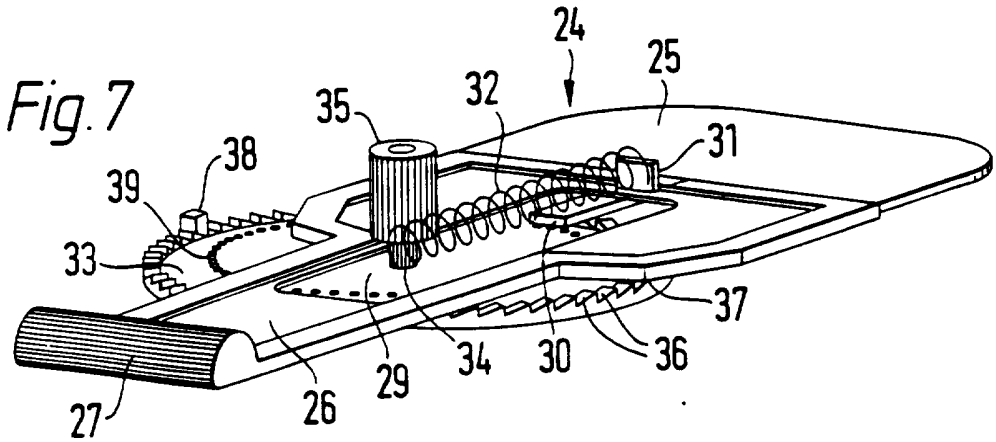
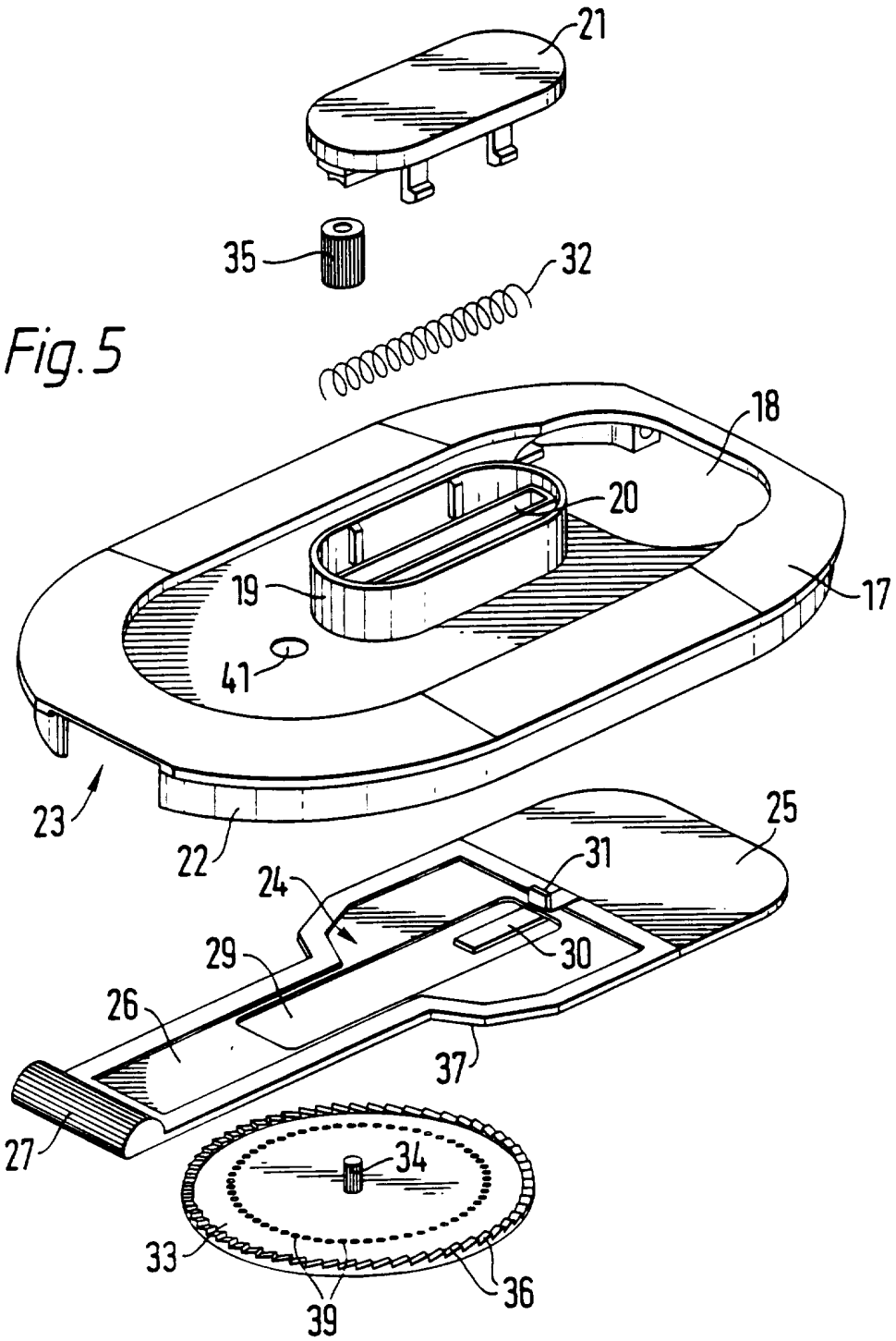


Fig. 5



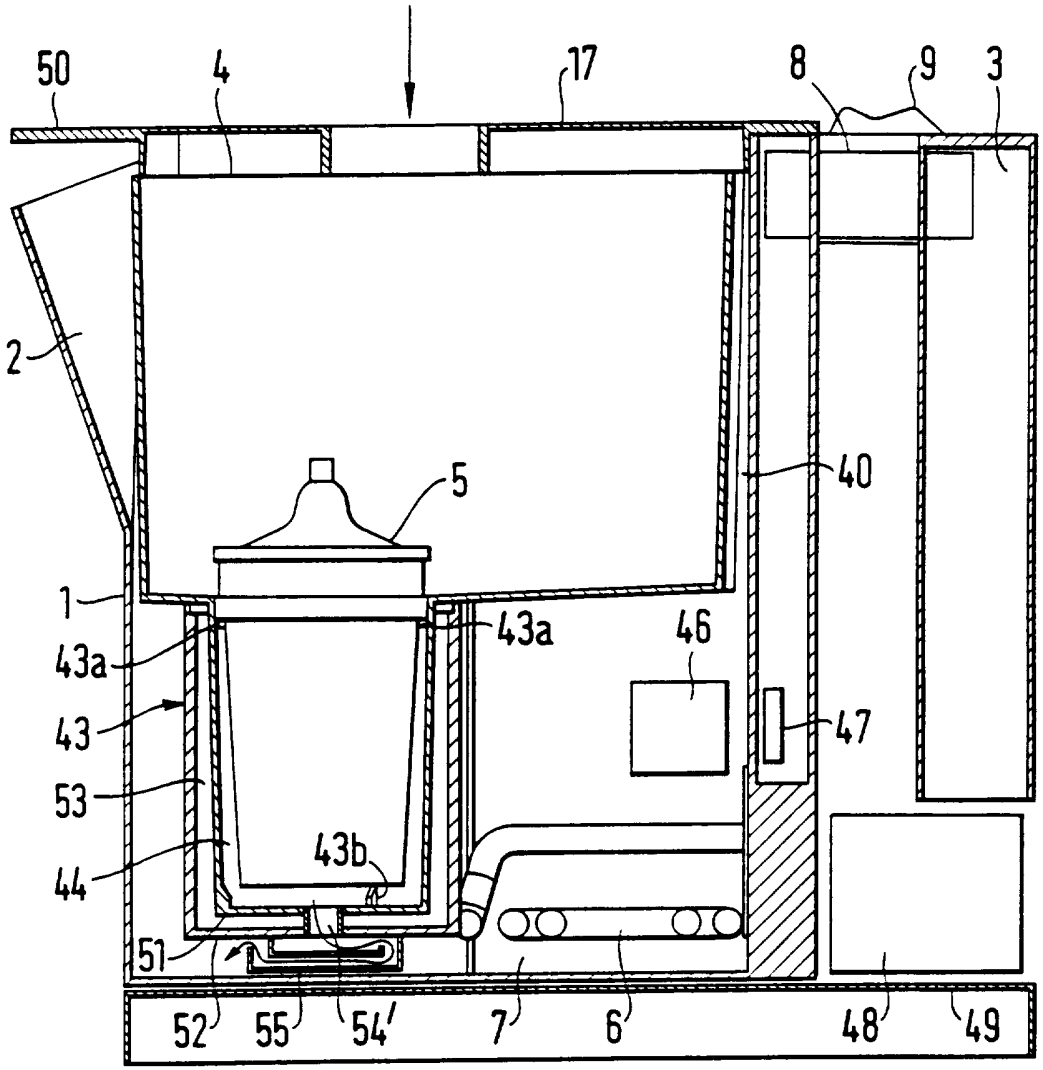


Fig. 8

INTERNATIONAL SEARCH REPORT

Int ional Application No
PCT/GB 96/00090

A. CLASSIFICATION OF SUBJECT MATTER

A 47 J 27/21

According to International Patent Classification (IPC) or to both national classification and IPC6

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A 47 J

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	WO, A, 95/29 131 (KENWOOD MARKS) 02 November 1995 (02.11.95), claims; figs.	1, 16,17
P,A	WO, A, 95/13 733 (MOULINEX S.A.) 26 May 1995 (26.05.95), abstract.	1
P,A	WO, A, 95/03 733 (MOULINEX S.A.) 09 February 1995 (09.02.95), abstract.	1
A	FR, A, 2 701 372 (SEB S.A.) 19 August 1994 (19.08.94), abstract.	1

[X] Further documents are listed in the continuation of box C.

[ ] Patent family members are listed in annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
22 March 1996	24. 05. 96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	REIF e.h.

Interr ıal Application No
PCT/GB 96/00090

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB, A, 2 268 680 (STRIX) 19 Jänner 1994 (19.01.94), abstract; fig. 1.	1
A	WO, A, 92/19 552 (WAYMASTER) 12 November 1992 (12.11.92), claim 1; fig. 1.	1

ANHANG

zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

ANNEX

to the International Search Report to the International Patent Application No.

ANNEXE

au rapport de recherche international relatif à la demande de brevet international n°

PCT/GB 96/00090 SAE 125373

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La présénte annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche international visée ci-dessus. Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsibilité de l'Office.

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