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(54) IRONING APPLIANCE, IN PARTICULAR FOR HOUSEHOLD USE, COMPRISING A FILTERING ELEMENT

(57) The present invention relates to an ironing appliance (1; 1'), in particular for household use, of the type comprising an iron (10; 10') with a soleplate (11; 11') allowing to carry out traditional ironing operations, in particular on textile items, and generator means (30; 30') for generating steam. The generator means (30; 30') comprise a tank (31; 31') adapted to contain a liquid and a filtering element (32; 32') associated with the tank (31; 31') for filtering the liquid. According to the invention, the filtering element (32; 32') comprises a filter (32F; 32F') made of polymeric material, in particular polysulfone, which is adapted to ensure ultrafiltration of the liquid contained in the tank (31; 31') as it flows through the filter (32; 32').

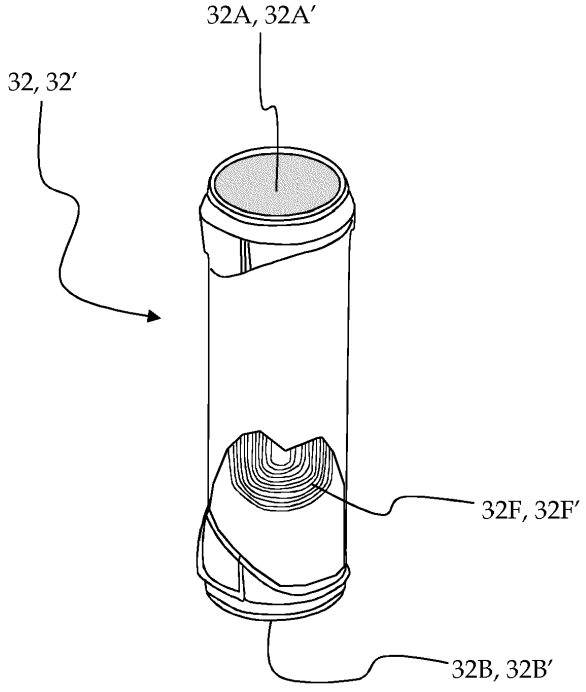

Fig. 5b

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Description

[0001] The present invention relates to an ironing appliance, in particular for household use, according to the preamble of claim 1.

[0002] The present invention applies to traditional ironing, in particular of textile items, within a household environment.

[0003] As is known in the art, ironing appliances, in particular for household use, may consist of either an iron alone or a set including a support structure and an iron, said support structure usually comprising a base acting as a support for the iron.

[0004] When the ironing appliance is an iron, it is usually so realized as to include generator means for generating steam, in particular comprising a tank adapted to contain a liquid, generally water, said tank being associated with a filtering element for filtering said liquid. Typically, the filtering element can filter mineral substances, particularly limestone, present in the liquid, which might otherwise obstruct the steam outlet holes in the iron soleplate; one example of such an iron is described in United States patent No. US5,063,697, wherein the filtering element consists of a filter comprising ion exchange resins.

[0005] The irons known in the art usually also comprise a pump, positioned downstream of the filtering element, for delivering the liquid to the iron soleplate, and heating means for obtaining steam that will exit through said holes in the soleplate.

[0006] When the ironing appliance is a set comprising a support structure and an iron, the generator means for generating steam are usually associated with said support structure. In particular, said generator means comprise a tank adapted to contain a liquid, generally water, associated with a filtering element for filtering said liquid; in this case, in fact, limestone removal is useful to prevent both the electrovalve at the boiler outlet and the steam exit holes in the iron soleplate from becoming obstructed. Preferably, the support structure is connected to the iron through connecting means comprising a duct for steam transportation and a cable for supplying electric power to the iron, both of which are usually enclosed in an external protection sheath.

[0007] One example of such an ironing appliance is described in European patent No. EP1616992B1, wherein it comprises a filtering element, consisting of a filter comprising ion exchange resins, and a pump positioned downstream of the filtering element for delivering the liquid to the iron.

[0008] However, the solutions known in the art and described above suffer from a few drawbacks.

[0009] In particular, such drawbacks are due to the fact that the known ironing appliances comprise generator means for generating steam that provide neither optimal filtration of the liquid contained in the tank nor the filtration of an adequate quantity of said liquid.

[0010] In the ironing appliances known in the art, furthermore, the filtering element may happen to get damaged during the ironing operations, in particular due to overheating. Further drawbacks are then due to the fact that the filtering element is so realized as to comprise ion exchange resins. In fact, when using such a filtering element a chemical reaction occurs between the mineral substances (particularly calcium carbonate) dissolved in the water and said resins; it is clear that, following a long period of use, the resins will become progressively saturated and the effectiveness of the filtering element will be heavily reduced.

[0011] It is also apparent that, when the resins become saturated, the filtering element will have to be replaced, resulting in higher maintenance and operating costs of the ironing appliance.

[0012] In some ironing appliances, it has been thought of extending the service life of the filtering element by increasing the quantity of filtering material, i.e. the ion exchange resins present in the filtering element itself.

[0013] However, such solutions have a number of drawbacks as well, in that the quantity of filtering material can only be increased by increasing the dimensions of the filtering element; it is apparent that such a modification inevitably implies that the whole ironing appliance needs to be redesigned, resulting in higher production costs.

[0014] It is clear that the increased dimensions of the filtering element and of the whole ironing appliance may also cause problems as concerns the positioning of the ironing appliance itself, especially if the user does not have sufficient room at his/her disposal for ironing.

[0015] In addition, a filtering element comprising ion exchange resins may release potentially harmful substances into the environment.

[0016] In this frame, it is the main object of the present invention to provide an ironing appliance, in particular for household use, which is adapted to overcome the above-mentioned drawbacks.

[0017] In particular, it is one object of the present invention to provide an ironing appliance, in particular for household use, comprising generator means for generating steam, which are adapted to ensure optimal filtration of the liquid contained in the tank as well as the filtration of an adequate quantity of said liquid.

[0018] It is another object of the present invention to provide an ironing appliance, in particular for household use, which is so realized as to prevent the filtering element from suffering any damage during the ironing operations, in particular due to overheating.

[0019] It is a further object of the present invention to provide an ironing appliance, in particular for household use, comprising a filtering element which is so realized as to ensure a longer service life, resulting in lower maintenance and operating costs of the ironing appliance.

[0020] It is another object of the present invention to provide an ironing appliance, in particular for household use, comprising a filtering element which is so realized that its filtering efficiency remains substantially unchanged for a long time.

[0021] It is a further object of the present invention to provide an ironing appliance, in particular for household use, comprising a filtering element that does not require that the whole ironing appliance be modified or redesigned in order to extend the life of the filtering element.

[0022] It is another object of the present invention to design said filtering element in such a way as to prevent the ironing appliance from becoming bulky or from causing problems in regard to the positioning of the whole ironing appliance.

[0023] It is yet another object of the present invention to provide an ironing appliance, in particular for household use, comprising a filtering element which is so realized as to not release any potentially harmful substances into the environment.

[0024] Said objects are achieved by the present invention through an ironing appliance, in particular for household use, incorporating the features set out in the appended claims, which are intended to be an integral part of the present description.

[0025] Further objects, features and advantages of the present invention will become apparent from the following detailed description and from the annexed drawings, which are supplied by way of non-limiting example, wherein:

- Fig. 1 is a perspective view of an ironing appliance, in particular for household use, according to the present invention and to a first embodiment thereof;
- Fig. 2 is a first sectional view of a portion of the ironing appliance of Fig. 1;
- Fig. 3 is a sectional view of an ironing appliance, in particular for household use, according to the present invention and to a second embodiment thereof;
- Fig. 4 is a general diagram of the ironing appliance, in particular for household use, according to the present invention;
- Figs. 5a and 5b show a perspective view and a partially sectional view of a component of the ironing appliance, in particular for household use, according to the present invention, said component being shown in a first and a second embodiments thereof, respectively.

[0026] Referring now to the annexed drawings, in Fig. 1 reference numeral 1 designates as a whole a first embodiment of an ironing appliance, in particular for household use, according to the present invention.

[0027] In accordance with said first embodiment, which is also shown in Fig. 2, said ironing appliance 1 comprises an iron 10 and a support structure 20.

[0028] In particular, the support structure 20 comprises a base 21 adapted to provide a support surface for said iron 10, said base 21 having at least one protrusion 21A made of heat-resistant material, in particular a plastic material; as an alternative, the whole base 21 may be made of heat-resistant material, in particular a plastic material.

[0029] The support structure 20 is connected to the iron 10 through connecting means 2, in particular comprising a duct for steam transportation, a cable for supplying electric power to the iron 10, and an external protection sheath adapted to contain said duct and said cable.

[0030] The iron 10 comprises a soleplate 11 (visible in Fig. 1), which allows performing traditional ironing operations, in particular on textile items; said soleplate 11 is preferably metallic and thermally conductive.

[0031] The iron 10 and/or the support structure 20 may further comprise selector means 3 adapted to select and/or set and/or display an ironing program and/or some operating parameters (e.g. relating to the temperature of the soleplate 11 of the iron 10) of the ironing appliance 1.

[0032] In Fig. 2 it can also be noticed that the ironing appliance 1 comprises generator means (designated as a whole by reference numeral 30 in Fig. 2) for generating steam, said generator means 30 comprising a tank 31 adapted to contain a liquid (not shown, usually comprising water) and a filtering element 32 associated with said tank 31 for filtering said liquid.

[0033] Said generator means further comprise heating means (not shown) for heating to evaporation the water contained in an evaporation chamber 40; in particular, in the first embodiment shown in Figures 1 and 2, said evaporation chamber 40 comprises a boiler with which said heating means are preferably associated.

[0034] Said soleplate 11 preferably has holes (also not shown) for the exit of the generated steam.

[0035] In the first embodiment shown in Figures 1 and 2, said generator means 30 are associated with the support structure 20.

[0036] Fig. 3 shows a second embodiment of the ironing appliance according to the present invention; it should be noted that in said figure the same reference numerals as those used in Figs. 1 and 2 have been adopted, with the addition of an apostrophe (’), to designate identical or equivalent elements.

[0037] In the second embodiment shown in Fig. 3, in fact, the ironing appliance 1’ comprises an iron 10’ equipped with a soleplate 11’ that allows performing traditional ironing operations, in particular on textile items; the soleplate 11’ is preferably metallic and thermally conductive, is associated with heating means (not shown) for heating it in operation, and has holes (not shown) for the exit of the generated steam.

[0038] In this case, said heating means may comprise an electric resistor (not shown) associated with the soleplate 11’, and steam can be generated when the liquid is in the proximity of said soleplate 11’, e.g. when the liquid is in an evaporation chamber 40’ associated with said soleplate 11’. It is however clear that steam can also be generated by using heating means arranged in a different manner, and that said evaporation chamber 40’ may also be positioned differently than shown in Fig. 3.

[0039] Also the ironing appliance 1’ of Fig. 3 comprises selector means 3’ adapted to select and/or set and/or

display an ironing program and/or some operating parameters (e.g. relating to the temperature of the soleplate 11') of the ironing appliance 1'; preferably, said selector means 3' are positioned in proximity to a handle 12' of the ironing appliance 1'.

[0040] Furthermore, the ironing appliance 1' of Fig. 3 comprises generator means (designated as a whole by reference numeral 30' in Fig. 3) for generating steam, said generator means 30' comprising a tank 31' adapted to contain a liquid (not shown, usually comprising water) and a filtering element 32' associated with said tank 31' for filtering said liquid.

[0041] Fig. 4 shows a general diagram of the ironing appliance 1, 1' according to the present invention.

[0042] Figures 2 to 4 show that, in accordance with the present invention, the ironing appliance 1, 1' comprises a pump 33, 33' positioned between the tank 31, 31' and the filtering element 32, 32' to take the liquid from the tank 31, 31' and supply it to the filtering element 32, 32'.

[0043] This provision allows supplying the liquid to the filtering element 32, 32' at a predetermined pressure, said pressure being preferably in the range of 1 to 5 bar and adequate to ensure the optimal operation of said filtering element 32, 32'; moreover, the particular arrangement of the pump 33, 33' allows delivering to the soleplate 11, 11' an adequate quantity of liquid for the ironing operations.

[0044] Preferably, the ironing appliance 1, 1' according to the present invention also comprises a non-return valve 34, 34', positioned downstream of the filtering element 32, 32'.

[0045] It must be pointed out that, in the ironing appliance 1 shown in Figures 1 and 2, the non-return valve 34 is positioned between the filtering element 32 and the evaporation chamber 40, which comprises a boiler; in the ironing appliance 1' shown in Fig. 3, instead, the non-return valve 34' is positioned between the filtering element 32' and an evaporation chamber 40' associated with the soleplate 11' of the iron 10'.

[0046] This provision allows protecting the filtering element 32, 32' against a possible return of liquid and/or steam, thus preventing said filtering element 32, 32' from suffering any damage.

[0047] Preferably, the ironing appliance 1 according to the first embodiment shown in Figures 1 and 2 comprises an electrovalve 41 for adjusting the steam flow towards the iron 10, in particular said electrovalve 41 being associated with an outlet of the evaporation chamber 40.

[0048] The annexed drawings also show that the ironing appliance 1, 1' according to the present invention comprises:

- a first duct 35A; 35A' for connecting the tank 31; 31' to the pump 33; 33';
- a second duct 35B; 35B' for connecting the pump 33; 33' to the filtering element 32; 32';
- a third duct 35C; 35C' for connecting the filtering element 32; 32' to the non-return valve 34; 34';
- a fourth duct 35D; 35D' for connecting the non-return valve 34; 34' to the evaporation chamber 40, 40'.

[0049] In the first embodiment shown in Figures 1 and 2, the ironing appliance 1 preferably comprises a fifth duct 35E for connecting said electrovalve 41 to the iron 10, in particular said fifth duct 35E being connected to said connecting means 2. It is clear that, as an alternative, the ironing appliance 1 according to the first embodiment may also be designed in a manner such that said electrovalve 41 is directly connected to said connecting means 2.

[0050] It must be pointed out that in the general diagram shown in Fig. 4 the electrovalve 41, the fifth duct 35E and the connecting means 2 are represented by a dashed-dotted line because such components are preferably not included in the second embodiment shown in Fig. 3, since in said second embodiment the evaporation chamber 40' is preferably associated with the soleplate 11'.

[0051] In accordance with the present invention, said filtering element 32; 32' comprises a filter 32F; 32F' made of polymeric material, in particular polysulfone, which is adapted to ensure ultrafiltration of the liquid contained in said tank 31; 31' as it flows through said filter 32F, 32F'.

[0052] Preferably, said polysulfone filter 32F, 32F' comprises a plurality of hollow capillary fibres, in particular obtained by extrusion; in particular, each hollow capillary fibre has a diameter comprised between 200 and 300 μm, with a surface having pores whose size is comprised between 0.001 and 0.030 μm.

[0053] The particular provisions of the present invention allow to provide an ironing appliance 1, 1', in particular for household use, comprising a filtering element 32, 32' designed to ensure a longer service life.

[0054] In addition, since the filtering element 32, 32' does not require frequent replacement, the maintenance and operating costs of the ironing appliance 1, 1' can be lowered.

[0055] The peculiar realization of the filtering element 32, 32' according to the present invention also allows to provide an ironing appliance 1, 1' which is not bulky (since it does not require the use of a bigger filtering element 32, 32') and which does not cause any problems in regard to the positioning of the whole ironing appliance 1, 1'. Furthermore, the special realization of the filtering element 32, 32' is such as to keep its filtering efficiency substantially unchanged even after a long period of use, while at the same time not releasing any potentially harmful substances into the environment. As can be seen in Fig. 3, wherein the generator means 30' are associated with the iron 10', the filtering element 32' is preferably located in the iron 10' in a remote position with respect to the soleplate 11'; in particular, said filtering element 32' is preferably positioned in a manner such that its orthogonal projection PO on a worktop P falls outside said soleplate 11' when said soleplate 11' is resting on said worktop P.

[0056] In Figure 3 one can see that the filtering element 32' is preferably positioned in the proximity of a rear portion 10A' of the iron 10', in particular said filtering element 32' being positioned over an arched portion 13' between the soleplate 11' and the rear portion 10A' of the iron 10'.

[0057] Thanks to the particular positioning of the filtering element 32', its outer housing and the filter 32F' can be kept in optimal conditions; in particular, said filtering element 32' is not affected by the heat released by the soleplate 11' and by any heating means possibly associated with said soleplate 11'.

[0058] As can also be seen in Figures 5a and 5b, according to the present invention the filtering element 32, 32' comprises at least one inlet 32A, 32A' allowing the liquid to flow into said filter 32F, 32F', in particular through the capillary fibres, where it is filtered by said pores on the surface of each fibre and from where it is then collected in the area of the filtering element 32, 32' external to the hollow capillary fibres; the filtering element 32, 32' further comprises at least one outlet 32B, 32B' allowing the permeate (i.e. the filtered liquid) to flow out of said filtering element 32, 32'.

[0059] As a result, in accordance with the present invention the filtration of the liquid occurs in "inside-out" mode.

[0060] In Fig. 5a one can see that, in a first embodiment, the filtering element 32, 32' comprises a plurality of substantially straight hollow capillary fibres substantially extending from an inlet 32A, 32A' to a closed portion 32P, 32P' of the filtering element 32, 32' opposite to said inlet 32A, 32A'. In said first embodiment, the filtering element 32, 32' preferably comprises a pair of outlets 32B, 32B' positioned on a side surface 32L, 32L' of said filtering element 32, 32'.

[0061] In Fig. 5b one can see that, in a second embodiment, the filtering element 32, 32' comprises a plurality of substantially U-shaped hollow capillary fibres, wherein each fibre extends from an inlet 32A, 32A' and then converges again towards said inlet 32A, 32A'. In said second embodiment, the filtering element 32, 32' preferably comprises an outlet 32B, 32B' positioned on a portion of the filtering element 32, 32' opposite to said inlet 32A, 32A'.

[0062] The advantages of an ironing appliance 1, 1', in particular for household use, according to the present invention are apparent from the above description.

[0063] In particular, such advantages are due to the fact that the particular arrangement of the pump 33, 33' between the tank 31, 31' and the filtering element 32, 32' allows supplying the liquid to the filtering element 32, 32' at a predetermined pressure, substantially comprised between 1 and 5 bar, said pressure being adequate to ensure the optimal operation of said filtering element 32, 32'.

[0064] Furthermore, the particular arrangement of the pump 33, 33' allows delivering to the soleplate 11, 11' an adequate quantity of liquid for the ironing operations.

[0065] The provision of the non-return valve 34, 34' and the position thereof downstream of the filtering element 32, 32' allow protecting said filtering element 32, 32' against any returning liquid and/or steam, thus preventing the filtering element 32, 32' from being damaged by said returning liquid and/or steam.

[0066] In addition, the provision of the filtering element 32, 32' comprising a filter 32F, 32F' made of polymeric material, in particular polysulfone, ensures a longer service life of said filtering element 32, 32'. Since the filtering element 32, 32' does not require frequent replacement, the maintenance and operating costs of the ironing appliance 1, 1' can be reduced.

[0067] The particular provisions of the present invention also allow to realize the ironing appliance 1, 1' in such a way that it is not bulky and does not cause any problems in regard to the positioning of the whole ironing appliance.

[0068] The special realization of the filtering element 32, 32' is such that its filtering efficiency remains substantially unchanged even after a long period of use, while at the same time not releasing any potentially harmful substances into the environment.

[0069] The ironing appliance, in particular for household use, described herein by way of example may be subject to many possible variations without departing from the novelty spirit of the inventive idea; it is also clear that in the practical implementation of the invention the illustrated details may have different shapes or be replaced with other technically equivalent elements.

[0070] It can therefore be easily understood that the present invention is not limited to the above-described ironing appliance, in particular for household use, but may be subject to many modifications, improvements or replacements of equivalent parts and elements without departing from the inventive idea, as clearly specified in the following claims.

Claims

1. An ironing appliance (1; 1'), in particular for household use, of the type comprising:

- an iron (10; 10') comprising a soleplate (11; 11') allowing to carry out traditional ironing operations, in particular on textile items;
- generator means (30; 30') for generating steam, said generator means (30; 30') comprising a tank (31; 31') adapted to contain a liquid and a filtering element (32; 32') associated with said tank (31; 31') for filtering said liquid,

characterized in that

said filtering element (32; 32') comprises a filter (32F; 32F') made of polymeric material, in particular polysulfone, which is adapted to ensure ultrafiltration of the liquid contained in said tank (31; 31') as it flows through said filter (32; 32').

2. An ironing appliance (1; 1') according to claim 1,

characterized in that said polysulfone filter (32F; 32F') comprises a plurality of hollow capillary fibres, in particular obtained by extrusion.

3. An ironing appliance (1; 1') according to claim 2, **characterized in that** each fibre has a diameter comprised between 200 and 300 μm, with a surface having pores whose size is comprised between 0.001 and 0.030 μm.

4. An ironing appliance (1; 1') according to one or more of the preceding claims, **characterized in that** said filtering element (32; 32') comprises:

- at least one inlet (32A; 32A') allowing the liquid to flow into said filter (32F; 32F');
- at least one outlet (32B; 32B') allowing the liquid filtered by said filtering element (32; 32') to flow out.

5. An ironing appliance (1; 1') according to claim 4, **characterized in that** said filtering element (32; 32') comprises a plurality of substantially straight hollow capillary fibres substantially extending from an inlet (32A; 32A') to a closed portion (32P; 32P') of the filtering element (32; 32') opposite to said inlet (32A; 32A').

6. An ironing appliance (1; 1') according to claim 5, **characterized in that** said filtering element (32; 32') comprises a pair of outlets (32B; 32B') positioned on a side surface (32L; 32L') of said filtering element (32; 32').

7. An ironing appliance (1; 1') according to claim 4, **characterized in that** said filtering element (32; 32') comprises a plurality of substantially U-shaped hollow capillary fibres.

8. An ironing appliance (1; 1') according to claim 7, **characterized in that** said filtering element (32; 32') comprises an outlet (32B; 32B') positioned on a portion of the filtering element (32; 32') opposite to said inlet (32A; 32A').

9. An ironing appliance (1; 1') according to one or more of the preceding claims, **characterized in that** it comprises a pump (33; 33') positioned between the tank (31; 31') and the filtering element (32; 32') to take the liquid from the tank (31; 31') and supply it to the filtering element (32; 32').

10. An ironing appliance (1; 1') according to claim 9, **characterized in that** it comprises a non-return valve (34; 34') positioned downstream of the filtering element (32; 32'), in particular said non-return valve (34; 34') being positioned between the filtering element (32; 32') and an evaporation chamber (40; 40').

11. An ironing appliance (1; 1') according to claim 10, **characterized in that** it comprises:

- a first duct (35A; 35A') for connecting the tank (31; 31') to the pump (33; 33');
- a second duct (35B; 35B') for connecting the pump (33; 33') to the filtering element (32; 32');
- a third duct (35C; 35C') for connecting the filtering element (32; 32') to the non-return valve (34; 34');
- a fourth duct (35D; 35D') for connecting the non-return valve (34; 34') to the evaporation chamber (40; 40').

12. An ironing appliance (1; 1') according to one or more of the preceding claims, **characterized in that** said generator means (30) are associated with a support structure (20) and comprise an electrovalve (41) for adjusting the steam flow towards the iron (10), in particular said electrovalve (41) being associated with an outlet of the evaporation chamber (40).

13. An ironing appliance (1; 1') according to one or more of the claims 1 to 11, **characterized in that** said generator means (30') are associated with the iron (10').

14. An ironing appliance (1; 1') according to claim 13, **characterized in that** said filtering element (32') is located in the iron (10') in a remote position with respect to the soleplate (11'), in particular said filtering element (32') being positioned in a manner such that its orthogonal projection (PO) on a worktop (P) falls outside said soleplate (11') when said soleplate (11') is resting on said worktop (P).

15. An ironing appliance (1; 1') according to claim 13 or claim 14, **characterized in that** said filtering element (32') is positioned in the proximity of a rear portion (10A') of the iron (10'), in particular said filtering element (32') being positioned over an arched portion (13') between the soleplate (11') and the rear portion (10A') of the iron (10').

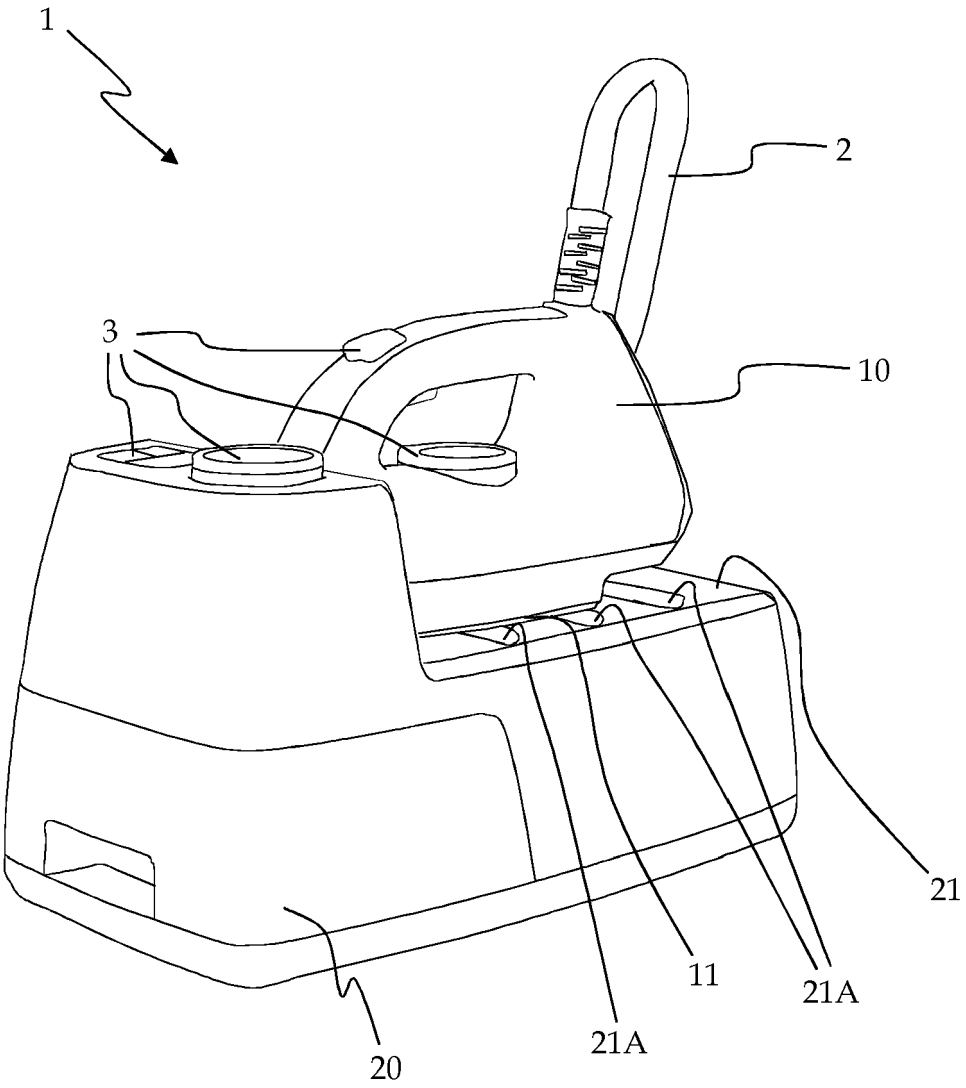
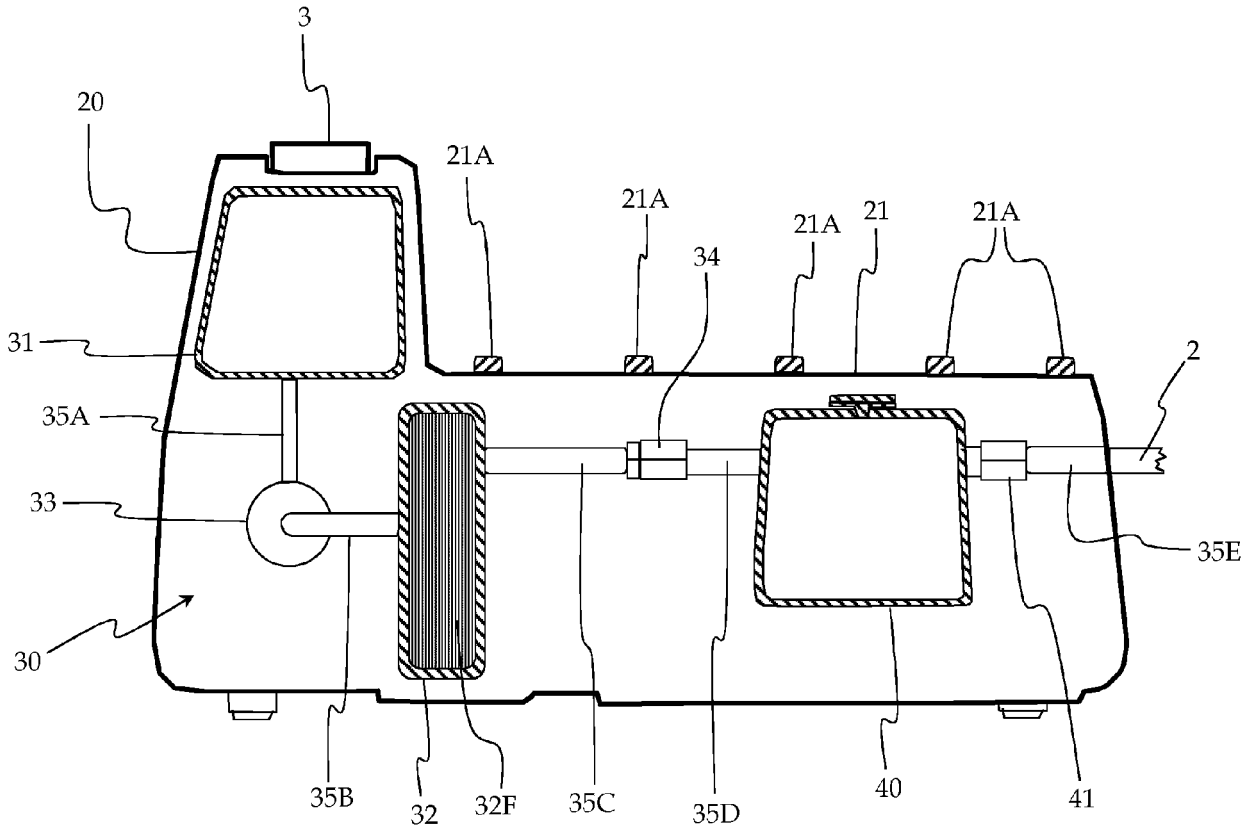


Fig. 1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21A
21A
21A
21
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35D
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41

Fig. 2

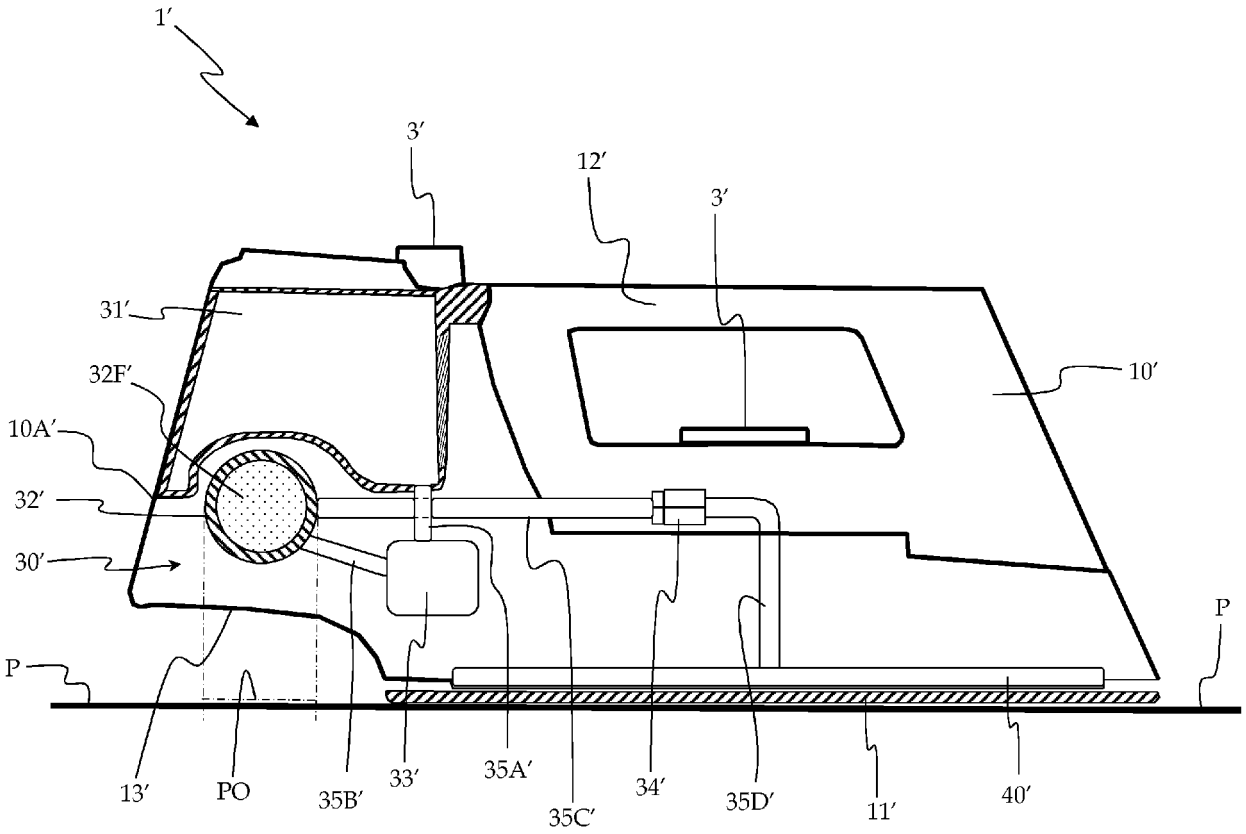
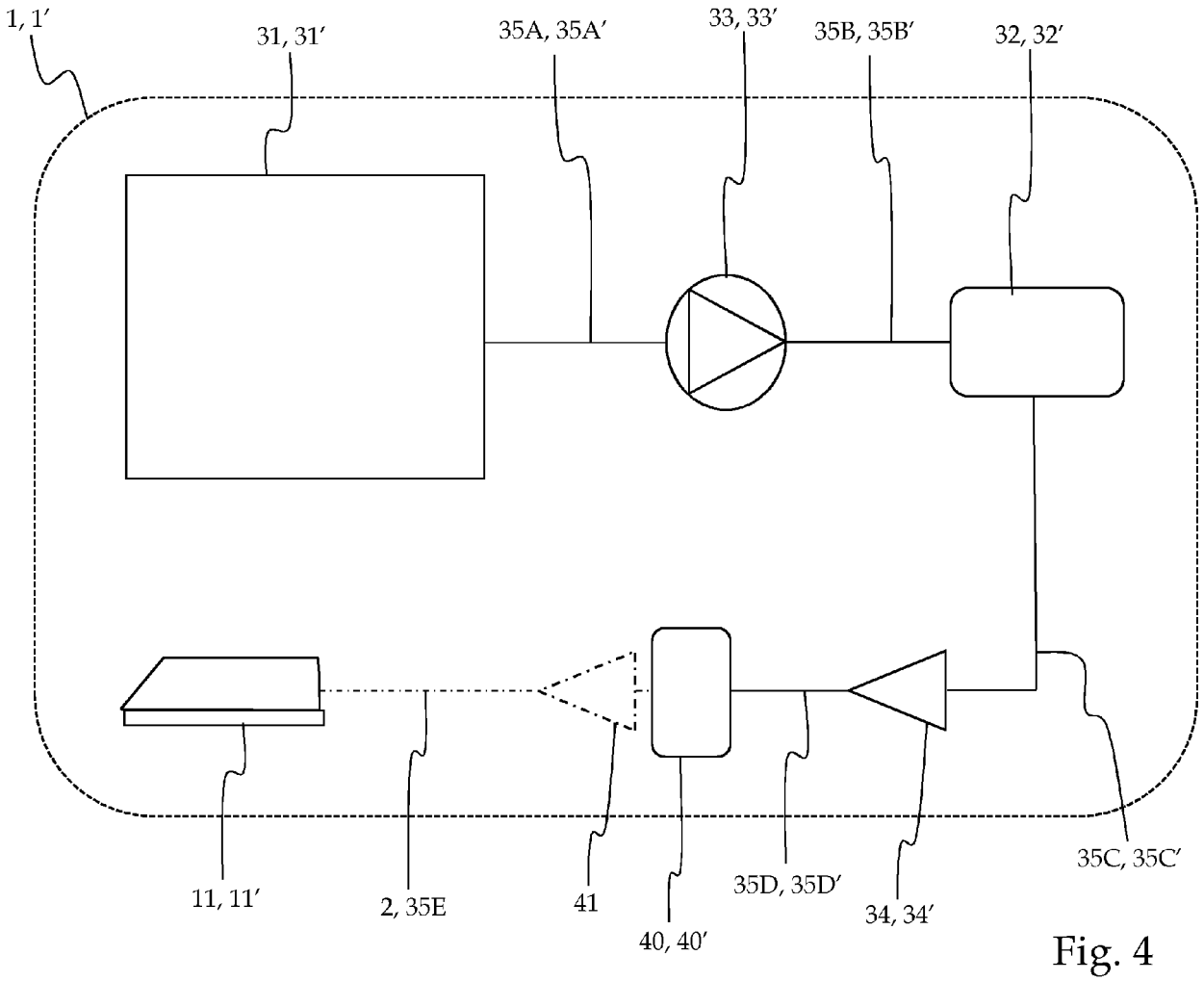


Fig. 3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31, 31'
35A, 35A'
33, 33'
35B, 35B'
32, 32'
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35D, 35D'
34, 34'
35C, 35C'

Fig. 4

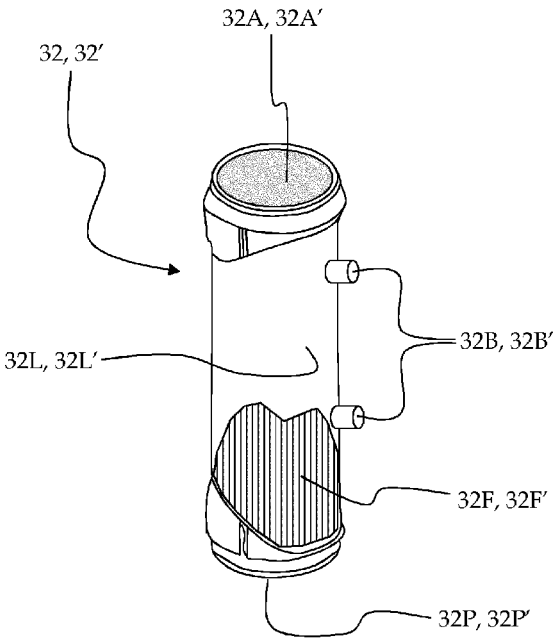
32A, 32A'
32, 32'
32L, 32L'
32B, 32B'
32F, 32F'
32P, 32P'

Fig. 5a

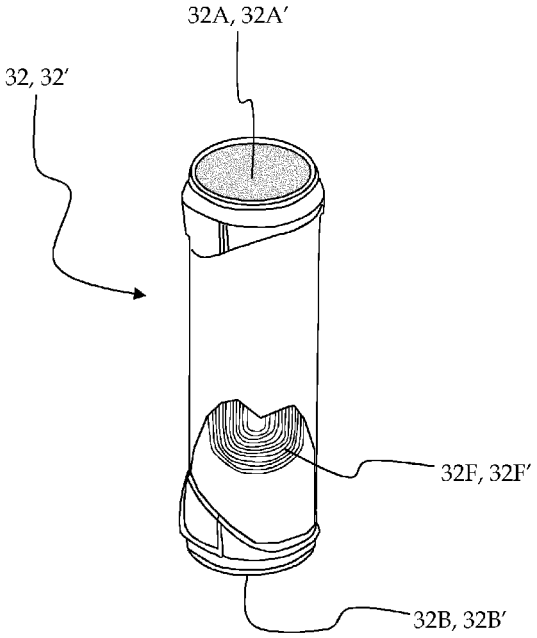
32A, 32A'
32, 32'
32F, 32F'
32B, 32B'

Fig. 5b

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 16 15 3910

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 0 557 901 A1 (MOULINEX SA [FR]) 1 September 1993 (1993-09-01) * column 2, line 10 - column 2, line 48 * * column 3, line 42 - column 4, line 6; figures 1,2 *	1-15	INV. D06F75/12 D06F75/14
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Place of search	Date of completion of the search	Examiner
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