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(54) **IRONING EQUIPMENT WITH GAS-FIRED HEAT SOURCE AND ELECTRIC HEAT SOURCE**

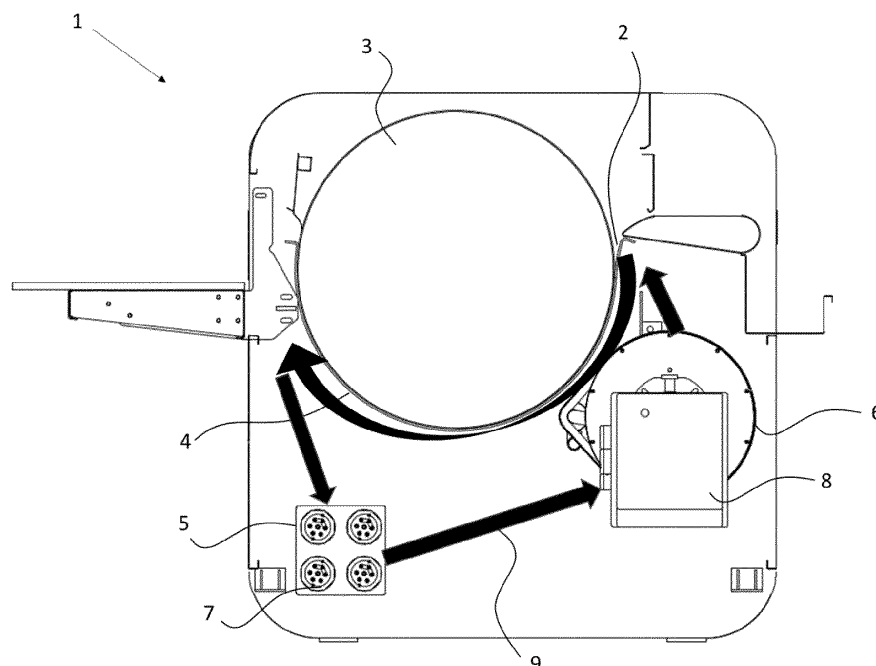
(57) The invention concerns an ironing device comprising:

- an ironing bed (2), preferably formed between at least one ironing roller (3) and at least one trough (4);
- at least one first heat source (5);
- at least one second heat source (6);
- a heat transfer medium (9) for the transfer of heat from the at least one first heat source (5) and the at least one second heat source (6) to the ironing bed (2);

wherein

- the at least one first heat source (5) is electric; and
- the at least one second heat source (6) is gas-fired.

The invention furthermore comprises a method for heating an ironing bed using an electric and a gas-fired heat source, and a method for the temporary storage of energy from a renewable energy source in an ironing device.



**Fig. 2**

**Description****TECHNICAL FIELD**

**[0001]** The invention concerns an ironing device for ironing laundry to be ironed. In particular, the invention concerns an industrial ironing device. The invention provides an ironing device with at least two different heat sources.

**TECHNOLOGICAL BACKGROUND OF THE INVENTION**

**[0002]** Ironing devices, and in particular industrial ironing devices for ironing laundry to be ironed, are large consumers of energy and heat. In an ironing device, an ironing bed must be kept at a sufficiently high temperature, and heat must be transferred to the laundry to be ironed for the actual ironing but also for the evaporation of water from the laundry to be ironed. In order to be able to generate sufficient heat, gas is often used as the heat source. Often, industrial ironing devices are used in laundries located in cities and densely populated regions. However, recently, the ever-stricter emissions standards in cities and densely populated regions mean that gas-fired ironing devices can no longer be operational. Switching to electric heating in cities and densely populated regions is often not possible because the electricity network in cities and densely populated regions, and/or the electrical connections of the laundries, is/are often unsuitable for the high electrical power levels required for heating the ironing devices. There is therefore a need for ironing devices which can be installed in urban and densely populated regions without extensive infrastructural changes.

**[0003]** There is also a demand for ironing devices which can use self-generated electricity, electricity which is generated for example from photovoltaic panels on the roof of the laundry. There is also a need for using self-generated electricity, for example in a laundry, favourably even when the laundry is not operational, for example outside working or opening hours.

**SUMMARY**

**[0004]** In order to meet the above-mentioned needs, the invention provides an ironing device for ironing laundry to be ironed, comprising:

- An ironing bed formed between at least one ironing roller and at least one trough;
- at least one first heat source, preferably at least one first heat source integrated in the ironing device;
- at least one second heat source, preferably at least one second heat source integrated in the ironing device;
- a heat transfer medium for transferring heat from the at least one first heat source and the at least one

second heat source to the ironing bed;

wherein the at least one first heat source is electric and the at least one second heat source is gas-fired.

**[0005]** By using both an electric heat source and a gas-fired heat source, the ironing device can work with lower emissions and also still use existing electricity connections or an existing electricity network. In some cases, self-generated electricity may be used to partially provide the necessary heat. Even if the ironing device is not operational, self-generated electricity may be used to keep the temperature of the heat transfer medium at the correct level or to at least partially heat the heat transfer medium before starting up the ironing device. In this way, the heat transfer medium may be used as a storage medium for energy or heat. Thus more self-generated electricity may be consumed by the device itself, which can avoid possible "prosumer" tariffs.

**[0006]** In one embodiment, the heat transfer medium is oil, preferably a thermal oil, which may be either mineral oil or synthetic. One example of a suitable oil is Thexatherm® from Texaco.

**[0007]** In one embodiment, the at least one first heat source and the at least one second heat source heat the heat transfer medium in series.

**[0008]** In one embodiment, the at least one first heat source and the at least one second heat source are configured for heating the heat transfer medium in series.

**[0009]** The invention also provides an ironing device (1) for ironing laundry to be ironed, comprising:

- an ironing bed (2) formed between at least one ironing roller (3) and at least one trough (4);
- at least one first heat source (5) integrated in the ironing device (1);
- at least one second heat source (6) integrated in the ironing device (1);
- a heat transfer medium (9) for transferring heat from the at least one first heat source (5) and the at least one second heat source (6) to the ironing bed (2); wherein
- the at least one first heat source (5) is electric; and
- the at least one second heat source (6) is gas-fired.

wherein the heat transfer medium (9) is oil; wherein the at least one first heat source (5) and the at least one second heat source (6) are configured for heating the heat transfer medium (9) in series; and

- wherein the trough (4) comprises flow channels; and/or

- wherein the ironing roller (3) comprises flow channels;

wherein the flow channels are configured for accommodating a stream or streams of heat transfer medium (9).

**[0010]** In one embodiment, the ratio of the sum of the

power of all first heat sources ( $P_1$ ) over the sum of the power of all second heat sources ( $P_2$ ) is at least 0.1 to at most 10.0, preferably at least 0.2 to at most 9.0, preferably at least 0.3 to at most 8.0, preferably at least 0.4 to at most 7.0, preferably at least 0.5 to at most 6.0, preferably at least 0.6 to at most 5.0, preferably at least 0.7 to at most 4.0, preferably at least 0.8 to at most 3.0, preferably at least 0.9 to at most 2.0.

**[0011]** In one embodiment, the sum of the power of all first heat sources ( $P_1$ ) is at least 10 kW, preferably at least 20 kW, preferably at least 30 kW, preferably at least 40 kW, preferably at least 50 kW, preferably at least 60 kW, preferably at least 70 kW, preferably at least 80 kW, preferably at least 90 kW, preferably at least 100 kW, preferably at least 120 kW, preferably at least 140 kW, preferably at least 160 kW, preferably at least 180 kW, preferably per ironing roller.

**[0012]** In one embodiment, the sum of the power of all second heat sources ( $P_2$ ) is at least 10 kW, preferably at least 20 kW, preferably at least 30 kW, preferably at least 40 kW, preferably at least 50 kW, preferably at least 60 kW, preferably at least 70 kW, preferably at least 80 kW, preferably at least 90 kW, preferably at least 100 kW, preferably at least 120 kW, preferably at least 140 kW, preferably at least 160 kW, preferably at least 180 kW, preferably at least 200 kW, preferably per ironing roller.

**[0013]** In one embodiment, the trough comprises flow channels through which the heat transfer medium can flow. In one embodiment, the flow channels are configured for accommodating a stream or streams of heat transfer medium (9).

**[0014]** In one embodiment, the ironing roller comprises flow channels through which the heat transfer medium can flow. In one embodiment, the flow channels are configured for accommodating a stream or streams of heat transfer medium (9).

**[0015]** In one embodiment, the ironing device is an industrial ironing device.

**[0016]** The invention furthermore comprises a method for heating an ironing bed formed between at least one ironing roller and at least one trough in an ironing device, comprising the steps:

- a) provision of a heat transfer medium;
- b) heating of the heat transfer medium by at least one first heat source, preferably at least one first heat source integrated in the ironing device;
- c) heating of the heat transfer medium by at least one second heat source, preferably at least one second heat source integrated in the ironing device;
- d) provision of a stream of heat transfer medium through or along the trough and/or the ironing roller, preferably thereby heating the ironing bed;

wherein

the at least one first heat source is electric, and the at least one second heat source is gas-fired.

**[0017]** The invention furthermore comprises a method for heating an ironing bed (2) formed between at least one ironing roller (3) and at least one trough (4) in an ironing device (1), comprising the steps:

- a) provision of a heat transfer medium;
- b) heating of the heat transfer medium by at least one first heat source (5), preferably at least one first heat source (5) integrated in the ironing device (1);
- c) heating of the heat transfer medium by at least one second heat source (6), preferably at least one second heat source (6) integrated in the ironing device (1);
- d) provision of a stream of heat transfer medium through or along the trough (4) and/or the ironing roller (3), thereby heating the ironing bed (2);

characterized in that

the at least one first heat source (5) is electric, preferably the at least one first heat source (5) is an electric heat exchanger; and the at least one second heat source (6) is gas-fired, preferably the at least one second heat source (6) is a gas burner;

wherein oil is provided as a heat transfer medium (9);

wherein it is provided that the at least one first heat source (5) and the at least one second heat source (6) heat the heat transfer medium (9) in series; and

wherein it is provided that the trough (4) comprises flow channels through which the heat transfer medium (9) flows, or wherein the ironing roller (3) comprises flow channels through which the heat transfer medium (9) flows.

**[0018]** The invention furthermore comprises a method for heating an ironing bed (2) formed between at least one ironing roller (3) and at least one trough (4) in an ironing device (1), comprising the steps:

- a) provision of a heat transfer medium (9), being oil;
- b) heating of the heat transfer medium (9) by at least one first heat source (5) integrated in the ironing device (1), wherein the at least one first heat source (5) is electric;
- c) heating of the heat transfer medium (9) by at least one second heat source (6) integrated in the ironing device (1), wherein the at least one second heat source (6) is gas-fired;
- d) provision of a stream of heat transfer medium through flow channels in the trough (4) and/or the ironing roller (3), thereby heating the ironing bed (2);

wherein that the at least one first heat source (5) and the at least one second heat source (6) heat the heat transfer

medium (9) in series.

**[0019]** In one embodiment, the temperature of the heat transfer medium after step b) and c), or after step c) and b), is at least 150°C, preferably at least 160°C, preferably at least 170°C, preferably at least 180°C, preferably at least 190°C, preferably at least 200°C, preferably at least 210°C, preferably at least 220°C. The invention furthermore provides a kit comprising an ironing device according to an embodiment described herein, and a renewable energy source.

**[0020]** In one embodiment, the renewable energy source supplies the first heat source. In one embodiment, the renewable energy source is configured for supplying the first heat source.

**[0021]** The invention furthermore comprises a method for temporary storage of energy from a renewable energy source in an ironing device, comprising:

- heating of a heat transfer medium in an ironing device using energy from the renewable energy source, preferably when the ironing device is not operational.

**[0022]** In one embodiment of the method, the ironing device is an ironing device according to an embodiment as described herein.

**[0023]** In one embodiment, the invention furthermore comprises a method for temporary storage of energy from a renewable energy source in an ironing device (1), comprising:

- heating of the heat transfer medium in the ironing device (1) using energy from the renewable energy source, preferably when the ironing device (1) is not operational;

wherein the ironing device (1) is an ironing device according to an embodiment as described herein and wherein the energy from the renewable energy source supplies the first heat source (5).

## DESCRIPTION OF THE FIGURES

**[0024]**

**Figure 1** illustrates an outline sketch of an ironing device according to one embodiment of the invention.

**Figure 2** shows the same outline sketch of an ironing device as figure 1 with an indication of a possible flow of the heat transfer medium in the ironing device.

## DETAILED DESCRIPTION

**[0025]** As used below in this text, the singular forms "a", "an" and "the" comprise both the singular and the plural unless the context clearly indicates otherwise.

**[0026]** The terms "comprise", "comprises" as used be-

low are synonymous with "inclusive", "include" or "contain", "contains", and are inclusive or open and do not exclude additional unmentioned parts, elements or method steps. The terms "comprise", "comprises" are inclusive of the term "contain".

**[0027]** The lists of numerical values using ranges of figures include all values and fractions within these ranges, as well as the cited end points.

**[0028]** The term "approximate", as used when referring to a measurable value such as a parameter, a quantity, a time duration etc., is intended to include variations of +/- 10% or less, preferably +/- 5% or less, more preferably +/- 1% or less, and even more preferably +/- 0.1% or less, of one of the specified values insofar as these variations are suitable for functioning in the invention described herein. It should be understood that the value to which the term "approximately", refers is also disclosed.

**[0029]** All documents cited in the present specification are hereby included in full by means of reference.

**[0030]** Unless defined otherwise, all terms disclosed in the invention, including technical and scientific terms, have the meaning usually understood by the person skilled in the art. As a further guidance, definitions are included for further explanation of terms which are used in the description of this invention.

**[0031]** The invention provides an ironing device for ironing laundry to be ironed, comprising:

- an ironing bed, preferably formed between at least one ironing roller and at least one trough;
- at least one first heat source, preferably at least one first heat source integrated in the ironing device;
- at least one second heat source, preferably at least one second heat source integrated in the ironing device;
- a heat transfer medium for transferring heat from the at least one first heat source and the at least one second heat source to the ironing bed;

wherein the at least one first heat source differs from the at least one second heat source. Preferably, the at least one first heat source is electric, and the at least one second heat source is gas-fired.

**[0032]** The term "electric heat source" as used herein refers to a heat source which converts electricity into heat. The electricity may be taken from the network or may be generated in a renewable energy source such as photovoltaic panels or windmills.

**[0033]** The term "gas-fired heat source" as used herein refers to a heat source which converts the gas, preferably a calorific gas, into heat. Examples of suitable gases are natural gas, propane, methane, butane, hydrogen, gases originating from biogas installations or fermentation installations, and mixtures thereof.

**[0034]** In one embodiment, the first heat source comprises an electric heating resistor. In one embodiment, the first heat source comprises a heat exchanger, preferably a heat exchanger which is electrically heated.

**[0035]** In one embodiment, the second heat source comprises a gas burner. In one embodiment, the second heat source comprises a heat exchanger, preferably a heat exchanger which is heated by combustion of gas.

**[0036]** In one embodiment, the heat transfer medium is oil.

**[0037]** In one embodiment, the ironing device comprises a pump for transporting the heat transfer medium. Preferably, the pump transports the heat transfer medium from the one heat source to the other. Preferably, the pump transports the heat transfer medium from the heat source to the trough and/or the ironing roller. Preferably, the pump transports the heat transfer medium from the trough and/or the ironing roller to the heat source.

**[0038]** In one embodiment, the ironing device comprises an agitator for setting the heat transfer medium in motion.

**[0039]** In one embodiment, the at least one first heat source and the at least one second heat source heat the heat transfer medium in series. In one embodiment, the at least one first heat source and the at least one second heat source are configured to heat the heat transfer medium in series. The term "in series" as used herein refers to the manner in which two heat sources are coupled together. The one heat source heats the heat transfer medium to a first temperature  $T_1$ , after which the other heat source heats the heat transfer medium further to a second temperature  $T_2$ . Preferably, the difference between  $T_2$  and  $T_1$  is at least 10°C, preferably at least 20°C, preferably at least 30°C, preferably at least 40°C, preferably at least 50°C, preferably at least 60°C, preferably at least 70°C, preferably at least 80°C, preferably at least 90°C, preferably at least 100°C. In one embodiment, the heat transfer medium is firstly heated by the at least one first heat source and then the heat transfer medium is further heated by the at least one second heat source. In an alternative embodiment, the heat transfer medium is firstly heated by the at least one second heat source and then the heat transfer medium is further heated by the at least one first heat source.

**[0040]** In one embodiment, the heat transfer medium is firstly heated:

- in the first heat source, preferably being the electric heat source, preferably being an electric heat exchanger, and
- then in the second heat source, preferably being the gas-fired heat source, preferably being a gas burner.

**[0041]** This has the advantage that the first heat source can be used to a maximum depending on the available electricity, being whether or not self-generated electricity. This means that as little gas as possible need be used to heat the ironing device, whereby the emissions are minimised. If sufficient electricity is present, the second heat source may even be disabled.

**[0042]** In one embodiment, the heat transfer medium is firstly heated:

- in the second heat source, preferably being the gas-fired heat source, preferably being a gas burner, and
- then in the first heat source, preferably being the electric heat source, preferably being an electric heat exchanger.

**[0043]** The invention also provides an ironing device (1) for ironing laundry to be ironed, comprising:

- an ironing bed (2) formed between at least one ironing roller (3) and at least one trough (4);
- at least one first heat source (5), preferably being an electric heat exchanger, integrated in the ironing device (1);
- at least one second heat source (6), preferably being a gas burner, integrated in the ironing device (1);
- a heat transfer medium (9) for transferring heat from the at least one first heat source (5) and the at least one second heat source (6) to the ironing bed (2);
- wherein
- the at least one first heat source (5) is electric; and
- the at least one second heat source (6) is gas-fired;

wherein the heat transfer medium (9) is oil;  
wherein the at least one first heat source (5) and the at least one second heat source (6) are configured for heating the heat transfer medium (9) in series; and

- wherein the trough (4) comprises flow channels; and/or

- wherein the ironing roller (3) comprises flow channels;

wherein the flow channels are configured for accommodating a stream or streams of heat transfer medium (9).

**[0044]** In one embodiment, the ratio of the sum of the power of all first heat sources ( $P_1$ ) over the sum of the power of all second heat sources ( $P_2$ ) is at least 0.1 to at most 10.0, preferably at least 0.2 to at most 9.0, preferably at least 0.3 to at most 8.0, preferably at least 0.4 to at most 7.0, preferably at least 0.5 to at most 6.0, preferably at least 0.6 to at most 5.0, preferably at least 0.7 to at most 4.0, preferably at least 0.8 to at most 3.0, preferably at least 0.9 to at most 2.0.

**[0045]** In one embodiment, the ratio of the sum of the power of all first heat sources ( $P_1$ ) over the sum of the power of all second heat sources ( $P_2$ ) is at least 0.1, preferably at least 0.2, preferably at least 0.3, preferably at least 0.4, preferably at least 0.5, preferably at least 0.6, preferably at least 0.7, preferably at least 0.8, preferably at least 0.9.

**[0046]** In one embodiment, the ratio of the sum of the power of all first heat sources ( $P_1$ ) over the sum of the power of all second heat sources ( $P_2$ ) is at most 10.0, preferably at most 9.0, preferably at most 8.0, preferably at most 7.0, preferably at most 6.0, preferably at most 5.0, preferably at most 4.0, preferably at most 3.0, pref-

erably at most 2.0.

**[0047]** In one embodiment, the sum of the power of all first heat sources ( $P_1$ ) is at least 10 kW, preferably at least 20 kW, preferably at least 30 kW, preferably at least 40 kW, preferably at least 50 kW, preferably at least 60 kW, preferably at least 70 kW, preferably at least 80 kW, preferably at least 90 kW, preferably at least 100 kW, preferably at least 120 kW, preferably at least 140 kW, preferably at least 160 kW, preferably at least 180 kW, preferably per ironing roller.

**[0048]** In one embodiment, the sum of the power of all first heat sources ( $P_1$ ) is at most 220 kW, preferably at most 200 kW, preferably at most 180 kW, preferably at most 160 kW, preferably at most 140 kW, preferably at most 120 kW, preferably at most 100 kW, preferably at most 80 kW, preferably at most 60 kW, preferably at most 40 kW, preferably per ironing roller.

**[0049]** In one embodiment, the sum of the power of all second heat sources ( $P_2$ ) is at least 10 kW, preferably at least 20 kW, preferably at least 30 kW, preferably at least 40 kW, preferably at least 50 kW, preferably at least 60 kW, preferably at least 70 kW, preferably at least 80 kW, preferably at least 90 kW, preferably at least 100 kW, preferably at least 120 kW, preferably at least 140 kW, preferably at least 160 kW, preferably at least 180 kW, preferably at least 200 kW, preferably per ironing roller.

**[0050]** In one embodiment, the sum of the power of all second heat sources ( $P_2$ ) is at most 240 kW, preferably at most 220 kW, preferably at most 200 kW, preferably at most 180 kW, preferably at most 160 kW, preferably at most 140 kW, preferably at most 120 kW, preferably at most 100 kW, preferably at most 80 kW, preferably at most 60 kW, preferably at most 40 kW, preferably per ironing roller.

**[0051]** In one embodiment, this trough comprises flow channels through which the heat transfer medium can flow. In one embodiment, the trough is a hollow trough through which heat transfer medium can flow. In one embodiment, the trough comprises a curved inner plate and a curved outer plate, wherein heat transfer medium can flow between the curved inner plate and the curved outer plate. Preferably, the curved inner plate and the curved outer plate are welded together by weld points, wherein the weld points are distributed over the surface of the inner plate and outer plate.

**[0052]** In one embodiment, the ironing roller comprises flow channels through which the heat transfer medium can flow. In one embodiment, the ironing roller is a hollow ironing roller through which heat transfer medium can flow.

**[0053]** In one embodiment, the ironing device is an industrial ironing device.

**[0054]** The term "ironing device" as used herein refers to a device for ironing and/or drying laundry to be ironed. Examples of ironing devices are ironing presses, roller ironing machines and mangles, preferably a roller ironing machine. In one embodiment, the ironing device is an industrial ironing machine, preferably an industrial roller

ironing machine.

**[0055]** The term "roller ironing machine" as used herein refers to an ironing machine which comprises at least one ironing roller. Preferably, a roller ironing machine comprises a trough, and the ironing roller and trough form the ironing bed through which the laundry to be ironed is guided. In one embodiment, the roller ironing machine comprises one, two or three ironing rollers.

**[0056]** In one embodiment, the trough can be pressed against an ironing roller by mechanical, hydraulic, pneumatic or electrical pressure. This allows an optimum evaporation effect of the moisture in the laundry to be ironed. This allows an optimum ironing effect of the laundry to be ironed. This allows an optimum conveying effect of the laundry to be ironed between the ironing roller, which is usually rotating, and the trough.

**[0057]** In one embodiment of the invention, the trough comprises several perforations distributed over the surface or part of the surface of the trough. The perforations in the trough may form an arbitrary pattern. Preferably, the perforations in the trough form a regular pattern. More preferably, the perforations in the trough form a triangular, rectangular or diamond-shaped pattern over the surface or part of the surface of the trough.

**[0058]** The term "ironing roller" comprises the cylindrical ironing roller for an ironing device. In one embodiment, the ironing roller comprises a casing.

**[0059]** In one embodiment, the ironing roller diameter is at least 200 mm, preferably at least 250 mm, preferably at least 300 mm, preferably at least 400 mm, preferably at least 500 mm, preferably at least 550 mm.

**[0060]** In one embodiment, the ironing roller diameter is at most 2000 mm, preferably at most 1600 mm, preferably at most 1300 mm, preferably at most 1200 mm, preferably at most 1000 mm, preferably at most 900 mm, preferably at most 800 mm.

**[0061]** In one embodiment, the ironing roller diameter is at least 200 mm up to maximum 2000 mm, preferably at least 200 mm up to maximum 1600 mm, preferably at least 200 mm up to maximum 1500 mm, preferably at least 250 mm up to maximum 1300 mm, preferably at least 300 mm up to maximum 1200 mm, preferably at least 400 mm up to maximum 1000 mm, preferably at least 500 mm up to maximum 900 mm, preferably at least 550 mm up to maximum 800 mm.

**[0062]** The term "laundry to be ironed" as used herein refers to any kind of fabric which may be introduced into an ironing device in order to be dried and/or ironed. Preferably, the laundry to be ironed has a minimum width of 1.0 m. Preferably, the laundry to be ironed has a maximum width of 3.3 m. Preferably, this laundry to be ironed comprises bed linen or table linen. The term "bed linen" comprises sheets, fitted sheets, undersheets, bedspreads, duvet covers and pillowcases. The term "table linen" comprises tablecloths and napkins. In one embodiment, the laundry to be ironed is a flat material.

**[0063]** The invention furthermore comprises a method for heating an ironing bed formed between at least one

ironing roller and at least one trough in an ironing device, comprising the steps:

- a) provision of a heat transfer medium;
- b) heating of the heat transfer medium by at least one first heat source, preferably at least one first heat source integrated in the ironing device;
- c) heating of the heat transfer medium by at least one second heat source, preferably at least one second heat source integrated in the ironing device;
- d) provision of a stream of heat transfer medium through or along the trough and/or the ironing roller, preferably thereby heating the ironing bed;

wherein

the at least one first heat source is electric; and  
the at least one second heat source is gas-fired.

**[0064]** The invention furthermore comprises a method for heating an ironing bed (2) formed between at least one ironing roller (3) and at least one trough (4) in an ironing device (1), comprising the steps:

- a) provision of a heat transfer medium (9), being oil;
- b) heating of the heat transfer medium (9) by at least one first heat source (5) integrated in the ironing device (1), wherein the at least one first heat source (5) is electric;
- c) heating of the heat transfer medium (9) by at least one second heat source (6) integrated in the ironing device (1), wherein the at least one second heat source (6) is gas-fired;
- d) provision of a stream of heat transfer medium (9) through flow channels in the trough (4) and/or the ironing roller (3), thereby heating the ironing bed (2);

wherein the at least one first heat source (5) and the at least one second heat source (6) heat the heat transfer medium (9) in series.

**[0065]** In one embodiment, the temperature of the heat transfer medium after step b) and c), or after step c) and b), is at least 150°C, preferably at least 160°C, preferably at least 170°C, preferably at least 180°C, preferably at least 190°C, preferably at least 200°C, preferably at least 210°C, preferably at least 220°C.

**[0066]** In one embodiment, step b) is carried out before step c).

**[0067]** In one embodiment, step c) is carried out before step b).

**[0068]** In one embodiment, the temperature of the heat transfer medium after step b) is at least 20°C higher, preferably at least 30°C higher, preferably at least 40°C higher, preferably at least 50°C higher, preferably at least 60°C higher, preferably at least 70°C higher, preferably at least 80° higher, preferably at least 90°C higher, than before step b).

**[0069]** In one embodiment, the temperature of the heat

transfer medium after step c) is at least 20°C higher, preferably at least 30°C higher, preferably at least 40°C higher, preferably at least 50°C higher, preferably at least 60°C higher, preferably at least 70°C higher, preferably at least 80° higher, preferably at least 90°C higher, than before step c).

**[0070]** In one embodiment, the temperature of the ironing bed is at least 120°C, preferably at least 130°C, preferably at least 140°C, preferably at least 150°C, preferably at least 160°C, preferably at least 165°C, preferably at least 170°C.

**[0071]** The invention furthermore concerns a kit comprising an ironing device according to an embodiment described herein, and a renewable energy source.

**[0072]** In one embodiment, the renewable energy source supplies the first heat source. In one embodiment, the renewable energy source is configured to supply the first heat source.

**[0073]** In one embodiment, the renewable energy source is photovoltaic panels.

**[0074]** The invention furthermore comprises a method for the temporary storage of energy from a renewable energy source in an ironing device, comprising:

- heating of the heat transfer medium in an ironing device using energy from the renewable energy source, preferably when the ironing device is not operational.

**[0075]** As used herein, an ironing device is operational when it is able to iron laundry to be ironed. An ironing device may be not operational if for example the temperature is not high enough or the ironing roller is not turning. An ironing device may be not operational but be in stand-by mode. An ironing device may be not operational, but the heat transfer medium can still be heated in this state.

**[0076]** In an embodiment of the method for the temporary storage of energy from a renewable energy source, the ironing device is an ironing device according to an embodiment described herein, preferably wherein the energy from the renewable energy source supplies the first heat source, preferably wherein the renewable energy source is configured to supply the first heat source.

**[0077]** In one embodiment, the invention furthermore comprises a method for the temporary storage of energy from a renewable energy source in an ironing device (1), comprising:

- heating of a heat transfer medium in an ironing device (1) using energy from the renewable energy source, preferably when the ironing device (1) is not operational;

wherein the ironing device (1) is an ironing device according to an embodiment as described herein, and wherein the energy from the renewable energy source supplies the first heat source (5).

**[0078]** In one embodiment, the renewable energy

source is configured to supply the first heat source.

## Examples

### Example 1

**[0079]** Figure 1 shows an outline drawing of an ironing device according to an embodiment of the invention. The figure shows an ironing device (1) wherein the ironing bed (2) is formed between an ironing roller (3) and a trough (4). The ironing device (1) comprises a first heat source (5), being an electrical heat source, comprising an electric heating resistor (7). The ironing device (1) comprises a second heat source (6), being a gas-fired heat source, comprising a gas burner (8).

### Example 2

**[0080]** Figure 2 shows the same outline drawing of an ironing device as figure 1 with an indication of the possible flow of a heat transfer medium (9) in the ironing device.

## Claims

1. Ironing device (1) for ironing laundry to be ironed, comprising:

- an ironing bed (2) formed between at least one ironing roller (3) and at least one trough (4);
  - at least one first heat source (5) integrated in the ironing device (1);
  - at least one second heat source (6) integrated in the ironing device (1);
  - a heat transfer medium (9) for transferring heat from the at least one first heat source (5) and the at least one second heat source (6) to the ironing bed (2);
- characterized in that**
- the at least one first heat source (5) is electric; and
  - the at least one second heat source (6) is gas-fired;

wherein the heat transfer medium (9) is oil; wherein the at least one first heat source (5) and the at least one second heat source (6) are configured for heating the heat transfer medium (9) in series; and

- wherein the trough (4) comprises flow channels; and/or
  - wherein the ironing roller (3) comprises flow channels;
- wherein the flow channels are configured for accommodating a stream or streams of heat transfer medium (9).

2. Ironing device (1) according to Claim 1, wherein the ratio of the sum of the power of all first heat sources ( $P_1$ ) over the sum of the power of all second heat sources ( $P_2$ ) is at least 0.1 to at most 10.0.

3. Ironing device (1) according to Claim 1 or 2, wherein the sum of the power of all first heat sources ( $P_1$ ) is at least 10 kW, preferably at least 20 kW, preferably at least 30 kW, preferably at least 40 kW, preferably at least 50 kW, preferably at least 60 kW, preferably at least 70 kW, preferably at least 80 kW, preferably at least 90 kW, preferably at least 100 kW.

4. Ironing device (1) according to at least one of Claims 1 to 3, wherein the sum of the power of all second heat sources ( $P_2$ ) is at least 10 kW, preferably at least 20 kW, preferably at least 30 kW, preferably at least 40 kW, preferably at least 50 kW, preferably at least 60 kW, preferably at least 70 kW, preferably at least 80 kW, preferably at least 90 kW, preferably at least 100 kW.

5. Ironing device (1) according to at least one of Claims 1 to 4, wherein the ironing device (1) is an industrial ironing device.

6. Ironing device (1) according to at least one of Claims 1 to 5, wherein the at least one first heat source (5) is an electric heat exchanger.

7. Ironing device (1) according to at least one of Claims 1 to 6, wherein the at least one second heat source (6) is a gas burner.

8. Method for heating an ironing bed (2) formed between at least one ironing roller (3) and at least one trough (4) in an ironing device (1), comprising the steps:

- a) provision of a heat transfer medium (9), being oil;
- b) heating of the heat transfer medium (9) by at least one first heat source (5) integrated in the ironing device (1), wherein the at least one first heat source (5) is electric;
- c) heating of the heat transfer medium (9) by at least one second heat source (6) integrated in the ironing device (1), wherein the at least one second heat source (6) is gas-fired;
- d) provision of a stream of heat transfer medium (9) through flow channels in the trough (4) and/or the ironing roller (3), thereby heating the ironing bed (2);

wherein the at least one first heat source (5) and the at least one second heat source (6) heat the heat transfer medium (9) in series.



9. Method according to Claim 8, wherein the temperature of the heat transfer medium after step b) and c), or after step c) and b), is at least 150°C, preferably at least 160°C, preferably at least 170°C, preferably at least 180°C, preferably at least 190°C, preferably at least 200°C, preferably at least 210°C, preferably at least 220°C. 5
10. Kit comprising an ironing device (1) according to at least one of Claims 1 to 7, and a renewable energy source. 10
11. Kit according to Claim 10, wherein the renewable energy source supplies the first heat source. 15
12. Method for temporary storage of energy from a renewable energy source in an ironing device (1), comprising:
- heating of a heat transfer medium in an ironing device (1) using energy from the renewable energy source, preferably when the ironing device (1) is not operational; 20
- wherein the ironing device (1) is an ironing device according to at least one of Claims 1 to 7, and wherein the energy from the renewable energy source supplies the first heat source (5). 25

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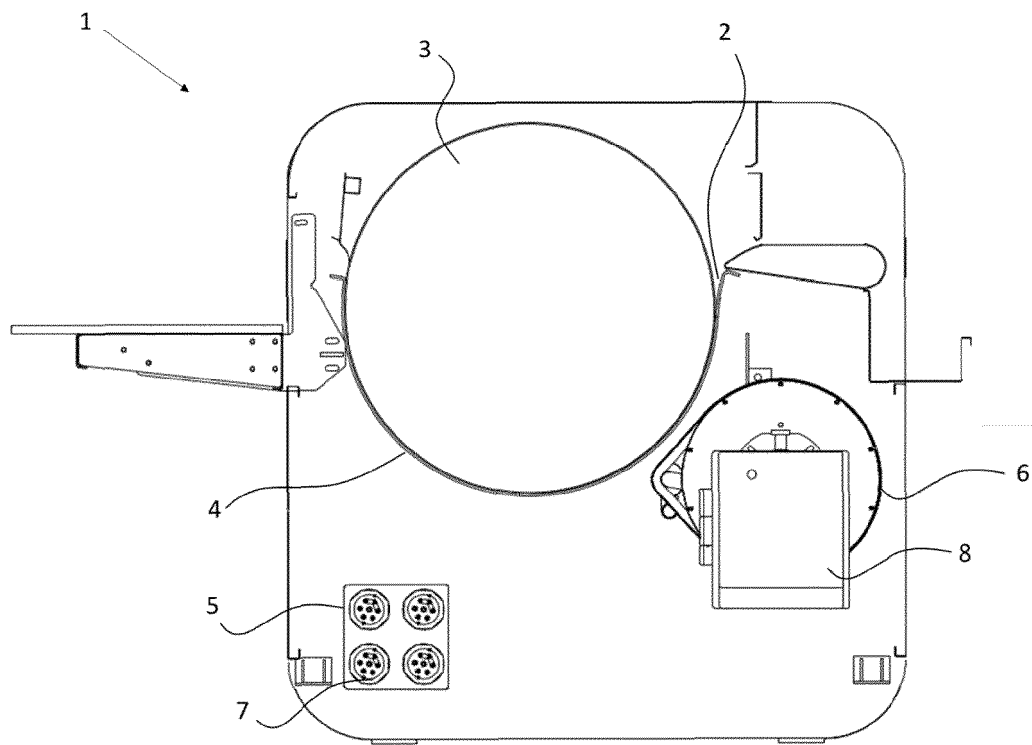


Fig. 1

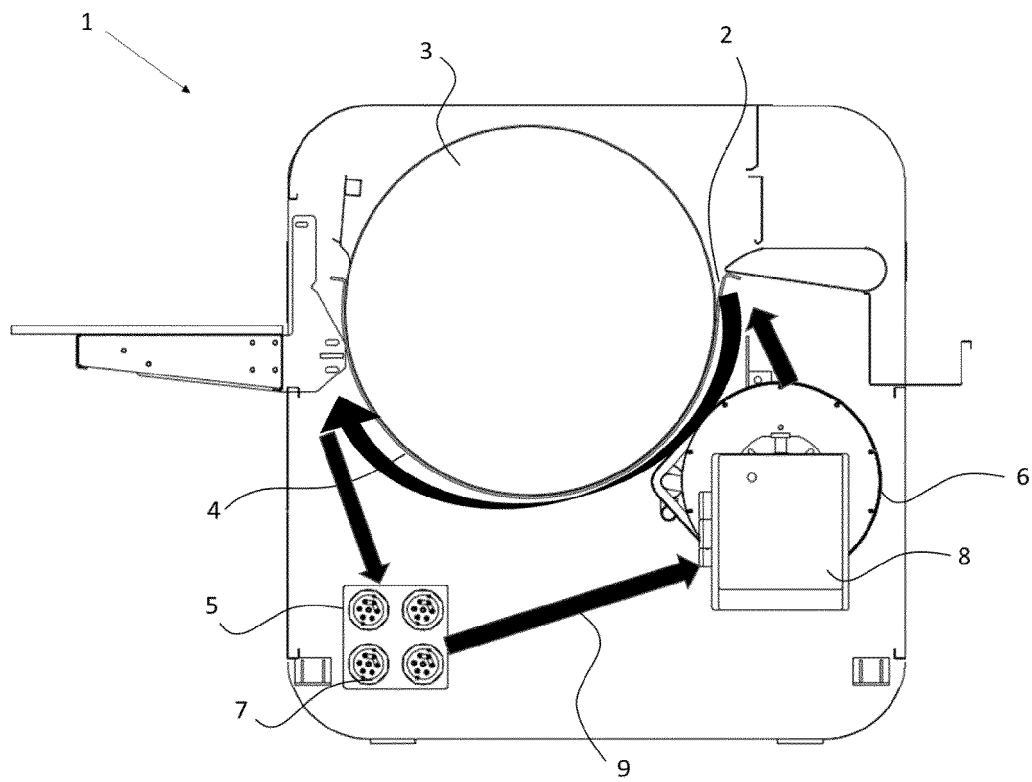


Fig. 2



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Application Number

EP 22 16 6074

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EPO FORM 1503 03.82 (P04C01)

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			D06F
The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>11 August 2022</b>	Examiner <b>Werner, Christopher</b>
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	

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