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⑦① Applicant: **Baldessari, Arnaldo, Corso Orbassano 218, I-10137 Torino (IT)**

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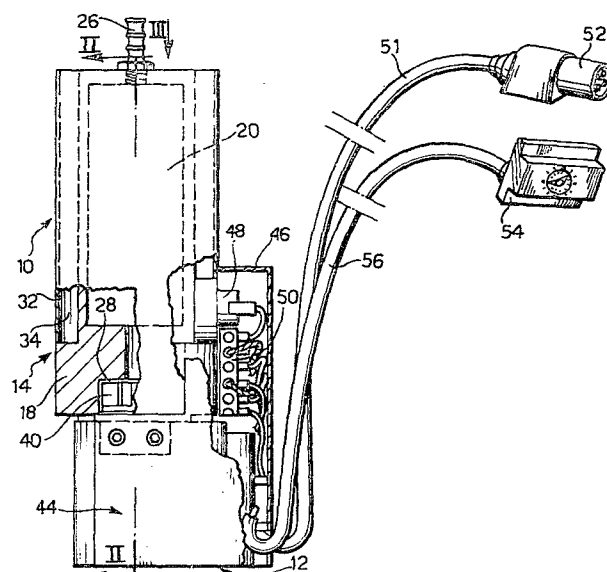
⑦② Inventor: **Baldessari, Arnaldo, Corso Orbassano 218, I-10137 Torino (IT)**

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⑦④ Representative: **Jacobacchi, Filippo et al, c/o Jacobacchi-CASETTA & PERANI S.n.c. Via Alfieri, 17, I-10121 Torino (IT)**

⑤④ A preheating device for preliminary heating the liquid of the cooling circuit of a motor-vehicle engine.

⑤⑦ A preheating device for preliminary heating the liquid of the cooling circuit of a motor-vehicle engine comprising a heater (10) formed by a massive metallic cylindrical body (14) having an axial through cavity (20) adapted to be connected to the cooling circuit of the engine and two axial bores (22) each containing an armored heating resistor (24), an electric pump (12), and an electric feeding circuit (50, 51, 52, 54) for connecting the device to an electrical source disposed outside the motor-vehicle. The electric circuit comprises a switch controlled by a programmable timer (54).



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"A preheating device for preliminary heating the liquid of the cooling circuit of a motor-vehicle engine".

The present invention relates to an auxiliary preheating device to be mounted on a motor-vehicle, particularly but not exclusively on an industrial vehicle provided with a diesel-cycle engine, and to be used for preliminary
5 ary heating the liquid of the cooling circuit of the engine of the vehicle in order to facilitate its cold start.

The object of the present invention is to provide a preheating device particularly simple, cheap and
10 functional, with a reduced encumbrance and formed by a restricted number of pieces.

According to the present invention there is provided a preheating device for preliminary heating the
15 liquid of the cooling circuit of a motor-vehicle engine comprising:

- a heater with heating resistors controlled by a thermostat, the said heater being formed by a

substantially cylindrical massive metallic body having a through axial cavity which forms a heating chamber through which in use the liquid of the cooling circuit of the engine of a motor-vehicle circulates, and at least two axial bores disposed on opposite sides with respect to the said heating chamber and each containing an armored resistor; the said metallic body being provided with an inlet tubular connector and an outlet tubular connector both communicating with the said heating chamber and adapted to be connected in use to the cooling circuit of the engine of a motor-vehicle,

- an electric pump having a body secured to one end of the metallic body and a rotor inserted within a cavity of the said metallic body communicating with the said heating chamber and with the said outlet tubular connector,

- an electric feeding circuit for connecting in use the heating resistors, the thermostat and the electric pump with an electric source placed outside the motor-vehicle.

In the preheating device according to the invention the thermal energy for preliminary heating the liquid of the cooling circuit of the engine of a motor-vehicle is supplied by an electric source independent from the battery of the vehicle on which the device is

to be mounted, thereby avoiding any risk of discharging the battery itself.

According to the invention, the electric feeding
5 circuit of the device is provided with a switch controlled by a programmable timer.

Due to this feature the switch can be automatically switched on, in order to put in action the heating
10 resistors and the electric pump, at a predetermined time, for example 15-20 minutes before the estimated time of starting the engine of the motor-vehicle.

According to another feature of the invention, the
15 device further comprises a tubular envelope which surrounds at least the portion of the metallic body wherein the said two axial bores containing the heating resistors extend, the said envelope defining with the lateral surface of the said metallic body a periferi-
20 cal annular interspace containing a thermally insulating material.

In this way an extremely high thermal efficiency of the heater is obtained.
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The invention will now be described in greater detail, reference being made by way of example to the accompanying drawings, in which:

30 Figure 1 is a partially sectioned side elevation

view of a preheater device according to the invention,

Figure 2 is a longitudinal section taken along the line II-II of Figure 1, and

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Figure 3 is a plan view according to the arrow III of Figure 1.

The preheating device according to the invention
10 essentially comprises a heater 10 and an electrical pump 12.

The heater 10 is constituted by a substantially cylindrical massive metallic body 14, preferably of aluminium, having an upper axial portion 16 and a lower enlarged axial portion 18. An axial cavity 20 of rectangular cross section is formed along the medial part of the body 14. Two diametrically opposed axial bores having a length substantially corresponding to that
15 of portion 16 of the body 14 extend adjacent to and on opposite sides of cavity 20. Within each bore 22 an armored heating resistor 24 is inserted. The armors of resistors 24 contact the walls of the respective bores 22.
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The axial cavity 20 communicates superiorly with an inlet tubular connector 26 screwed into the body 14, and inferiorly with an axial chamber 28 extending in correspondence of the lower end of the portion
30 18 of the body 14. This chamber 28 communicates

with an outlet tubular connector 30 screwed within the lateral wall of the body 14.

5 The portion 16 of the body 14 is coaxially surrounded by a tubular envelope 32 which defines with the external surface of the portion 16 a periferical annular inter-space 34 within which a thermally insulating material is inserted.

10 The electric pump 12 comprises an electric motor 36 disposed within a cylindrical case 38 hermetically fixed to the lower end of the portion 18 and of the body 14. The shaft of the motor 36 drives at one end a rotor 40 inserted within the chamber 28 of
15 the body 14, and at the other end a cooling fan 42.

An external protective envelope 44 having a lateral upper projection 46 is removably fixed to the case 38. The projection 46 forms a cover for a thermostat
20 48, disposed within the lower part of one of the bores 22, and for a terminal board 50 supported by the lateral wall of the portion 18 of the body 14 for the connection of a number of cables connected to the heating resistor 24, to the electric motor
25 36 and to the thermostat 48.

The thermical board 50 is connected through a cable 51 to an electrical plug 52 which can be introduced within a common current tap or socket, not shown
30 in the drawings, connected to an alternate current

distribution network. The electrical connection between the terminal board 50 and the plug 52 is controlled by means of a switch 54 provided with a programmable timer of conventional type connected
5 to the terminal board 50 by way of a cable 56.

As shown in Figure 3, the portion 18 of the body 14 is provided, on its side opposite to the projection 46 of the envelope 44, with a flat portion 58 provided
10 with bores 60 adapted to receive screws for securing the device to a motor-vehicle strut.

The above described preheating device can be used in order to facilitate cold starting of the engine
15 of the motor-vehicle on which it is mounted. The mounting of the device is accomplished, after fixing the body 14 to the strut of the vehicle, connecting the inlet connector 26 and the outlet connector 30 to the cooling circuit of the engine of the vehicle.

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In use, after insertion of plug 52 into a corresponding socket, the switch 54 may be programmed in order to connect automatically the plug 52 with the terminal board 50 at a predetermined time, corresponding for
25 example to 15-20 minutes before the estimated time of starting the engine of the vehicle. In this way the current is fed exactly at the predetermined hour through the terminal board 50 to the heating resistor 24, to the electric motor 36 of the pump 12 and to
30 the thermostat 48. By means of the pump 12 the cooling

liquid of the engine circulates through the cavity 20 of the body 14 and is thus preheated, by conduction through the body 14, by the two resistors 24. In this way the cooling liquid is preheated within the
5 heater 10 as long as a predetermined temperature, comprised for example between 60 and 70°C, is reached.

The value of the predetermined temperature can be modified adjusting the temperature of intervention of the thermostat 48. As soon as this temperature
10 is reached, the thermostat 48 cuts off the current to the heating resistors 24. At this point the plug 52 can be drawn out from the socket and the engine of the vehicle can be started.

15 It is evident from the foregoing how the preheating device according to the invention, besides being extremely simple and functional, has an extremely limited encumbrance and can be manufactured in a simple and cheap way.

CLAIMS:

1. A preheating device for preliminary heating the liquid of the cooling circuit of a motor-vehicle engine, comprising;

5 - a heater (10) with heating resistors (24) controlled by a thermostat (48), the said heater (10) being constituted by a substantially cylindrical massive metallic body (14) having an axial through cavity (20) forming a heating chamber through which in use
10 the liquid of the cooling circuit of the engine of a motor-vehicle circulates, and two axial bores (22) disposed on opposite sides with respect to the said heating chamber (20) and each containing an armored resistor (24); the said metallic body (14) being provided
15 with an inlet tubular connector (26) and an outlet tubular connector (30) communicating with the said heating chamber (20) and are adapted to be connected, in use, to the cooling circuit of the engine of a motor-vehicle.

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- an electric pump (12) having a body (38) secured to one end (18) of the metallic body (14) and a rotor (40) inserted within a cavity (28) of the said metallic body (14) which communicates with the said heating
25 chamber (20) and with the said outlet tubular connector (30).

- an electric feeding circuit (50, 51, 52, 54) for connecting in use the heating resistors (24), the

thermostat (48) and the electric pump (12) with an electric source disposed outside the motor-vehicle.

2. A preheating device as defined in Claim 1, wherein
5 the electric feeding circuit comprises a switch controlled by a programmable timer (54).

3. A preheating device as defined in Claim 1, further comprising a tubular envelope (32) surrounding at
10 least the portion (16) of the metallic body (14) within which the said axial bores (22) containing the heating resistors (24) extend, the said tubular envelope (32) defining with the lateral surface of
the metallic body (14) a peripheral annular interspace
15 (34) containing a thermally insulating material.

4. A preheating device as defined in Claim 1, wherein the lateral surface of the metallic body (14) has a flat portion (58) provided with bores (60) for
20 securing the device to a motor-vehicle strut.

