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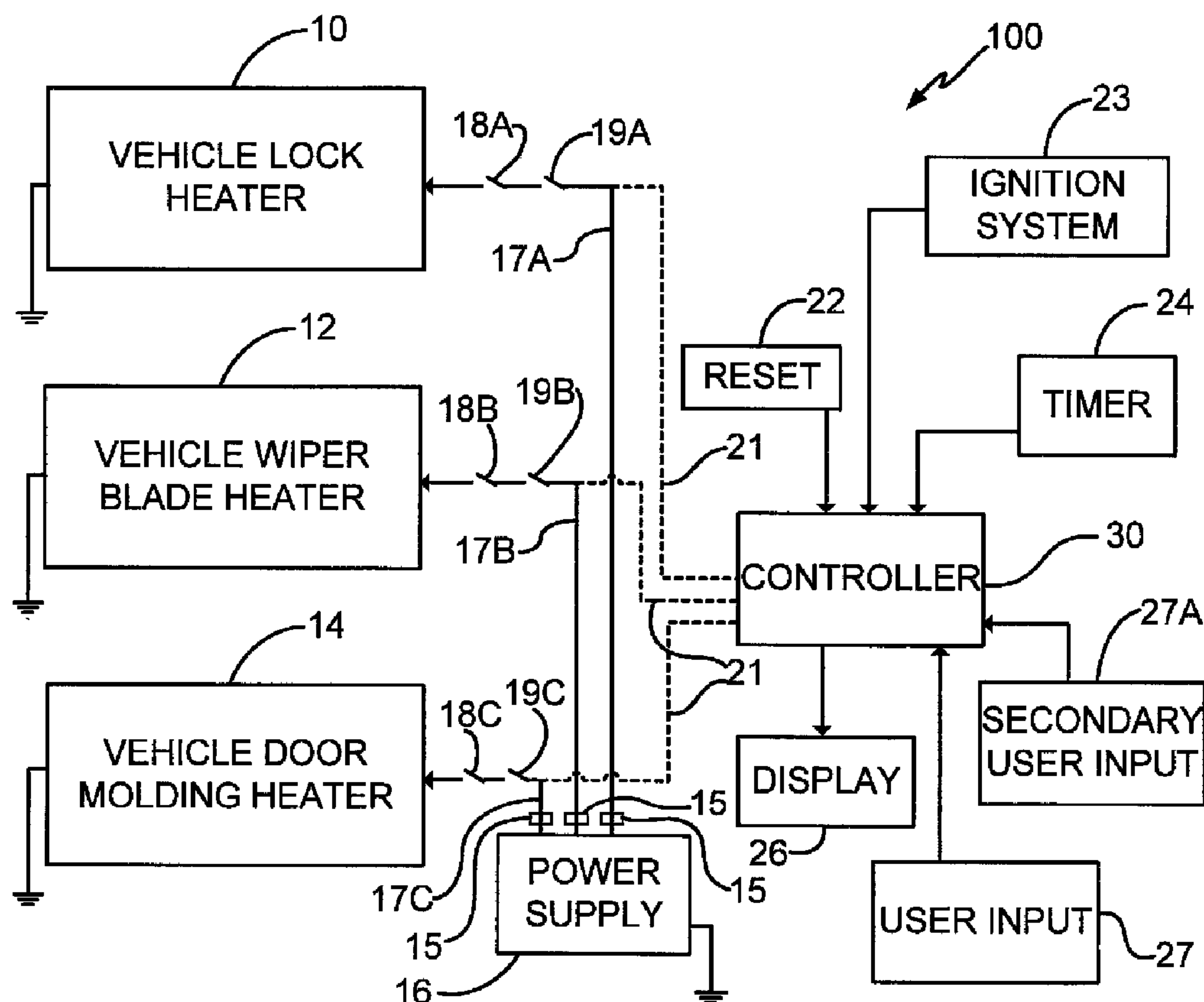
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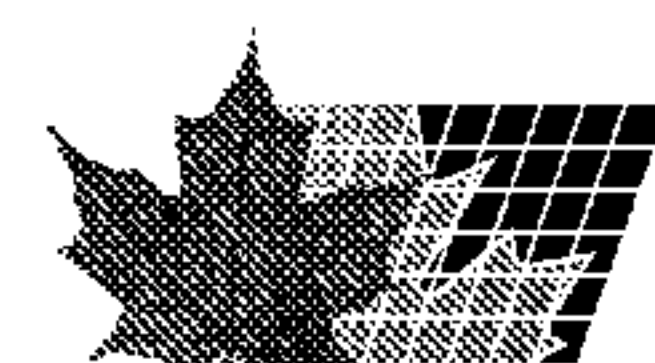
(54) Titre : APPAREIL DE DEGLACAGE DE VEHICULES

(54) Title: VEHICLE DE-ICING APPARATUS



(57) Abrégé/Abstract:

Apparatus is provided for de-icing the door lock, wiper blades and door molding of a vehicle. The apparatus includes a lock heater, a wiper blade heater and a door molding heater, connectable to a power supply through thermostat switches and control switches.



(57) **Abrégé(suite)/Abstract(continued):**

The apparatus also includes a controller for controlling supply of power to each of the lock heater, wiper blade heater and door molding heater. The controller closes or opens the control switches in response to commands received from a user input. The user input may comprise a remote control. The controller may also close or open the control switches based on the state of a timer, reset button and vehicle ignition system.

Abstract of the Disclosure

Apparatus is provided for de-icing the door lock, wiper blades and door molding of a vehicle. The apparatus includes a lock heater, a wiper blade
5 heater and a door molding heater, connectable to a power supply through thermostat switches and control switches. The apparatus also includes a controller for controlling supply of power to each of the lock heater, wiper blade heater and door molding heater. The controller closes or opens the control switches in response to commands received from a user input. The
10 user input may comprise a remote control. The controller may also close or open the control switches based on the state of a timer, reset button and vehicle ignition system.

VEHICLE DE-ICING APPARATUS

Technical Field

5 **[0001]** This invention relates to apparatus for installation in vehicles to de-ice or defrost components of vehicles which are subject to icing in cold climates. Particular embodiments of the invention are directed to apparatus for de-icing or defrosting a door lock, door molding and a windshield wiper blade of a vehicle.

10 **Background**

[0002] In cold climate regions, ice may form on a vehicle while the vehicle is parked outside or in an unheated building. The ice may have formed as a result of condensation or precipitation collecting and freezing on the vehicle exterior. In particular, ice may form on or around the vehicle lock.
15 This creates difficulties with unlocking the vehicle door, as the ice can block insertion of a key into the lock or impede rotation of the lock cylinder. Ice may also form around the vehicle door, so as to wedge the door in the door frame and prevent the door from being opened.

20 **[0003]** Ice may further form on the vehicle windshield wipers while the vehicle is parked or moving. For example, the ice may build up on the linkages which connect the wiper blade to the rods and gears driving the wiper blade. The ice build up impedes windshield wiper operation which can be particularly dangerous in winter driving conditions.

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[0004] The prior art has evolved various solutions for thawing vehicle door locks. However, these solutions may incorporate de-icing devices which are external to the vehicle, and/or which may be inconvenient to carry and difficult to use. Further, in using such prior art devices, the operator may be
30 required to stand outside the vehicle while thawing the door lock. Also, once the operator has thawed the door lock and is able to unlock the vehicle, the operator may be faced with the further challenge of prying open the vehicle

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door which may be stuck in the door frame due to ice around the door and on the door molding. The operator may also be faced with the problem of ice build up on the windshield wipers.

- 5 [0005] There is a desire for apparatus for de-icing and/or defrosting components of vehicles which address or at least ameliorate the deficiencies with the prior art.

Brief Description of Drawings

- 10 [0006] In drawings which illustrate non-limiting embodiments of the invention,

Figure 1 schematically depicts the components of a vehicle defrosting apparatus according to a particular embodiment of the invention;

- 15 Figure 2 is a perspective view of a vehicle lock heater according to a particular embodiment of the invention that may be used in the apparatus of Figure 1;

Figure 3 is a perspective view of the Figure 2 vehicle lock heater with its housing and plaster partially cut away to reveal the heating wire of the vehicle lock heater;

- 20 Figure 4 is a side elevation view of a vehicle wiper blade heater assembly according to a particular embodiment of the invention that may be used in the apparatus of Figure 1;

Figure 4A is a sectional view taken along line B-B of Figure 4;

- 25 Figure 5 is a side elevation view of a door having a door molding heater according to a particular embodiment of the invention that may be used in the apparatus of Figure 1;

Figure 5A is a sectional view taken along line A-A of Figure 5; and

- 30 Figure 6 is a top elevation view of a display and user input module according to a particular embodiment of the invention that may be used in the apparatus of Figure 1.

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Description

[0007] Throughout the following description, specific details are set forth in order to provide a more thorough understanding to persons skilled in the art. However, well known elements may not have been shown or described in
5 detail to avoid unnecessarily obscuring the disclosure. Accordingly, the description and drawings are to be regarded in an illustrative, rather than a restrictive, sense.

[0008] Figure 1 shows a schematic block diagram of a vehicle de-icing
10 apparatus **100** according to one embodiment of the invention. In the illustrated embodiment, apparatus **100** comprises a vehicle lock heater **10**, a vehicle wiper blade heater **12** and a vehicle door molding heater **14**. Heaters **10**, **12** and **14** receive power from a power supply **16** to respectively thaw the vehicle lock, wiper blade assembly and door molding, as will be described in more detail
15 below. Power supply **16** may be a vehicle battery or other source of power in the vehicle. Power supply leads **17A**, **17B**, **17C** (collectively, power supply leads **17**) electrically connect power supply **16** to heaters **10**, **12** and **14** respectively.

20 [0009] The output of power supply **16** to heaters **10**, **12** and **14** may be respectively controlled by thermostat switches **18A**, **18B** and **18C** (collectively, thermostat switches **18**). Thermostat switches **18** are placed in a closed position to permit current flow to respective heaters **10**, **12** and **14** only if the temperature is below a threshold temperature (e.g. -1° Celsius/30.2°
25 Fahrenheit or below). Thermostat switches **18** thereby ensure that heaters **10**, **12** and **14** receive current and emit heat only in certain temperature conditions (e.g. when the temperature is such that there is a possibility of icing on the vehicle lock, wiper blade assembly and door molding). Thermostat
30 switches **18** may prevent heaters **10**, **12** and **14** from being unnecessarily activated, for example, by the user pressing a command button on user input **27** to activate the heaters when the temperature is above freezing. If

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heaters **10**, **12** and **14** are activated, thermostat switches **18** are placed in the open position to deactivate heaters **10**, **12** and **14** if the temperature increases to the threshold temperature or higher. Thermostat switches **18** may be encased in a protective housing.

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[0010] In particular embodiments, thermostat switches **18** are located proximate to components which are heated by heaters **10**, **12** and **14**. The temperatures at the different thermostat switch locations may be different from one another and from the exterior temperature (i.e. the temperature outside of the vehicle). However, each thermostat switch **18** operates, between open and closed positions, in response to the temperature at the location of thermostat switch **18**. For example, thermostat switch **18A** may be positioned in door **28** at a location near lock **29** (e.g. at a location about 38 mm (1.5 inches) away from cylinder **34** of lock **29**). If the exterior temperature has warmed up to above -1° Celsius (30.2° Fahrenheit) but the area at which thermostat switch **18A** is located is below -1° Celsius (30.2° Fahrenheit), thermostat switch **18A** will permit current flow to heater **10** upon activation of heater **10**. Similarly, thermostat switch **18B** may be positioned near wiper blade assembly **49** (e.g. about 38 mm (1.5 inches) away from wiper blade **46**) to operate in response to a temperature near wiper blade assembly **49**. Thermostat switch **18C** may be positioned in door **28** at a location near door molding **54** (e.g. about 38 mm (1.5 inches) away from door molding **54**) to operate in response to a temperature near door molding **54**.

25 [0011] In other embodiments, the control circuit may be configured to allow the operator to manually override thermostat switches **18**. For example, an override circuit incorporating a resistor and switch may be connected in parallel to each of the thermostat switches **18**. When the operator wishes to override thermostat switches **18**, the operator causes controller **30** to send a control signal to place the switch of each override circuit in a closed position to permit current flow to respective heaters **10**, **12** and **14** (by way of the

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override circuit) even if the thermostat switches **18** are in the open position. Other suitable mechanisms for overriding thermostat switches **18** may be provided in other embodiments.

5 **[0012]** The output of power supply **16** to heaters **10**, **12** and **14** may further be controlled by switches **19A**, **19B** and **19C** respectively (collectively, switches **19**). In the illustrated embodiment, controller **30** transmits signals **21** to switches **19** for selectively closing or opening such switches to activate or deactivate a supply of power to each of heaters **10**, **12** and **14**. Controller **30**
10 may be a suitable controller such as a microprocessor, computer, ASIC, PLA or the like. The signals transmitted by controller **30** to switches **19** may be determined by command signals received from a user input **27** and, optionally, from a secondary user input **27A**.

15 **[0013]** Controller **30** may also transmit signals **21** to switches **19** based on the state of reset button **22**, timer **24**, and/or ignition system **23**. Controller **30** may also output, to a display **26**, certain information such as whether heaters **10**, **12** and **14** have been activated or deactivated, or whether there is a potential problem with the operation of one of heaters **10**, **12** and **14**.
20 Switches **19**, controller **30** (including the wiring of controller **30**), reset button **22**, timer **24**, secondary user input **27A** and/or display **26** may be implemented by hardware and/or software which is housed in one or more modules for installation in a vehicle. Each module may be installed in a vehicle during vehicle manufacture or the module may be retrofitted into an
25 existing vehicle.

[0014] User input **27** may comprise a combination of one or more devices which allow an operator to transmit commands to controller **30**. In some embodiments, user input **27** is advantageously a remote control to permit
30 operation of apparatus **100** while the operator is in a location remote to the vehicle (for example, while the operator is inside a building which is adjacent

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to the street or parking lot where the vehicle is parked). In some embodiments, user input **27** has push-buttons or switches which allow the operator to send one or more of the following commands to controller **30**:

- selection of one or more of vehicle lock heater **10**, vehicle wiper blade heater **12**, and vehicle door molding heater **14** which the user desires to activate.
- ON / OFF. In some embodiments, selecting ON will simultaneously activate only those heaters selected by the operator, and selecting OFF will simultaneously deactivate all heaters. In other embodiments, there may be specific ON and OFF inputs for each of the heaters. In still other embodiments, selecting ON will by default activate all of the heaters. In still other embodiments, selecting ON will activate both of the vehicle lock heater **10** and vehicle door molding heater **14**.
- heat level settings (e.g. HIGH or LOW) or temperature settings.

If user input **27** is a battery-powered remote control, user input **27** may have an LED light which flashes when an input has been activated, indicating to the operator that the battery of the remote control is functioning. When the battery becomes weak, the LED may flash slower and/or less brightly, indicating to the operator that the battery needs changing.

[0015] When the operator sends a command (e.g. by user input **27**) to activate one or more of heaters **10**, **12** and **14**, controller **30** outputs a signal **21** to close appropriate switches **19** so as to activate the selected heater(s).

[0016] In some embodiments, selecting the ON state with user input **27** activates both vehicle lock heater **10** and vehicle door molding heater **14**. Upon receiving the ON or activation signal from the operator, controller **30** outputs a signal **21** to close switches **19A** and **19C**. Controller **30** also starts timer **24** to record an elapsed time. Once a predetermined time has elapsed (e.g. 5 minutes) according to timer **24**, controller **30** outputs a signal **21** to open switches **19A** and **19C** thereby deactivating heaters **10** and **14**. Use of

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timer **24** ensures that heaters **10** and **14** are not inadvertently left on for prolonged periods of time. If the operator wishes to continue with heating, the operator must reactivate heaters **10** and **14** through user input **27**. The predetermined time that a heater may be left on before it is deactivated may be
5 configurable by the operator.

[0017] While only one timer **24** is shown in Figure 1, in some embodiments, there may be separate timers associated with heaters **10**, **12** and/or **14**, so that the duration for which each heater is ON may be
10 independently controlled. Controller **30** may send a deactivation signal to the appropriate switch **19** when the predetermined time has elapsed.

[0018] In the illustrated embodiment of Figure 1, individual circuit breakers **15** (e.g. 15A or 20A circuit breakers) may be connected to protect
15 heaters **10**, **12** and **14** in the event of an overload or other fault condition. Circuit breakers **15** may be reset by the operator.

[0019] In some embodiments, display **26** may provide an indicator indicating faulty or abnormal operation of heaters **10**, **12** and **14**. For example,
20 circuitry may detect whether any of circuit breakers **15** has been triggered, and display **26** may display a message or turn on a light on the display indicating that one or more of heaters **10**, **12** and **14** has been deactivated due to a potential problem. Figure 6 depicts one example display and user input module **41** incorporating a display **26** and a secondary user input **27A**. Each of
25 the light indicators **25A**, **25B** and **25C** (which form part of the display **26**) may be associated with a circuit breaker **15** for one of heaters **10**, **12** and **14**, and is turned on when the associated circuit breaker **15** has been triggered.

[0020] In some embodiments, controller **30** may accept a reset command
30 from reset input **22** depressed by the operator, causing controller **30** to send a signal to open all of switches **19** to deactivate heaters **10**, **12** and **14**. Reset

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input **22** may be incorporated in user input **27** (e.g. the remote control), and/or may be incorporated in another user control interface connected to controller **30** such as secondary user input **27A** on display and user input module **41** (Figure 6).

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[0021] Vehicle wiper blade heater **12** may be controlled differently from vehicle lock heater **10** and vehicle door molding heater **14** in some embodiments. For example, secondary user input **27A** may have an ON/OFF button or switch **32** for activating/deactivating vehicle wiper blade heater **12**.

10 In some embodiments, activation of heater **12** is triggered by the vehicle ignition in addition to, or instead of, commands from the operator. For example, controller **30** may be connected to vehicle ignition system **23** to detect whether the vehicle is running (i.e. ignition is ON) or not running (i.e. ignition is OFF). If controller **30** determines that the vehicle is running,
15 controller **30** sends a signal to close switch **19B** to permit current flow to heater **12**. As soon as controller **30** has detected that the vehicle has ceased running, controller **30** sends a signal to open switch **19B**. The heat level (e.g. HIGH/LOW or temperature setting) of heater **12** may be adjustable. In the illustrated embodiment, the heat level of heater **12** may be controlled by
20 selecting one of the HIGH and LOW inputs **13A**, **13B** on secondary user input **27A** (Figure 6). The default heat level setting of heater **12** may be set to LOW.

[0022] In other embodiments, the activation/deactivation and heat level
25 of heater **12** may be controlled by a multi-function push button. Pushing the button a first time turns heater **12** ON and sets the heat level of heater **12** to LOW. Pushing the button a second time sets the heat level of heater **12** to HIGH. Pushing the button a third time turns heater **12** OFF.

30 **[0023]** During normal operation in non-freezing temperature conditions, when a key is inserted into a lock **29** and rotated about the lock's axis,

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cylinder 34 of lock 29 is caused to rotate about its axis within a cylindrical lock shaft 33 that is secured to vehicle door 28 (Figures 2 and 3). This action unlocks door 28. However, when ice has formed on or in lock 29, the ice may block the key from being inserted in lock 29, or the ice may prevent rotation of cylinder 34 within shaft 33. In such circumstances, the ice must be thawed or broken before cylinder 34 can be rotated to unlock door 29. In the illustrated embodiment, vehicle lock heater 10 comprises an annular piece that is installed around cylinder 34 of lock 29 to heat and thaw out ice which has formed on lock 29.

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[0024] As best seen in Figure 3, heater 10 incorporates a resistance heating wire 31, embedded in an electrically-insulating plaster material 35. Plaster material 35 is encased in a housing 36 which may be made of copper. To construct heater 10, heating wire 31 is coiled and placed in a partially constructed housing 36 (which is left open on one side, for example, through face 38, allowing for insertion of heating wire 31). Opposite ends of heating wire 31 are arranged to protrude from apertures in housing 36. A heat-resistant plaster 35 in liquid form is poured into housing 36 and around heating wire 31, and cured. Next, face 38 of housing 36 is soldered on or otherwise attached to the remainder of housing 36 to seal plaster 35 and heating wire 31 inside housing 36 to form vehicle lock heater 10. Housing 36 has a bore 37 shaped to accommodate cylinder 34 of lock 29. Vehicle lock heater 10 is installed by sliding cylinder 34 through bore 37. At least a portion of the surfaces of housing 36 defining bore 37 and adjacent to cylinder 34 may contact surfaces of cylinder 34 and/or may be positioned slightly apart from surfaces of cylinder 34 (e.g. by a maximum separation of 7 mm/0.2756 inch). Heater 10 may then be secured to cylinder 34 by a spring clip 39 or other suitable retaining device which prevents heater 10 from detaching from or sliding off cylinder 34 but which still permits rotation of cylinder 34 within lock shaft 33.

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[0025] Heating wire **31** is electrically connected to power supply **16**. In particular embodiments, power supply **16** is a DC vehicle battery (e.g. 12 to 24 Volt battery) and opposite ends of heating wire **31** are electrically connected to a pair of power supply leads **17A'**, **17A''** respectively (collectively, power supply leads **17A**) one of which may be connected to a positive terminal of power supply **16** via switches **18**, **19** and circuit breakers **15** and the other one of which may be connected to a negative terminal of power supply **16**. When power is supplied to vehicle lock heater **10** through power supply leads **17A**, wire **31** heats up through resistive heating of heating wire **31**. Heat from heating wire **31** is conducted through plaster **35** and housing **36**, and heats cylinder **34** and other components of lock **29** to thaw ice which has formed on lock **29**.

[0026] In the illustrated embodiment of Figure 4, vehicle wiper blade heater **12** is installed in vehicle wiper assembly **49**. Vehicle wiper assembly **49** may be a conventional vehicle wiper assembly having a wiper blade **46** mounted to a base **55** (Figure 4A). Base **55** is connected to arms, rods or other linkages **56** for driving vehicle wiper assembly **49**. Vehicle wiper blade heater **12** incorporates a semi-rigid or flexible protective casing **45** which is shaped to fit around at least a portion of vehicle wiper assembly **49**, such as, for example, the portion of vehicle wiper assembly **49** below blade **46**. Casing **45** may be a rubber, snugly-fitting casing, for example, which is stretched and placed around vehicle wiper assembly **49**. Spring-loaded clips or other suitable fasteners may be used for removably securing casing **45** to vehicle wiper assembly **49**. Vehicle wiper blade heater **12** also incorporates one or more electrically-insulated heating strips **44** enclosed in casing **45**. A heating strip **44** may extend along a length of vehicle wiper assembly **49** on either side of vehicle wiper assembly **49** (Figure 4A). Heating strips **44** comprise a resistance heating wire **42** housed in tubing **43** made of an electrically-insulating material (e.g. flexible nylon, rubber, vinyl). Heating wire **42** is connected to power supply **16** via power supply lead **17B**, switches

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18B, 19B and circuit breaker **15**. The portion of power supply lead **17B** extending from heating wire **42** may be secured to an arm of linkages **56** so as not to interfere with the operation of vehicle wiper assembly **49**.

5 **[0027]** When power is supplied to heating wire **42**, heating wire **42** heats up through resistive heating. Heat from heating wire **42** is conducted through tubing **43** to heat an air space **56** between heating strip **44** and casing **45**, and to heat casing **45** and vehicle wiper assembly **49**. The heat thaws ice which has built up on vehicle wiper assembly **49**. When not in use, the components of
10 vehicle wiper blade heater **12** (e.g. casing **45** and all of the heating components therein) may be detached from vehicle wiper assembly **49** and stored.

[0028] In some embodiments, vehicle wiper assembly **49** is provided with a built-in, non-detachable vehicle wiper blade heater **12** having the
15 components described above. Vehicle wiper assembly **49** may replace a conventional vehicle wiper assembly during winter months. Vehicle wiper assembly **49** may have a replaceable rubber wiper blade **46**.

[0029] In the illustrated embodiment of Figure 5, door molding heater **14**
20 comprises an electrically-insulated heating strip **50** comprising a resistance heating wire **51** housed in tubing **52** made of an electrically-insulating material (e.g. flexible nylon, rubber, vinyl). The heating strip **50** is inserted inside molding **54** of door **28** (Figure 5A). In the illustrated embodiment, door molding **54** is shown as a hollow tube and heating strip **50** is positioned in the
25 space within the hollow tube. Door molding **54** may be a rounded hollow tube. However, this is not necessary. Door molding **54** may comprise a strip having an L-shaped cross-section or a U-shaped cross-section, for example, defining a concavity in which heating strip **50** may be received.

30 **[0030]** Heating wire **51** is connected to power supply **16** via power supply lead **17C**, switches **18C, 19C** and circuit breaker **15**. When power is

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supplied to heating wire **51** from power supply **16**, heating wire **51** heats up through resistive heating. Heat from heating wire **51** is conducted through tubing **52** to heat a space **53** between heating strip **50** and molding **54**, and also to heat molding **54** to thaw ice which has formed on molding **54**.

5

[0031] The embodiments of apparatus **100** described herein may be installed in a vehicle during manufacture of the vehicle, or may be provided as kits for retrofit installation in a vehicle.

10 **[0032]** To install vehicle lock heater **10**, the inside panel cover of door **28** is removed/absent to expose lock **29**. Vehicle lock heater **10** is placed around cylinder **34** of lock **29**, and secured in place by spring clip **39** or another retaining device. Power supply lead **17A** connected to heating wire **31** may be strapped to door **28**, and routed past the hinges of door **28** (along with other
15 wiring for electrically-powered components installed in door **28**, such as power door locks, power door windows, etc.) Power supply lead **17A** may be wired through controller **30** to power supply **16**.

[0033] To install vehicle door molding heater **14**, heating strip **50** is
20 inserted in door molding **54**. In some embodiments, this step is not required as door molding **54** may be provided with heating strip **50** embedded in door molding **54**. Heating strip **50** and/or door molding **54** may be cut to have a length to extend around the perimeter of door **28**. Door molding **54** is fitted around the periphery of door **28**. Door molding **54** may be attached to door **28**
25 using clips, adhesive or any other suitable attachment means known to those of skill in the art. Power supply lead **17C** connected to heating wire **51** may be routed past the hinges of door **28** (along with other wiring for electrically-powered components installed in door **28**), and wired through controller **30** to power supply **16**. In some embodiments, door molding heater **14** may be
30 installed only around the driver door **28**. In other embodiments, door molding

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heater **14** may be installed around both the driver door **28** and one or more of the passenger doors **28**.

[0034] To install vehicle wiper blade heater **12**, casing **45** and the heating components contained therein may be fitted around vehicle wiper assembly **49** on the vehicle. In other embodiments where vehicle wiper assembly **49** is provided with a built-in vehicle wiper blade heater **12**, the existing wiper blade assembly on the vehicle is removed and the vehicle wiper assembly **49** with heater **12** is installed on the vehicle. Power supply lead **17B** is routed past arms or linkages **56** connected to vehicle wiper assembly **49**, and wired through controller **30** to power supply **16**.

[0035] Controller **30** may be mounted inside the vehicle (e.g. under the vehicle dash). Display and user input module **41** is wired to controller **30** and may also be mounted inside the vehicle (e.g. under the vehicle dash).

[0036] The embodiments of apparatus **100** described herein may be adapted for use in defrosting door locks, door moldings and windshield wipers of different kinds of vehicles, including cars, trucks, vans, buses, trains, aircraft, industrial mining vehicles, forestry vehicles, loaders, boats, ships, and the like.

[0037] While a number of exemplary aspects and embodiments have been discussed above, those of skill in the art will recognize certain modifications, permutations, additions and sub-combinations thereof. It is therefore intended that the following appended claims and claims hereafter introduced are interpreted to include all such modifications, permutations, additions and sub-combinations as are within their true spirit and scope.

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WHAT IS CLAIMED IS:

1. An apparatus for de-icing a lock, a wiper blade assembly and door molding of a vehicle, comprising:
 - a lock heater attachable to the lock and electrically connectable to
 - 5 a power supply through a first control switch;
 - a wiper blade heater attachable to the wiper blade assembly and electrically connectable to the power supply through a second control switch;
 - a door molding heater insertable in the door molding and electrically connectable to the power supply through a third control switch;
 - 10 and,
 - a controller for controlling a supply of power from the power supply to the lock heater, wiper blade heater and the door molding heater, wherein the controller is configured to open or close the first, second and third control switches in response to an input signal received from a user input.
 - 15
2. The apparatus according to claim 1, wherein the controller is configured to close the first and third control switches and to activate a timer upon receiving a user input activation signal from the user input, and to open the first and third control switches when a predetermined time period has
- 20 lapsed according to the timer.
3. The apparatus according to claim 1, wherein the lock heater comprises a housing having a bore therethrough for receiving a cylinder of the lock.
- 25
4. The apparatus according to claim 3, wherein the lock heater comprises a resistance heating wire embedded in plaster and encased in the housing, the resistance heating wire electrically connectable to the power supply through the first control switch.
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5. The apparatus according to claim 1, wherein the wiper blade heater comprises an electrically-insulated heating strip.
6. The apparatus according to claim 5, wherein the wiper blade heater comprises a casing enclosing the electrically-insulated heating strip, the casing shaped to fit around at least a portion of the wiper blade assembly.
7. The apparatus according to claim 6, wherein the wiper blade heater is removably attachable to the wiper blade assembly.
8. The apparatus according to claim 6, wherein the electrically-insulated heating strip comprises a resistance heating wire encased in electrically-insulating tubing, the resistance heating wire electrically connectable to the power supply through the second control switch.
9. The apparatus according to claim 1, wherein the door molding heater comprises an electrically-insulated heating strip insertable in the door molding.
10. The apparatus according to claim 9, wherein the electrically-insulated heating strip comprises a resistance heating wire encased in electrically-insulating tubing, the resistance heating wire electrically connectable to the power supply through the third control switch.
11. The apparatus according to claim 1, wherein the lock heater is electrically connectable to the power supply through a first thermostat switch.
12. The apparatus according to claim 11, wherein the wiper blade heater is electrically connectable to the power supply through a second thermostat switch.

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13. The apparatus according to claim 12, wherein the door molding heater is electrically connectable to the power supply through a third thermostat switch.
- 5 14. The apparatus according to claim 13, wherein for each of the first, second and third thermostat switches, the thermostat switch is configured to be in a closed position if a temperature at a location of the thermostat switch is less than 1 degree Celsius.
- 10 15. The apparatus according to claim 14, wherein the first thermostat switch is located about 1.5 inches away from the lock heater.
16. The apparatus according to claim 15, wherein the second thermostat switch is located about 1.5 inches away from the wiper blade
15 assembly.
17. The apparatus according to claim 16, wherein the third thermostat switch is located about 1.5 inches away from the door molding.
- 20 18. The apparatus according to claim 1, comprising a circuit breaker connected between the power supply and each of the lock heater, wiper blade heater and door molding heater.
19. The apparatus according to claim 1, wherein the controller is
25 connected to a vehicle ignition system such that the controller detects running of a vehicle ignition, and the controller is configured to close the second control switch if the vehicle ignition is running and to open the second control switch if the vehicle ignition is not running.

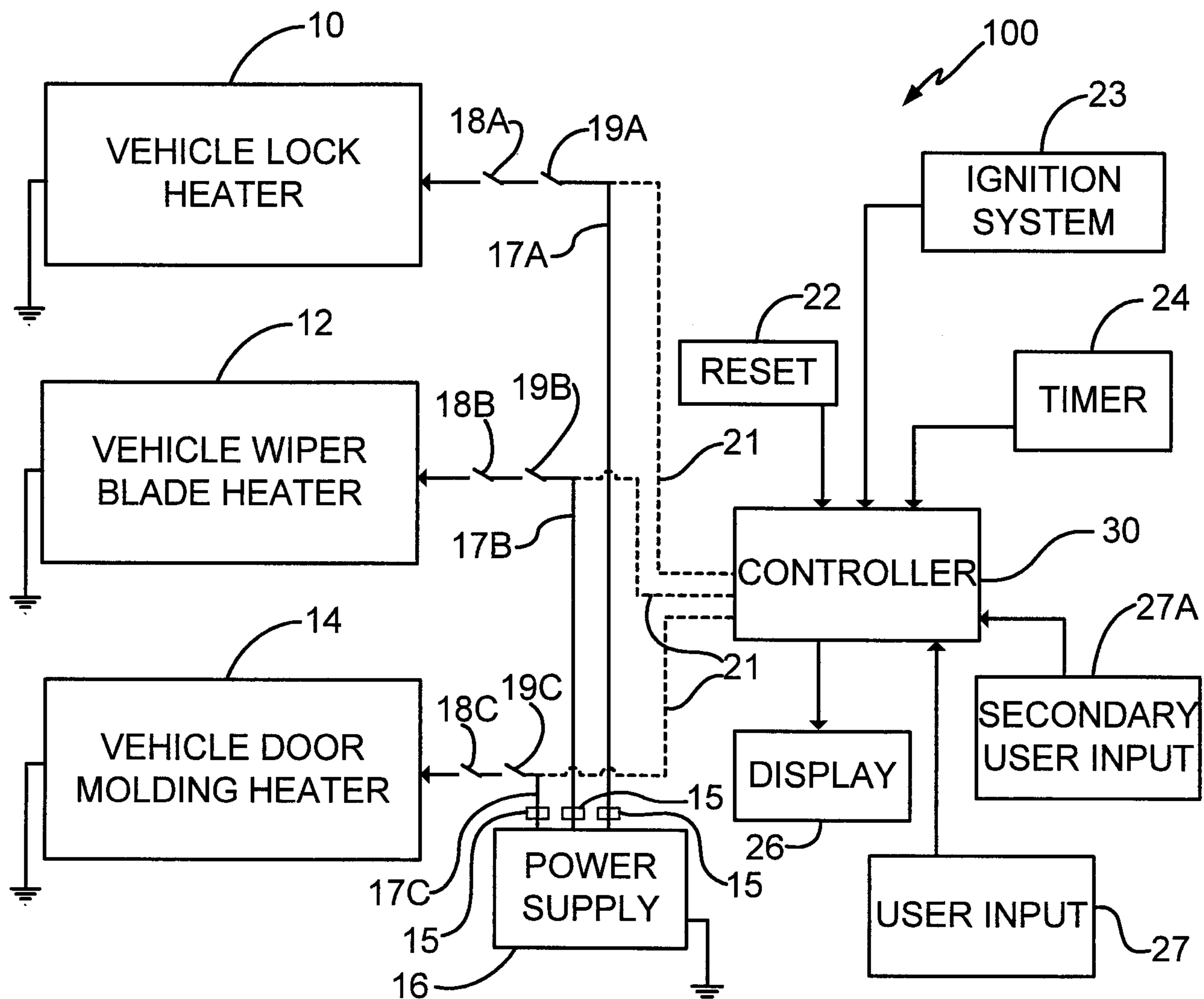
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20. The apparatus according to claim 1, comprising a display connectable to the controller for displaying an indication of an operational status of each of the lock heater, wiper blade heater and door molding heater.
- 5 21. An apparatus for de-icing components of a vehicle, comprising:
a heater comprising at least one of:
a lock heater attachable to a vehicle lock;
a wiper blade heater attachable to a vehicle wiper
blade; and
10 a door molding heater insertable in a vehicle door molding;
wherein the heater is electrically connectable to a vehicle power supply through a control switch; and
a controller for controlling a supply of power from the vehicle
15 power supply to the heater, the controller configured to open or close the control switch in response to an input signal received from a user input.
22. A vehicle comprising the apparatus according to claim 1.
- 20 23. A vehicle de-icing kit comprising:
a lock heater attachable to a lock of the vehicle;
a vehicle wiper assembly comprising a wiper blade heater;
a door molding strip comprising a door molding heater;
a controller for controlling a supply of power from a vehicle
25 power supply to:
the lock heater through a first control switch;
the wiper blade heater through a second control switch; and
the door molding heater through a third control switch;
wherein the controller is configured to open or close the first,
30 second and third control switches in response to an input signal received from a user input; and

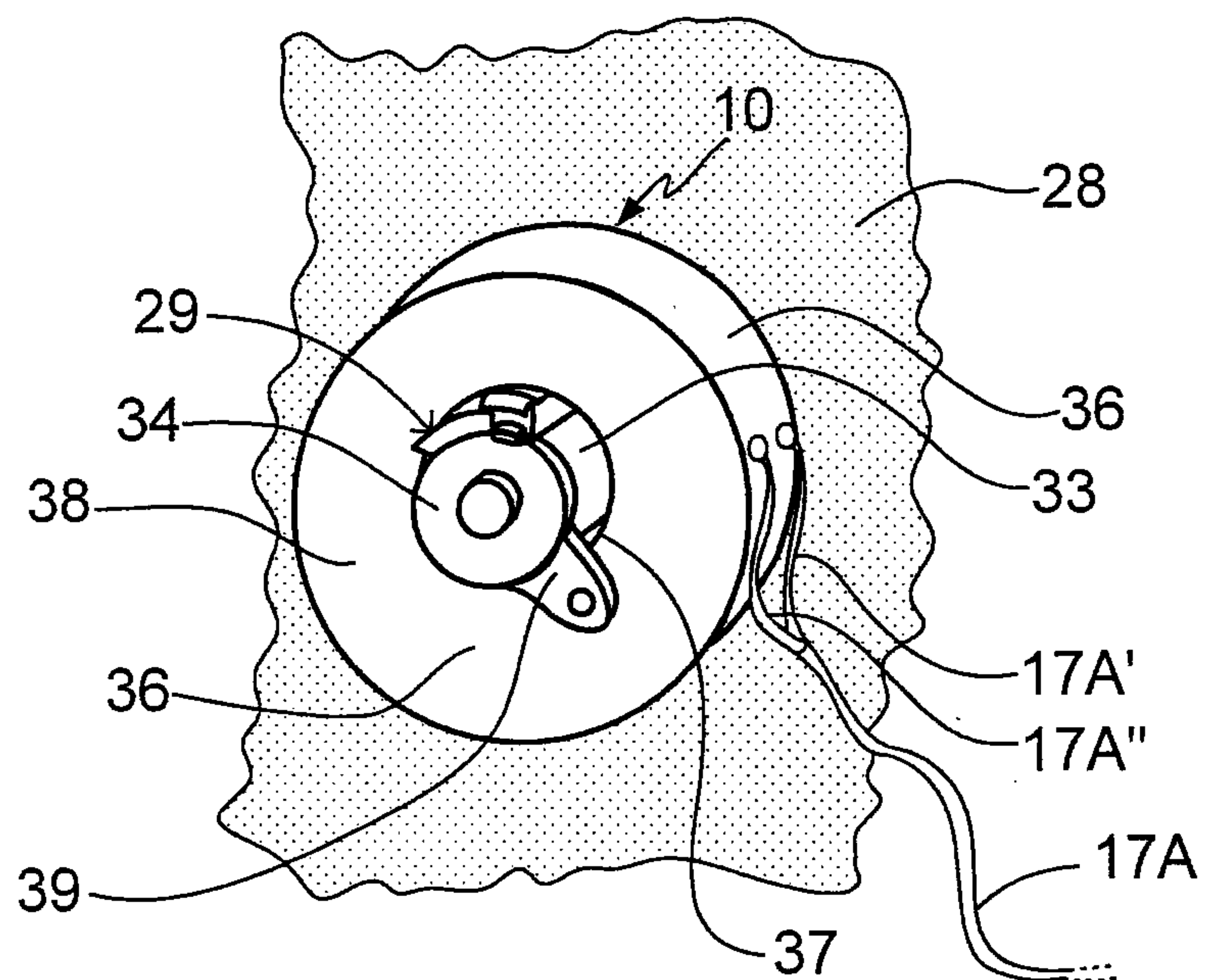
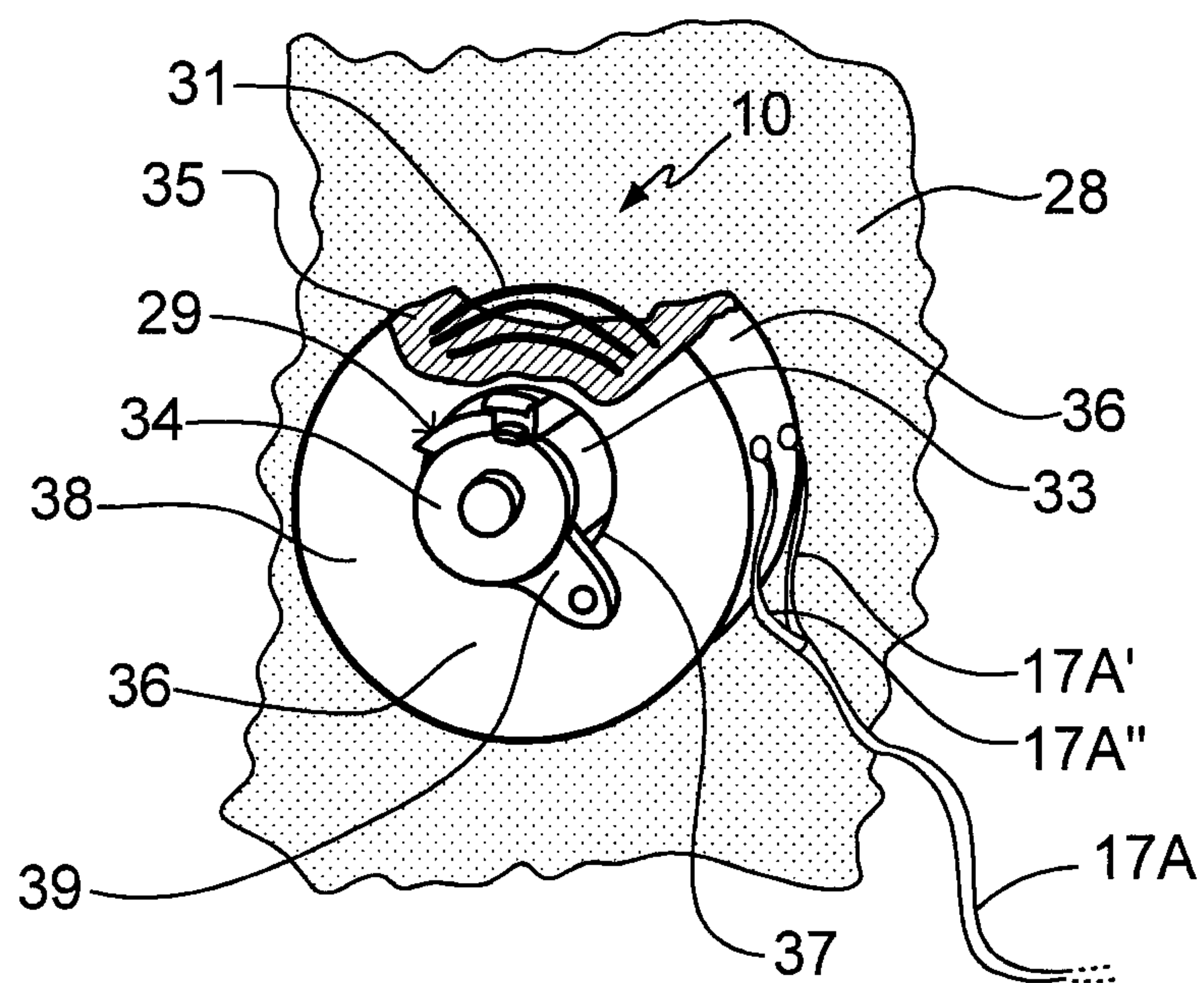
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means for electrically connecting the lock heater, wiper blade heater and door molding heater to the vehicle power supply through the first, second and third control switches, respectively.

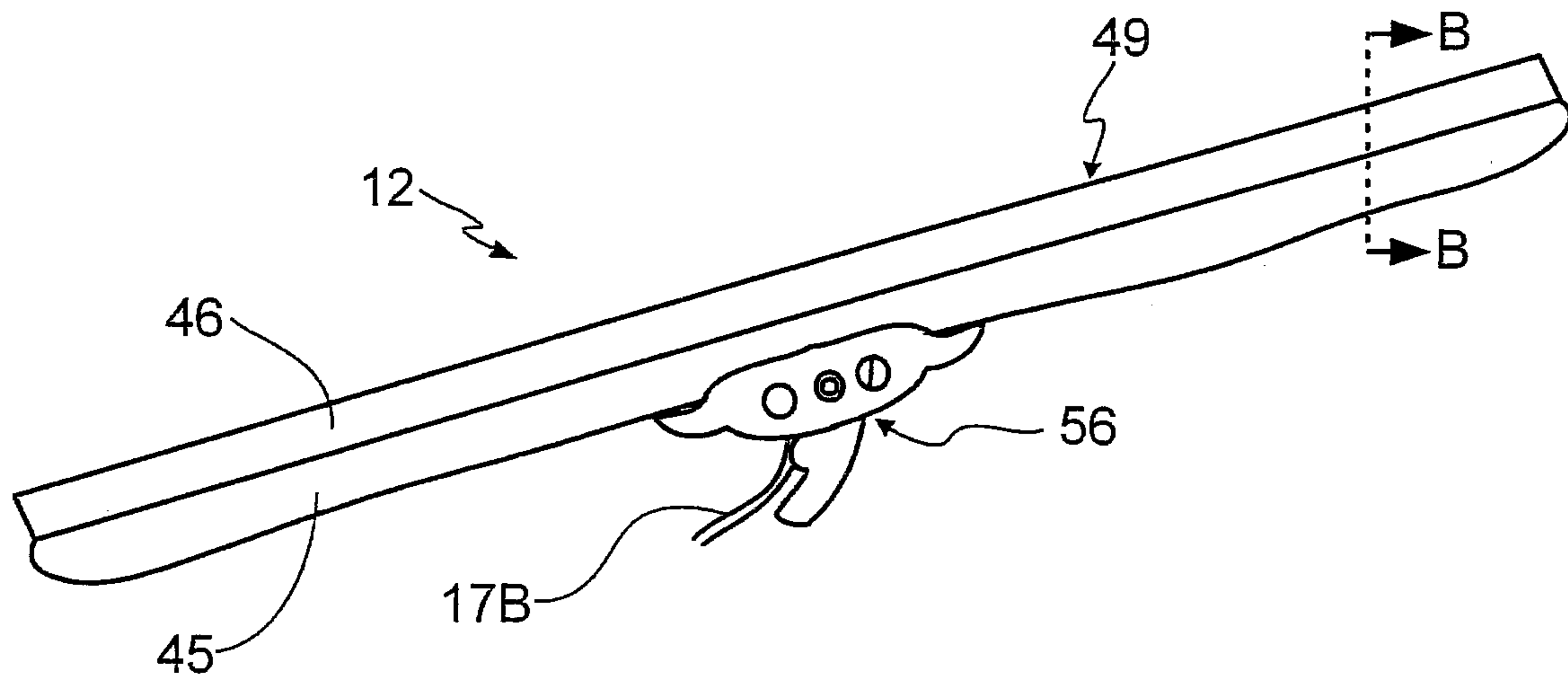
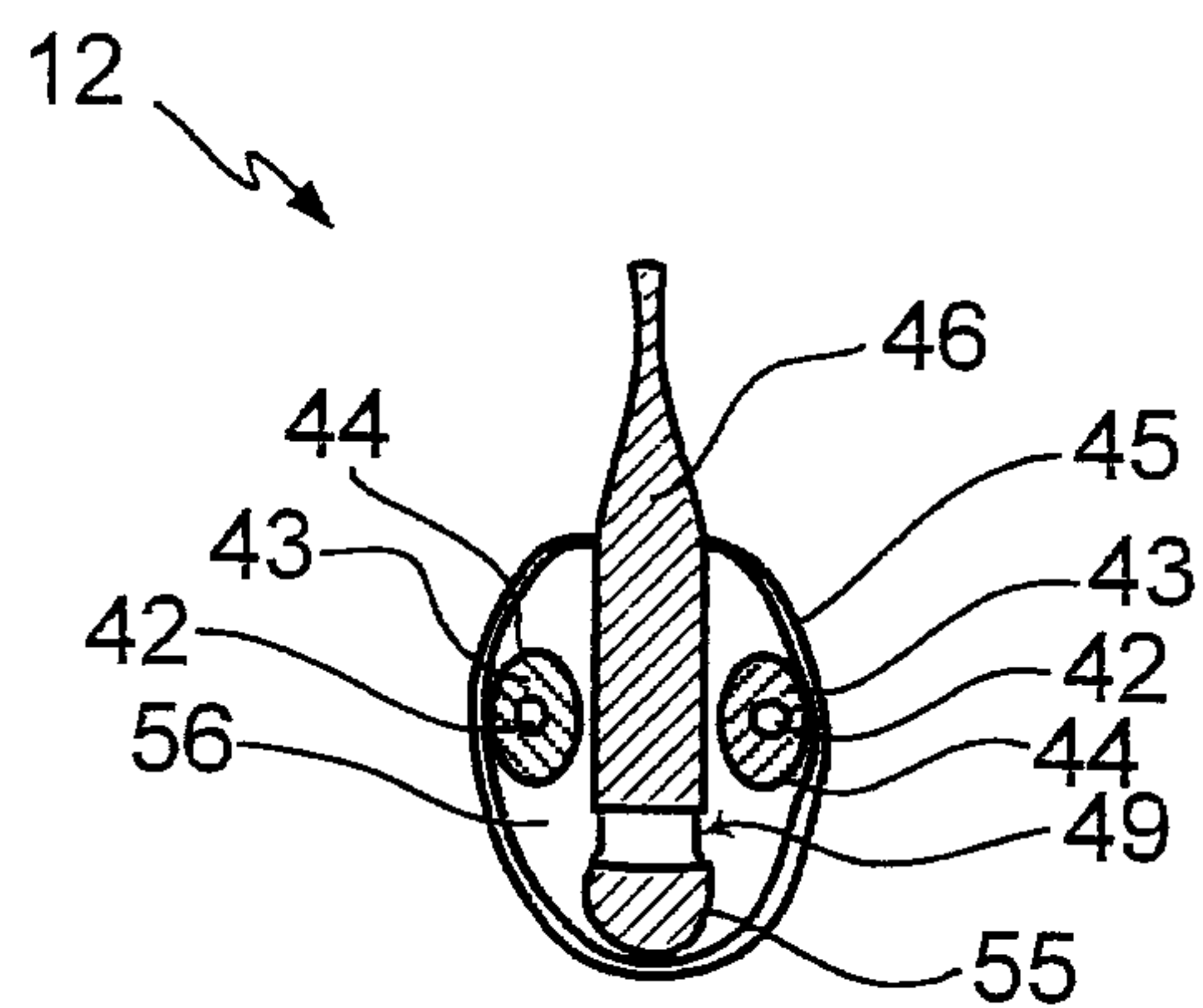
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**FIGURE 1**

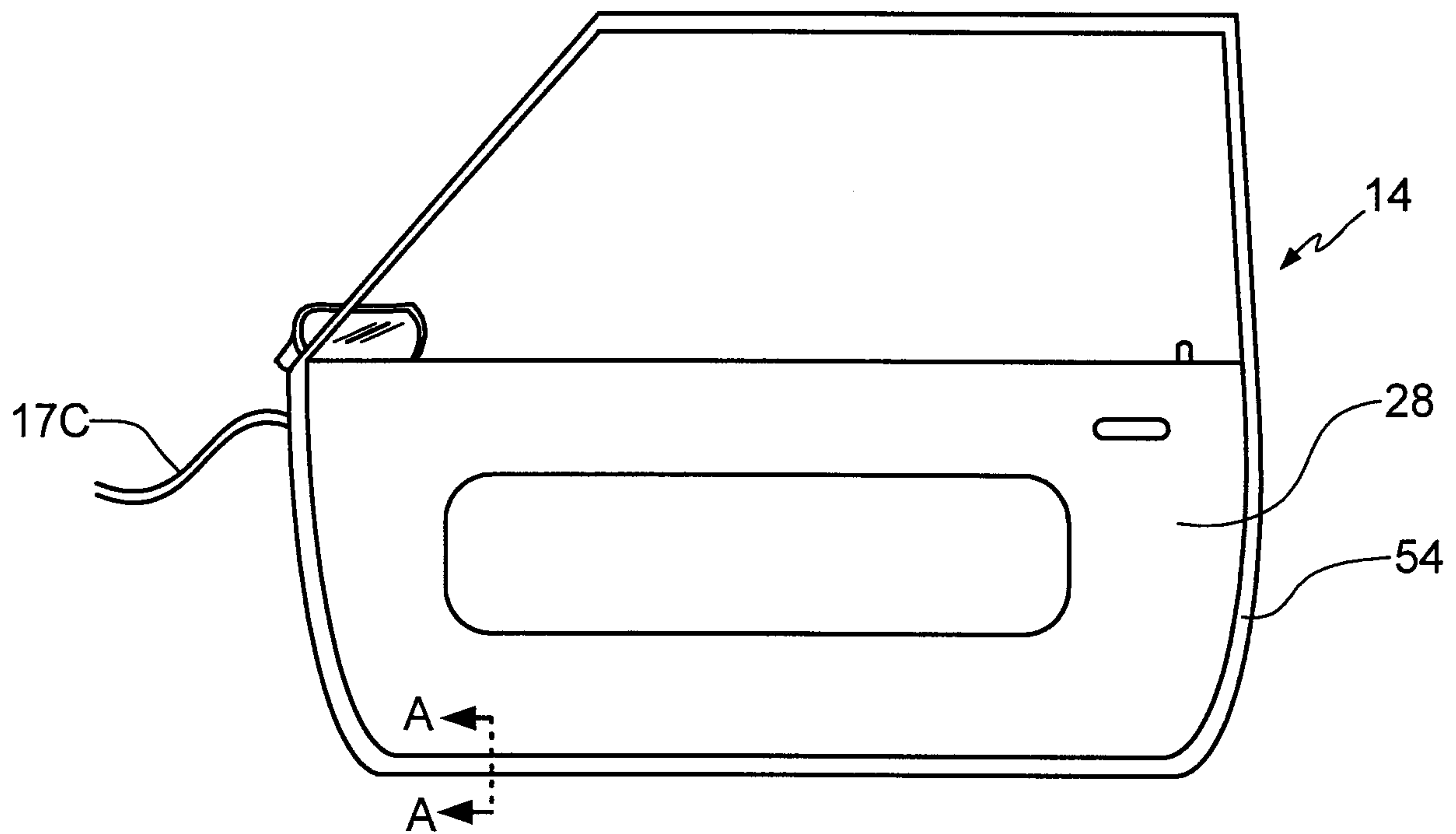
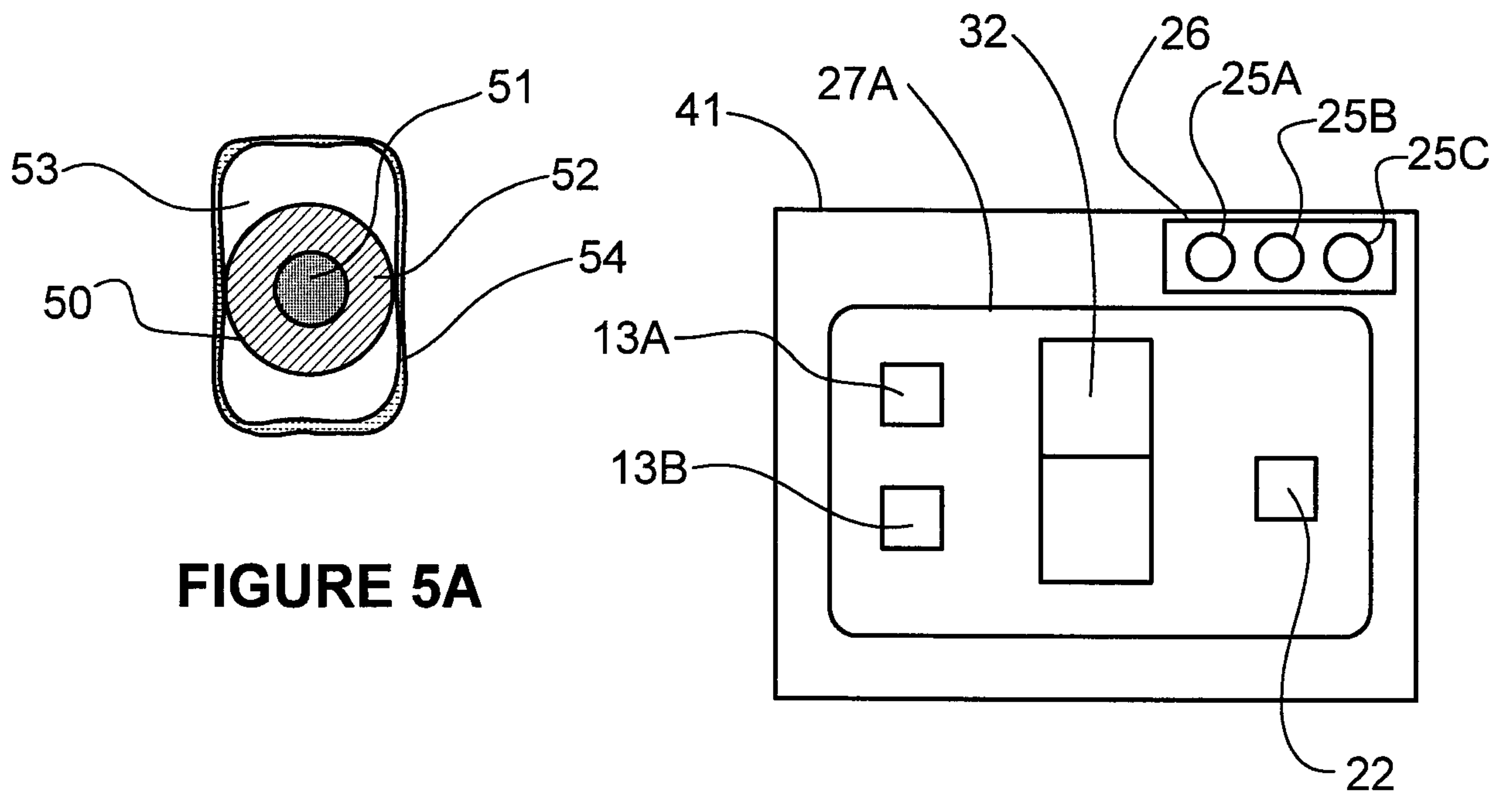
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**FIGURE 2****FIGURE 3**

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**FIGURE 4****FIGURE 4A**

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**FIGURE 5****FIGURE 5A****FIGURE 6**

