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HANDHELD SYSTEM AND METHOD FOR HEATING AND DISPENSING SHAVING FLUID

Abstract

A handheld, watertight system can dispense heated skincare fluid, such as shaving fluid, promptly. A user can initiate dispensing shaving fluid, for example via actuating a dispensing valve associated with a pressurized vessel containing shaving fluid. The system can comprise a predictor that predicts or anticipates when the user will dispense heated shaving fluid and can initiate heating in advance of the user actuating the dispensing valve or otherwise prompting the system to dispense heated shaving fluid. In some disclosed examples, the system can utilize a battery, a heating coil, a pulse width modulator, a feedback control loop, and/or an executable control algorithm in support of heating shaving fluid.

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Background/Summary

TECHNICAL FIELD

[0001] Embodiments of the technology relate generally to heating shaving fluid and more particularly to a handheld system for heating and dispensing shaving fluid, such as shaving cream, wherein the system may utilize energy from a battery for heating and may comprise a digital controller or an executable control algorithm that addresses deadtime.

BACKGROUND

[0002] In many respects, conventional technologies underserve heating shaving fluid and dispensing heated shaving fluid. For instance, need exists for a capability to heat and dispense shaving fluid from a system that is sufficiently compact to be handheld and/or sufficiently watertight to be used in a shower or bathtub.

[0003] Need further exists for a capability to dispense heated shaving fluid promptly. Need further exists for a capability to manage or reduce deadtime, time lag, or time delay between a user initiating dispensing of heated shaving fluid and the user receiving heated shaving fluid. Need further exists for a capability to manage or reduce an amount of unheated shaving fluid that may be dispensed in advance of dispensing heated shaving fluid. Need further exists for a capability to improve temperature uniformity along a stream of heated shaving fluid that is being dispensed, for instance into the user's hand. Need further exists for a capability to improve temperature uniformity of a bolus of shaving fluid that has being dispensed. Need further exists for a capability of controlling temperature of heated shaving fluid, such as by reducing deviation between desired temperature and actual temperature of heated shaving fluid.

[0004] The aforementioned needs are representative rather than exhaustive. A technology addressing one or more of the needs discussed above, or some related deficiency in the art, would benefit skin care and personal hygiene. As will be appreciated by those having skill in the art, the disclosure provided herein includes written description containing clear, exact terms to enable carrying out embodiments meeting the foregoing needs.

SUMMARY

[0005] A system can heat and/or dispense heated skincare fluid or fluids. In some aspects of the disclosure, the skincare fluid comprises a shaving fluid. In some aspects of the disclosure, the shaving fluid comprises shaving cream, shaving gel, shaving soap, shaving oil, shaving foam, shaving lather, or shaving soap (some representative examples rather than an exhaustive list). In some aspects of the disclosure, the skincare fluid comprises a liquid, a gel, an oil, a suspension, a paste, a lather, or a foam. In some aspects of the disclosure, the skincare fluid comprises a combination of two or more of a liquid, a gel, an oil, a suspension, a paste, a lather, and a foam. In some aspects of the disclosure, the skincare fluid is viscous. In some aspects of the disclosure, the skincare fluid is nonviscous. In some aspects of the disclosure, the skincare fluid comprises a cleansing fluid, for example shower gel, hand soap, or body wash. In some aspects of the disclosure, the skincare fluid comprises a disinfecting fluid. In some aspects of the disclosure, the skincare fluid comprises an antimicrobial fluid.

[0006] In some aspects of the disclosure, the system can be handheld. In some aspects, the system can be watertight or operable in a shower or bath. In some aspects, the system can be battery powered. In some aspects, the system can comprise a pressurized vessel containing shaving fluid, such as an aerosol can of shaving cream. In some aspects, the system can be housed in or packaged as a cap that snaps on and off an aerosol can of shaving fluid or other portable, pressurized vessel containing shaving fluid.

[0007] In some aspects of the disclosure, a user can initiate dispensing shaving fluid from the system, for example by actuating a dispensing valve associated with a pressurized vessel containing

shaving fluid. In some subaspects, the system can respond by promptly dispensing heated shaving fluid. In some subaspects, the system can support low-latency delivery of heated shaving fluid. In some subaspects, the system can predict or anticipate when the user will dispense heated shaving fluid and can initiate heating in advance of the user actuating the dispensing valve or otherwise prompting the system to dispense heated shaving fluid. In some subaspects, the system can manage or reduce deadtime, time lag, or time delay between the user initiating dispensing of heated shaving fluid and the user receiving heated shaving fluid. In some subaspects, the system can comprise a temperature sensor, a predictor, and/or a dispensing sensor to support controlled heating of shaving fluid. In some subaspects, the system can comprise a feedback control loop that controls heating of shaving fluid. In some subaspects, the system can comprise a digital controller or an executable control algorithm that controls heating of shaving fluid. In some subaspects, the system can comprise a heating coil operably coupled to a pulse width modulator that electrically powers the heating coil in collaboration with the feedback control loop, the digital controller, or the executable control algorithm.
[0008] The foregoing discussion about heating shaving fluid is for illustrative purposes only. Various aspects of the present disclosure may be more clearly understood and appreciated from a review of the following text and by reference to the associated drawings and the claims that follow. This Summary does not intend to be exhaustive, nor does it intend to enumerate each and every aspect of the disclosure. Other aspects, systems, methods, features, advantages, and objects of the present disclosure will become apparent to those with skill in the art upon examination of the following drawings and text. It is intended that all such aspects, systems, methods, features, advantages, and objects are to be included within this description and covered by this paper and by the appended claims.

Description

BRIEF DESCRIPTION OF THE FIGURES
[0009] FIGS. **1**A, **1**B, and IC (collectively FIG. **1**) are illustrations of a handheld system for heating and dispensing shaving fluid in accordance with some example embodiments of the disclosure.
[0010] FIG. **2** is an illustration of a handheld system for heating and dispensing shaving fluid, wherein a portion of the handheld system is sectioned to provide a cross sectional view in accordance with some example embodiments of the disclosure.
[0011] FIGS. **3**A and **3**B (collectively FIG. **3**) are perspective illustrations of a heating coil of a handheld system for heating and dispensing shaving fluid in accordance with some example embodiments of the disclosure.
[0012] FIGS. **4**A and **4**B (collectively FIG. **4**) are perspective illustrations of upper and lower sides of a circuit board of a handheld system for heating and dispensing shaving fluid in accordance with some example embodiments of the disclosure.
[0013] FIG. **5** is a functional block diagram of a handheld system for heating and dispensing shaving fluid in accordance with some example embodiments of the disclosure.
[0014] FIG. **6** is flowchart of a method or process for heating and dispensing shaving fluid in accordance with some example embodiments of the disclosure.
[0015] Many aspects of the disclosure can be better understood with reference to these figures. The elements and features shown in the figures are not necessarily to scale, emphasis being placed upon clearly illustrating principles of example embodiments of the disclosure. Moreover, certain dimensions and features may be exaggerated to help visually convey such principles. In the figures, reference numerals often designate like or corresponding, but not necessarily identical, elements throughout the several views.
DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

[0016] The technology will be discussed more fully below with reference to the Figures, which provide additional information regarding representative or illustrative embodiments of the disclosure. The present technology can be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the technology to those having ordinary skill in the art. Furthermore, all "examples," "embodiments," and "exemplary embodiments" provided herein are intended to be non-limiting and among others supported by representations of the disclosure.

[0017] Those of ordinary skill in the art having benefit of this disclosure will be able, without undue experimentation, to combine compatible elements and features that are described at various places in this written description, which includes text and illustrations. That is, the illustrations and specification are organized to facilitate practicing numerous combinations, such as by combining an element of one illustrated embodiment with another element of another illustrated embodiment or by combining a feature disclosed in an early paragraph of the specification with another feature disclosed in a later paragraph of the specification.

[0018] This document includes sentences, paragraphs, and passages (some of which might be viewed as lists) disclosing alternative components, elements, features, functionalities, usages, operations, steps, etc. for various embodiments of the disclosure. Unless clearly stated otherwise, all such lists, sentences, paragraphs, passages, and other text are not exhaustive, are not limiting, are provided in the context of describing representative examples and variations, and are among others supported by various embodiments of the disclosure. Accordingly, those of ordinary skill in the art having benefit of this disclosure will appreciate that the disclosure is not constrained by any such lists, examples, or alternatives. Moreover, the inclusion of lists, examples, embodiments, and the like (where provided as deemed beneficial to readers) may help guide those of ordinary skill in practicing many more implementations and instances that embody the technology without undue experimentation, all of which are intended to be within the scope of the claims.

[0019] This disclosure includes figures and discussion in which features and elements of certain embodiments may be organized into what might be characterized as functional blocks, units, subsystems, or modules. And, certain processes and methods may be organized into blocks or into steps. Such organization is intended to enhance readership and to facilitate teaching readers about working principles of the technology and about making and using an abundance of embodiments of the disclosure. The organization is not intended to force any rigid divisions or partitions that would limit the disclosure. In practice, the flexibility of the technology and the depth of this disclosure supports dispersing or grouping functionalities, elements, and features in many different ways. The inclusion of an element or function in one block, unit, module, or subsystem verses another may be substantially arbitrary in many instances, with the divisions being soft and readily redrawn using the teaching provided herein in combination with ordinary skill. Accordingly, functional blocks, modules, subsystems, units, and the like can be combined, divided, repartitioned, redrawn, moved, reorganized, or otherwise altered without deviating from the scope and spirit of the disclosure. This is not to say that, nor will it support a conclusion that, any disclosed organizations and combinations are not novel, are not inventive, or are obvious.

[0020] Certain steps in the processes and methods disclosed or taught herein, may naturally need to precede others to achieve desirable functionality. However, the disclosure is not limited to the order of the described steps if such order or sequence does not adversely alter functionality to the extent of rendering the technology inoperable or nonsensical. That is, it is recognized that some steps of a process or method may be performed before or after other steps or in parallel with other steps without departing from the scope and spirit of the disclosure.

[0021] In some instances, a process or method (for example that entails using, making, or practicing) may be discussed with reference to a particular illustrated embodiment, application, or environment. For instance, a flowchart may reference or be discussed with reference to a figure.

Those of skill in the art will appreciate that any such references are by example and are provided without limitation. Accordingly, the disclosed processes and methods can be practiced with other appropriate embodiments supported by the present disclosure and in other appropriate applications and environments. Moreover, one of ordinary skill in the art having benefit of this disclosure will be able to practice many variations of the disclosed and flowcharted methods and processes as may be appropriate for various applications and embodiments.

[0022] The term “couple,” as may be used herein, generally refers to joining, connecting, or associating something with something else.

[0023] As one of ordinary skill in the art will appreciate, the term “operably coupled,” as may be used herein, encompasses direct coupling and indirect coupling via another, intervening component, element, or module; moreover, a first component may be operably coupled to a second component when the first component comprises the second component.

[0024] As one of ordinary skill in the art will appreciate, each of the terms “approximate” and “approximately,” as may be used herein, provides an industry-accepted tolerance for the corresponding term it modifies. Similarly, the terms “substantial” and “substantially,” as may be used herein, provide an industry-accepted tolerance for the corresponding term modified. Such industry-accepted tolerances range from less than one percent to ten percent and correspond to, but are not limited to, component values, process variations, and manufacturing tolerance.

[0025] As will be appreciated by those of skill in the art, unless clearly specified otherwise, the values provided herein are intended to reflect commercial design practices or nominal manufacturing targets. For example, what may be described or specified as having a thickness of one millimeter or 1.0 mm, may deviate from one millimeter or 1.0 mm when implemented in a commercial product due to fabrication error, warpage, or customary tolerances.

[0026] Turning to the drawings, FIGS. **1**, **2**, **3**, **4**, **5**, and **6** describe representative features of some example systems for heating skincare fluid and for dispensing heated skincare fluid. Some example embodiments in which the skincare fluid comprises shaving fluid will be further discussed below. One of ordinary skill in the art who has benefit of the disclosure provided herein will be able, without undue experimentation, to make, use, and practice embodiments in which the skincare fluid comprises something other than shaving fluid, including, without limitation, each embodiment of skincare fluid disclosed herein.

[0027] Referring now to FIG. **1**, this figure illustrates an example handheld system for heating and dispensing shaving fluid according to some embodiments of the disclosure. FIG. **1**A illustrates an isometric view of the handheld system. FIG. **1**B illustrates an oblique view showing a side of the handheld system that outputs heated shaving fluid. FIG. **1**C illustrates another oblique view of the handheld system taken orthogonal to the view of FIG. **1**B, wherein heated shaving fluid emits to the left, i.e., left from a reader's perspective.

[0028] In the illustrated example embodiment of FIG. **1**, the handheld system **100** for heating and dispensing shaving fluid comprises a pressurized vessel **110** containing shaving fluid and a cap **105**. As illustrated, the cap **105** and the pressurized vessel **110** are cylindrical in form with like diameters. In some example embodiments, the pressurized vessel **110** can comprise an aerosol can of shaving cream, such as is commercially available at various grocery stores and retail outlets, but with its conventional cap (not illustrated) pried off and discarded. In the illustrated example handheld system **100**, the conventional cap, which lacks a heating capability, has been replaced with the cap **105**. In the illustrated example of FIG. **1**, the cap **105** has like dimensions and like geometry to the discarded, conventional cap. In some example embodiments, an aerosol can of shaving cream can be manufactured and supplied without a cap, and a consumer or other user can attach the cap **105** to the aerosol can to form the handheld system **100** for heating and dispensing shaving fluid that FIG. **1** illustrates.

[0029] In the illustrated example of FIG. **1**, the cap **105** comprises an upper portion **105**A and a lower portion **105**B. The lower portion **105**B is positionally fixed to the pressurized vessel **110** containing shaving fluid. The upper portion **105**A can piston vertically, along an axis (not illustrated) of the pressurized vessel **110**, relative to the pressurized vessel **110** and relative to the lower portion **105**B. The lower portion **105**B captures the upper portion **105**A within a cavity **295** (illustrated by FIG. **2**) and limits vertical travel or displacement of the upper portion **105**.

[0030] A user can manually press down on the upper portion **105**A of the cap **105** to initiate dispensing of heated shaving fluid. As further discussed below, in operation, when the user manually depresses the upper portion **105**A, the cap **105** receives unheated shaving fluid from the pressurized vessel **110**, heats the received shaving fluid, and outputs the resulting heated shaving fluid from an outlet **120**.

[0031] The illustrated combination of the cap **105** and the pressurized vessel **110**, upon which the cap **105** is seated, represents one embodiment of a handheld system for heating and dispensing shaving fluid. The cap **105** alone represents another embodiment of a handheld system for heating and dispensing shaving fluid. Accordingly, some example embodiments of a handheld system for heating and dispensing shaving fluid can comprise the cap **105** with or without the pressurized vessel **110**.

[0032] Some example embodiments will now be further discussed with reference to FIGS. **2**, **3**, **4**, and **5**. FIG. **2** illustrates the example handheld system **100** for heating and dispensing shaving fluid with the example cap **105** sectioned to show example internal features according to some embodiments of the disclosure. FIG. **3** illustrates an example heating coil **240** that the example cap **105** comprises according to some embodiments of the disclosure. FIG. **4** illustrates example upper and lower sides **410**A, **410**B of an example circuit board **410** that the example cap **105** comprises according to some embodiments of the disclosure. FIG. **5** illustrates an example functional block diagram of the example handheld system **100** for heating and dispensing shaving fluid according to some embodiments of the disclosure.

[0033] As illustrated, the cap **105** is watertight with respect to electrical circuitry (discussed below) that the cap **105** comprises or houses. Accordingly, the handheld system is sufficiently waterproof that the user can operate the illustrated handheld system **100** to dispense heated shaving fluid while taking a shower or taking a bath in a bathtub. In some example embodiments, the upper portion **105**A of the cap **105** comprises a watertight housing or enclosure that encloses the electrical circuity. In some example embodiments, the cap **105** comprises a conformal coating or encapsulation that coats or encapsulates the electrical circuitry and protects the electrical circuitry from water.

[0034] As illustrated, the cap **105** comprises a battery **230** mounted to the upper side **410**A of the circuit board **410**. The circuit board **410** is attached to and disposed within the upper portion **105**A of the cap **105**. Thus, the circuit board **410** (and components mounted thereto) move with the upper portion **105**A of the cap **105** when the user depresses the upper portion **105**A of the cap **105** to initiate delivery of heated shaving fluid. The lower portion **105**B of the cap **105** comprises an inwardly projecting shoulder **285** that can capture the circuit board **410** within the cavity **295**. The inwardly projecting shoulder **285** can prevent inadvertent removal of the upper portion **105**A from the lower portion **105**B. Separation between the upper portion **105**A and the lower portion **105**B of the cap **105** forms a gap **211**. The gap **211**, in cooperation with the inwardly projecting shoulder **285**, provides for a limited amount of relative vertical travel of the upper portion **105**A of the cap **105**. The vertical travel facilitates the user depressing the upper portion **105**A of the cap to dispense heated shaving fluid.

[0035] As illustrated by FIG. **4**, the circuit board **410** comprises two apertures **499** for aligning the circuit board **410** during assembly of the cap **105**. A connector **420** provides an interface for connecting a developmental cable (not illustrated) for testing and programming of the cap **105**.

[0036] In the illustrated example, the battery **230** is rechargeable via a watertight charging port **415** disposed on a vertically oriented cylindrical side of the cap **105** opposite the outlet **120**. In some example embodiments, the watertight charging port **415** comprises a waterproof USB-C connector.

In some example embodiments, the battery **230** comprises a capacity of 1amp-hour, a 5 C discharge rate, and a nominal voltage of 7 volts. (Other example embodiments may comprise batteries having other battery specifications.) In some example embodiments, the battery **230** is rechargeable and comprises one or more lithium-ion (Li-ion) cells. In some example embodiments, the battery **230** is rechargeable and comprises one or more nickel-cadmium (NiCd) cells. In some example embodiments, the battery **230** is rechargeable and comprises one or more nickel-metal hydride (NiMH) cells.

[0037] In the illustrated example, an electrical path **501** extends between the battery **230** and the watertight charging port **415**. As illustrated in FIG. **5**, a charging system **555** manages battery recharging. The battery **230**, the watertight charging port **415**, and the charging system **555** are example features of a power system **550**. The power system **550** further comprises a power supply **560** that converts voltage of the battery **230** into voltage levels used by various electrical components as illustrated and discussed below.

[0038] In some example embodiments, the battery **230** comprises a single-use battery, such as an alkaline battery comprising one or more cells, without an accompanying charging system **555** or charging port **415**. In some such embodiments, the battery **230** can have an energy capacity selected to heat the shaving fluid of a single pressurized vessel **110** containing shaving fluid. Accordingly, in some single-use embodiments, an energy capacity of the battery **230** and an amount of shaving fluid in the pressurized vessel **110** can be selected so they become exhausted synchronously, concurrently, in parallel with one another, or within a specified usage time of one another. In some examples, a single-use embodiment of the battery **230** is configured to become exhausted when less than approximately fifteen percent of the original shaving fluid remains in the pressurized vessel **110**. In some examples, a single-use embodiment of the battery **230** is configured to be exhausted when less than approximately fifteen percent of the original pressure remains in the pressurized vessel **110**.

[0039] As can be seen in FIG. **2**, the illustrated example embodiment of the cap **105** comprises a receptacle **225** disposed at a bottom side of the lower portion **105**B of the cap **105**. The pressurized vessel **110** containing shaving fluid releasably plugs into the receptacle **225**. In some example embodiments, the receptacle **225** comprises integral features of a housing of the cap **105** that is formed by injection-molding a polymer, such as polypropylene, polymethyl methacrylate, nylon, or acetal (not an exhaustive list). The illustrated example receptacle **225** comprises a releasable catch **205** configured to releasably engage a protruding rim **215** of the pressurized vessel **110** containing shaving fluid. In the illustrated example, the releasable catch **205** comprises an array of releasable catches **205** that are arranged in a circular pattern and configured to snap onto the protruding rim **215**. Each releasable catch **205** comprises a respective notched protrusion **210** dimensioned to receive and engage the protruding rim **215**.

[0040] When the user exhausts one pressurized vessel **110** containing shaving fluid, the releasable catch **205** can facilitate the user removing the cap **105** from the exhausted vessel and attaching the cap **105** to a new pressurized vessel **110** containing shaving fluid. Thus, the illustrated example cap **105** snaps onto and off of pressurized vessels **110** of shaving fluid. Accordingly, via the illustrated receptacle **225** that comprises the resealable catch **205**, some embodiments of the cap **105** can be compatible with commercially available aerosol cans of shaving cream.

[0041] In some other example embodiments, the cap **105** can be configured to be permanently attached to a single aerosol can of shaving fluid. For instance, an embodiment of the cap **105** that incorporates a non-rechargeable battery can be permanently attached to an aerosol can of shaving cream to form a single-use unit that may be disposable or that may be returnable to a supplier for recycle.

[0042] The illustrated pressurized vessel **110** containing shaving fluid comprises a nozzle **220** configured to emit shaving fluid and an associated manually actuated dispensing valve **510**. The manually actuated dispensing valve **510** is internal to the pressurized vessel **110** and below the nozzle **220**; thus, the manually actuated dispensing valve **510** is not visible in FIG. **2**. The functional block diagram of FIG. **5** illustrates the manually actuated dispensing valve **510** as a functional block. For compatibility with commercially available aerosol cans of shaving cream, a threshold amount of depression of the upper portion **105**A of the cap **105** can transfer to the nozzle **220** to actuate the manually actuated dispensing valve **510** to open the valve **510**, causing shaving fluid and emit through the nozzle **220**.

[0043] The cap **105** comprises an inlet **222** that is centrally disposed in the receptacle **225** and is dimensioned to mate with the nozzle **220**. In some example embodiments, the nozzle **220** and the inlet **222** have mating tapers. The inlet **222** receives shaving fluid emitted through the nozzle **220**. The cap **105** further comprises a channel **235** that extends from the inlet **222** to the outlet **120** and comprises a turn from vertical to horizontal that can comprise a perpendicular turn. As illustrated, the inlet **222** comprises an inlet of the channel **235**, and the outlet **120** comprises an outlet of the channel **235**. In operation, shaving fluid flows through the channel **235** when the user actuates the manually actuated dispensing valve **510** by depressing the upper portion **105**A of the cap **105** (and thereby depressing the nozzle **220** and opening the dispensing valve **510**).

[0044] In some example embodiments, the gap **211** has a selected dimension (i.e. a selected amount of vertical separation between the upper and lower portions **105**A, **105**B of the cap **105**) that correlates with a threshold amount of depression of the nozzle **220** for opening the manually actuated dispensing valve **510**. In some example embodiments, the gap **211** comprises a first distance of vertical separation between the upper and lower portions **105**A, **105**B of the cap **105** that defines maximum vertical travel distance of the upper portion **105**A of the cap **105**; a second distance defines an amount of vertical depression of the nozzle **220** that opens the manually actuated dispensing valve **510**; and the first distance is no less than the second distance. In some example embodiments, the first distance is greater than the second distance and less than 1.33 times the second distance.

[0045] As illustrated, a heating coil **240** is mounted to the lower side **410**B of the circuit board **410**. The illustrated heating coil **240** comprises an example embodiment of a heating clement. The heating coil **240** is disposed in the channel **235** in the illustrated example configuration. As illustrated, the heating coil **240** is disposed in a portion of the channel **235** that is below the circuit board **410** and that extends lengthwise along the lower side **410**B of the circuit board **410**. In the illustrated example, the heating coil **240** comprises four heating coil segments **241** (i.e., segments of heating coil) that extend lengthwise alongside one another in the channel **235**. As viewed in cross section, the four heating coil segments **241** are arranged in a cloverleaf pattern, i.e., in a geometry resembling a four-leaf clover. The four heating coil segments **241** are connected together in electrical series. In some example embodiments, each of the four heating coil segments **241** comprises 70 loops of copper wire having a diameter of 0.25 mm. Some other embodiments can comprise different coil arrangements or different heating elements. In operation, shaving fluid flows through and around the heating coil segments **241** as the shaving fluid moves through the channel **235** and is heated by the heating coil **240**. Accordingly, in some example embodiments, shaving fluid deliberately contacts the heating coil **240** in the channel **235** while the heating coil **240** heats the shaving fluid. In some example embodiments, the heating coil **240** heats the shaving fluid in the channel to achieve a target or setpoint temperature of 150 degrees Fahrenheit (approximately 65.5 degrees Celsius) of shaving fluid output from the channel through the outlet **120**. Other embodiments may heat to higher or lower targets temperatures of dispensed shaving fluid.

[0046] In the illustrated example, a temperature sensor **245** is mounted to the lower side **410**B of the circuit board **410** and is disposed in the channel **235**. In the illustrated example, the temperature sensor **245** is disposed downstream from the heating coil **240**. In the illustrated example, the temperature sensor **245** is disposed adjacent the outlet **120**. Accordingly, in some example embodiments, shaving fluid deliberately contacts the temperature sensor **245** as the shaving fluid flows through the channel **235** and the heating coil **240** heats the shaving fluid. In some example embodiments, the temperature sensor **245** comprises a thermistor, a negative temperature coefficient (NTC) thermistor, a resistance temperature detector (RTD), a thermocouple, or other appropriate means for sensing temperature.

[0047] In the illustrated example, the cap **105** comprises a dispensing sensor **255** that is operative to sense manual actuation of the manually actuated dispensing valve **510**. As illustrated by FIG. **4**B, an example embodiment of the dispensing sensor **255** comprises three microswitches **255** mounted to the lower side **410**B of the circuit board **410** adjacent a periphery **411** or outer edge of the circuit board **410**. In the illustrated example embodiment, the three microswitches **255** are spaced about the periphery **411** of the circuit board **410** in a triangular geometry. Thus, the three microswitches **255** are arranged to form three respective vertices of a triangle (not illustrated), wherein a vertical axis (not illustrated) of the nozzle **220** and the pressurized vessel **110** extends centrally through the triangle. When the user depresses the upper portion **105**A of the cap **105** to open the manually actuated dispensing valve **510**, the temperature sensor **245** notifies a temperature controller **530** by sending a dispensing signal over one or more input/output lines **504**.

[0048] In the example embodiment that FIG. **5** illustrates, the cap **105** comprises a controller **400** that can comprise a microcontroller. In some example embodiments, the microcontroller can comprise an embedded controller or a microcontroller unit (MCU). In some example embodiments, the controller comprises memory **570**, a processor **565**, and input/output on a single chip or in an integrated package or format. In some example embodiments, the processor **565** can comprise a microprocessor. In the embodiment that FIG. **4**B illustrates, the controller **400** comprises a chip mounted to the lower side **410**B of the circuit board **410**.

[0049] As illustrated by FIG. **5**, the controller **400** comprises the temperature controller **530** with a control program **535** stored in the memory **570**. For example, the memory can comprise non-transitory memory or non-volatile memory that stores instructions of the control program **535**. As further discussed below with reference to FIG. **6**, some example embodiments of the control program **535** can define or set forth a process or method (or steps thereof) for controlling the heating coil **240** to heat shaving fluid to dispense shaving fluid comprising a target or setpoint temperature. The processor **565** can execute the control program **535**, and the cap **105** can perform the process or method or steps thereof.

[0050] As illustrated by example FIG. **5**, the temperature controller **530** receives a temperature signal from the temperature sensor **245** via one or more input/output lines **503**. As further illustrated by example FIG. **5** and discussed above, the temperature controller **530** receives the dispensing signal from the dispensing sensor **255** via one or more input/output lines **504**.

[0051] In the illustrated example embodiment of FIG. **5**, the cap **105** comprises a pre-dispense sensor **525**. The pre-dispense sensor **525** can predict or anticipate actuation of the manually actuated dispensing valve **510**, which the dispensing sensor **255** senses as discussed above. In some example embodiments, the pre-dispensing sensor **525** senses that the user will initiate dispensing of heated shaving fluid and that such initiation is imminent, approaching, forthcoming, anticipated, or otherwise predicted to occur at a future time. In some example embodiments, the future time can comprise a specified time, for instance at 7:30 am every weekday. In some example embodiments, the future time can comprise a future time period, for instance during the next five seconds. The cap **105** can thus predict that the user is about to initiate dispensing of shaving fluid.

[0052] In some example embodiments, the pre-dispense sensor **525** sends a sensing signal to the temperature controller **530** via one or more input/output lines **502** as illustrated by FIG. **5**. In some example embodiments, the pre-dispense sensor **525** is integrated into the controller **400**, for instance as an accelerometer that is integrated into a single chip or disposed within an integrated package or format.

[0053] As further discussed below, including with reference to FIG. **6**, the temperature controller **530** can commence heating of the heating coil **240** in response to receiving a pre-dispense signal from the pre-dispense sensor **525**, thereby expediting dispensing of heated shaving fluid when the user initiates dispensing of heated shaving fluid.

[0054] In some example embodiments, the pre-dispense sensor **525** comprises a predictor. The term “predictor,” as used herein, generally refers to something that predicts or anticipates an occurrence of an event prior to the event occurring.

[0055] In some example embodiments, the pre-dispense sensor **525** comprises a predictor that comprises an accelerometer. The accelerometer can sense motion of the cap **105** associated with the user picking up the handheld system **100** in preparation for dispensing heated shaving fluid. Responsive to sensing motion, the accelerometer can provide the temperature controller **530** a signal indicative of pre-dispensing. Responsive to that signal, the temperature controller **530** can initiate heating in advance of the user initiating dispensing of heated shaving fluid by the user manually actuating the manually actuated dispensing valve **510**.

[0056] In some example embodiments, the pre-dispense sensor **525** comprises a predictor that comprises a capacitive sensor. The capacitive sensor can sense the user's hand approaching the handheld system **100** in preparation for dispensing heated shaving fluid. Responsive to sensing this condition, the capacitive sensor can provide the temperature controller **530** a signal indicative of pre-dispensing. Responsive to that signal, the temperature controller **530** can initiate heating in advance of the user initiating dispensing of heated shaving fluid by the user manually actuating the manually actuated dispensing valve **510**.

[0057] In some example embodiments, the pre-dispense sensor **525** comprises a predictor that comprises a photodetector. The photodetector can sense the user turning on a light, such as a bathroom light, in preparation for dispensing heated shaving fluid. Responsive to sensing this condition, the photodetector can provide the temperature controller **530** a signal indicative of pre-dispensing. Responsive to that signal, the temperature controller **530** can initiate heating in advance of the user initiating dispensing of heated shaving fluid by the user manually actuating the manually actuated dispensing valve **510**.

[0058] In some example embodiments, the pre-dispense sensor **525** comprises a predictor that comprises a microphone. The microphone can sense noise or a voice command of the user associated with the user preparing to dispense heated shaving fluid. Responsive to sensing this condition, the photodetector can provide the temperature controller **530** a signal indicative of pre-dispensing. Responsive to that signal, the temperature controller **530** can initiate heating in advance of the user initiating dispensing of heated shaving fluid by the user manually actuating the manually actuated dispensing valve **510**.

[0059] In some example embodiments, the pre-dispense sensor **525** comprises a predictor that comprises a user-depressible button or switch. The user can press the user-depressible button or flip the switch to notify the handheld system **100** that that the user intends to initiate dispensing heated shaving fluid. Responsive to sensing pressing of the button or flipping the switch, the temperature controller **530** can determine a pre-dispensing condition and can initiate heating in advance of the user initiating dispensing of heated shaving fluid by the user manually actuating the manually actuated dispensing valve **510**.

[0060] In some example embodiments, the pre-dispense sensor **525** comprises a predictor that comprises an antenna. Via the antenna, the temperature controller **530** can receive a wireless signal from the user notifying that the user intends to initiate dispensing heated shaving fluid. For instance, the user can send the signal via a smart phone or other appropriate device of the user that communicates wirelessly. Responsive to receipt of the wireless signal, the temperature controller **530** can determine a pre-dispensing condition and can initiate heating in advance of the user initiating dispensing of heated shaving fluid by the user manually actuating the manually actuated dispensing valve **510**.

[0061] In some example embodiments, the pre-dispense sensor **525** comprises a predictor that comprises a clock or a timer and a user interface. In some embodiments, the user interface can be a physical part of the cap **105** or a remote interface on a smartphone that wirelessly connects to the cap **105**. Via the user interface, the user can enter a time that the user intends to initiate dispensing heated shaving fluid. At the entered time, the temperature controller **530** can determine a pre-dispensing condition and can initiate heating in advance of the user initiating dispensing of heated shaving fluid by the user manually actuating the manually actuated dispensing valve **510**.

[0062] As illustrated in FIG. **5**, in some example embodiments, the temperature controller **530** is configured to issue or output a temperature control signal **545** to a solid state switch **425** via one or more input/output lines **507**. In some example embodiments, the solid state switch **425** comprises a metal-oxide-semiconductor field-effect transistor (MOSFET). In the embodiment that FIG. **4** illustrates, the solid state switch **425** is mounted to the lower side **410**B of the circuit board **410**. The solid state switch **425** controls electricity supplied from the battery **230** to the heating coil **240** for temperature control. In some example embodiments, the solid state switch **425**, when in a conducting state, supplies electricity directly from the battery **230** to the heating coil **240**. That is, electricity can flow from the battery **230**, through the solid state switch **425**, and to the heating coil **240** without flowing through any component that, under normal operating conditions, purposely attenuates voltage or current of said electricity. In some example embodiments, when the solid state switch **425** is in the conducting state, voltage drop between the battery **230** and the heating coil not is more than one-third of a volt.

[0063] In some example embodiments, the cap **105** comprises a pulse width modulator in which the temperature controller **530** and the solid state switch **425** collaboratively utilize pulse width modulation (PWM) to control temperature. In some example embodiments, the control program **535** can comprise a pulse width controller (PWC) **589** that supports producing the temperature control signal **545**. The pulse width modulator can comprise the solid state switch **425** and the pulse width controller **589** in some example embodiments. Further, the temperature controller **530** and the solid state switch **425** can comprise the pulse width modulator.

[0064] Some example embodiments of the temperature control signal **545** can set a duty cycle defining a fraction of time that the solid state switch **425** provides electricity to the heating coil **240**. For example, when the temperature controller **530** sets the duty cycle to twenty five percent, the solid state switch **425** can provide flow of electricity from the battery **230** to the heating coil **240** for twenty five percent of available time, for instance by providing electrical pulses having a width (i.e., of a time duration) that is twenty five percent of a full/maximum width. Similarly, when the temperature controller **530** sets the duty cycle to one hundred percent, the solid state switch **425** can provide flow of electricity from the battery **230** to the heating coil **240** for one hundred percent of available time, for instance by providing electrical pulses having a width that is one hundred percent of a full/maximum width. And when the temperature controller **530** sets the duty cycle to zero percent, the solid state switch **425** can ongoingly block electricity from flowing to the heating coil **240**, which may be viewed as providing pulses having zero width.

[0065] Accordingly, the solid state switch **425** can be configured to control the heating coil **240** according to the control signal **545** by modulating width of pulses of electricity flowing from the battery **230** to the heating coil **240**.

[0066] As illustrated by FIG. **5**, the example handheld system can comprise a feedback control loop **500** that controls the temperature of dispensed shaving fluid utilizing the temperature sensor **245** for feedback. The feedback control loop **500** can comprise a digital controller that the control program **535** comprises. For example, the feedback control loop **500** can comprise a code-based proportional-integral-derivative (PID) controller as an example embodiment of a digital controller.

[0067] Some example methods and processes for heating and dispensing shaving fluid be further discussed below. In some example embodiments, the controller **400** comprises non-transitory memory **570** and instructions stored thereon, that when executed by the controller, perform a method or cause the cap **105** or the handheld system **100** to perform a method. In some example embodiments, the method comprises controlling the heating coil **240** by varying the control signal

545 according to a temperature signal provided by the temperature sensor **245**, according to a dispensing signal provided by the dispensing sensor **255**, and according to an accelerometer signal provided by an embodiment of the pre-dispensing sensing **525** that comprises an accelerometer.

[0068] In some example embodiments, the method comprises: predicting or anticipating when the user will actuate the manually actuated dispensing valve **510**; and initiating heating of the heating coil **240** in advance of the user actuating the dispensing valve **510**. In some example embodiments, the method is performed by the controller **400** and comprises: in advance of the user initiating dispensing of heated shaving fluid, predicting whether the user is about to initiate dispensing of heated shaving fluid; and responsive to a prediction that the user is about to initiate dispensing of heated shaving fluid, heating the heating coil **240** in advance of the user initiating dispensing of heated shaving fluid.

[0069] Advance heating of the heating coil **240** can heat shaving fluid that resides in the channel **235** from prior dispensing, such as from dispensing moments earlier, or from a previous usage of the handheld system **100**, such as residue from an earlier shave that may have occurred hours or a day earlier. Moreover, advance heating of the heating coil **240** can shorten or eliminate lag or response time associated with heating the heating coil **240**, with heating sidewalls of the channel **235**, and with heating materials of the cap **105** that adjoin the channel **235**. That is, advance heating of the heating coil **240** can avoid time delay associated with raising temperature of the heating coil **240** and adjacent materials of the cap **105** from ambient temperature to an elevated target temperature. Accordingly, when the user actuates the manually actuated dispensing valve **510**, heat can rapidly transfer to the shaving fluid, and the handheld system **100** can dispense heated shaving fluid promptly or without user-perceptible delay. In some example embodiments, the first shaving fluid that the outlet **120** outputs in response to the user actuating the manually actuated dispensing valve **510** is heated to a desired or target level according to a setpoint. In some example embodiments, responsive to the user actuating the manually actuated dispensing valve **510**, the handheld system **100** outputs a stream of heated shaving fluid of sufficient quantity for shaving, wherein an initial or leading portion of the stream is heated to a desired or target level according to a setpoint. In some example embodiments, that initial or leading portion of the stream has a first Celsius temperature, and an ending or trailing portion of the stream has a second Celsius temperature that is within ten percent of the first Celsius temperature. In some example embodiments, any temperature variation along the stream is at a level that is imperceptible to the user as the stream is received in a palm of the user's hand. Accordingly, in some example embodiments, the method can comprise managing or reducing deadtime, time lag, or time delay between the user initiating dispensing of heated shaving fluid and the user receiving heated shaving fluid.

[0070] Turning now to FIG. **6**, this figure illustrates an example flowchart of an example method **600** for heating and dispensing shaving fluid according to some embodiments of the disclosure. In example embodiments, the method **600** can be viewed as a process.

[0071] At block **605** of the method **600**, the handheld system **605** is in a sleep mode. In some example embodiments of the sleep mode, the temperature controller **530** monitors for input from the dispensing sensor **255** and the pre-dispense sensor **525**, while the heating coil **240** is remains in an unenergized mode, without receiving heating electricity from the battery **230**.

[0072] The method **600** proceeds from block **605** to decision block **610**. At decision block **610**, the temperature controller **530** determines if activity has been detected. If the temperature controller **530** determines that a dispensing signal from the dispensing sensor **255** or a pre-dispense signal from the pre-dispense sensor **525** has not been received, then the method **600** loops from block **610** back to block **605**, and the handheld system remains in the sleep mode. On the other hand, if the temperature controller **530** receives a dispensing signal from the dispensing sensor **255** or a pre-dispense signal from the pre-dispense sensor **525**, then the method **600** executes block **615** and the handheld system **100** wakes, thereby changing from the sleep mode to a wake mode.

[0073] Execution of decision block **620** follows block **615** in the flowcharted example method **600** of FIG. **6**. At decision block **620**, method **600** branches to block **630** if the temperature controller **530** receives a pre-dispense signal from the pre-dispense sensor **525**. On the other hand, method **600** branches from decision block **620** to block **625** if the temperature controller **530** receives a dispense signal from the dispensing sensor **255**.
[0074] At block **625**, the temperature controller **530** heats the temperature controller **530** with full power for a specified amount of time. In some example embodiments, the temperature controller **530** issues a control signal **545** that causes the solid state switch **425** to operate at a one hundred percent pulse width modulation duty cycle as discussed above. Thus, fixed-width pulses of electricity can flow from the battery **230** to the heating coil **240**, wherein pulse width is fixed to one hundred percent of full/maximum pulse width. A configurable number stored in the memory **570** can define the specified period of time, for example 10 seconds or an another appropriate value. Thus, at block **625**, the handheld system **100** operates in a mode of heating, in open loop, with full power for a specified period of time.
[0075] At block **630**, the temperature controller **630** sends a control signal **545** to the solid state switch **425** to heat the heating coil **240** with a specified amount of power while imposing a temperature limit. Thus, the handheld system **100** operates in a mode of heating, in open loop, with less than full power under a temperature limit. In some example embodiments, the control signal **545** causes the solid state switch **425** to operate at a twenty five percent pulse width modulation duty cycle as discussed above. Thus, fixed-width pulses of electricity can flow from the battery **230** to the heating coil **240**, wherein pulse width is fixed to twenty five percent of full/maximum pulse width. (Twenty five percent is an example, non-limited value among other supported by this disclosure.) This value, twenty five percent or another appropriate value, can be stored in the memory **570** as a configurable number and retrieved by the temperature controller **630**. At block **630**, the temperature controller **630** monitors temperature as sensed by the temperature sensor **245** and compares the monitored temperature to the temperature limit. If the temperature controller **630** determines that the monitored temperatures exceeds the temperature limit, then the temperature controller **630** causes the solid state switch **425** to cease supplying electricity to the heating coil, for instance by setting the pulse width modulation duty cycle to zero. In some example embodiments, the temperature limit is a configurable value stored in the memory **570**. In some example embodiments, the temperature limit is set to 150 degrees Fahrenheit (approximately **65.5** degrees Celsius), which is an example, non-limited value among other supported by this disclosure.
[0076] In the example embodiment of the method **600** that FIG. **6** flowcharts, execution of decision block **635** follows execution of block **630**. At decision block **635**, the temperature controller **630** determines whether the dispensing sensor **255** has issued a dispense signal within a specified period of time of the temperature controller **630** receiving the pre-dispense signal at decision block **620**. A configurable number stored in the memory **570** can define the specified period of time, for example 180 seconds or an another appropriate value. If the determination at decision block **635** is negative, then the method **600** loops back to block **605** and the handheld system **100** returns to sleep mode. If, on the other hand, the temperature controller **630** makes a positive determination at decision block **635**, then the method **600** proceeds to block **640**, and the temperature controller **630** executes block **640**.
[0077] In addition to executing block **640** following a positive determination at decision block **635**, the method **600** executes block **640** following execution of block **625**, which is discussed above. At block **640**, the handheld system **100** operates in a mode of closed loop feedback control utilizing the feedback control loop **500** for temperature control. In some example embodiments, operating the handheld system **100** in the closed loop mode comprises modulating width of pulses of electricity flowing from the battery **240** to the heating coil **230** according to a temperature setpoint and feedback provided by the temperature sensor **245**. The handheld system **100** operates in the closed loop mode while the temperature controller **530** receives the dispense signal from the

dispensing sensor **255**, indicating that the user is actuating the manually actuated dispensing valve **510**. In some example embodiments, the temperature sensor **245** provides a real-time temperature measurement of dispensed shaving fluid that the control program **535** of the temperature controller **530** uses as feedback. In some example embodiments, the control program **535** comprises the PID controller discussed above. The control program **535** can thus comprise a digital controller or an executable control algorithm. In example operation, the control program **535** manipulates the control signal **545** and thereby adjusts electricity supplied to the heating coil **240** to achieve a target or setpoint temperature of dispensed shaving fluid as measured by the temperature sensor **245**. The temperature controller **530** can thus adjust electrical power delivered to the heating coil according to a difference between a setpoint temperature and a measured temperature. Representative adjustments can comprise increasing power if the measured temperature is below the setpoint temperature and decreasing power if the measured temperature is above the setpoint temperature. In some example embodiments, the temperature target or setpoint is a configurable value stored in the memory **570**. In some example embodiments, the target or setpoint may be user-defined, for instance entered by the user into a user interface (not illustrated) that the cap **105** comprises or a remote user interface in wireless communication with the cap **105**. In some example embodiments, the target or setpoint temperature is set to 150 degrees Fahrenheit (approximately 65.5 degrees Celsius), which is an example, non-limited value among other supported by this disclosure. Once the user releases, or stops depressing, the dispensing valve **510**, the temperature controller **530** ceases heating of the heating coil **240**, and the method executes decision block **645**.
[0078] As discussed above, the method **600** proceeds from block **640** to decision block **645** upon the user releasing the manually actuated dispensing valve **510**. Decision block **645** determines whether the temperature controller **530** has received a dispense signal or a pre-dispense signal within a specified time limit of the release of the dispensing valve **510**. If the determination is negative, then the method **600** loops back to block **605** and the handheld system **100** returns to the sleep mode. If the determination is positive, then the method **600** loops back to decision block **610**, and the handheld system **100** executes decision block **610** as discussed above.
[0079] Useful technology for heating and dispensing skincare fluids has been described. From the description, it will be appreciated that an embodiment of the disclosure overcomes limitations of the prior art. Those skilled in the art will appreciate that the technology is not limited to any specifically discussed application or implementation and that the embodiments described herein are illustrative and not restrictive. Furthermore, the particular features, structures, or characteristics that are set forth may be combined in any suitable manner in one or more embodiments based on this disclosure and ordinary skill. Those of ordinary skill having benefit of this disclosure can make, use, and practice a range of embodiments via combining the disclosed features and elements in permutations without undue experimentation and further by combining the disclosed features and elements with what is well known in the art. This disclosure not only includes the illustrated and described embodiments, but also provides a roadmap for additional embodiments using the various disclosed technologies, elements, features, their equivalents, and what is well known in the art. From the description of the example embodiments, equivalents of the elements shown herein will suggest themselves to those skilled in the art, and ways of constructing other embodiments will appear to practitioners of the art. Therefore, the scope of the technology is to be limited only by the appended claims.

Claims

1. A handheld system for heating and dispensing shaving fluid, the handheld system comprising: a housing comprising: a lower portion; an upper portion that comprises a cylindrical surface, that is disposed above the upper portion, and that is vertically oriented; a gap between the upper portion and the lower portion; and a receptacle disposed at a bottom side of the lower portion of the housing, the receptacle comprising a releasable catch configured to engage a protruding rim of a pressurized vessel containing shaving fluid, wherein the pressurized vessel containing shaving fluid comprises a manually actuated dispensing valve and a nozzle that emits shaving fluid when the manually actuated dispensing valve is manually actuated by depressing the upper portion to reduce the gap; an inlet that is centrally disposed in the receptacle, dimensioned to mate with the nozzle, and operative to receive shaving fluid emitted by the nozzle; an outlet disposed on the cylindrical surface of the upper portion of the housing and operative to emit heated shaving fluid; a channel extending from the inlet to the outlet; a watertight charging port disposed on the cylindrical surface of the upper portion of the housing; a circuit board mounted in the upper portion; a battery mounted to an upper side of the circuit board; an electrical path extending between the battery and the watertight charging port; a heating coil mounted to the circuit board, wherein the heating coil is disposed in a portion of the channel that is below the circuit board and that extends along a lower side of the circuit board, wherein the heating coil comprises four heating coil segments that extend lengthwise alongside one another in the channel, and wherein the four heating coil segments are connected in electrical series to one another; a temperature sensor mounted to the lower side of the circuit board and disposed in the channel downstream from the heating coil adjacent the outlet; a dispensing sensor that is operative to sense manual actuation of the manually actuated dispensing valve, the dispensing sensor comprising three switches mounted to the lower side of the circuit board adjacent a periphery of the circuit board, wherein the three switches are spaced about the periphery in a triangular geometry; an accelerometer disposed adjacent the circuit board; a controller mounted to the lower side of the circuit board and comprising an output configured to output control signals; and a solid state switch mounted to the lower side of the circuit board, wherein the solid state switch is operably coupled to the output of the controller to receive the control signals, to the battery, and to the heating coil, wherein the solid state switch comprises a metal-oxide-semiconductor field-effect transistor, wherein the solid state switch is configured to control the heating coil according to the control signals by modulating width of pulses of electricity flowing from the battery to the heating coil, wherein the handheld system is watertight with respect to electrical circuitry that the handheld system comprises, wherein the controller further comprises non-transitory memory and instructions stored thereon, that when executed by the controller, perform a method, and wherein the method comprises controlling the heating coil by varying the control signals according to a temperature signal provided by the temperature sensor, a dispensing signal provided by the dispensing sensor, and an accelerometer signal provided by the accelerometer.

2. The handheld system of claim 1, wherein the method comprises: by the controller, monitoring the dispensing sensor and the accelerometer while the handheld system is in a sleep mode; by the controller, responsive to a receipt of the accelerometer signal that occurs before a receipt of the dispensing signal, waking the handheld system from the sleep mode and operating the handheld system in an open loop mode, wherein operating the handheld system in the open loop mode comprises the controller issuing at least one control signal to the solid state switch to cause fixed-width pulses of electricity to flow from the battery to the heating coil; and by the controller, responsive to said receipt of the dispensing signal, changing from operating the handheld system in the open loop mode to operating the handheld system in a closed loop mode, wherein operating the handheld system in the closed loop mode comprises modulating width of pulses of electricity flowing from the battery to the heating coil according to a temperature setpoint and feedback provided by the temperature sensor.

3. A handheld system for dispensing heated shaving fluid, comprising: a battery mounted within the handheld system; an inlet disposed to receive shaving fluid from a pressurized vessel that contains shaving fluid and that comprises a dispensing valve; an outlet disposed to emit the heated shaving fluid from the handheld system; a channel that extends from the inlet to the outlet; a heating element mounted within the handheld system and in thermal communication with the channel; a temperature sensor mounted within the handheld system and in thermal communication with the channel; a predictor that is operative to output a first signal responsive to predicting an occurrence of an event that comprises opening of the dispensing valve; a sensor mounted within the handheld system and operative to output a second signal responsive to sensing the occurrence of the event; and a plurality of electrical paths respectively extending between the battery and the heating element, the temperature sensor, the predictor, and a controller, wherein the controller is operative to perform a method that comprises: responsive to receiving the first signal, operating the heating element in a first mode comprising a first power level; and responsive to receiving the second signal, operating the heating element in a second mode comprising a second power level that exceeds the first power level.

4. The handheld system of claim 3, wherein operating the heating element in the first mode comprises heating the heating element in open loop subject to a temperature limit based on a third signal produced by the temperature sensor.

5. The handheld system of claim 4, wherein operating the heating element in the second mode comprises heating the heating element in closed loop using the third signal for feedback.

6. The handheld system of claim 3, wherein operating the heating element in the first mode comprises supplying electricity to the heating element in open loop subject to a time limit and subject to a temperature limit based on a third signal produced by the temperature sensor, wherein operating the heating element in the second mode comprises operating the heating element in closed loop using the third signal for feedback, and wherein the method further comprises: responsive to receiving the second signal while operating the heating element in the first mode, changing from the first mode to the second mode.

7. The handheld system of claim 3, wherein the heating element comprises four segments of heating coil that extend lengthwise adjacent one another, that are disposed in the channel, and that are connected together in series.

8. The handheld system of claim 3, wherein the heating element comprises a heating coil disposed in the channel.

9. The handheld system of claim 8, wherein the temperature sensor is disposed in the channel downstream from the heating coil.

10. The handheld system of claim 8, wherein the handheld system comprises a pulse width modulator that is operative to modulate electricity flowing from the battery to the heating coil according to a control signal produced by the controller.

11. The handheld system of claim 10, further comprising a receptacle that comprises a catch configured to engage releasably a protruding rim of the pressurized vessel containing shaving fluid, wherein the inlet is centrally disposed in the receptacle and is dimensioned to mate with a nozzle of the pressurized vessel.

12. The handheld system of claim 11, further comprising a watertight recharging port for recharging the battery, wherein the handheld system is watertight with respect to electrical circuitry housed by the handheld system.

13. The handheld system of claim 3, wherein the predictor comprises an accelerometer.

14. The handheld system of claim 3, wherein the predictor comprises a capacitive sensor.

15. The handheld system of claim 3, wherein the predictor comprises a photodetector.

16. The handheld system of claim 3, wherein the predictor comprises a microphone.

17. The handheld system of claim 3, wherein the predictor comprises an antenna.

18. The handheld system of claim 3, wherein the predictor comprises a user-depressible button.

19. The handheld system of claim 3, wherein the predictor comprises: a clock that measures time; a memory that stores a user-specified time; and a circuit that produces the first signal when the time that the clock measures is the user-specified time.

20. A method of operating a handheld system for heating and dispensing shaving fluid that comprises a heating coil, the method comprising: by the handheld system, in advance of a user initiating dispensing of heated shaving fluid, predicting whether the user is about to initiate dispensing of heated shaving fluid; and by the handheld system, responsive to a prediction that the user is about to initiate dispensing of heated shaving fluid, heating the heating coil in advance of the user initiating dispensing of heated shaving fluid.