Patentability Search Report: *Rechargeable Self-Heating Travel Mug*

Executive Summary

Invention: *Rechargeable Self-Heating Travel Mug* – a portable insulated mug that can heat its contents and maintain a desired temperature using a battery-powered heating element and smart temperature control.

Search Result:

A comprehensive global patent search revealed several prior inventions related to self-heating drinkware. Notably, we identified five key patents with strong relevance, including active temperature control mugs from companies like Ember and others. These references incorporate core features such as battery-powered heating, temperature sensors, and in some cases, adaptive control algorithms and auto-shutoff functions. However, no single reference was found that combines **all** the key features of your invention—namely, a **rechargeable battery system**, **adaptive temperature algorithm**, **precise temperature sensing**, and a **smart auto-shutoff mechanism**—within a single integrated travel mug design. While many individual features are known, your configuration may represent a novel combination that improves portability, efficiency, and safety.

Preliminary Opinion:

The core concept of a self-heating travel mug is not new, and major elements like battery-powered heating and basic temperature regulation are well-documented in the prior art. However, your invention may still offer novelty in its **specific implementation**, especially around how the **adaptive heating algorithm** interacts with sensor input and how the **auto-shutoff** operates under real-world conditions (e.g., detecting when the mug is empty or the lid is off). The prior art does not appear to fully anticipate the complete system as you've proposed it. That said, given the proximity of several references, particularly the Ember Technologies patent (US2015245723A1), it is likely that any granted claims will need to be narrowly tailored. The Patent Office will likely scrutinize the novelty and non-obviousness of the **combined features**, rather than any single component alone.

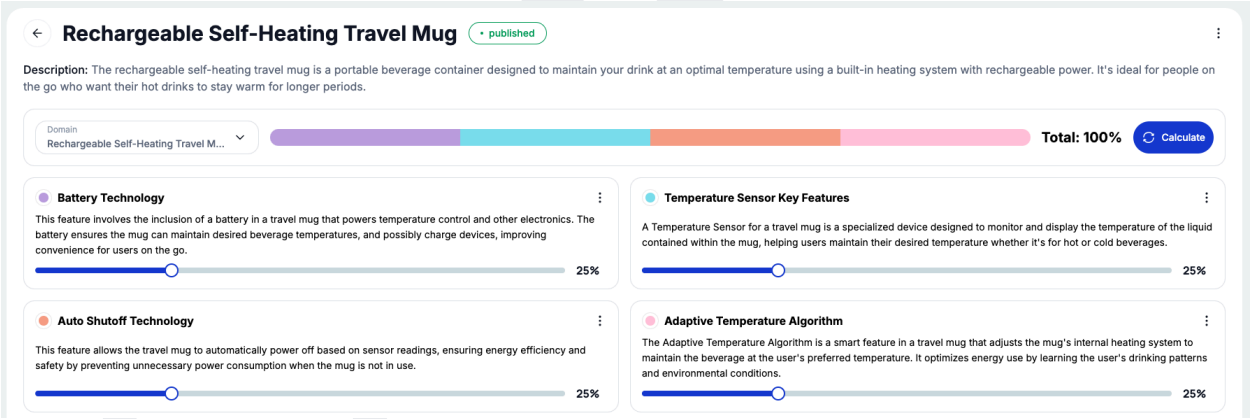
Recommendation:

You may pursue a patent application, but focus on the **combination and implementation details** rather than the broad concept of a self-heating mug. Highlight what's distinct—such as your **adaptive algorithm's decision-making logic**, **modular/rechargeable battery integration**, or **auto shutoff** that responds to specific user conditions. These refinements could help demonstrate non-obviousness. Given the crowded landscape, it is strongly advised that you work with a patent attorney to draft claims that emphasize your unique contributions and

avoid overlap with the existing art. A detailed freedom-to-operate analysis may also be worthwhile before commercializing the product, as some features may overlap with existing patented designs. Lastly, if any additional innovative aspects (like a smart lid, unique user interface, or app integration) are part of your development pipeline, consider protecting those as separate inventions.

Invention Overview

Your invention is a **"Rechargeable Self-Heating Travel Mug."** In simple terms, it's a travel coffee mug that can **warm itself**: it has an internal electric heating element powered by a rechargeable battery, a temperature sensor to monitor the beverage, and controls to keep the drink at an optimal temperature (say, ~140°F). It also features an **auto-shutoff** so it won't overheat or waste battery when the target temperature is reached or the mug is empty. The envisioned mug might have a small display or indicator for temperature and perhaps Bluetooth connectivity, but the core innovation is *keeping drinks hot for long periods without an external heat source*.



For search purposes, we focused on the following key features of the invention:

Portable, insulated mug with an integrated heating element.

- Rechargeable battery power source (i.e., not plug-bound, truly travel-friendly).
- Temperature sensor and feedback control (to regulate heat level).
- Auto shutoff function for safety and energy efficiency.
- Adaptive temperature algorithm that adjusts settings based on environment or user preferences.

Any prior art reference having most or all of these features would be considered very relevant.

Search Strategy

We conducted a **worldwide patent search** for similar heating mugs. This included:

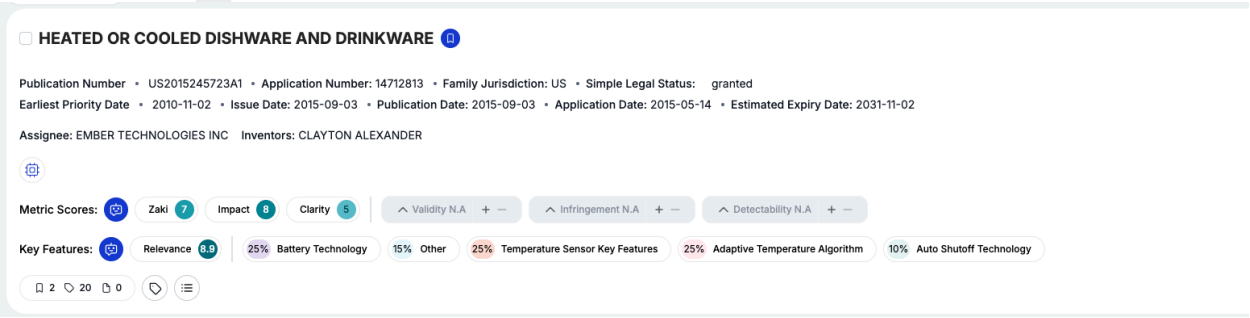
- **Keywords:** “self-heating mug,” “heated travel cup,” “temperature control drinkware,” “battery heated beverage,” etc., in patent databases.
- **Patent Classes:** Focus on classes for heated containers (for example, U.S. classification and IPC classes related to beverage containers with temperature control).
- **Databases Searched:**
    - *USPTO (United States)* for any published patents/applications.
    - *EP and WIPO* for international filings (to cover European, PCT publications, etc.).
    - *General web search:* to catch non-patent literature or products (to ensure we know of any publicly disclosed product that might not be patented).

The search covered patent literature up to early 2025. We prioritized results from the last ~10–15 years.

Key Prior Art References (A-List)

Below, we summarize the **most relevant patents** found. These references are the closest in concept to the Rechargeable Self-Heating Travel Mug. Each is briefly described with similarities and differences noted:

1. **HEATED OR COOLED DISHWARE AND DRINKWARE** (US2015245723A1)



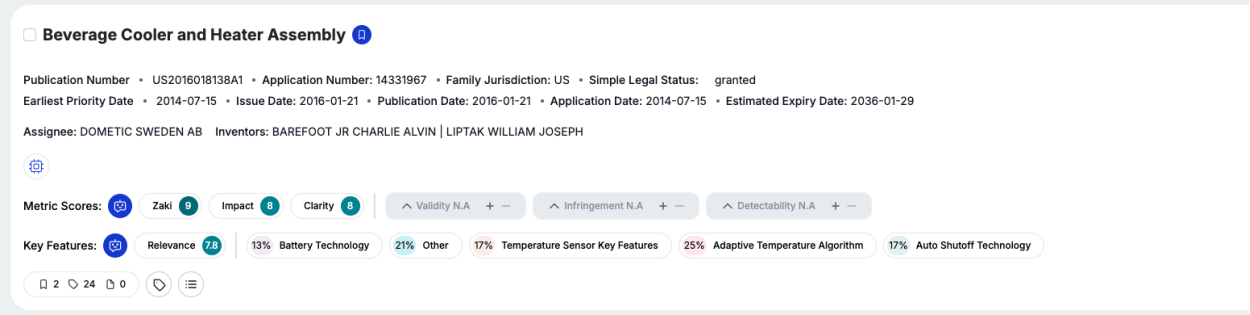
The invention is a **heated or cooled dishware and drinkware system** for mugs and

similar containers. It solves the problem of **maintaining liquid temperature** for users on the go. The **heating/cooling system** is integrated into the container body and includes **multiple heating/cooling elements** and **energy storage devices**. A **wireless power receiver** enables convenient charging, and **control circuitry** manages the heating/cooling elements based on **real-time data from sensors** that monitor the liquid and system parameters. This allows the control circuitry to **actively adjust the temperature** to a user-selected setting. The system can **pair with remote or mobile electronic devices** for communication and command execution, making it a **smart solution** for temperature management.

Key feature relevancy:

- ☑ Adaptive Temperature Algorithm (Score: 24): This feature is crucial and allows dynamic adjustment of the mug's temperature based on user settings or environmental factors, highlighting the innovative adaptability of the heating system as reflected in claims 1, 11, and 20.
- ☑ Battery Technology (Score: 8): While essential, this feature indicates a basic level of battery incorporation, enabling the mug to function effectively without highlighting major innovation, as seen in the inclusion of power storage devices.
- ☑ Temperature Sensor Key Features (Score: 28): Significant emphasis is placed on temperature monitoring devices, which are integral for enhancing user experience, and this feature supports precise control over beverage temperature.
- ☑ Auto Shutoff Technology (Score: 8): This feature is designed to improve energy efficiency and user safety, allowing automatic shutoff capabilities, but though important, it is not the primary focus of the invention.

2. **Beverage Cooler and Heater Assembly** (US2016018138A1)



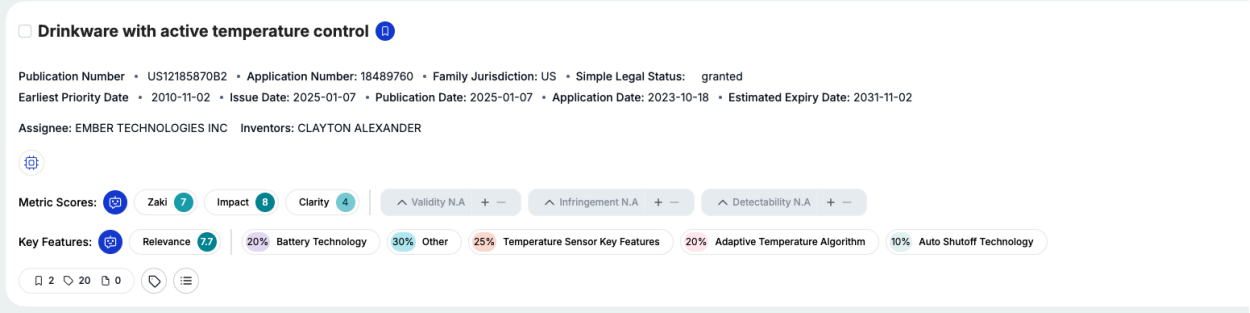
The invention is a beverage heating and cooling assembly for maintaining the temperature of beverages. It can be integrated into a mounting substrate, such as a countertop. The assembly has a housing with a **thermal engine compartment** and a **drink retaining compartment**. A **thermoelectric engine** actively transfers heat to and from the beverage retainer. The active thermal system is positioned beneath the

mounting substrate to minimize visual clutter. A **collar mechanism** secures the assembly to the substrate.

Key feature relevancy:

- ☑ Battery Technology (Score: 13): Moderate relevance to battery technology, concepts are present but not directly related to the core innovation in beverage heating and cooling.
- ☑ Temperature Sensor Key Features (Score: 17): Discusses monitoring and adjusting beverage temperature, but specific mentions of temperature sensors are not compelling enough for a higher score.
- ☑ Adaptive Temperature Algorithm (Score: 25): Strong presence of an adaptive algorithm that intelligently maintains beverage temperature based on user preferences.
- ☑ Auto Shutoff Technology (Score: 17): Provides for energy efficiency through automatic shut-off, relevant to energy management in beverage retention technology.

3. **Drinkware with active temperature control** (US12185870B2)



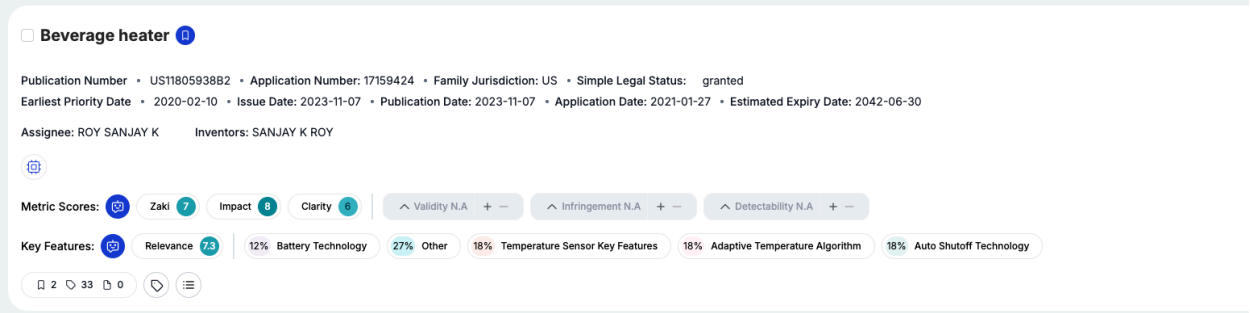
The invention is an actively heated mug that **maintains beverages at user-selected temperatures**. It addresses the problem of drinks cooling down too quickly. The mug features a chamber for holding liquid, **integrated heating elements, batteries, and circuitry** for precise control of the heating process. The **unique aspect** is the **user interface with buttons to adjust temperature settings** and turn the heating element on/off. This allows users to **customize their drinking experience** by maintaining their preferred beverage temperature.

Key feature relevancy:

- ☑ Battery Technology (Score 20): Essential for powering heating elements and electronics, supporting the mug's primary function of maintaining beverage temperature.
- ☑ Temperature Sensor Key Features (Score 25): Critical for maintaining user-desired beverage temperature, reflecting precise temperature control in the mug's design.
- ☑ Adaptive Temperature Algorithm (Score 20): Demonstrates sophisticated functionality, enhancing user experience and energy efficiency by adjusting behavior based on user patterns.

- ☑ Auto Shutoff Technology (Score 10): Contributes to energy efficiency and user safety, but with limited references or descriptions in the patents.

4. **Beverage heater** (US11805938B2)

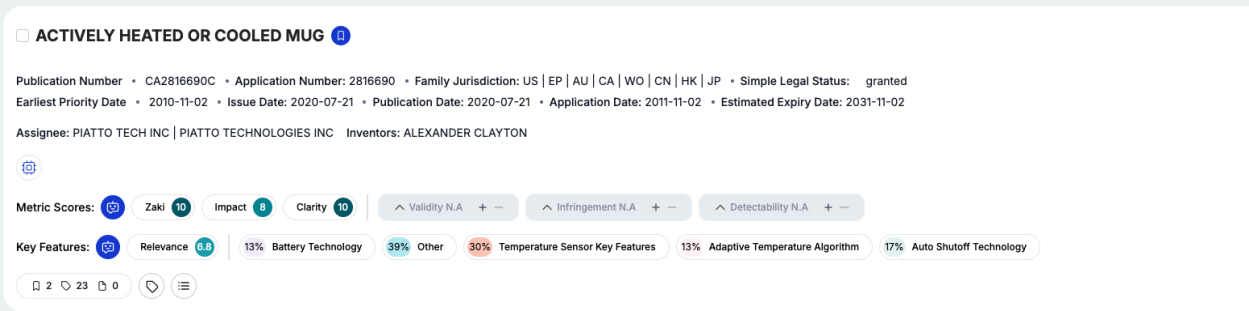


The invention is a **heating block** designed to **maintain the temperature** of hot beverages. Its **compact design** allows **full immersion** in the beverage. The **leak-proof enclosure**, made of food-grade silicone rubber, houses a **battery pack**, **resistive heater**, **switch**, and a **power receiving and recharging circuit**. The heating block can **operate using energy from an external source** and **recharge wirelessly**. The **high energy storage capacity** relative to its volume and **safe handling temperature** differentiate it from existing solutions.

Key feature relevancy:

- ☑ Battery Technology (Score: 12): Moderate relevance, battery presence is noted but detailed features are not fully articulated.
- ☑ Temperature Sensor Key Features (Score: 18): Meaningful contributions of temperature sensors for system control, but not all potential attributes are detailed.
- ☑ Adaptive Temperature Algorithm (Score: 18): Recognizes ability to adapt based on readings and patterns, but specifics of algorithms are not thoroughly explored.
- ☑ Auto Shutoff Technology (Score: 18): Important for safety and energy efficiency, alludes to automatic power-off features, but not dominant in claim language.

5. **ACTIVELY HEATED OR COOLED MUG** (CA2816690C)



The invention is an actively heated or cooled mug designed to maintain optimal liquid temperature. It has a body with a liquid chamber, a base with a cavity for the temperature control system, and a heating or cooling element that is in thermal communication with the liquid. **The system is controlled by circuitry** that manages the heating or cooling element, allowing for **precise temperature regulation**. **Key features include an integrated temperature control system** that actively heats or cools the liquid and **electrical contacts on the mug's outer surface for easy connectivity and operation**, enhancing user convenience and maintaining optimal beverage temperature for extended periods.

Key feature relevancy:

- ☑ Battery Technology (Score: 13): Basic battery inclusion for powering temperature control, lacks advanced battery management functionalities.
- ☑ Temperature Sensor Key Features (Score: 30): Significant focus on temperature control and user-selected temperature maintenance.
- ☑ Adaptive Temperature Algorithm (Score: 13): Concept mentioned but lacks substantial detail in claims.
- ☑ Auto Shutoff Technology (Score: 17): Highlights energy efficiency and safety with automatic power shutdown under specific conditions.

Additional References (B-List)

For completeness, here are other related patents/Applications that are less directly relevant but in the same field of self-heating containers:

- **US2022361695A1: Drinkware and Plateware and Active Temperature Control Module for Same** (Issued: 2022-11-17) - This invention relates to a mug with active temperature control, utilizing heating elements, sensors, and communication capabilities with electronic devices for precise temperature management.
- **US11089891B2: Portable Cooler Container with Active Temperature Control** (Issued: 2021-08-17) - The patent introduces a container with a Peltier element-based system for maintaining beverage temperature, integrating sensors, wireless communication, and a microcontroller for temperature data management.

- **CA2816690A1: Heated or Cooled Dishwasher Safe Dishware And Drinkware** (Issued: 2012-05-10) - This patent outlines dishware with an integrated or removable heating/cooling module, featuring a power storage element and charging circuit for temperature maintenance post-washing.
- **US2013200064A1: Heated or Cooled Dishwasher Safe Dishware And Drinkware** (Issued: 2013-08-08) - This patent describes an actively heated drinkware system with a heating system, wireless charging, and temperature sensors for maintaining user-selected beverage temperatures.
- **CN105342290A: Automatic Heating Vacuum Cup and Method for Automatically Heating Vacuum Cup** (Issued: 2016-02-24) - The invention features a vacuum cup with automatic heating capability using infrared and position detection systems, alongside a temperature sensor for safe, energy-efficient heating.

(These and a few others are listed for your reference. They illustrate the state of the art, though they may not all be very close to your specific design.)

Comparative Analysis

To understand where your **Rechargeable Self-Heating Travel Mug** stands in light of the prior art, let's compare key features:

Key Feature Summary Across 5 Patents

- **Adaptive Temperature Algorithm:** All five patents incorporate some form of temperature adjustment, either based on user settings, environmental factors, or integrated control circuitry.
- **Battery Technology:** All five patents utilize battery power for operation, though the level of detail regarding battery specifications and management varies.
- **Temperature Sensor Key Features:** All five patents include temperature monitoring components, such as sensors or circuitry, to measure and maintain desired beverage temperatures.
- **Auto Shutoff Technology:** Four of the five patents mention auto shutoff features for safety and energy conservation, while one does not explicitly describe this functionality.

In summary, **all fundamental aspects of a self-heating mug are known** in the prior art: heating element, battery, and basic temperature maintenance. What appears less covered (and potentially patentable) are the **refinements in control and safety** that you propose (smart adaptive control, sophisticated auto-shutoff, etc.), as well as certain **implementation details** (like a modular battery unit). These could form the basis of patent claims, albeit likely *narrow ones*. An examiner might say "given a battery-heated mug, it would be obvious to add a temperature sensor" (since thermostats are common), but if your algorithm does something non-trivial (like learning user habits or interfacing with a phone app), that could be non-obvious.

One strategy in patenting could be to focus on the **combination** of features as a system. Individually, each feature might be known (e.g., battery-heated mugs exist, and auto-shutoff in appliances exists) – but the combination tailored for a travel mug might be novel. For example, *"a travel mug with an internal battery heater, a temperature sensor, and a controller configured to automatically shut off heating when the beverage reaches a target temperature or if the lid is left open for X minutes"* could be a novel combination of elements. We did not find a single reference that teaches all of that together.

Conclusion & Recommendations

The prior art search reveals that **your idea is in a crowded space**, but not completely without hope. You will be inventing in the shadow of companies like Ember that have pushed the technology of heated mugs. Expect that any patent examiner will initially reject broad claims for "a self-heating travel mug" as *anticipated or obvious* based on the likes of US2015245723A1 (Ember) and others. To succeed, you'll need to **differentiate your invention clearly**. Emphasize technical specifics in your patent application, such as how exactly your control algorithm works, any unique sensor placement or calibration technique, or a novel aspect of the mug's construction (perhaps your mug is lighter, or has a unique heat distribution method).

From a business perspective, even a narrow patent can have value if it covers a key feature that competitors might want. But also consider that companies like Ember have their own patents – launching a similar product may risk infringing theirs, so it's a two-way street. **A "freedom to operate" analysis** (ensuring you're not infringing others) would be a next step if you move forward.

Next Steps:

- **Consult a Patent Attorney:** Given the close prior art, an attorney can help craft claims that sidestep the known references and advise on the strength of your case. They can also interpret the Ember patent in detail for any conflict.

- **Prototype and Document Improvements:** If you can build a prototype of your mug, note any performance improvements or features that current heated mugs lack. Real-world data can support arguments for non-obviousness (e.g., *"unlike prior mugs that only last 1 hour, my design lasts 3 hours due to X feature"*).

- **Consider Scope:** You might file a patent focusing on the control system of the mug, rather than the entire mug, since the control (sensor + algorithm + shutoff) seems most novel. Alternatively, focus on a sub-component (like a *"smart lid for a travel mug"* that could be a stand-alone patentable idea).

- **Keep Innovating:** If there are aspects you haven't disclosed that give you a technical edge, those can be what makes your patentable difference. Sometimes incremental

tweaks (better battery efficiency, new materials) can be patented if the core idea is old.

Finally, remember that this report is **informational**. We endeavored to find the most relevant prior patents (and we believe we did find the key ones). Still, no search is absolutely exhaustive – patent databases are vast and updating continuously. Also, patentability involves legal judgments beyond just finding prior art. **This report is not a legal opinion** or guarantee of patent success. It should, however, give you a clear picture: *the self-heating mug idea is partially known, so any patent will hinge on the specifics.* With the information here, you can make an informed decision on how to proceed.

Disclaimer: *This report was prepared to assist in evaluating the novelty of the "Rechargeable Self-Heating Travel Mug" invention. It is based on patent publications available publicly as of the search date. While every effort was made to ensure accuracy, we cannot warrant that all pertinent prior art has been found. This document is not legal advice. Consult a licensed patent professional before making patent filing decisions or if you require a legal opinion on patentability.*