

COMPLETE ICE CREAM: A Two-Phase Revolution in Frozen Dessert Pleasure

Patent Prior-Art Analysis Summary

Title: *Complete Ice Cream: A Two-Phase, Dual-Sensory Frozen Dessert System*

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Purpose: Preliminary novelty assessment for potential patent filing

1. Invention Summary (Claim Basis)

Core Concept

A method for manufacturing ice cream in which the **gaseous phase (air or inert gas) is infused with food-safe volatile aromatic compounds**, forming frozen microbubbles during aeration. Upon consumption and melting, these bubbles release aroma compounds into the **retronasal pathway**, enhancing the olfactory experience in synchrony with taste.

Key Differentiators

- **Use of microbubbles as an aroma delivery vehicle**, not just a texture enhancer
- **Integration of smell and taste as co-equal sensory targets**
- Potential for **customized or therapeutic chemosensory profiles**

2. Patent Classes of Relevance

- **A23G 9/32** – Ice-cream; Preparation; Apparatus specially adapted therefor
- **A23L 27/30** – Aroma added to food (gas-infused or encapsulated)
- **A23L 1/05** – Use of gases in food preservation or structure
- **A23L 2/52** – Delivery of nutrients/flavors using gas or encapsulation
- **A23L 29/269** – Nano- or microencapsulation of flavor components

3. Search Summary and Representative Results

✅ No direct matches found for:

- Ice cream incorporating **aroma-carrying gas microbubbles**
- **Frozen aroma delivery** mechanisms based on gas infusion during whipping/aeration
- Simultaneous use of **gustatory and olfactory delivery via phase-separated structuring**

🔍 Closest Indirect Technologies Identified:

Patent / Reference	Description	Relevance
US20060204642A1 (General Mills)	Reduced-density food using microbubbles for texture	Focuses on mouthfeel only; no mention of volatile aromatics
EP1634877B1	Use of nitrogen microbubbles in whipped frozen products	Gas phase used for texture only
US20210098250A1 (Unilever)	Stabilized frozen dessert with inclusions	Discusses stabilization of structure and taste, but not smell
WO2011054862A1	Encapsulation of flavor compounds in solid matrices	No integration with gaseous phases

Patent / Reference	Description	Relevance
US11191211B2	Method for improving flavor intensity in frozen desserts	Applies coatings to solids; does not use gas-phase delivery

4. Literature and Trade Review

- **Scientific Literature** (via Google Scholar, ScienceDirect):
 - Many studies on volatile aroma retention in frozen systems.
 - None propose **gas-borne encapsulation or direct gas-infusion** of aromatics into microbubble phase.
- **Industry Practices:**
 - Leading companies (Unilever, Nestlé, Häagen-Dazs) use aroma in liquid or solid formats.
 - **No evidence of gas-phase aroma integration** in commercial ice cream production or experimental food design.

5. Provisional Uniqueness Rating

Novelty Component	Assessment
Gas bubbles in ice cream	Well known (texture, overrun)
Aroma-active volatile infusion in gas phase	Appears novel
Dual-phase taste/smell release during melting	Appears novel
Aroma personalization per consumer preference	Not patented
Therapeutic/functional dessert via smell targeting	Not found in prior art

6. Potential Patent Claims (Preliminary)

Claim 1: A method of manufacturing a frozen aerated dessert comprising:

- preparing a base mixture of dairy or non-dairy ingredients,
- introducing a food-grade gas infused with volatile aromatic compounds during the freezing process,
- forming a dispersed gas phase of frozen microbubbles carrying said compounds,
- wherein said frozen microbubbles release said compounds retro-nasally during consumption.

Claim 2: The method of Claim 1, wherein the volatile compounds are selected for volatility at mouth temperature (30–37°C), ensuring synchronized release with melting.

Claim 3: The method of Claim 1, wherein flavor combinations are personalized based on a consumer's chemosensory profile.

7. Recommendations for Next Steps

a. Legal

- Engage a patent attorney to conduct:
 - **Freedom-to-operate (FTO)** analysis
 - **Patentability opinion**
 - Preparation and filing of a **provisional patent application**

b. Technical

- Design **proof-of-concept trials** using nitrogen or food-grade CO₂ infused with aroma oils.
- Conduct **controlled sensory studies** to measure retro-nasal aroma release and perception.

c. Strategic

- Consider a **defensive publication** if patent protection is not pursued, to block competitors.
- Explore **licensing or co-development deals** with flavor houses or dessert manufacturers.

8. Summary Statement

Complete Ice Cream introduces a potentially **first-in-class method** for delivering flavor via a gas phase encapsulated within a frozen aerated matrix. Preliminary analysis indicates **no prior art directly anticipates this mechanism**. This suggests strong grounds for patentability and product differentiation, especially in the premium or personalized food markets.