

EQUINOX

WHERE WARMTH AND COLD MEET

A compact domestic appliance that freezes, chills, gently warms food and microwaves from a single heat pump, recovering the heat it moves so that warming one chamber makes ice in the other.

From one circuit, hot and cold



One circuit heats one chamber while cooling the other; the warmth and the ice are the same act.

White Paper

Version 1.0, 2026

Srinivas Kasturi

Contents

Executive summary	3
1. The problem	3
2. The solution	4
3. Under the hood	5
4. Who it serves	6
5. In practice	6
6. Design principles	7
7. How this differs	7
8. Intellectual property	7
9. Roadmap	8
10. Conclusion	8
Appendix A: Glossary	8
Appendix B: Important notices	9

Executive summary

A modern kitchen runs several machines to manage temperature, and each of them throws away the by-product of doing its one job. A refrigerator-freezer makes cold and dumps the heat it removes into the room. An oven, a hob or a microwave makes heat. And when there are guests to feed, there is usually nowhere to keep cooked dishes at serving warmth without buying yet another appliance, a warming drawer, which spends fresh electricity to make heat of exactly the kind the fridge beside it is busy throwing away.

Equinox takes a different approach. It is a single compact appliance, with the size and form of an upright refrigerator, built around one heat pump. From that one circuit it both heats and cools, and it recovers the heat it moves rather than wasting it. The lower chamber is a refrigerator with a small zone that, when wanted, becomes a freezer; the upper chamber can be a freezer, a gentle food warmer, or a microwave oven. When you set the top to keep dinner warm, the appliance draws the heat it needs by freezing that small zone in the fridge below — so the act of warming your food is also the act of making your ice, and almost nothing is wasted.

This paper sets out the problem, the design of the device, the people it serves, and how it differs from what exists today. The methods described here are the subject of a patent application filed by the inventor, Srinivas Kasturi.

1. The problem

One job per machine. A kitchen keeps cold in one box and makes heat in another, and to keep food warm for guests it adds a third. Each appliance is dedicated to a single direction of temperature, and the home pays, in money and in space, for each one separately.

The by-product is thrown away. A refrigerator works by moving heat out of its cabinet; that heat is real, useful warmth, and it is vented to the room and lost. A warming drawer, or an oven left on low, then spends new energy to make warmth of just that kind. The heat a kitchen discards and the heat it pays to create pass each other unseen.

Keeping food warm is a wasteful afterthought. The usual ways to hold a cooked dish — a dedicated warming drawer, a low oven, a hostess trolley — are bulky, single-purpose, and energy-hungry, and most kitchens simply have no good answer at all.

Combination cabinets bolt a heater onto a fridge. Where hot and cold are offered in one cabinet, as in some shop display cases, the warm side is almost always heated by a separate electric element while the cold side is refrigerated independently. The two are unrelated; the condenser heat is still wasted, and the unit is large and built for the counter, not the home.

Ice runs short exactly when it is wanted. Entertaining is precisely when a household wants ice for drinks, and precisely when the freezer is fullest and least able to spare the space and the cold to make more.

Bulk and clutter. A fridge-freezer, a microwave and some means of keeping food warm are three objects competing for room in a kitchen that, increasingly, does not have it.

Across all of these the pattern is the same. A kitchen makes heat and cold side by side, in separate machines, and throws away the by-product of each.

2. The solution

Equinox answers each of these problems with one design: a single heat pump that warms one chamber while cooling another, recovers the heat between them, and reconfigures a chamber between freezing, warming and microwaving — all in the cabinet of an ordinary fridge.

2.1 One heat pump, two chambers

A single sealed vapour-compression circuit, with one compressor, serves two independently controlled chambers separated by an insulated divider. There is one machine inside, not three.

2.2 Heat recovered, not wasted

To warm a chamber, the heat pump delivers to it the heat drawn from the cold side together with the work of the compressor. A rear coil sheds surplus heat to the room, or gathers extra heat from room air when more warmth is needed, so the heat a fridge would normally discard becomes the warmth that holds the food.

2.3 A fridge whose freezer zone earns its keep

The lower chamber is a refrigerator with a small sub-zone. On an ordinary day that zone sits at fridge temperature, so the whole chamber is usable fridge space. When the top is set to warm, however, the zone is driven below freezing — and that is not a side effect but the point, because the heat removed in freezing it is exactly the heat the pump carries up to warm the food. The same act gives you warm dishes above and a fresh supply of ice below.

2.4 Warmth that holds, not cooks

The warming is done by gentle, even warm air from the heat pump, which keeps already-cooked food at a pleasant serving temperature. It is a holding warmth, not a reheating or cooking heat; food is kept as it was served rather than dried out or cooked further.

2.5 The same chamber is also a microwave

The upper chamber can additionally be used as a microwave oven for reheating or a quick boost. The food cavity is kept a clean metal enclosure; the chamber's heat exchanger and fan live in a plenum behind it, screened by vents that pass air but block microwaves, so one chamber does the work of a freezer, a warmer and a microwave without the three getting in each other's way.

2.6 Each chamber keeps its own temperature

Each chamber is held at its own set temperature, independently of the other, even though their demands for heating and cooling are rarely equal. A shared rear coil that either chamber can call upon on its own account lets the single circuit satisfy both at once.

2.7 The form of an ordinary fridge

All of this sits in a compact, upright, refrigerator-shaped cabinet. There is no separate warming drawer and no separate microwave taking up the worktop.

The warmth and the ice are one act

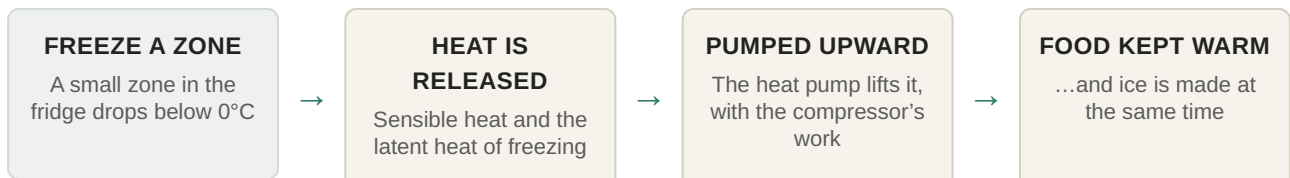


Figure 1. In heating mode, freezing a zone in the fridge below supplies the heat that warms the food above, and makes ice in the doing.

3. Under the hood

3.1 The single refrigerant circuit

One compressor circulates refrigerant around a circuit linking three heat exchangers: a first, in the upper chamber; a second, in the lower chamber; and a third that exchanges heat with the room. One or more expansion devices and a changeover valve complete the circuit. A controller reads the temperature of each chamber and drives the compressor, the valves and the fans.

3.2 The reconfigurable upper heat exchanger

A changeover, or reversing, valve lets the upper heat exchanger act either as a condenser, giving out heat to warm its chamber, or as an evaporator, absorbing heat to cool it. The controller selects which according to whether the upper chamber is set to warm or to cool. When it switches from cooling to warming, the hot gas entering the exchanger conveniently defrosts it.

3.3 The shared rear coil and per-chamber control

The third, rear heat exchanger is a node shared by both chambers, and each chamber is connected to it independently under the control of its own thermostat. This is what allows the single circuit to hold two different temperatures at once: when one chamber is satisfied, its surplus heat is sent to the rear coil and shed to the room without interrupting the duty being done for the other chamber.

3.4 The freezing sub-region as a heat source

In heating mode the heat pump needs somewhere to draw heat from. Driving the lower chamber's sub-zone below freezing provides it. Freezing water releases a large quantity of latent heat, which the pump lifts to the warm chamber. This also solves a subtler problem: when the fridge is already cold and would otherwise offer no heat to recover, the sub-zone gives the pump a source on demand, so the warming never stalls. The store of ice in effect migrates to whichever chamber is cold — the upper freezer on an ordinary day, the lower sub-zone while the top is warming.

3.5 The cavity, the plenum and the microwave chokes

For microwave use, the food sits in a cavity bounded by conductive walls. The heat exchanger and fan are not in the cavity but in an adjoining plenum, joined to it by vents formed as microwave chokes: panels of small apertures, far smaller than the microwave wavelength, that let air circulate freely while attenuating the field so strongly that it never reaches the metal of the exchanger. The door seals the cavity, forms part of the microwave choke, and carries an interlock, so the magnetron runs only with the door shut. Because the exchanger is coupled to the cavity by moving air rather than placed within it, the cavity can be chilled to a freezer temperature as readily as it is warmed, and any defrost water collects in the plenum, away from the food.

3.6 The controller and the modes

The controller runs the appliance in three modes and the transitions between them. In the everyday mode the upper chamber is a freezer and the lower a refrigerator. In the heating mode the upper chamber is warmed, sourced first from the freezing sub-zone, then from room air through the rear coil, and, for a rapid boost, from the microwave. In the microwave mode the magnetron runs with the refrigerant flow to the upper exchanger isolated and the door closed.

3.7 Refrigerant and compressor

The circuit uses a low-impact refrigerant such as R290, and a compressor chosen to work across a wide range, from a low temperature for freezing to a higher temperature for warming. The whole is sealed and built to the relevant safety standards.

4. Who it serves

Equinox is for any household that wants to make better use of the heat and cold a kitchen already produces, and that would rather keep one well-made machine than three.

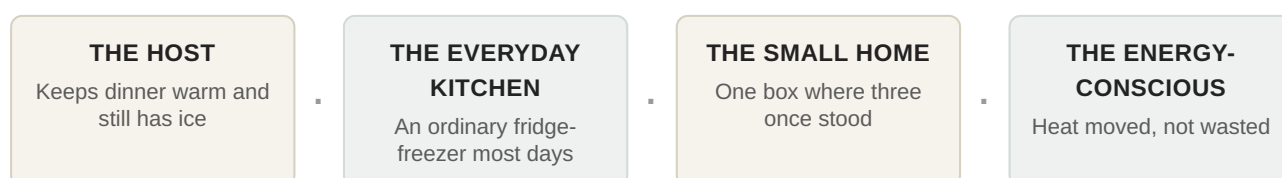


Figure 2. One appliance in place of several, serving the household that entertains, the everyday kitchen, the small home and the energy-conscious.

4.1 At home and entertaining

For a household that entertains, Equinox keeps cooked dishes at serving warmth through an evening while still providing ice for drinks, from a single appliance that the rest of the time is simply the fridge-freezer in the corner.

4.2 In smaller kitchens

In a flat or a small kitchen, one cabinet does the work of a fridge-freezer, a microwave and a warming drawer, freeing the worktop and the floor that three separate machines would claim.

5. In practice

The host. Anil sets the top chamber to keep the evening's dishes warm and drops a tray of water into the zone in the fridge below. As the meal is held at serving warmth, that zone quietly freezes, and by the time the guests arrive there is ice for their drinks — made from the very heat that kept the food warm.

The everyday. Most days the appliance is simply a fridge-freezer: the top a freezer, the bottom a fridge, the sub-zone just more fridge space. Nothing about ordinary use asks anything of the owner.

The small kitchen. In her studio flat, Mei has one cabinet where there would once have been a fridge-freezer, a microwave and nowhere at all to keep food warm. The worktop is clear.

The energy-conscious. Tomás likes that the warmth holding his dinner is heat the fridge would otherwise have thrown into the room, lifted and reused rather than made afresh.

6. Design principles

- **One machine, not many:** a single appliance and a single circuit do the work of several.
- **Recover, don't waste:** the heat moved out of the cold side becomes the warmth on the hot side.
- **Make the cold pay for the warm:** freezing a zone supplies the heat to warm the food, and gives ice in return.
- **Hold, don't cook:** gentle, even warmth keeps food as served, with the microwave reserved for a deliberate boost.
- **Honest about the landscape:** heat pumps, dual-temperature cabinets and microwaves all exist; the contribution here is the specific combination of one circuit heating and cooling at once with recovery, a fridge zone that becomes the heat source and the ice maker, and a chamber that is freezer, warmer and microwave in one.

7. How this differs

The table below sets common approaches today against the design described here. It aims to be fair rather than complete, and the features of other products vary.

Dimension	Common approaches today	Equinox
Appliances	Separate fridge-freezer, microwave and warming drawer	One compact appliance from a single heat pump
The waste heat	The cold side vents its heat to the room; warmth is made separately	Heat recovered from the cold side to warm the hot side
Keeping food warm	A dedicated warming drawer, or an oven left on low	A chamber warmed gently and evenly by the heat pump
Ice while entertaining	Freezer space competes with stored frozen food	A fridge zone becomes a freezer on demand, making ice as the top warms
The warm chamber	Single-purpose	Also a freezer and a microwave
Microwave with refrigeration	Not attempted in one chamber	Coil hidden in a plenum behind microwave chokes
Footprint	Several machines	The form of one upright fridge

8. Intellectual property

The methods described in this paper — namely a two-chamber appliance served by a single vapour-compression circuit, in which one chamber's heat exchanger is reconfigurable between a condenser and an evaporator and each chamber connects independently to a shared external heat exchanger so that the one circuit heats one chamber while cooling the other; a reconfigurable freezing sub-region of

the cooled chamber that supplies the low-grade heat for warming while forming ice; and the coexistence of microwave heating with an in-appliance refrigeration heat exchanger by coupling the exchanger to the cavity through microwave chokes — are the subject of a patent application filed by Srinivas Kasturi with the United Kingdom Intellectual Property Office. This paper describes the device at the level needed to understand it; it does not grant any licence.

9. Roadmap

Phase 1, the core appliance. A single, well-made upright appliance with the two chambers, the reconfigurable upper chamber, the freezing sub-zone, the shared rear coil and the microwave function.

Phase 2, range. Sizes and formats from built-in to compact countertop, refinement of the control and of the warm-, cold- and microwave-mode transitions.

Phase 3, reach. Efficiency improvements, alternative refrigerants and compressor arrangements for a wider operating envelope, and connected control.

Dates and scope are indicative and will be confirmed as the project develops.

10. Conclusion

A kitchen makes heat and cold all day long and throws both away. Equinox keeps them in one machine and lets each pay for the other: the cold it makes warms the food, and the warmth it gives makes the ice. By heating one chamber while cooling another from a single heat pump, by turning a fridge zone into both the heat source and the ice maker, and by letting one chamber be freezer, warmer and microwave at once, it sets out to fold a corner of the kitchen into a single, compact appliance — where, as at the equinox, warmth and cold are held in balance.

Appendix A: Glossary

Heat pump. A device that moves heat from a cooler place to a warmer one using a circulating refrigerant and a compressor; the same machine both cools one place and warms another.

Vapour-compression circuit. The sealed loop of compressor, condenser, expansion device and evaporator that carries out the heat-pumping.

Condenser and evaporator. The heat exchanger that gives out heat (condenser) and the one that absorbs it (evaporator); in this device one exchanger can act as either.

Reversing valve. A valve that swaps the roles of two heat exchangers, so a chamber can be warmed or cooled by the same parts.

Heat recovery. Using the heat rejected by the cooling side, which is ordinarily wasted, to do useful warming.

Reconfigurable freezing sub-region. A small zone of the refrigerated chamber that is held at fridge temperature in ordinary use and driven below freezing when the other chamber is being warmed, both to supply heat and to make ice.

Microwave choke. A vent of apertures much smaller than the microwave wavelength, acting as a waveguide below cut-off, that lets air pass while blocking the microwave field.

Plenum. An air space, here behind the microwave cavity, that houses the heat exchanger and fan out of the microwave field.

Appendix B: Important notices

A note on forward-looking statements. This paper describes intended design and direction. Final designs and specifications may change.

This document is for information only and describes intended design and direction. It is not medical advice, nor an offer or solicitation to buy or sell any product, security, token or other instrument, nor a promise of future features, availability or returns, nor legal, financial or investment advice. Any device of this kind would be subject to applicable safety and regulatory requirements, including those governing refrigerants and microwave emissions, before sale. Statements about future plans are forward-looking and may change. Trademarks and product names of third parties belong to their respective owners and appear here only for comparison. The methods described are the subject of a pending patent application, and nothing here grants any licence.