**Title of the Invention** Smart Recycling and Vending System for Food Redemption

**Field of the Invention** The present invention relates to the fields of recycling technology, vending systems, and public service infrastructure. More specifically, it pertains to a smart vending machine system that converts recyclable materials into redeemable credits for food, promoting both environmental sustainability and food accessibility.

**Background of the Invention** In many regions, recycling systems and food insecurity exist side by side, yet no practical infrastructure connects the two. Individuals experiencing homelessness or poverty often lack access to healthy, hot meals and may not own a mobile device or have access to a bank account. Simultaneously, many recyclable materials go uncollected, contributing to waste and environmental harm.

**Summary of the Invention** The invention provides an integrated system where users deposit recyclable materials (such as bottles and cans) into a vending machine that automatically detects, scans, and calculates a redemption value. Users receive a physical gift card or re-loadable smart card that can store and manage balances directly through the machine interface. The card can be used to instantly purchase and heat meals from the same vending system.

The system supports instant issuance of gift cards with low denominations (e.g., $2–$5), eliminates the need for a smartphone or bank account, and allows anonymous access. For individuals choosing to redeem credits for non-food purposes, a slightly lower payout value is offered. The vending system tracks user balances and transaction history internally, allowing for both convenience and accessibility.

**Detailed Description of the Invention**

*Machine Overview:* The vending system comprises the following:

- A recycling intake module with scanner and sorter
- A display screen and interactive interface
- A balance tracking and card reader module
- A food storage and microwave heating unit
- A printer or card dispenser for issuing gift cards

*User Flow:*

1. **Recycling Input**: Users deposit recyclables such as cans and plastic bottles. The machine scans barcodes or uses image recognition to verify validity and categorizes the item.
2. **Valuation**: The machine calculates the total value based on quantity and type. The per-item value may vary based on regional recycling incentives.
3. **Redemption Options**:

    - Users may choose to receive a gift card for food at full value.
    - Alternatively, a lower value card may be requested for general-purpose use (e.g., Vanilla prepaid cards).
4. **Card Dispensing and Reloading**: Users receive a physical smart card or gift card. The smart card can be tapped in the future to add new credits from additional recycling or to deduct value when purchasing meals.
5. **Meal Selection and Heating**: Users browse a touch-screen menu of meals (e.g., Factor75 precooked options). Upon selection, the machine dispenses and heats the meal using an internal microwave.

*Technical Features:*

- Secure, embedded balance management stored locally with optional cloud syncing
- Multi-language and accessible interface for users without digital literacy
- Anonymous usage supported without name, phone number, or app
- Optional integration with regional recycling databases or rebate systems

**Figures** FIG. 1: Front view of the vending system FIG. 2: Block diagram showing system modules and data flow FIG. 3: Sample gift card and card reader interface

**Conclusion** This invention promotes sustainability and social welfare by directly converting recyclable materials into nourishing meals without requiring digital devices or permanent addresses. It is a scalable, inclusive, and environmentally-conscious solution that bridges recycling and basic human needs.

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