



Indian Institute of Technology Kanpur

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Contact No. 6178

Intellectual Property Disclosure Form



1. **Title of the invention:** Efficient Container Weighing and Packaging System for Retail
2. **Innovator(s) who have contributed or conceived an essential element of the invention, either independently or jointly with others during evolution of the technology concept or reduction to practice:**
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Inventors are requested to provide their Full Name (without initials**), Position (e.g **Professor / Associate Professor / Assistant Professor, Post Doc / Phd / M. Tech / B. Tech Student**), Phone Number (**Personal**), Email ID (**Official along with Personal**)*

Students are advised to provide their **home address as well.*

3. Non-Confidential description of the invention in layman's Language:

A. Abstract in 100 words

The disclosed embodiment includes an integrated system for weighing entities within a container, featuring a load cell at the container's base for precise weight determination, reducing the need for multiple transfers. Additional elements include embedded central heat rod mechanisms for sealing and automated printed labeling. The system further integrates the entire product pipeline to enhance customer convenience. This innovation offers a comprehensive solution for streamlined weighing and packaging, optimizing efficiency while maintaining product quality, making it particularly suitable for supermarket and mall applications.

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B. Use Case

The present scenario of weighing an entity, for example loose grain and distributing it to customers as per their required quantity involves scooping out the grain and then going to a separate counter in most cases to access the weighing scale and maybe also moving back and forth to adjust the quantity right. The system can be employed in such places where there is a need for better efficiency in the manual process of weighing and distribution. Efficiency is achieved by eliminating back and forth movement to fixed position of a weighing scale and the system brings in the self-service in customer-oriented spaces as it is easy to use, hence reducing the operational cost for the owner by optimizing the number of assistants required in the store.

C. Keywords

Subtractive Weighing Mechanism + Storage Container Weighing Scale + heat packing + high load weighting + Integrated system for packing

Note: *Please note that the above Information alone will be circulated to several agencies for technology commercialization purposes once the patent is filed. Thus the fields should be self-explanatory to highlight commercialization potential.*

4. How does this invention relate to new processes, machines, compositions of matter, etc.? Please cover the following points:

- (a) Describe the invention in detail for technical evaluation. Please use additional sheets for sketches, drawing, photographs and other materials that help to illustrate the description.

I. Detailed description of drawings

The foregoing detailed description of preferred embodiments is better understood when it is read in conjunction with the appended drawings. For the purpose of illustrating the invention, the drawings show exemplary constructions of the invention.

Figure 1 shows an isometric view of the assembly.

Figure 2 shows a side view of the front side assembly.

Figure 3 shows an isometric view of the subassembly of the packing unit.

Figure 4 shows a side view of the subassembly of the packing unit before packing.

Figure 5 shows a side view of the subassembly of the packing unit after packing.

Figure 6 shows a schematic of the electronics assembly of the system.

Figure 7 shows a render illustration of full product assembly.

II. Summary of the invention

The invention at hand is a pioneering solution aimed at revolutionizing the way loose groceries are weighed, packaged, and processed in retail environments such as supermarkets, grocery stores, and other similar establishments. This smart weighing machine with integrated packing and receipt printing capabilities has been designed to address the inherent inefficiencies and challenges associated with the traditional process of weighing and packaging loose grocery items.

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The core components of this innovative system include a load cell, a grocery container, a digital display, a polybag dispenser, a manual polybag feeding system, an actuator for polybag locking and unlocking, a grocery transfer mechanism, a heat-sealing system, and a receipt printer with a barcode feature. These components work in harmony to provide a seamless and efficient workflow for both customers and store personnel.

The load cell, located at the base of the device, plays a pivotal role in accurately measuring the weight of the loose groceries. It is integrated into the grocery container, which serves a dual purpose as both a weighing scale and a storage unit for the loose items. This eliminates the need for a separate weighing scale, making the process more compact and convenient.

At the top of the device, a digital display provides users with real-time information on the weight of the groceries. This feature enables customers to monitor the weight as they scoop groceries, allowing for precise measurements and the ability to stop when the desired weight is reached.

A critical element of the invention is the polybag dispenser, which stores and dispenses polybags for packaging the groceries. Customers can easily access the polybags as needed, streamlining the packaging process.

To ensure that the polybags remain securely in place during filling, an actuator is employed. This actuator also serves the purpose of unlocking the polybags after the sealing process is completed, providing a seamless transition from one step to the next.

Once the polybags are locked in position, the device facilitates the transfer of loose groceries into these bags. This is achieved by opening a gate or valve at the bottom of the grocery container, allowing the groceries to flow directly into the polybags.

Following the successful transfer of groceries into the polybags, a heat sealing system comes into action. This system consists of two heated rods that move into contact with the polybag and securely seal it. This process ensures that groceries are not only hygienically packaged but also prevents spillage during transportation.

The final step of the process involves the receipt printer, which generates a receipt for the packaged groceries. The receipt includes essential information such as the weight, date, time, and a barcode for efficient scanning at the billing counter. This feature greatly improves the checkout process, making it faster and more accurate.

The advantages of this invention are multifold. It fundamentally streamlines the process of weighing and packaging loose groceries. By eliminating the need for manual transfers to a separate weighing scale, it not only reduces the risk of errors but also significantly enhances operational efficiency and cost-effectiveness for businesses. The overall customer experience is also greatly improved, particularly during peak hours and special sale seasons when efficiency and convenience are paramount.

In conclusion, the smart weighing machine with integrated packing and receipt printing is a novel and transformative invention with the potential to disrupt and greatly improve the traditional method of weighing and packaging loose grocery items. Its combination of innovative features and integrated design sets it apart, making it a valuable asset for businesses in the grocery retail industry. It not only benefits customers by providing a more efficient and convenient shopping experience but also has the potential to reduce operational costs and improve productivity for retailers.

(b) What is Novel in the invention?

The novelty in our invention lies in the integration of various components and functions into a single smart weighing machine with a packing and receipt printing system. Here are the key aspects that make our invention novel:

1. **All-in-One Solution:** Our product combines multiple functionalities in a single device. It not only weighs the loose groceries but also facilitates their seamless transfer to polybags, locks the bags, seals them, and generates a receipt. This eliminates the need for multiple separate steps or devices in the grocery packaging process.

2. **Automated Process:** The integration of an actuator to lock the polybags during filling and unlock them after sealing, along with the heat seal packaging mechanism, automates what is typically a manual and labor-intensive process. This automation reduces the need for additional staff to handle these tasks, making it more efficient.

3. **Container as Weighing Scale:** The unique feature of using the container itself as a weighing scale with a load cell is novel. This eliminates the need for customers or staff to transport groceries to a separate weighing scale, saving time and effort.

4. **Poly Bag Dispenser:** The inclusion of a polybag dispenser (180) within the device further simplifies the packaging process. It ensures that customers have easy access to the bags they need, streamlining the overall experience.

5. **Receipt Printing with Barcode:** The integration of a receipt printer that includes a barcode is a valuable feature. This allows for quick and efficient scanning at the billing counter, reducing checkout times and enhancing the customer experience.

6. **Operational Efficiency:** Our invention addresses a common challenge in the retail industry where weighing and packaging loose grocery items can be time-consuming and labor-intensive, especially during peak hours or sale seasons. By automating and streamlining this process, your invention improves operational efficiency for businesses like supermarkets.

In summary, the novelty of our invention lies in its comprehensive approach to addressing the challenges associated with weighing and packaging loose grocery items. It streamlines the process, reduces the need for manual labor, and enhances the overall efficiency and convenience for both customers and businesses.

- (c) What is the “inventive” step in your invention? Is the step non-obvious to a person from related fields?

Detailed description of invention

Disclosed embodiments include the system a system that employs a container designed for use in retail environments, allowing for the weighing, packaging, and label printing of raw materials such as pulses and grains during the purchase process.

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In this method, the consumer utilizes the container to scoop and transfer the desired quantity of raw material (205) into the filling box (150) . Once the user has selected their preferred quantity, they initiate the packaging process by pressing a button on the control panel (160). This action triggers the formation of the package, followed by sealing using a heating mechanism, after which the sealed packet is dispensed through the outlet compartment (170).

The weighing system (130) operates by employing a subtractive weight calculation approach. It quantifies the selected amount by determining the difference between the weight of the material transferred into the filling box and the initial weight. This weight differential is displayed on the control panel. Positioned beneath the filling box is a rack (280) and pinion (210) system, actuated by a stepper motor (290), responsible for transporting the packaged item to the adjacent compartment. The packaging's sealing operation is incorporated into the opening of the package, achieved through a sub-assembly (101).

This sub-assembly comprises two pairs of linear actuators (260), each connected to two package holders (285). Each holder is connected to two links (250, 255), with a heating rod (270, 275) affixed to the end of each link. These links are attached to the stepper motor (240, 245), facilitating the sealing process.

Upon activating the sealing function, the heating rods move to the center and apply heat to secure the package (235). Concurrently, the rods return to their original positions, and the linear actuators, guided by the links, release the packet into the outlet compartment for the consumer to retrieve.

The integrated printer (140) is responsible for generating a sticker that includes essential details such as cost, size, and weight.

The product hence addresses various needs and demands, including efficiency, precision, user-friendliness, information provision, transparency, reliability, safety, and ease of access in the context of retail raw material handling and packaging at the consumer's end.

This improves the overall customer experience and is also greatly improved, particularly during peak hours and special sale seasons when efficiency and convenience are paramount.

- (d) What are the advantages of the present invention over comparable inventions available in patent literature? Please attach a summary of your patent search*.

Reference may be made to the Patent No. US4579252A entitled, "Loss-in-weight gravimetric feeder" which is an Apparatus for weighing a continuous stream of material during flow; Conveyor belt weighers having means for controlling the rate of feed or discharge of the loss-in-weight feeding type. It calculates the weight of material required to flow using a similar subtractive principle but has restricted its use in large manufacturing plants. Besides the Subtractive weighing mechanism the device does not offer any of the additional features represented in this patent.

Reference maybe made to the Patent no. US20120000976A1 entitled, "Produce weighing scale with a camera and methods of operating a produce weighing scale having a camera" where in the stationary weighing platform provides user with the weight of perishable goods measured. This means that the user will have to make multiple trips to the weighing machine to weigh their produce and get the desired weight. On the contrary, our device allows the users to weigh out desired quantities at the respective aisles themselves thereby cutting down the processing time and make the process more seamless.

Reference maybe made to the Patent no. US6894232B2 entitled, " Bagger Scale" wherein A bag rack has a scale attached to its base with the scale connected to an indicator. The plastic bag rests on the scale which weighs the contents of the bag as they are being added. The indicator checks the weight of the contents of the bag. If the contents are under the targeted weight an indicator is lit, when the targeted weigh is reached another indicator is lit, and if a "not to exceed weight" is reached a warning indicator is lit. While the device is nifty it does not

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solve the problem of cutting down time taken by customer to weigh their produce and in fact increases mental load as it requires users to set desired quantity beforehand and thus expects them to figure out how to do so on their own. Moreover it fails to give a cumulative weight of total produced scooped out unlike in the case of our device.

(e) NOTE: The inventors should go through the Patent Search report carefully and write the difference between his/her invention and each contents of the patent search. For Patent search please contact ipr@iitk.ac.in

(f) Has the invention been tested experimentally? Are experimental data available?

Currently undergoing a field test.

(g) Technology Readiness Levels (**TRL**) description (mention the applicable stage of TRL given below). Please Mark as Appropriate with adequate justification.

- ☐ **TRL-1**
Research Idea
(Potential Application/Basic Principles observed)
- ☐ **TRL-2**
Applied Research Idea
(Hypothesis testing and initial proof of concept is demonstrated in a limited number of trials)
- ☐ **TRL-3**
Project Plan
(Device Characteristics documents & project proposal completed, Proof-of concept phase)
- ☒ **TRL-4**
Design and Development
(POC & Safety of device demonstrated by prototype design)
- ☐ **TRL-5**
Standardization
(Validating the result of the prototype by testing in simulated environment)
- ☐ **TRL-6**
Preclinical Evaluation
(Clinical trials of functional prototype)
- ☐ **TRL-7**
Technology Transfer
(Technology transfer of the developed system)
- ☐ **TRL-8**
Clinical Evaluation
(Evaluation of the system by clinical trials or demonstration)
- ☐ **TRL-9**
Commercialization
(Commercialization & Post Market Surveillance)

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(h) Need and Demand

(Technology gaps addressed in domestic & international markets, pain points of Industry which are being resolved)

Measuring loose entities or grocery in a supermart, or a small-scale store is a back-and-forth task involving multiple steps. In large-scale stores, assistive staff are hired by owners to help the customers, which adds to extra operational cost. This invention will help the owners cut down on the number of staff hired for this process, facilitate fast process by introducing self-service and enhance customer experience which was earlier hampered by subjective availability and wait time for the staff in rush hours or other reasons. The system will make the process efficient and accurate. It will also display the rate and price of the SKU, which will also aid in better user experience as customers won't have to do the mental math. Increasing focus on customer experience in retail stores gives an edge to the invention and its adaptation by making a one-time investment in the system.

(i) Market Access Information

(Current Global & domestic Scenario, market size & CAGR)

The market for weighing equipment witnessed substantial growth between the years 2022 and 2023, with its global size expanding from \$3.66 billion to \$3.91 billion at a compounded annual growth rate (CAGR) of 6.8%. The electronic weighing machine market is anticipated to experience substantial growth in the future, driven by the significant expansion in the retail industry. The retail industry operates by providing customers with goods and services for sale. One example is the data from the United States Census Bureau's 2020 Annual Retail Trade Survey, which reveals that US retail sales experienced a 3.1% growth, soaring from \$5,402.3 billion in 2019 to \$5,570.4 billion in 2020. Due to the significant increase in retail sales, the electronic weighing equipment market is experiencing substantial growth. A few significant contenders in the electronic weighing machine market consist of A and D Company Limited, Shimadzu Corporation, BONSO Electronics International Inc., Doran Scales Inc., and EssaeTeraoka Pvt. The following companies are included in this list: Ltd., Fairbanks Scales Inc., Kern and Sohn GmbH, Mettler-Toledo International Inc., Sartorius AG, Rice Lake Weighing Systems, Cardinal Scale Manufacturing Company, Contech Instruments Ltd., and Tanita Corporation. Product innovations have become increasingly popular in the electronic weighing machine market, representing a significant trend. Companies in the electronic weighing machine industry are continuously launching novel products to satisfy the needs of customers.

The electronic weighing machine market in 2022 witnessed Asia-Pacific emerging as the leading region. The electronic weighing machine market report encompasses the following regions: Asia-Pacific, Western Europe, Eastern Europe, North America, South America, the Middle East, and Africa.

The consumption values of revenues for a specified geography refer to the revenues generated by organizations within the market of that geography, regardless of their production location. Revenues from resales along the supply chain or as part of other products are not included.

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(j) Future Developments

(Scope of future technology development and their application)

Currently the system is designed for manual operation of taking out the required amount in a takeaway bag. It can be modified into an automated dispenser like system where the user enters the amount in terms of weight and the system dispenses the required weight automatically. A built-in label printer can also be incorporated for fast billing at the counter through QR code, reading the unique SKU and price along with the takeaway package sealing mechanism. Other relevant information in the display apart from SKU identification, cost and price can also be added to the display. Minimal gamification can be introduced in the display where the system is in use at the customer front areas for better engagement, interactive experience and recall value of the brand. Further development can be obtained by a suitable choice of material to be used for manufacturing to get further weight reduction of the complete system.

(k) Application/s of the invention

(Please refer to Appendix-I)

All the commercially oriented places where user need to measure loose items from a storage unit effectively and efficiently, for example supermarts, small scale stores. It can cater to the growing need to enhance customer experience at customer front stores.

5. IPR Ownership

(a) Was the intellectual property created with the significant use of funds or facilities of IITK?

Yes

(b) Please describe any source of funding for the invention (Name of the funding agency and copy of agreement, letter of intent if any, must be enclosed with this form).

NA

(c) What is the source of Salary/Remuneration of inventor/Co-inventor?

IIT Kanpur

(d) Have you presented in any conference, seminar, etc., if yes, please give details?

No

(e) Have you published full/part of this invention, if yes, please give copy of publications?

No

(f) Was the intellectual property created in the course of or pursuant to a sponsored/consultancy research agreement with IITK? If yes, please enclose a copy of MOU with concerned project.

NA

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- (g) Was the intellectual property created as a part of academic research leading towards a degree or otherwise?

Yes

- (h) **REVENUE SHARING AMONG INVENTORS:** Please disclose the extent of contribution of each inventor in the invention in percentage terms for revenue sharing.

NAME OF THE INVENTOR	% SHARE*	SIGNATURE
1. Nachiketa Tiwari	12.5	
2. Pooja Gupta	12.5	
3. Aparna Singh	12.5	
4. Arunav Rajesh	12.5	
5. Amit Bohara	12.5	
6. Anil	12.5	
7. Swapnil Tiwari	12.5	
8. Shashikant Yadav	12.5	

* If this column is not filled and signed then it will be assumed that all inventor(s) have equal contribution

6. Commercial potential

Give brief description of potential commercialization by specifying

- a) Why should the individual(s)/organization consider procuring this innovation?

The system improves efficiency in the process of weighing loose groceries and reduces operational costs by introducing self-service and reducing the assistive staff by making a one-time investment. It also enhances customer experience as they can perform the activity themselves without having to wait for the staff in rush hours and make the process faster. Customers can also look at the real time price against the measured weight helping them not stress too much on the mental math. A better customer experience improves the brand recall value of the store and hence repeat customers.

- b) These questions are related to the question (i) above:

- i. In your opinion what are the steps/processes that must be undertaken by the procurer to commercialize the use of this innovation?

An aesthetic look of the display on which the user is interacting.

- ii. How long may it take to reach the commercial stage by the procurer?

Six months

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- c) Please give specific list of companies and contact details of concerned person who can be contacted for initiating Technology Licensing

Sr. No.	Name of Companies	Name of the contact person	Contact no.
NA	NA	NA	NA

(*Unsigned & Incomplete IPDF forms shall not be accepted).

- d) Do you want to file Patent under PCT Route in other countries?

Yes ☐

No ☒

***The institute shall file patent under PCT route only in those cases wherein industry/company has exhibited interest for commercialization.**

Disclaimer: *I/We declare that before the submission of this disclosure form or/and during the process of filing this invention as an IPR prospect, I/We will not publish the above information in public domain.*


I/We also give consent to IIT Kanpur being the applicant of this IPR prospect, that they may use this disclosure upon their discretion, which will not be limited to publication on e-auction website, Industry meets & different portals for promotional & licensing purposes.

Signature of Inventor with date


2/11/23

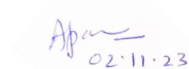
Signature of Inventor with date

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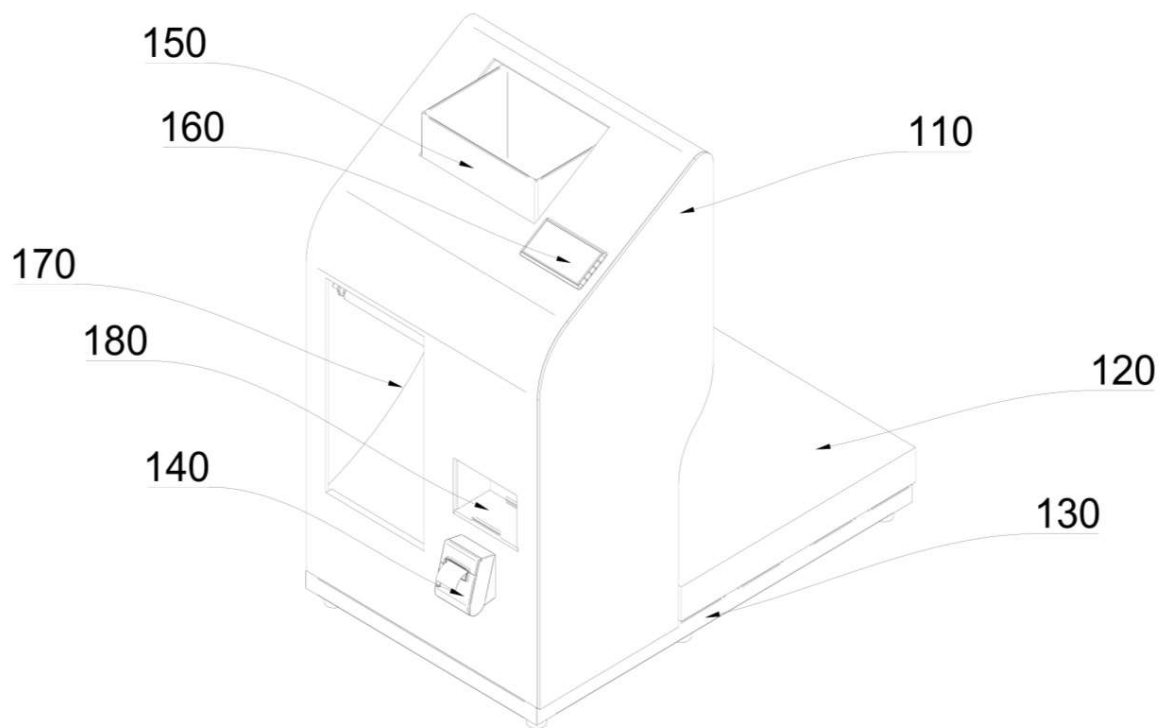


Figure 1

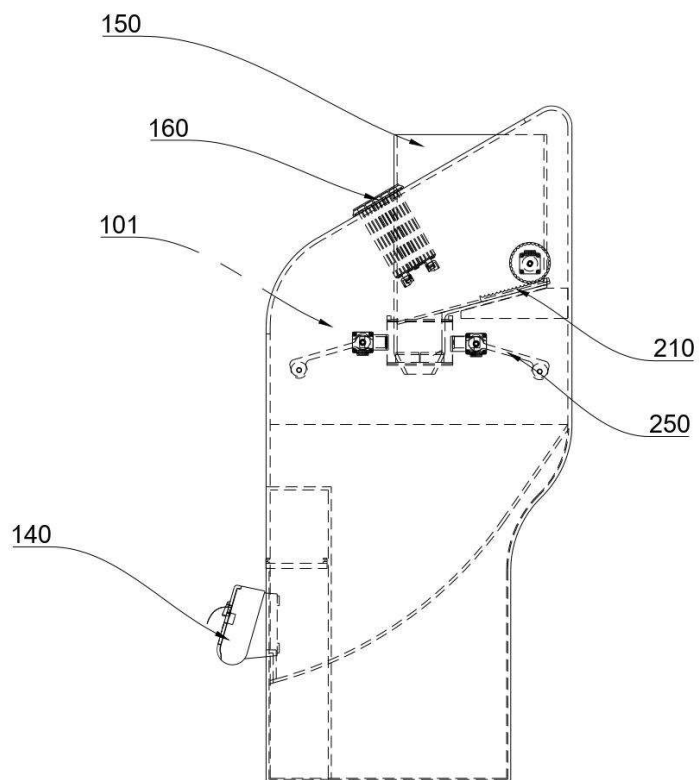


Figure 2

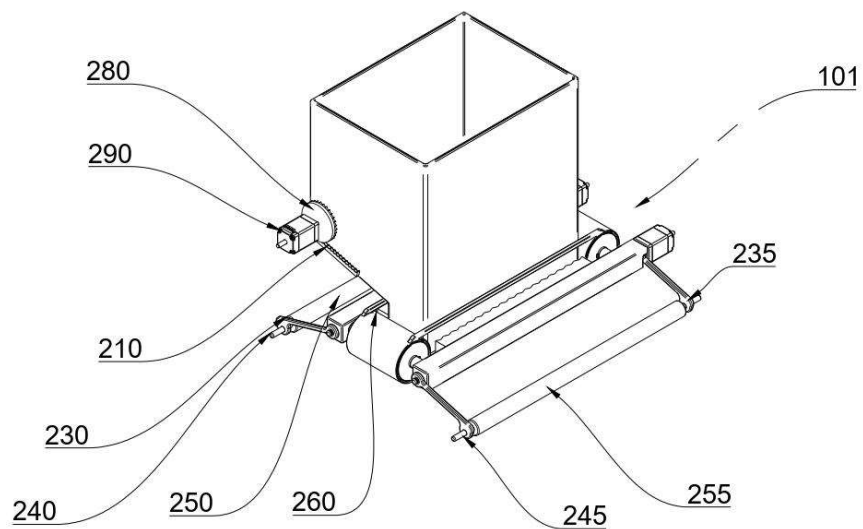


Figure 3

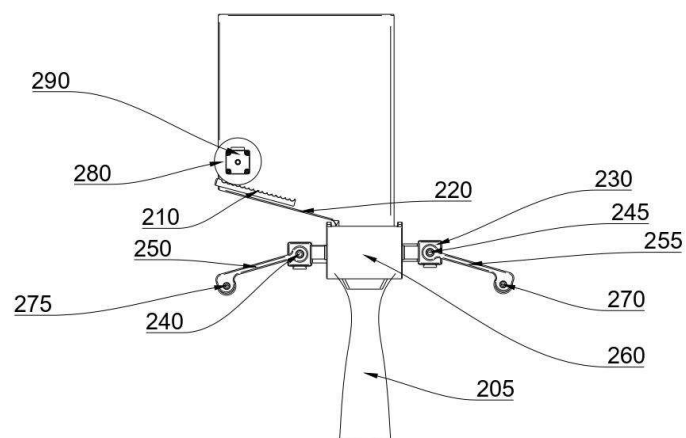


Figure 4

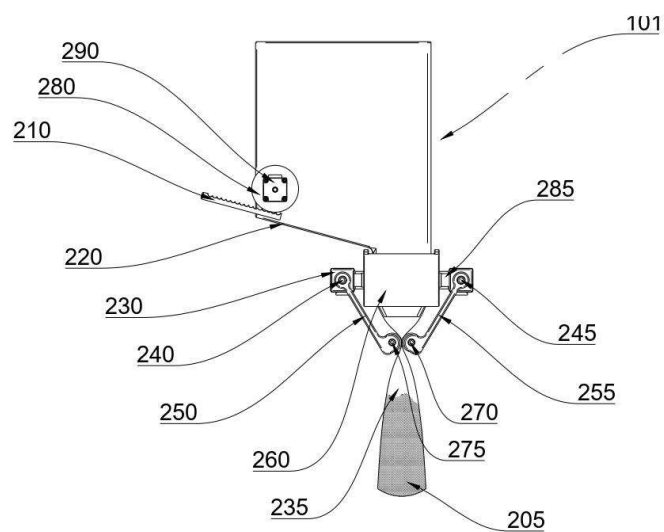


Figure 5

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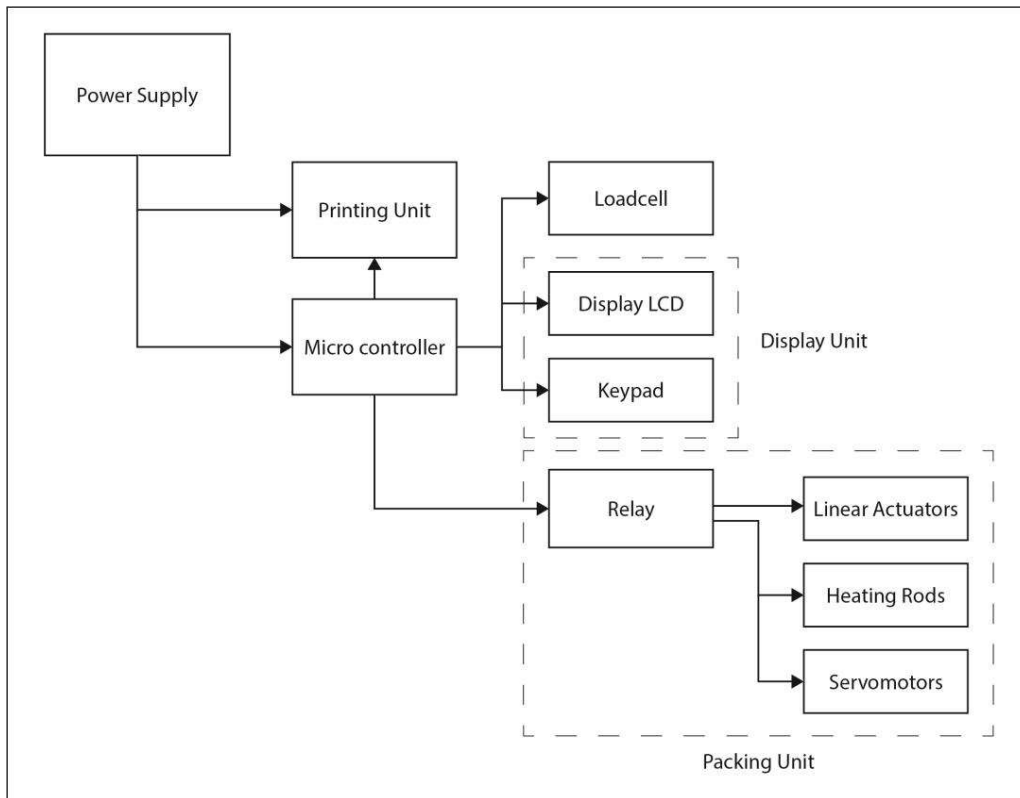


Figure 6

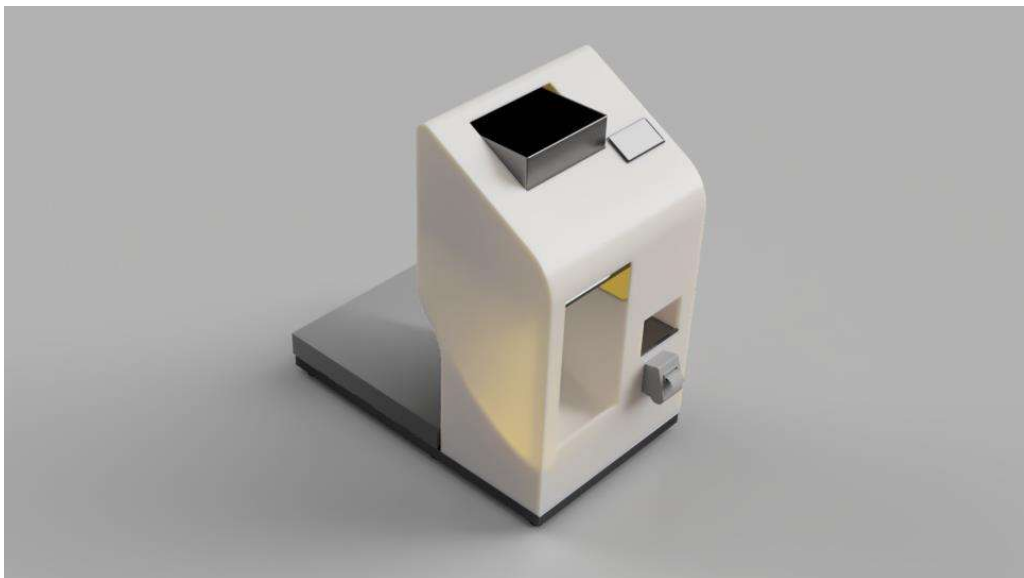


Figure 7