



FABRICATION OF A TROLLEY IT IS ATTACHED TO A TWO-WHEELER FOR AGRICULTURAL PURPOSES

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Abstract: Modern agricultural practices aim to increase productivity and efficiency. An essential part of this growth is the development of new instruments that enable farmers to do their tasks more effectively. This study describes the design and development of a tram system that can be mounted on a two-wheeler and specifically addresses the requirements of small- and medium-sized farmers engaged in agricultural activities. The tram system will make it easier for farmers to move machinery, tools and produce throughout their fields by enhancing transportation alternatives. Weight capacity, stability, maneuverability, and ease of attachment to a normal two-wheeler were all carefully considered when designing the tram. In the manufacturing process, welded steel and sturdy materials were employed to ensure the trolley's durability and keep the weight manageable for the two-wheeler to carry. Additionally, safety features like reflectors and brake systems were built into the design to guarantee safe operation both during the day and at night. Due to the user-friendly design of the connection mechanism, farmers can rapidly attach and detach the tram from their two-wheeler. This adaptability gives farmers flexibility by enabling them to use the same two-wheeler for a range of jobs. To evaluate the performance of the tram, field testing was done with varied loads and surfaces. The research revealed that the tram greatly boosts the two-Wheeler's carrying capacity, allowing farmers to transport more equipment, seeds, and fertilizer. According to an assessment of the stability of the trolley attachment and its impact on maneuverability, the trolley system maintained a decent balance while not materially compromising the two-Wheeler's handling.

Index Terms - Trolley, Two-Wheeler, Transport equipment, Agriculture Purpose etc.

I. INTRODUCTION

Agriculture has long been the backbone of human society, providing both food and resources. Due to the ongoing increase in global population, good agricultural practices are increasingly necessary to assure food security. It is crucial in this situation to integrate modern equipment and technology into traditional farming methods. One such invention is the development of agricultural trolleys that can be connected to a two-wheeler. In this essay, the concept of such a tram system is explored, with an emphasis on how it might profoundly change how small- and medium-scale farmers conduct their daily business. A significant portion of the global agricultural output is produced by small- and medium-sized farmers. These farmers usually operate on a tight budget and are required to carry out a variety of tasks by hand, including planting, harvesting, and moving crops. The amount of cargo that can be transported across the fields may be hampered by labor-intensiveness, inefficiency, and a lack of merchandised equipment, particularly for transportation. Two-wheeler are commonly utilized as a mode of transportation in rural areas due to their accessibility, ease of

maintenance, and capacity to handle challenging terrain. However, because a standard two-wheeler has a limited carrying capacity, farmers find it challenging to move larger quantities of crops, equipment, and other essentials. To get over this limitation, the idea of attaching a tram to a two-wheeler seems novel. The objective of this project is to develop and build a tram system that seamlessly links with a two-wheeler in order to boost a two-wheeler's carrying capacity while maintaining stability and maneuverability. The trolley is made to assist farmers with various agricultural duties, such as moving tools and equipment, evenly distributing fertilizer or seeds over their farms, and transporting harvested crops from the fields to storage locations. We'll discuss the challenges encountered by farmers in remote areas and how this tram system might be able to provide a practical solution. We will also go into detail regarding the testing procedures used to assess the tram's performance and how it affected the two-wheeler's operation.

A specific type of wheeled machine or apparatus that is used to transport people, goods, or other objects is frequently referred to as a tram. Moving objects around is made simple by the fact that it frequently consists of a platform or container connected on wheels or a set of rails. Trolleys are used for a number of purposes in a range of situations and come in a variety of sizes and shapes. For illustration:

Cart or shopping trolley: A four-wheeled cart known as a "cart" or "shopping trolley" is used to transport goods when making purchases at supermarkets and other stores. In hospitality settings (such hotels and restaurants), a wheeled cart known as a "service trolley" is regularly used to transport food, drinks or cleaning materials.

Tram or tram: Often used for local, short-distance travel, trams are a type of public transportation that runs on tracks underground in city streets.

In warehouses or factories, large products are routinely moved using an overhead trolley, which travels along a network of suspended tracks.

A cable car is a trolley-like vehicle that is suspended on a cable and is widely used for transportation in hilly or mountainous terrain.

Trolleybus: A type of electric vehicle that resembles a tram but is powered by overhead wires rather than rails. It moves along on wheels.

A wheeled vehicle used to transfer luggage at airports or train stations is a luggage trolley.

II. LITERATURE REVIEW

Mr. Madhukara Nayak et.al., [1] A shopping cart is an essential piece of equipment for grocery or supermarket shopping. However, there were shopping carts that had been used and then left all over the supermarket. Additionally, there were safety hazards with shopping carts, including sliding off an escalator. On the other hand, customers who are rushing around a supermarket looking for desired items find it inconvenient and time-consuming. To address the issues, an automated human and line-following shopping cart with a smart shopping system was created. The shopping cart had an ultrasonic sensor to help it avoid obstacles. In conclusion, consumers may enjoy shopping and focus more on their kids while doing so without having to push a shopping cart.

P. Shashidar et.al., [2] There are several uses for trolleys in the modern world. Tippers can draw a wide range of materials, including gravel, grain, sand, fertilizer, large rocks, etc., in both industrial and home settings. The challenge of unloading the materials led to the development of the older dropping trolley/dumper. A survey conducted in this respect in a number of car garages found that the majority of the time, challenging techniques were used to remove the debris from the tram. The tipper mechanism needs to be studied and researched due to the broad extent of the subject in order to improve its effectiveness and economy.

Avesh Khan et.al., [3] A bicycle trolley is a wheeled frame without a motor that has a hitch mechanism for carrying cargo for bicycles. It can significantly boost a bicycle's capacity for cargo. The tram may be needed as a general-purpose goods carrier or for a specific purpose, such as the transportation of passengers or the

movement of a certain kind of cargo. The tram has been around for a very long time and has made it easier for people to move items than they could if they did it themselves.

Virag A. Timbadia et.al.,[4]The trolley is the tool used to move materials from one location to another or to carry loads. There are many different varieties of trolleys on the market for diverse applications. The trolley will be chosen based on the specified task, however it can only be used for that task. An innovative tram with multiple uses was created to solve this issue. There are many different types of trolleys on the market for use in a variety of settings, including airports, shopping centers, businesses, hospitals, etc., to transport large or light loads. This paper describes the creation of a trolley that incorporates construction and design based on creativity and may be applied to a variety of tasks. The tram was created by combining shopping mall and airport trolleys. The design also included a motorized wheel, which minimizes the amount of effort needed to move a load and can also be controlled manually if necessary.

Bhavin J Shah et.al.,[5]A trolley is a mechanical device used to convey materials or carry loads between locations. Specific types of trolleys must be chosen for various applications. One novel trolley that may be utilized for multiple field applications is developed to solve the issue of specialized task trolleys. This essay describes the creation and development of a trolley using inventiveness and the ability to carry out several tasks. The tram was created by combining shopping mall and airport trolleys. When designing, the four main considerations are form, function, and cost.

Rupesh Nair et.al.,[6]In our project, we will design and build a hand truck or trolley that can be attached to the front portion of a bicycle. This will turn the bike into a tricycle, which can be used as a bicycle trolley for outdoor shopping because it can carry more weight than commercially available bicycles. We can utilize this tram as our main cart if we disconnect it from the bicycle.

Mr. Aditya S. Deshpande et.al.,[7]The handling of materials is crucial to the industrial process. Therefore, choosing the right material handling gear is crucial. In this post, we develop a castings-carrying rail transfer trolley. Trolley parts are developed using analytical formulation, and after that, they are modeled and put together in the Solid Works 2016 software using the computed dimensions. ANSYS 16 performs analysis of designed components. Trolley Assembly is meshed using the Hypermesh14.0 programme for additional analysis.

B.Ravindar et.al.,[8]A trolley is typically used to transport big objects with little effort from the user. When making the trolley, careful planning, precise production, and directed analysis using finite element software result in improved mobility that can withstand heavy loads with little effort. In order to fabricate a trolley with better performance under heavy duty with less effort, the model is first sketched using solid works and imported into ANSYS software for structural analysis. This paper deals with manufacturing of such stair climbing trolleys with simple mechanisms (i.e., ratchet mechanisms).

Potli Aswartharayana et.al.,[9]Travelling is inextricably linked to one's luggage. Carrying luggage is a challenging undertaking for anyone, especially if it is heavy. To tackle this problem, numerous inventions have been made. People carry their belongings in a variety of trolley bags. However, trolley bags are slightly more expensive and out of everyone's budget range. The greatest answer to this issue is a portable luggage cart. It is easy to use and capable of supporting 150 kg. Its layout makes it possible to pack it within a backpack. The size doubles when it is unfolded. The focus of the current effort is on the design and construction of a portable luggage cart. To strengthen the stability of the cart, four caster wheels are installed. The cart is created in CATIA, and ANSYS is then used to determine the equivalent stress and overall design deformation. The design was prototyped utilizing the additive manufacturing process. Prototypes are created using an FDM (Fusion Deposition Modelling) based STRATASYS 3D printer. Due of its low density, aluminium bars are utilized to prepare actual carts. Basic mechanical procedures including cutting, slotting, fitting, and broaching are used to create the finished cart. By facilitating faster passenger circulation, these carts will ease congestion in bus and train terminals.

Sachin P. Dhavane et.al.,[10]Each company's fundamental requirement is the transportation of automobile parts within the facility, between industries, or from the manufacturing sector to OEMS sectors. Timely delivery and fewer defective parts during transit are important factors in inventory control, which ultimately affects the industry's profitability. The shipped components are to be stored or utilized in an assembly line,

depending on the needs of the future. Therefore, several carts are used to store such parts securely and for the allotted time. The purpose of the paper is to demonstrate material handling trolley design and production for the automotive sector. This essay focuses mostly on a case study concerning a trolley that is used to store and move HVC front panels. The major goal is to create a trolley that can handle the specified load conditions, decrease clutter, and enable efficient picking and handling. Solid Works 2014*64 edition software is used for the modelling design, while Hyper mesh 2017 software is used for the trolley analysis. By using analytical calculations and the outcomes of the software analysis, the trolley's desired design parameters are verified. The paper empathizes with the choice of the ideal material, dimensions, and safety requirements for the production of the trolley.

O.J. Oyejide et.al.,[11]The goal of this project is to create a flexible, sensor-controlled convertible cart-trolley that will facilitate physical distribution of commodities. In labs, offices, supermarkets, warehouses, and industrial settings, transporting homogeneous and heterogeneous commodities is a regular practise. In poor nations, manual trolleys are typically used for material handling and transportation. This study was done since such practise could be time-consuming and labor-intensive. Three mechanisms make up the innovative design; when stretched, they transform the system into a cart; when tilted, they transform it into an incline cart with a flat plate attached to stabilize payloads; and when folded, they transform it into a trolley. The two wiper motors, which are affixed to the two wheels and are powered by 12V DC batteries, are in charge of steering and propelling the trolley. Relays, cables, and a wireless module (ESP8266EX) make up the circuit board. The relay regulates the amount of current discharged from the batteries to the motors and the circuit in general, while the wireless module (ESP8266EX) functions as the microprocessor holding the commands to be carried out by the cart. As a receiver, the Wireless Module (ESP8266EX) is used. The cart trolley was created and put through testing; the results revealed that it had an efficiency and throughput capacity of 550.37 kg per hour and 52.2%, respectively.

Vaibhav Phule et.al.,[12]Robotic Trolley, which might function as a moving unit in a closed-off area. The past two years are the only factors used to justify this decision. We have all been impacted by the covid pandemic, which altered life all around the world. Health professionals, nurses, fitness-care staff, and medical group workers are among the many people affected by this pandemic. performed front line work. Even though social distance is evident in the Covid isolation unit, there is a constant supply of food, water, and medications. These services are being offered by our medical professionals, which immediately put them in danger due to their close proximity to patients who could benefit from them. And we're eager to lessen this risk by allowing our remote-managed tram to roam in those wards and provide these essential services. Our primary focus was on creating and developing a mobile tram that can be operated remotely. This action was conducted while the area was under lockdown due to COVID. should stay away from contact less services. It can be used to store things like food, drinks, and medications. Embedded C is used in the programming of this remote procedure. For motion control, an Arduino Mega is used, and Mecanum Wheels are employed for motion in each practical direction. Using a camera, real-time viewing is possible. We are allowed access to the actual view from the tram. A sanitizer doling out unit is linked for self-sanitation.

III. PROBLEM DEFINATION

A common requirement of modern agricultural practices is the transportation of heavy equipment, crops, and other items over varied terrains. Traditional methods, which rely on manual effort or bullock carts, may be inefficient and time-consuming. In order to address this issue, the project's objective is to design and produce a multifunctional trolley attachment that can be quickly and simply fastened to a two-wheeler (motorcycle or scooter) for efficient and useful transportation in agricultural tasks.

IV. METHODOLOGY

A framework that can effectively bear a range of loads and be compatible with the two-Wheeler's towing mechanism must be designed and built if a trolley for agricultural use is to be attached to one. Here is a general description of the manufacturing process:

Materials and Tools: For the frame, metal pipes or square tubing bed sheets made of metal, equipment for welding and welding rods, instruments for cutting (angle grinder, hacksaw), marking tools and measuring tape, nuts, washers, and bolts, axles and wheels, Paint or a barrier coat

The procedures used to make the trolley Procedures for cutting, machining, welding, and assembling parts.

V. FABRICATION

There are various fabrication procedures involved in building a four-wheeled tram that is connected to a two-wheeled bike. This kind of alteration is frequently carried out for a variety of reasons, such as the transportation of passengers or products. Remember that altering a car should be done safely, legally, and in accordance with local laws. The general stages to build a four-wheeled tram that is connected to a two-wheeled bike are as follows:

- Determine the purpose of the trolley (e.g., cargo transportation, passenger transport).
- Create detailed sketches or CAD drawings of your trolley design, including dimensions, materials, and attachment points.
- Gather the necessary materials, which typically include steel or aluminum tubing for the frame, sheet metal for the body, wheels, axles, and various fasteners. The joint of the bike and 4-wheeler trolley figures are given below 1 and 2.



Fig-1: Joint of the Bike.



Fig-2: Joint of the trolley.

- Ensure you have access to welding equipment, cutting tools (e.g., saws, grinders), measuring tools (e.g., tape measure, square), and safety gear (e.g., gloves, goggles).
- Cut and weld the steel or aluminum tubing to create the frame of the trolley. The frame should be strong enough to support the intended load.
- Ensure the frame is securely attached to the bike's rear axle or frame. Consider using a detachable hitch for versatility.
- Attach the wheels and axles to the trolley frame. Ensure they are aligned properly to prevent wobbling and uneven wear.
- Construct the body of the trolley using sheet metal or other suitable materials. This can be a box-like structure for cargo or seating for passengers. Cut openings for doors, windows, or access points as needed.
- Sand and smooth any rough edges on the frame and body. The connection between bike and 4-wheeler trolley is in figure 3, The down side view of the trolley is in figure 4 in given below.



Fig-3: The bike and trolley connecting point.



Fig-4: The down view of the trolley.

- Apply primer and paint to protect the metal from rust and corrosion. Choose a color or finish that suits your preferences.
- Install safety features like reflectors, lights, and indicators to enhance visibility on the road.
- Connect the trolley to the bike: Connect the trolley to the bike using a hitch or a coupling. Ensure that the connection is secure and that the trolley is level with the ground.
- Ensure that all components are securely attached and function properly. Conduct a test ride to evaluate the stability and handling of the bike with the attached trolley. The back and front view is shown in the figure 5,6 in it.



Fig-5: The back view of the 4-wheeler trolley.



Fig-6: The front view of the 4-wheeler trolley.

- Check local regulations to ensure compliance with road safety and vehicle modification laws.
- Regularly inspect and maintain the trolley to ensure it remains safe and functional. The 4-wheeler trolley is connected with the bike with loading and without loading is given below in the figure 7,8 in it.



Fig-7: The 4-wheeler trolley is connected to the bike without loading.



Fig-8: The trolley with loading.

You may construct a four-wheeled trolley that can be connected to a two-wheeled bike by using the procedures shown below. When creating a modification like this for a vehicle, safety should always come first. When it comes to welding and car modifications, seeking advice from a qualified specialist or skilled fabricator might be beneficial. In addition, be careful to abide by any local rules and laws governing the use of roads and vehicle modifications.

VI. FARMERS CAN USE THE ATTACHED TWO-WHEELED CART

The concept of attaching a two-wheeler to a tram has several advantages for farmers. Here are some scenarios in which such a system would be helpful:

- Farmers are able to access portions of their fields that could be difficult to access with larger vehicles because of the trolley's greater maneuverability due to the two-wheeler link. This is particularly useful in fields with irregular or constrained paths, as well as in compact areas.
- Farmers can use a trolley-two-wheeler combo to transport harvested crops from the fields to storage facilities or marketplaces. Even delicate crops are delivered damage-free due to the increased maneuverability.
- Farmers frequently need to move irrigation hoses and other equipment throughout their farms. The trolley-two-wheeler arrangement makes this job easier, especially when irrigation is needed in remote or challenging locations.

- Farmers may easily move the cart to different parts of the farm after loading it with bags of seed or fertilizer, distributing these materials where they are most required.
- Because it may be used for a range of crops, the trolley-two-wheeler system is a flexible choice for farmers who raise different types of products throughout the year.
- In areas where agricultural fairs or festivals are frequent, the trolley-two-wheeler combination might be a practical way to present and convey produce for sale.
- Farm workers may be able to carry heavier loads with less physical effort while using the trolley-two-wheeler combination, reducing their stress levels and maybe increasing their overall labour productivity.
- A trolley-two-wheeler system might be easier to deploy at a lower cost than larger agricultural equipment, making it an attractive option for farms with smaller staffs or tighter budgets.

VII. ADVANTAGES:

There are several definite advantages to using a tram with a two-wheeler attachment in agricultural settings that revolutionist present transportation practices and enhance farm operations as a whole. Major advantages include:

- Farmers can distribute supplies and equipment more effectively even in challenging conditions thanks to the trolley's addition of a two-wheeler attachment that makes it easier to operate through limited spaces and uneven terrain.
- The trolley's two-wheeler adaptor expands the range of its available mobility. This versatility is particularly helpful in areas with varied topography where the tram must function well on a variety of surfaces.
- When moving supplies and crops about the farm, the trolley's improved maneuverability with the two-wheeler attachment saves time and labour. This leads to higher production and cheaper labour costs.
- The trolley's design and two-wheeler attachment allow it to be used for a range of tasks, such as delivering tools and harvested crops as well as moving irrigation equipment. It is therefore a flexible choice for a range of agricultural purposes.
- The trolley-two-wheeler combination offers a useful replacement for more sophisticated transit machinery. It utilizes equipment that is already in existence, like a standard trolley, and increases that tool's capability by adding a two-wheeler attachment.
- Due to the two-wheeler attachment's simplicity, maintenance is typically easy and straightforward, reducing downtime and maintenance costs.
- Due to its reduced ground contact and compact form, the two-wheeler attachment may cause less soil disturbance and have a less environmental impact than larger four-wheel systems.

VIII. LIMITATIONS:

Limited Load Capacity: The load capacity of a trolley with a two-wheeler attachment may be less than that of some larger agricultural vehicles. This could have an effect on the amount of cargo that can be transported in a single trip.

The likelihood of lower stability while employing a two-wheeler attachment raises safety concerns, especially when hauling heavy or unbalanced goods. This might increase the likelihood that it will topple over, particularly on rocky or uneven terrain.

Unequal Weight Distribution: Inadequate loading of the trolley may lead to uneven weight distribution on the two-wheel attachment, which may affect maneuverability and may present handling difficulties.

Compatibility Issues: Making sure the trolley and the two-wheeler attachment are compatible may be challenging because different trolley designs and sizes may affect how well they work together.

Initial Investment: It might still be necessary to make a little upfront investment to adapt or purchase the two-wheeler attachment and adjust the trolley correspondingly, even if it is probably more economical than larger agricultural equipment.

Limited Speed and Efficiency: The trolley-two-wheeler combination may not be as fast or as efficient as more specialized vehicles designed for faster delivery.

Limitations on Long Distance: In long-distance transportation throughout expansive farms, a tram with a two-wheeler attachment would not be as efficient as larger vehicles designed for this particular function.

IX. APPLICATIONS:

It is possible to employ a trolley attached by a two-wheeler arrangement in a number of agricultural circumstances and jobs. Here are some specific applications of this arrangement that might work well:

Crop Harvesting: Move recently harvested crops from the fields to storage locations using the trolley-two-wheeler system to reduce the risk of damage and assure effective handling.

Transport of Materials: Using this setup, farmers may move tools, equipment, and products like fertilizer, insecticides, and irrigation supplies throughout their farms with ease.

Irrigation Management: Irrigation systems can be set up and maintained by facilitating the movement of hoses, pumps, and other irrigation equipment around the farm.

Community agricultural: The adjustable trolley and two-wheeler set-up can aid cooperatives and community agriculture initiatives in efficiently managing shared resources. Farmers can transport their goods to local fairs, agricultural shows, and farmers' markets to be shown and sold using a trolley-two-wheeler combo.

Terraced farming: In situations where larger vehicles could struggle, the manoeuvrable tram with a two-wheeler attachment can help with efficient transportation.

Remote areas: The configuration may be highly useful in remote or difficult-to-access areas that are inaccessible to regular vehicles.

Small-Scale Farming: For small-scale or subsistence farmers, this arrangement may be a more inexpensive option than larger machinery for transporting crops and inputs.

X. RESULTS

To create a trolley that is attached to a two-wheeler, only two degrees of freedom are required. The tram tilts with the towing bicycle, making the hookup quick and efficient. This kind of trolley is particularly useful for swiftly and easily transporting large things between different sites. A hand truck attached to a two-wheeler can transport loads up to 250 kg, per a performance test. All the materials required for the fabrication may also be obtained locally. Construction of a tram attached to a two-wheeler can significantly enhance agricultural operations by increasing transportation capabilities, increasing production, and offering customization options to match the farmer's needs. Careful design, construction, and safe operation are crucial for this system to truly pay off.

XI. CONCLUSION

In conclusion, the use of a trolley with a two-wheeler attachment has enormous potential for farmers in various agricultural settings. The practicality of a standard tram platform is combined with the greater maneuverability and flexibility of a two-wheeler system in this innovative design. As farmers try to optimize their operations and adapt to evolving demands, this arrangement offers a number of benefits tailored to their specific needs. The trolley-two-wheeler combination gets beyond the challenges posed by the uneven ground, rocky terrain, and restricted spaces commonly encountered in agricultural settings. It enables farmers to move crops, supplies, tools, and equipment easily, which results in more efficient operations and increased yield. This technology is adaptable and can be utilized for a variety of tasks, including as controlling irrigation systems, moving items, and gathering produce. In a world where agricultural practices are always evolving, the tram attached by a two-wheeler mechanism symbolizes the inventive spirit of farming communities. It offers as an illustration of how everyday tasks can be improved for sustainability, adaptability, and effectiveness while still satisfying the shifting requirements of modern farmers. This innovation has the potential to profoundly revolutionise the way we see agricultural transportation, ultimately improving farmers' wealth and success as they navigate the complexities of the agricultural environment.

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