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DESIGN OF A MULTIPURPOSE HANGING HANDGRIP FOR RAPID TRANSIT SYSTEMS

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Thesis Submitted

in Partial Fulfillment of the Requirements for the

Degree of

MASTER OF DESIGN

in

Lifestyle and Accessory Design

by

Anirudh Chauhan

(Roll No. 23/MDLD/01)

Under the Supervision of

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1

To the

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Thank You.

Anirudh Chauhan

CANDIDATE'S DECLARATION

I **Anirudh Chauhan** hereby certify that the work which is being presented in the thesis entitled **Design of a Multipurpose Hanging Handgrip for Rapid Transit Systems** in partial fulfillment of the requirements for the award of the Degree of Master of Design, submitted in the Department of **Design**, Delhi Technological University is an authentic record of my own work carried out during the period from **2023** to **2025** under the supervision of **Dr. Ranganath M. Singari and Dr. Taruna Singh.**

The matter presented in the thesis has not been submitted by me for the award of any other degree of this or any other Institute.

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Design of a Multipurpose Hanging Handgrip for Rapid Transit Systems

ABSTRACT

Transit while standing is already an inconvenience for passengers, couple that with luggage and it just compounds the problem even more. Metro trains have rules about how the passengers that are standing should carry their luggage if they don't want to rest it on the floor, so that they don't block the way of passengers that are moving towards the gates. But sometimes following those rules is not possible out of tiredness, forgetfulness of the rule or travelling with a lot of luggage; and that inevitably leads to less space for other passengers to move around.

I wish to tackle this problem with the infrastructure of hanging handgrips. Hanging handgrip is a vehicle accessory that functions as a grip for passengers who do not get a seat to maintain their balance while the metro is in transit. And to implement that, the metro trains have established a remarkable infrastructure of overhead rails and poles that are attached with these handgrips that the passengers can hold and reliably support their weight on. Therefore, my aim is to design a multipurpose handgrip that makes use of this existing infrastructure to also carry their luggage without any hindrance to the movement of other passengers.

After going through many reference images of products that achieve individual solutions for all the aspects involved in this problem, as well as many design ideations of my own as initial attempts at a solution- I settled on a novel design for a handgrip system that allows passengers to hang their luggage on a hook and carry it in front of them, close to their body. It consists of a hook that is designed to be easy to hang onto, easy to come off from and is un-hinderingly wide enough to support straps and handles of different dimensions. It consists of a handle for the passengers to hold and an additional short arm protruding from the handle that has the hook hanging from it, and to balance the weight it will be offset from its usual center and act like a tower crane. And, it consists of a collar with a click mechanism that will hold the hook out of the way when not in use.

Implementing the final design in use would yield many advantages like opening up the scope for people to uphold their clean habits. It would allow the passenger to support their weight on the strap/rope of the hook and maintain their balance when a crowded commute keeps them from having a grip on the handle and, when the metro is not crowded it would compel the passengers to move closer towards handgrips, which are strategically hung out of the walking area, which would inadvertently clear the space for moving passengers. And it allows the passengers to easily carry their luggage in front of them which is useful in a crowded commute.

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CHAPTER 1

INTRODUCTION

Lifestyle and accessory design is the field of design and study that relates to peoples way of living and the products they interact with. It aims at creating objects that assist people in their lifestyles (Fig. 1.1). Studying and designing for the requirements of a lifestyle focuses on understanding what works in accessories, products and even comfort products that people choose to include in their personal space (Fig. 1.2). This is achieved through studying works in jewelry, watches, bags, luggage, footwear, lightings, furniture, interior objects, colors-material- decorations, automobile interiors, etc. and even trend researches. In a nutshell, lifestyle products and accessories let you carry your lifestyle and exercise your lifestyle anywhere you go (Fig. 1.3, Fig. 1.4).



Fig. 1.1: Passenger Using a Luggage Bag.



Fig. 1.2: Passenger Using Multiple Luggage Bags at Once.



Fig. 1.3: Person Carrying Multiple Lifestyle-products for a Hiking/Camping Lifestyle.



Fig. 1.4: Person Carrying Multiple Lifestyle-products for a Jogging/Trekking Lifestyle.

One such aspect of lifestyle is a commute in public transport. It is a daily chore, it takes up a lot of our time and so, becomes a key part of our lifestyle. Thus, it should also be looked at with the similar parameters and standards that we hold our surroundings to. For this project, the focus will be on a specific peril of a standing commute i.e.- managing luggage while balancing oneself.

1.1 Design Motivation

Anyone who has ever commuted in a metro has at some point felt the need to rest their belongings on the floor, but chose not to out of concerns over sanitation, crowding or security. But that becomes difficult during a long journey or when sometimes out of necessity the bag is heavier than what they are used to, making carrying it very tiresome. While sitting people can always rest their bag on their laps (Fig. 1.6) but while standing the only option left is to carry it either on the back or hold it in hands (Fig. 1.5).



Fig. 1.5: Passengers Carrying Large Luggage on Their Backs.



Fig. 1.6: Passengers Resting Their Luggage on Laps.

People might not be willing to put their stuff on the floor out of reasons of sanitation; like keeping the underside of the luggage clean so they can put it on their lap once they get a seat, or when the bag they are carrying has to be kept on a sitting place that will be used by someone else in the future like a vehicle seat, office chair, chair in a class (Fig. 1.7), some public seat (Fig. 1.8), etc., or when the thing they are carrying has to be put on some counter in the kitchen or some other clean place like a bed (Fig. 1.9), or when the luggage at some point in the journey would require to be held close to the body (Fig. 1.10) or held with two hands or held from its base. And also many sentimental reasons; like when they would be carrying musical instruments, or when they are carrying things that are going to take part in a prayer.



Fig. 1.7: Bag Kept over some Books on a Chair.



Fig. 1.8: Bag Kept on a Public Seat.



Fig. 1.9: Bag Kept over a Bed.



Fig. 1.10: Sitting with Luggage at very Close Contact to ones Personnel.

1.2 Design Aim

For getting started with this project the first point of reference would be to remember the instincts that would be felt about wanting to handle the luggage conveniently, closely, securely and reliably in control of oneself when facing those problems described earlier (Fig. 1.11). That would act as a guide towards what someone is expecting would be available for use when they get into those situations, and that knowledge would act as the starting point for our design.



Fig. 1.11: Passenger Managing His Luggage and Maintaining Balance during Transit, opting not to rest it on the floor.

Now the design has to start from the point forward from till where the passenger can handle the inconveniences on their own, so that less infrastructure and elements will go into the design and keep it simple. That would also mean it will be relevant in the long run. And if the design complements the people's own instinct it will not become redundant in any way and not end up becoming obsolete which would save resources of the authorities involved.

On further exploring upon those instincts it became clear that the solution would require some sort of point of support that can be personal to each standing passenger and it turns out the hanging handgrips in a metro perfectly fit that description (Fig. 1.12), hanging handgrips are a vehicle accessory that functions as a grip for passengers who do not get a seat to maintain their balance while the metro is in transit, so they provide a point of support for the passengers to grab and lay their weight on to absorb the dis-balancing jerks of a commute. These handgrips are connected to a whole infrastructure of overhead bars and rails that enable them to do so (Fig. 1.13). So I decided towards considering tweaking with their designs for devising a solution that would also in some way help with carrying the passenger's luggage and be multipurpose in its functioning like that. *[For a peak at the final design: pg. 35, 36, 37]*.



Fig. 1.12: Hanging Handgrips in Delhi Metro.



Fig. 1.13: Infrastructure of Overhead Bars and Rails for Supporting the Handgrips.

So, keeping in mind these considerations, I decided my aim for this project will be to **design a multipurpose hanging handgrip for rapid transit systems** (commonly referred to as 'metro') and explore their different concepts through illustrations. *[For a peak at the final design: pg. 35, 36, 37]*.

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Moving forward with that in mind, it is clear that in order to achieve the goals of this project this design will have a hook and strap contraption that will support itself to the same setup of overhead rails and bars that are in-place to support the hanging handgrips. Incorporating this contraption and the existing simple design of the handgrip with each other will be the biggest obstacle to overcome for this project. *[For a peak at the final design: pg. 35, 36, 37]*.

CHAPTER 2

UNDERSTANDING THE HOOK

The next step at making progress is incorporating a hook in the design to hang the bag on. That hook will take the weight of the bag and free the passenger from hassling with managing the weight of the luggage while standing and only leave them with the responsibility of just minding the luggage.

This chapter describes the process that went into deciding on the design of the hook based on all the functions it is going to be put through. It is done by recognizing there are many parts to a hook, understanding the impact of each of those parts on the functioning of the hook and then using those lessons to tailor each part of the hook to cater to our desired function.

2.1 Understanding the Nose in a Hook

The “nose” of a hook is the front most part of it which acts as a stopper for the objects inside it and keeps them from exiting. Experimenting with its geometry can yield shapes that can provide a performance-edge to the hook during different functions.

The hook involved in our project will work in crowded environments and that would entail not tangling unintentionally into anything. So, it is important that the hook is “un-catching” and it does not hook onto the clothes and straps of stray passengers walking nearby. That sort of design solution can be seen on a J-hook that has a thick lip curling inwards at their end (Fig. 2.1), which makes them difficult to accidently catch onto anything that they contact because instead of a point that can dig into anything, this inwards curling-lip with a thick geometry gives them a curvature at the end of the nose that can slip away from hooking to anything by accident (Fig. 2.2).



Fig. 2.1: A J-hook with a Thick Lip Curling Inwards at the Front.



Fig. 2.2: A Clear Side Profile of a J-hook.

Another way this can be done is by having a “blob” at the end of the nose (Fig. 2.3). A sphere is a shape that does not slip into anything like a wedge does but also does not provide complete stoppage like a wall. To let a sphere pass through- someone has to push the object on it otherwise it would not engage with it, so if we give a spherical blob at the tip of the nose to a hook it would not let anything accidentally engage with it and would fulfill our concerns about its desired functioning.



Fig. 2.3a: An Example of a Hook with a Spherical Blob at the End of Its Nose.



Fig. 2.3b: Another Example of a Hook with a Spherical Blob at the End of Its Nose.

For our project, a spherical blob at the end of the nose seems a better fit and thus, that is the design choice we will move forward with.

2.2 Understanding the Forehead in a Hook

The “forehead” of the hook is the top most part of the hook that often connects the hook to a chord or any kind of tether.

An example of “forehead” in a hook design is this bucket hook that is used to hang buckets securely for feeding animals (Fig. 2.4); it is there to achieve a factor of safety- By extending the forehead of the hook out over its nose the hook no longer has a probing element sticking out dangerously, which is necessary in this case so that the animals don’t hurt themselves in the haste of feeding (Fig. 2.5).



Fig. 2.4: A Hook Design with a Protruding Forehead Covering the Hook’s Nose.

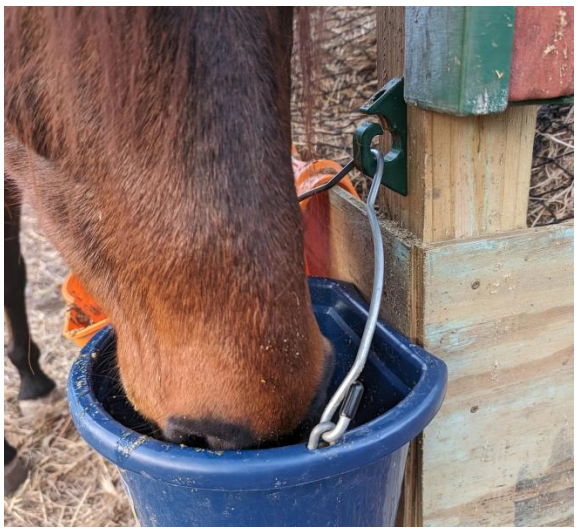


Fig. 2.5: A Hook Design with a Protruding Forehead in Action.

For our project we need the “forehead” as a resting place for the hand so the passenger can hold the strap of the hook to maneuver it and not worry about the hand slipping down to the hook. *[For a peak at this design: pg. 25]*.

2.3 Understanding the Stomach in a Hook

The “stomach” is the lowest part of a hook that makes it possible to hang objects on it. It is the part where objects rest after entering the hook. “Stomach’s” in a hook comes in different shapes owing to the functions they need to accomplish, as each shape provides functioning-edge during different situations. Thus, we will design our hook for the considerations of this project.

One of those considerations is to recognize that the passengers standing don’t always remain standing, they sometimes get a seat, they sometimes need to rush out the door when their stop is nearby and they sometimes need to displace themselves owing to the changing rush of the commute, all of this indicates that the hook should be easy to engage with and then equally easy to come-off from. One such way of achieving it is to make the stomach of the hook pretty shallow (Fig. 2.6), because in actuality we only need to protect the luggage from falling off during the side-to-side or forwards-and-backwards sway and not worry much about vertical movements as that is the nature of transit in metro trains. A deep stomach on the hook (Fig. 2.7) only comes in handy to protect the object from exiting the hook during any vertical displacement and any shape of hook that would achieve so would also provide some hindrance in engaging and disengaging a hook. So, making the hook shallow is in-line with the goals of the project.



Fig. 2.6a: Example of a Shallow Stomach in a Hook.



Fig. 2.7a: Example of a Deep Stomach in a Hook.



Fig. 2.6b: Example of a Shallow Stomach in a Hook.

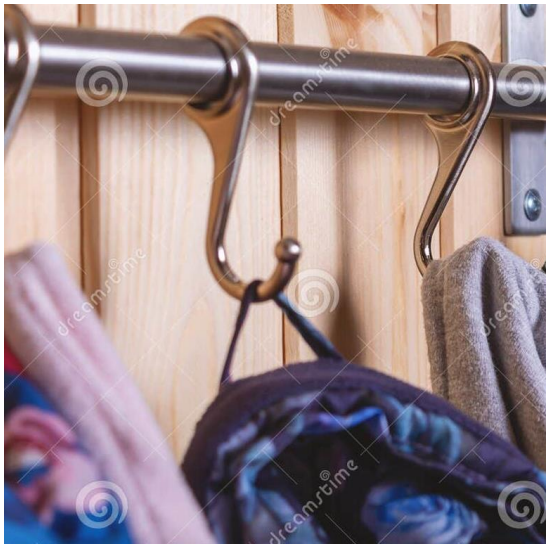


Fig. 2.7b: Example of a Deep Stomach in a Hook.



Fig. 2.6c: Example of a Shallow Stomach in a Hook.



Fig. 2.7c: Example of a Deep Stomach in a Hook.

2.4 Understanding the Mouth in a Hook

The “mouth” of the hook is the gap between the nose and the forehead of the hook. It is the opening through which we place objects inside the hook and engage it.

The design of a coupling hook, which is used in locomotives to join two bogeys together, demonstrates the benefit of having a wide mouth on a hook (Fig. 2.8). The function of the hook is not directly related to our goal but the design is inspirational enough to point towards considering such a design (Fig. 2.9). The wide mouth gives easy access to the stomach of the hook; it is easy to engage, easily comes-off. And for a consumer level reference of the same design we can look at a fire-bucket hook which has an open mouth (and a blunt nose as well) in its design (Fig. 2.10).



Fig. 2.8: Two Coupling Hooks Performing Their Function.



Fig. 2.9: Clear Image of a Single Coupling Hook.



Fig. 2.10: Clear Image of Hooks Designed for Holding Fire-buckets.

Hooks for fire-buckets are designed to be un-hindering and fast when being used, and they achieve those properties by giving a wide and open mouth design to the hook. As this project needs the same properties for its design, the same will be used for this project as well.

2.5 Finalizing the Hook's Design

Final design of the hook is an amalgamation of all the lessons discussed above about different examples of hooks used in different applications (Fig. 2.11). Each application teaches how different parts of a hook are designed to achieve different functionalities. These lessons greatly helped in crafting an original design for the hook by tailoring every part of it for the needs of this project.

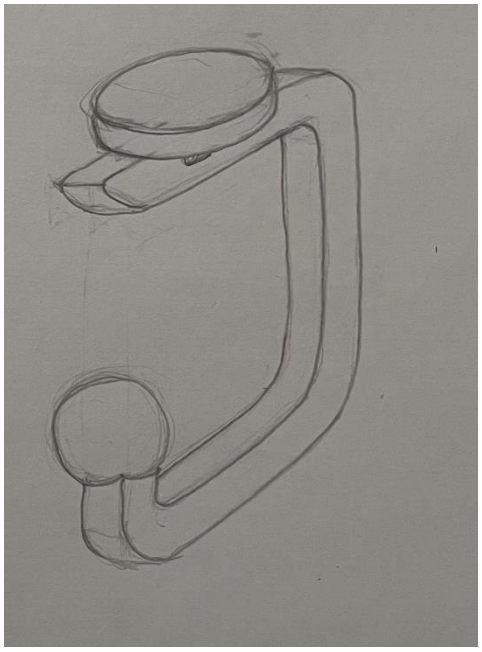


Fig. 2.11a: Final Design of the Hook.

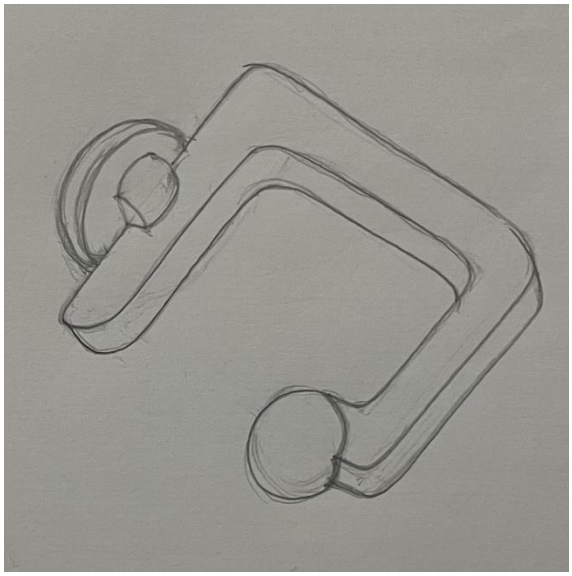


Fig. 2.11b: Final Design of the Hook.

The hook has a spherical blob at the end of its nose; it has a forehead that extends over its nose; it has a shallow stomach; and it has a wide mouth. Thus, this hook will not tangle itself into anything in its surrounding without any deliberation; this hook has a factor of safety and provides an ease of access to passengers that need to handle the hook to adjust their luggage, adjust their stance, etc.; this hook is easy to engage with because any object can easily hang on it and easily come-off from it

without any hindrance or latency; and lastly, this hook can work with a wide variety of handle-types on a luggage owing to its wide mouth that can cover all sorts of dimensions of a handle, that includes shoulder straps as well- for bags that don’t have a handle or might have the handle in a delicate state.

CHAPTER 3

UNDERSTANDING THE STRAP AND ITS ENABLERS

The strap is the tether that attaches the hook to the handle. When the hook is used, the tether takes the weight of the luggage from the hook and transfers that weight to its point of attachment.

3.1 Considerations about the Strap

5

For this project the strap needs to be strong enough to support the weight of the luggage and even the passenger. Fortunately all industrial grade straps that are manufactured for use in transportation are already at those levels of strength. The different examples here in reference images show that it is possible to make a strap that can support a passenger's weight while needing little infrastructure to not break away from its attachment point (Fig. 3.1).

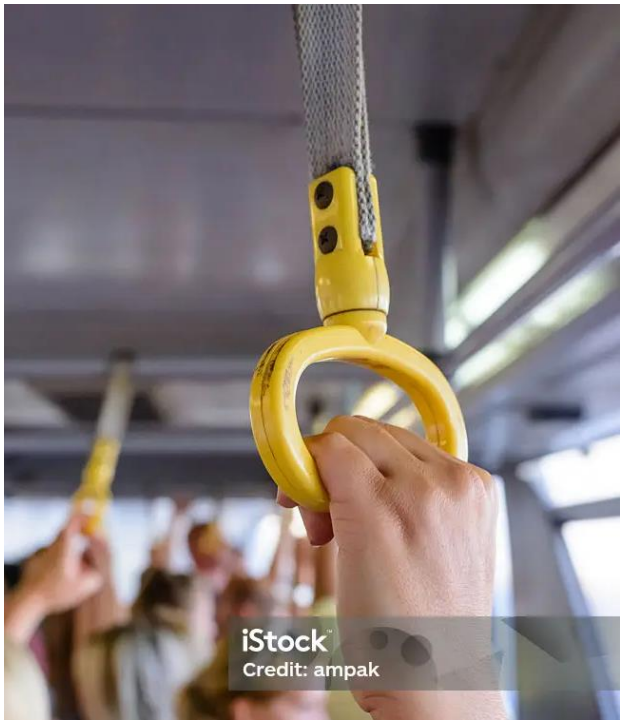


Fig. 3.1a: An Example Demonstrating Weight Bearing Capabilities of a Strap and the Omni-directional Rotating Mechanism of the Handle.



Fig. 3.1b: An Example Demonstrating Weight Bearing Capabilities of a Strap and the Omni-directional Rotating Mechanism of the Handle.

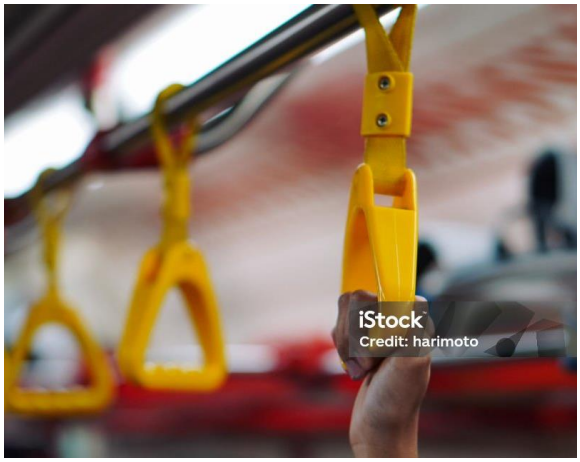


Fig. 3.1c: An Example Demonstrating Weight Bearing Capabilities of a Strap.

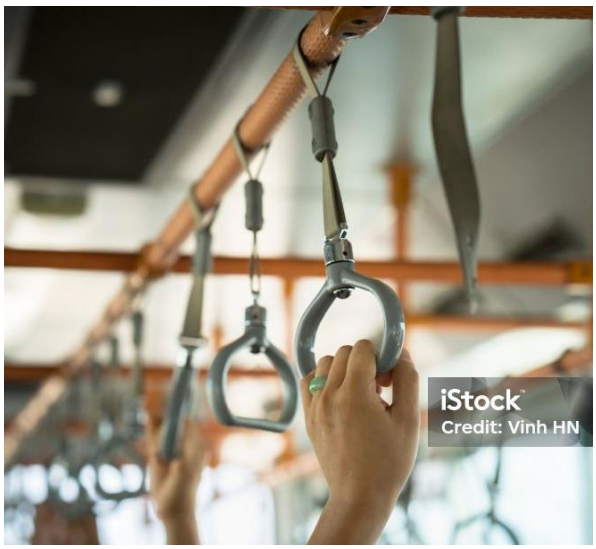


Fig. 3.1d: An Example Demonstrating Weight Bearing Capabilities of a Strap.



Fig. 3.1e: An Example Demonstrating Weight Bearing Capabilities of a Strap.

For this project we need the hook to rotate and face any direction that the passenger requires. Many designs for straps that are used in handgrips throughout the world already use such an enabler that lets them rotate the handle in any direction (Fig. 3.2), we can repurpose that same enabler to attach a hook at its end and that will fulfill our requirements flawlessly (Fig. 3.3).

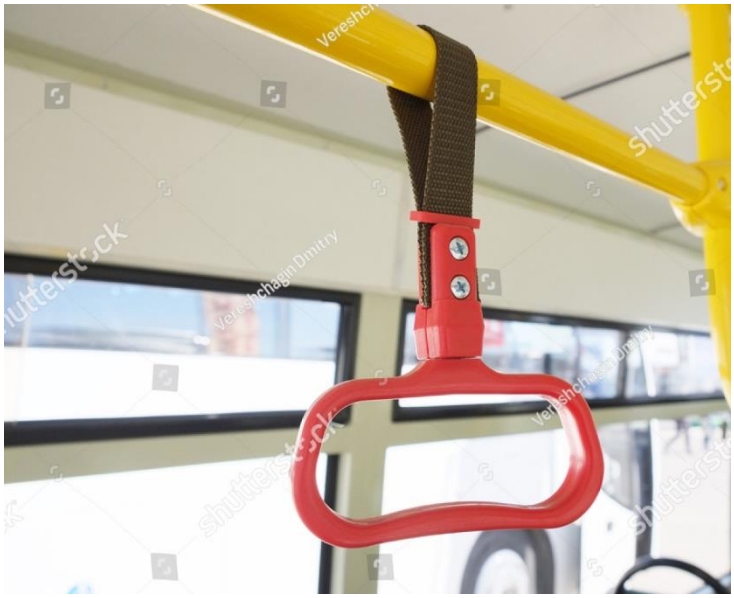


Fig. 3.2a: A Handgrip System that Uses Omni-directional Rotation Enablers.

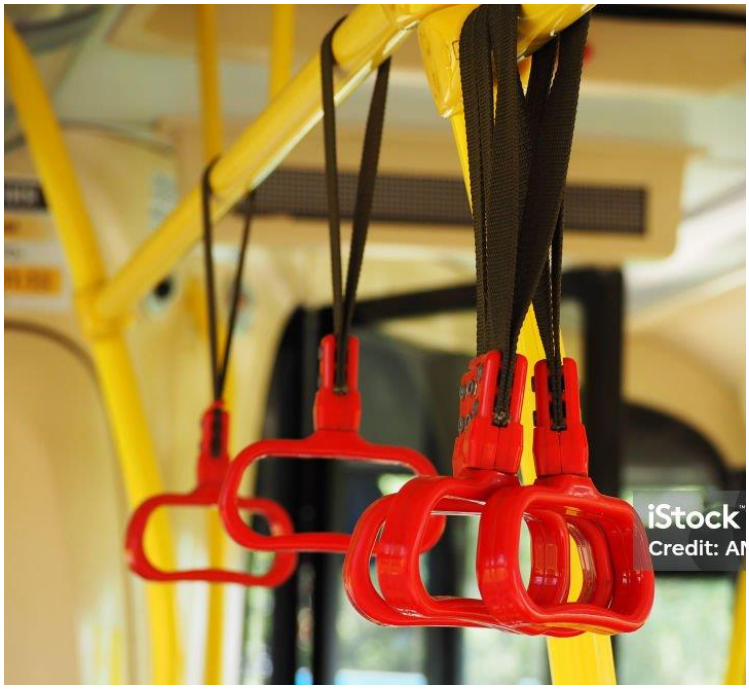


Fig. 3.2b: A Handgrip System that Uses Omni-directional Rotation Enablers.

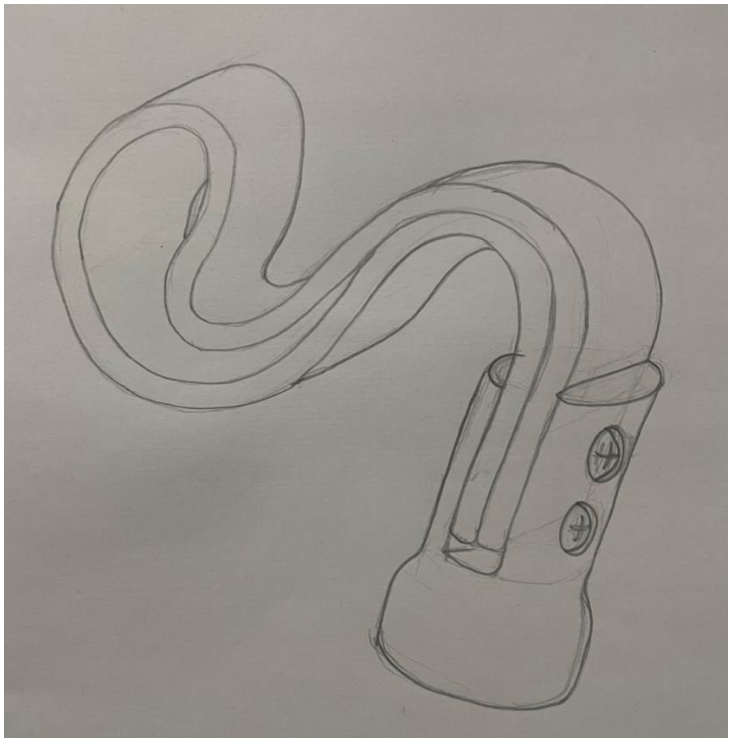


Fig. 3.3a: Our Design for the Hook's Strap with an Omni-directional Rotation Enabler.

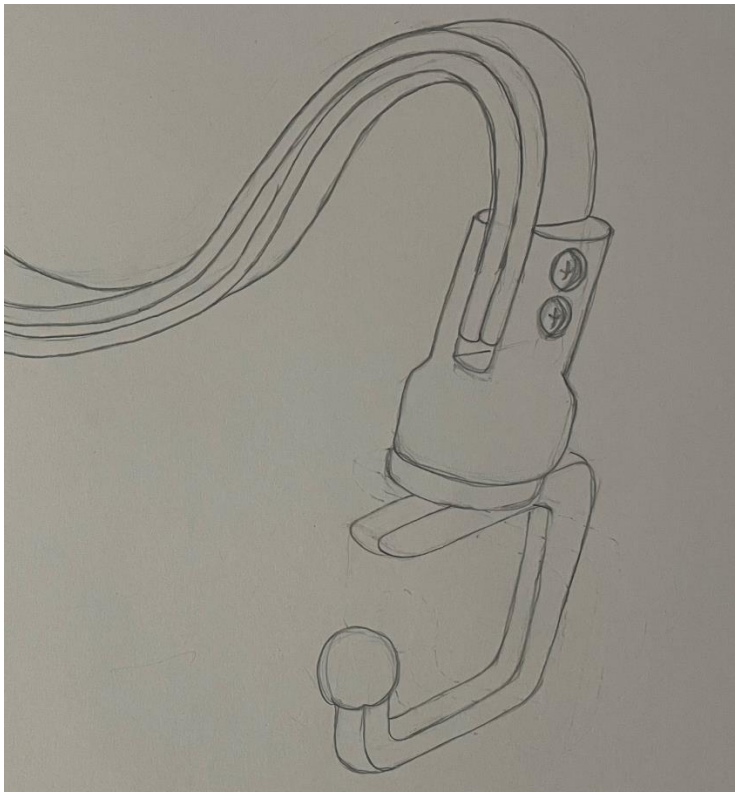


Fig. 3.3b: Our Design for the Hook's Strap with an Omni-directional Rotation Enabler; with a Hook at its End.

The strap will be kept long enough that it ends at the chest of the passenger, so that while the passenger is holding the handgrip, the bag can rest against the chest and can be held with the other hand, which helps to maneuver and manage the hanging bag through the jerks of a commute and the surrounding crowd.

The color grey and black is chosen as the color for the straps as it matches the color of majority of bag-straps that are manufactured in the world. So it is safe to the assume that the same colors are also likely to be the most common amongst the bags of the passengers, thus this way the color of our strap would match with those of the handles and straps of bags.

3.2 Designing of a Hook Holding Collar

The hook-holding collar is another enabler that will hold the hook inside of it when the hook is not in use (Fig. 3.4). It is built in with a push-latch mechanism similar to what is inside a memory card slot in many electronic devices (Fig. 3.5), where pushing the memory card in the slot locks it in the slot and makes a ‘click’ noise and now cannot be pulled out, and to release the card from the slot the card has to be pushed in again which then removes the lock on the card and ejects out the card halfway from the slot which is sufficient enough to grip it with the fingers and pull it out. But here the same push-latch mechanism locks on the back of the hook when it is inserted in the slot and clicked in, and to unlock the hook it is similarly clicked in and the locked back of the hook gets released and it can then come out of the slot (Fig. 3.6). It will be mounted at the top- adjacent to the spring-and-tether of the handgrip, this way the mechanism can hold it out of the way to prevent it from hanging loose and swinging and colliding with anything when it is not in use (Fig. 3.7).

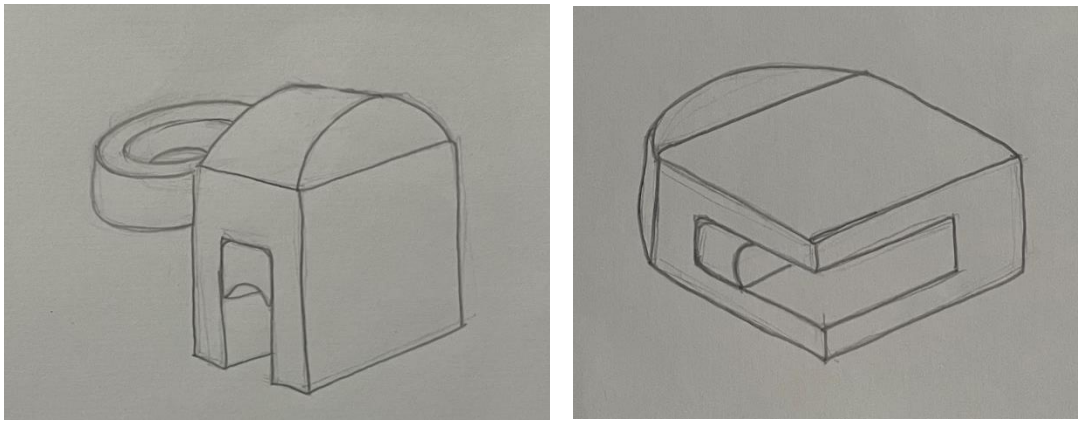
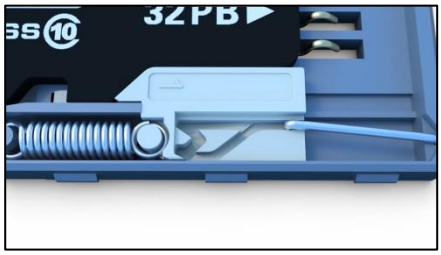
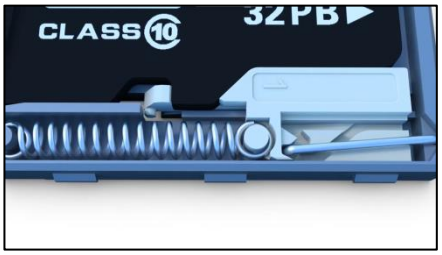


Fig. 3.4: Hook-holder/ Hook Holding Collar from different angles.



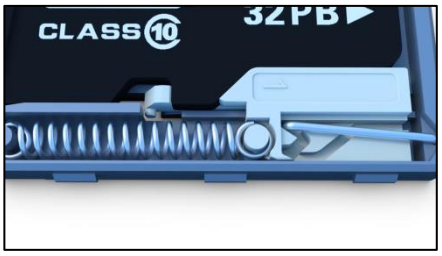
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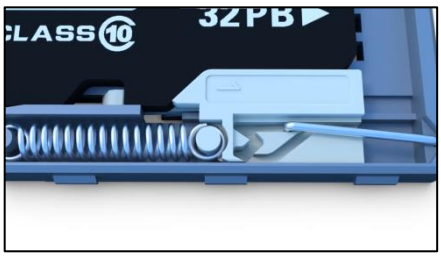
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Fig. 3.5: Push latch mechanism in a memory card slot.

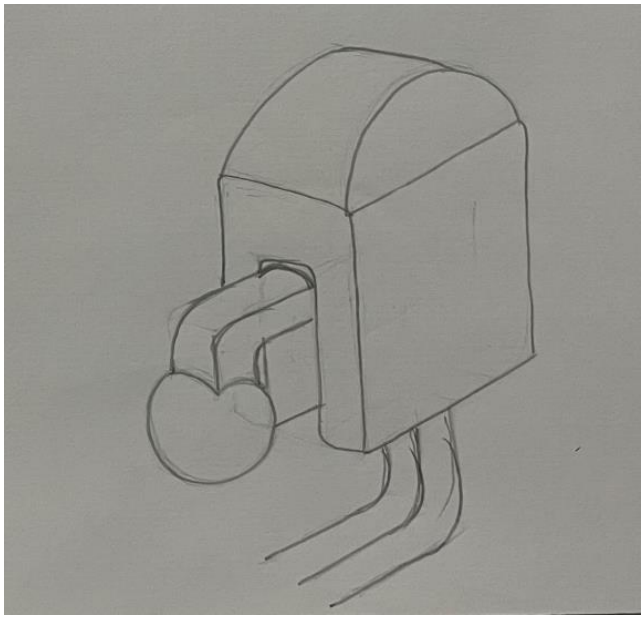


Fig. 3.6: Hook Holding Collar in Action.

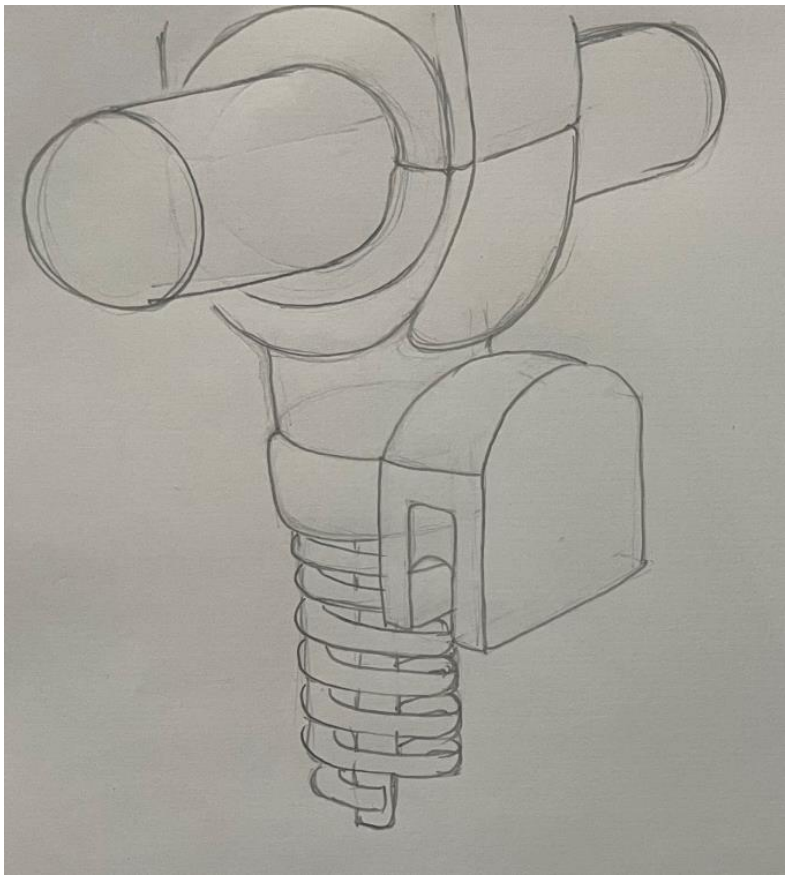


Fig. 3.7: Hook Holding Collar Mounted on its Proper Place; Adjacent to the Spring-and-tether for the Handgrip.

CHAPTER 4

DESIGNING THE HANDLE

The handle is the main component that the passenger interacts with. It provides them with a grip to maintain their balance and in this project it will also incorporate a strap-and-hook system and will be the attachment point for the strap of the hook.

The main challenge about the inclusion of strap in the design is to deploy it without the passenger's fist getting in the way of it. After much iteration, the finalized design for the handle will accomplish this consideration by attaching the strap to a pair of lugs (Fig. 4.1) {horizontal lugs in our case (Fig. 4.2)}, extending sufficiently far from the handle, and to add to that it will also be offset from its usual center further increasing the distance.



Fig. 4.1a: Lugs of a Watch.



Fig. 4.1b: Lugs of a Handle.



Fig. 4.1c: Lugs on a Beam.

4.1 Designing the Lugs

Lugs are where the handle connects to the strap coming from the hook. They are small pieces of the same material as the handle, which extend from it to act as a point of attachment for the hook's strap. They are situated far apart from each

other at a distance called the lug-width. Lug-width is the measurement of distance between the two lugs that is decided based on the width of the strap. Our design incorporates them by flipping them horizontally and using them as the attachment point that will hold the strap.

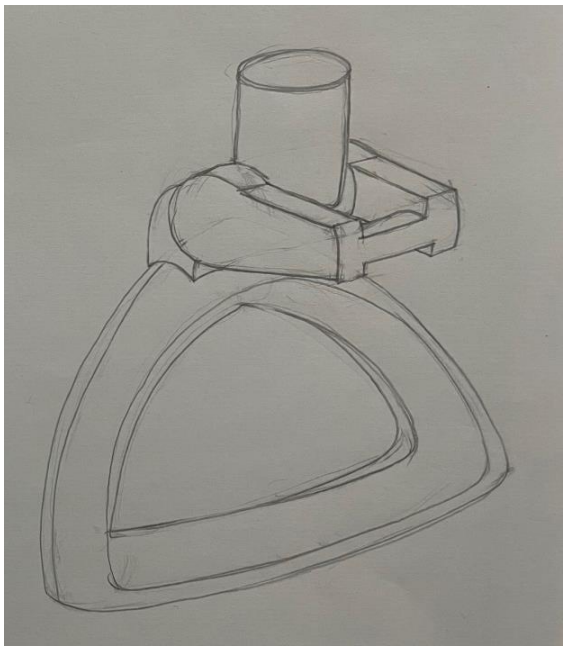


Fig. 4.2a: Horizontal Lugs of the Multipurpose Hanging Handgrip Extending out From the Handle.

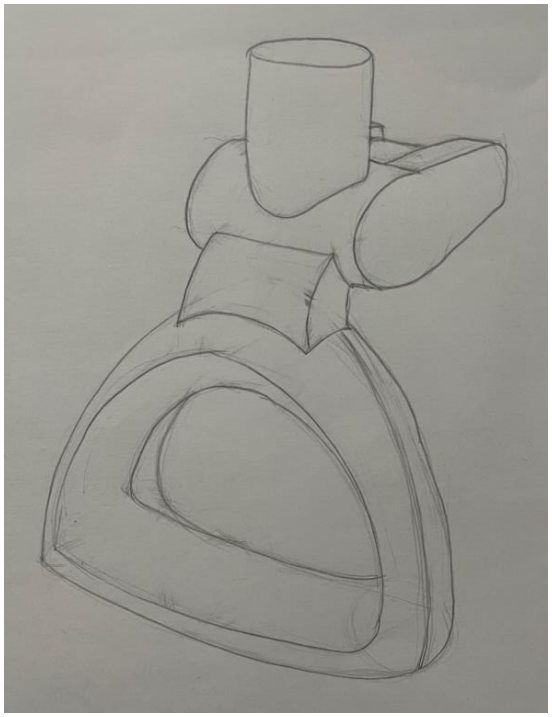


Fig. 4.2b: Horizontal Lugs of the Multipurpose Hanging Handgrip from another Angle.

The proof of concept for this design comes from the fact that this same design feature is already used in handgrips employed in transportation sector throughout the world (Fig. 4.3). These examples demonstrate the weight bearing capacity of this small component and why it is suitable to be included in our design.



Fig. 4.3a: An Example of Handgrip that Uses Lugs to Bear the Passenger's Weight.



Fig. 4.3b: An Example of Handgrip that Uses Lugs to Bear the Passenger's Weight.

The handle has been placed a little off-center to make space for the passenger's fist (Fig. 4.4), so the strap may not touch the fist and keep causing discomfort to the passenger. But by doing so, we have introduced a system that counterbalances the weight of the luggage on the lugs with that of the passenger's own hand, like a tower crane (Fig. 4.5). This makes it easier to maneuver the luggage with the same hand that grips the handle.

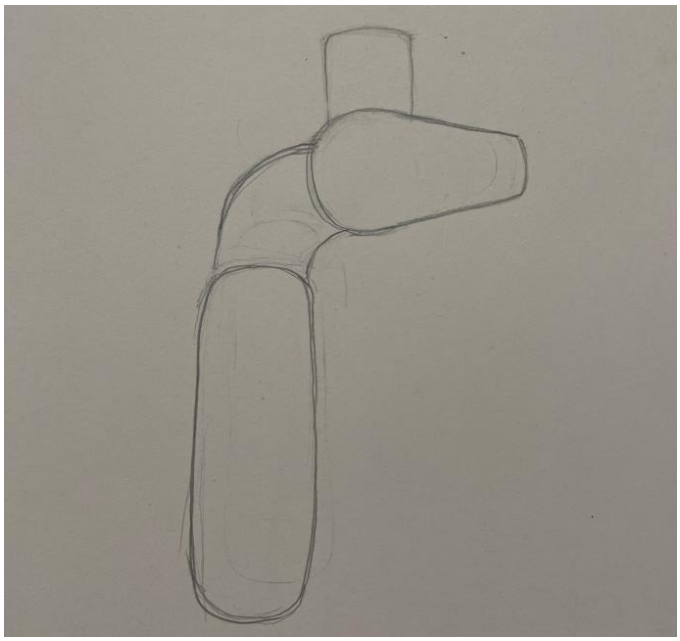


Fig. 4.4: Multipurpose Hanging Handgrip from Side Profile.



Fig. 4.5a: A Tower Crane Hauling Heavy Load.

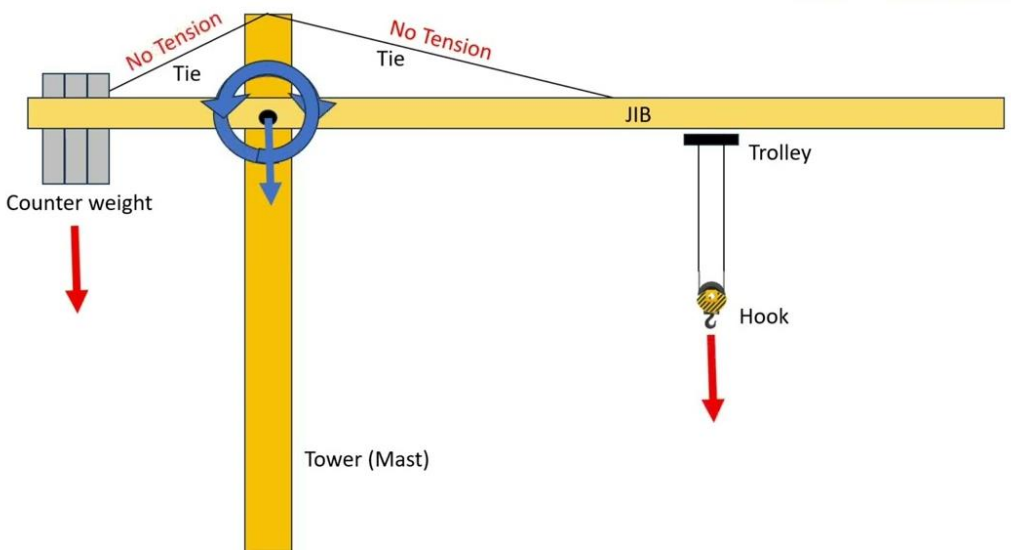


Fig. 4.5b: Forces and There Directions Acting on a Tower Crane.

4.2 Assembling the Elements

In the previous chapters we ventured into meticulously tailoring every component of our product to function masterfully in its respective task. Now, we need to assemble all of them together to make a complete product which will be our solution to the design problem that we have taken up (Fig. 4.6).

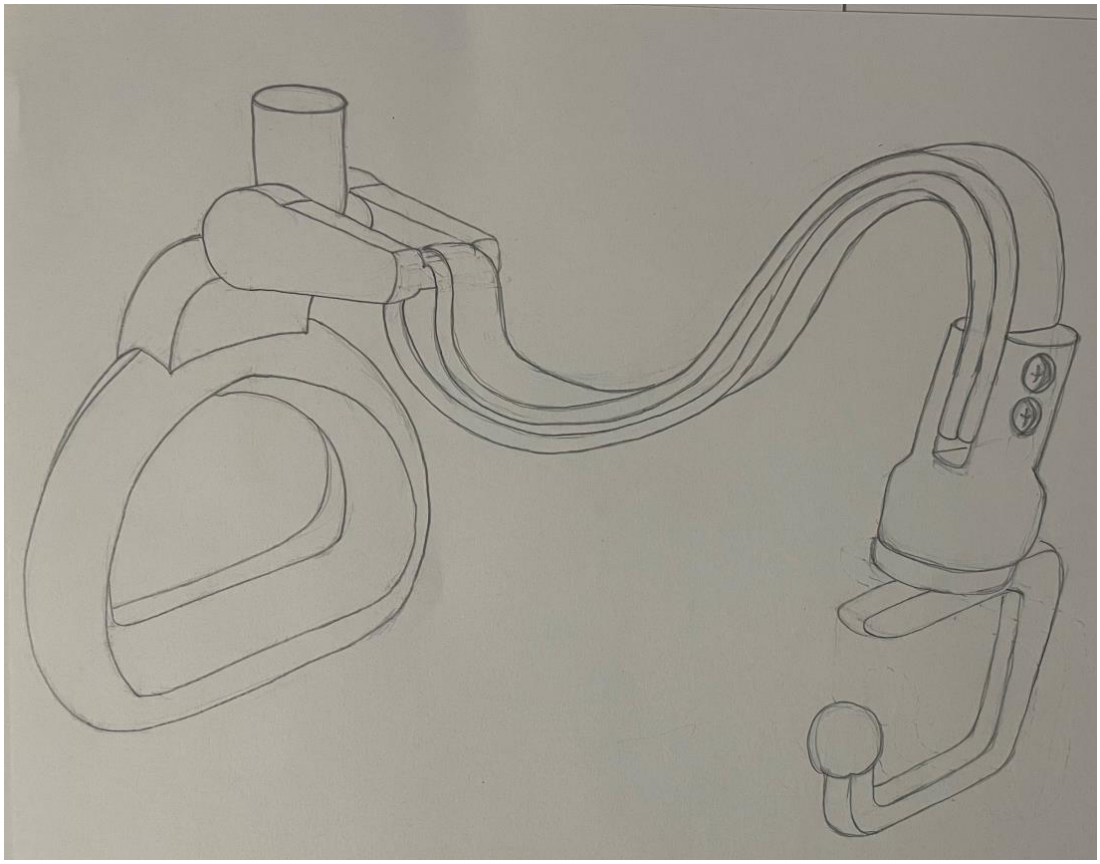


Fig. 4.6a: Final Design for the Multipurpose Hanging Handgrip.

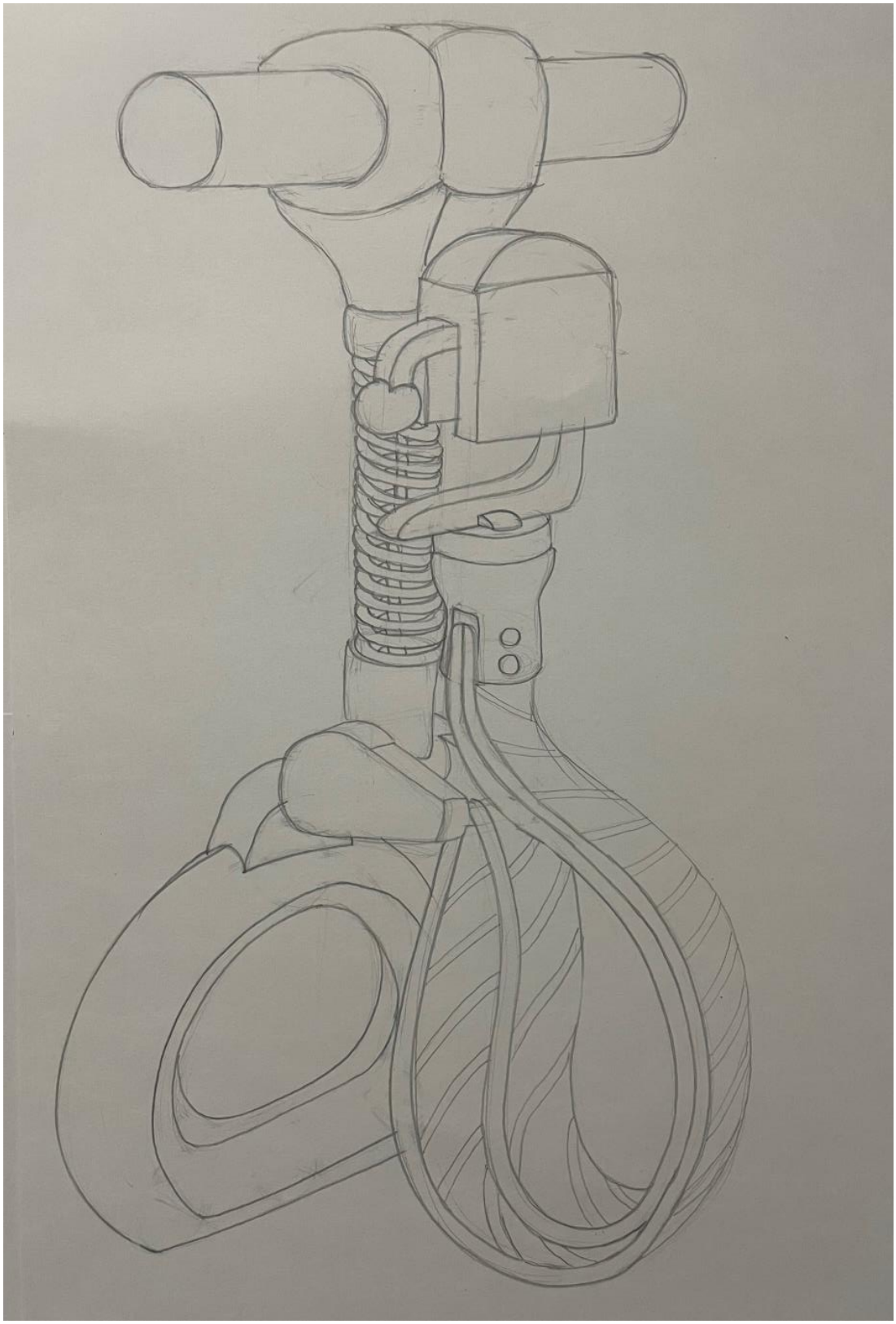


Fig. 4.6b: Final Design for the Multipurpose Hanging Handgrip Mounted on an overhead bar; with Hook Holder Collar.

With this product, the commuters will be able to; hang their luggage on the hook, keep it at a chest-level, easily manage the luggage in a crowd and stand freely (Fig. 4.7).

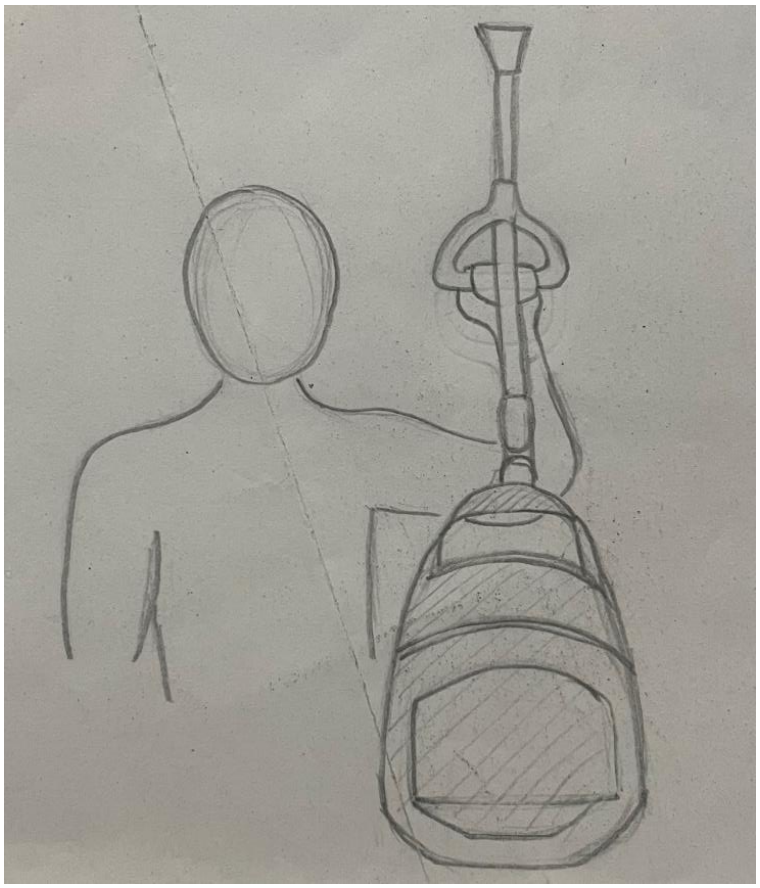


Fig. 4.7: Illustration of a Passenger Carrying His Luggage on the Multipurpose Hanging Handgrip.

And as a final statement to this chapter, it should be stated that the proof of concept for this design of a **multipurpose hanging handgrip** system comes from the fact that in the reference images, it is evident that these elements of designs and their dimensions are already relied upon all around the world in a similar use case. This project is essentially an amalgamation of these elements, like a cut and paste craft project; taking these design elements in their original forms out of their original designs and combining them with each other. So if it works in their original design it will certainly work here because their original form has not been disturbed.

CHAPTER 5

REJECTED ITERATIONS OF DESIGN

Here, all the rejected ideas have been listed; described and illustrated- that seemed good at first glance but came up with drawbacks when dwelled on deeper.

5.1 First Iteration

In the first iteration of idea, to keep the design uniform we use the same spring and cable used by the current handgrips as the tether for the hook instead of the strap and have a split-open style handle configuration where the two halves of the handle would be attached to each other by a hinge and both the spring-cables would be attached to each of the handle-halves (Fig. 5.1). When closed, the hook would be towards the roof and when the passenger would want to use the hook, the handle had to be split open and one half had to be hinged over to the other half and the hook would now be hanging towards the ground ready for use (Fig. 5.2, Fig. 5.3). The drawback of this approach is that this setup will not provide sufficient length for the hook to reach the passengers chest, a hook-setup of this length would keep some part of luggage at eye-level and block the view and be inconvenient all-round.

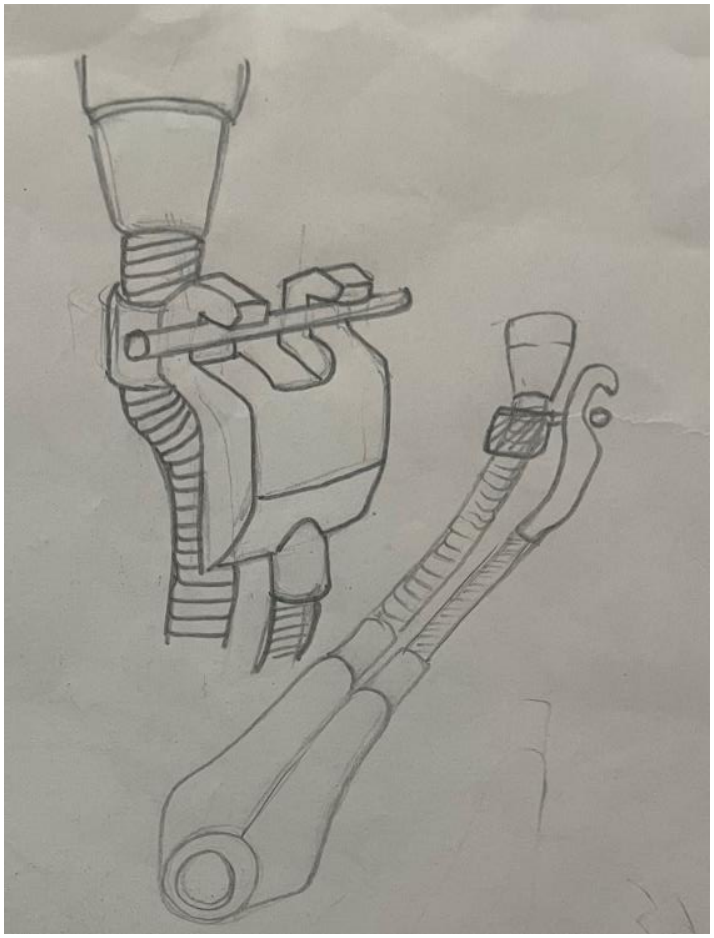


Fig. 5.1: Rejected Iteration One; Split Handle with its Spring Cables and Hook System.

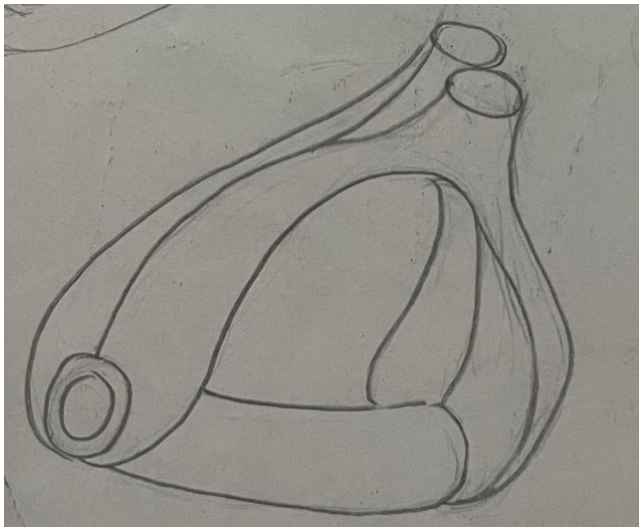


Fig. 5.2: Rejected Iteration One; Split Handle in Closed State.

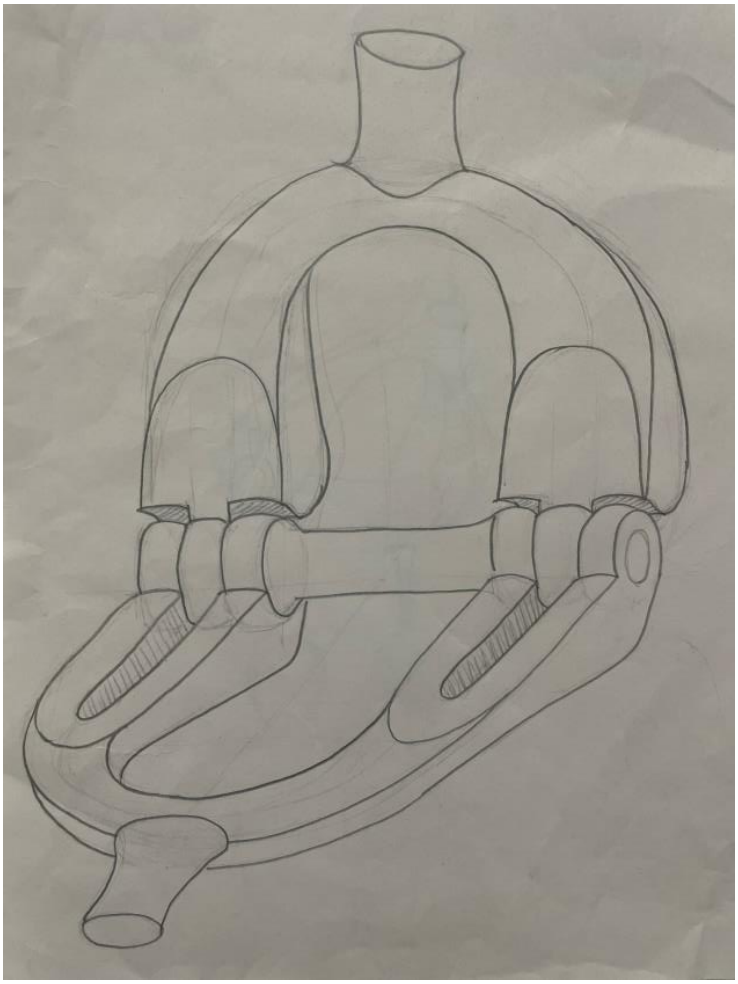


Fig. 5.3: Rejected Iteration One; Split Handle in Open State.

5.2 Second Iteration

Another line of thinking was to fit low hanging hooks around the vertical pole (Fig. 5.4). The hooks, instead of being directly fixed to the poles would instead be attached to a strap so that when the number of bags would increase, the added flexibility of the strap will be able to incorporate them by easily taking overlapping positions. But the drawbacks of this configuration are that the passengers will be away from their bags or risk crowding the pole space and walking people might get the hanging bags in their way.

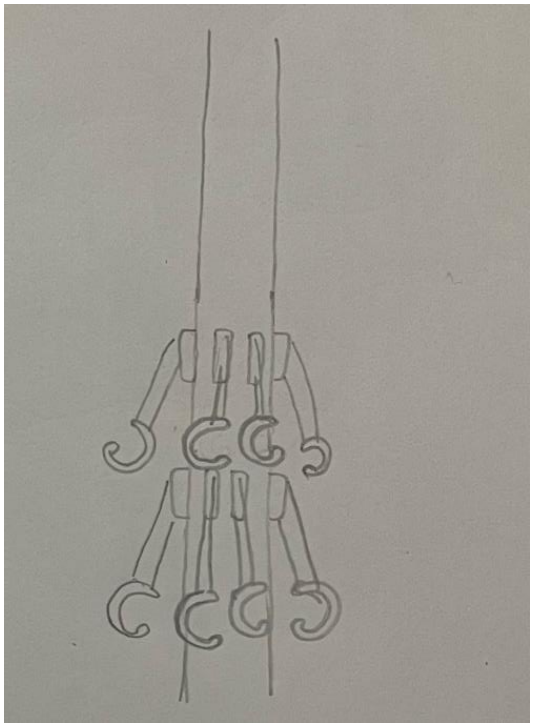


Fig. 5.4: Rejected Iteration Two; Multiple Hooks with Straps Mounted on a Pole.

5.3 Third Iteration

Another option of setting up this amenity was to create the handgrip and the hook system as separate units and have it be directly fixed to the overhead rail, one unit of hook system right next to handgrip (Fig. 5.5). The drawbacks of this approach are that the handgrip and the hook-strap are fixed in their places so over the course of movements to make space for other passengers and shift here and there, the strap would get crossed with the handgrip (Fig. 5.6) and may even entangle with the passenger also, ultimately bothering them by rubbing against the arm or getting caught in front of the passenger's body and pulling back on the shoulder and may even reduce movability. It would then have to be adjusted by letting go of the handgrip, returning the strap to its original side and then hold the handgrip back again.

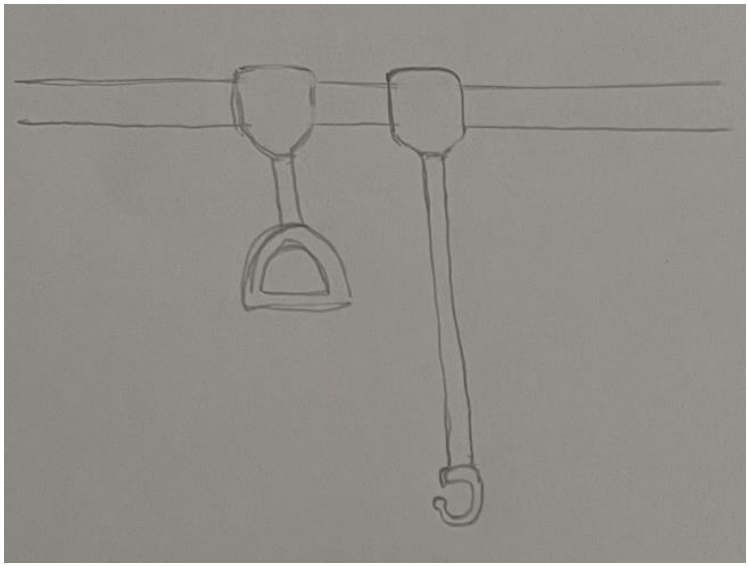


Fig. 5.5: Rejected Iteration Three; Handgrip and Hook System as Separate Entities.

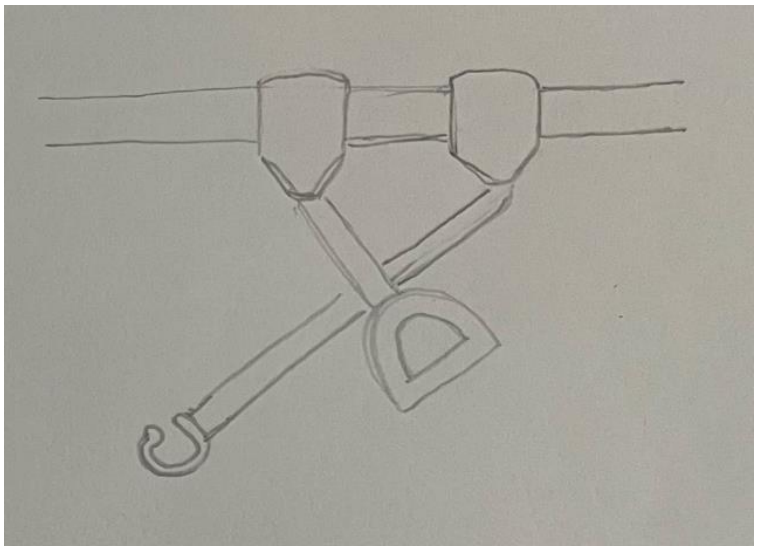


Fig. 5.6: Rejected Iteration Three; Handgrip and Hook System Crossing Each Other.

CHAPTER 6

MISCELLANEOUS TANGENTS TO THE PROJECT

A common behavior of passengers that carry luggage in metro is that- to keep their luggage out of other people's way they look for spaces that are away from the flowing footfall of passengers so they don't have to constantly adjust themselves and their luggage in the crowd. Such places that are aside from the walking area of a metro floor usually include the corner spaces (they can be the corners of a metro coach or the corners at the metro gates) (Fig. 6.1). This means that majority of people with luggage will eventually find themselves in theses corners, where they don't need any kind of overhead handgrip as there is sufficient wall-space to lean on. But what they might require is a way to go through their commute without having to put their luggage on the floor. So, this is another design problem that is similar in spirit to this project. And the solution would be to design a similar hook-and-strap contraption suited to be installed in the corner spaces for this use case. With some tweaks, the design from the multipurpose hanging handgrip that we have made for our project can also be used for this design problem.



Fig. 6.1a: People with Luggage Standing in Corner Spaces.



Fig. 6.1b: People with Luggage Standing in Corner Spaces.



Fig. 6.1c: People with Luggage Standing in Corner Spaces.



Fig. 6.1d: People with Luggage Standing in Corner Spaces.

CHAPTER 7

CONCLUSION, FUTURE SCOPE AND SOCIAL IMPACT

In conclusion, this project opens up the scope for people to uphold their clean habits instead of having to make compromises with them once they are out of the house. By making relevant tools available we can give the passengers a chance at tackling any uncomfortable stuff that comes with a daily life's routine, on their own terms and ideologies. Ideologies like sanitation, responsibility towards others and the unspoken promise of doing things properly are the top sentiments for many people and they would like to have the chance to practice them. This project is a small attempt towards that. Physical-presence of objects that complies with someone's ideologies is a great confidence booster at inspiring them to follow that ideology with even more resolve.

This project will bring benefits to society with its social impact. During a crowded commute when the order of standing won't be feasible with always standing favorably below the hand grips (Fig. 7.1), this multipurpose setup will give the passenger an option to pull the hook strap towards them if they can't find access to the handgrips in a normal fashion and support their weight on that strap to maintain their balance (instead of having to stand in awkward positions to get a reach at the handgrips) (Fig. 7.2). It is already shown through many reference images that all components and their materials that are used for manufacturing a handgrip can support a lot of weight even with thin dimensions (Fig. 7.3).



Fig. 7.1: Passengers having to Stand Directly below Handgrips to Find Access to Them.



Fig. 7.2: Several Passengers Standing Without any Access to the Handgrips Owing to the Order that the Crowd is set in.



Fig. 7.3: Passenger Supporting His Weight on a Handgrip with Thin Dimensions.

Inversely, when the commute is not crowded and the spacing is favorable, this extra point of connection with the handgrip compels the passengers to move closer towards the handgrip and stand directly below the overhead beam that holds the handgrip- this clears the space for moving passengers as the handgrips are strategically situated at the middle beam when near the gates and at the side beams when in front of the seats, so when passengers will stand below those beams they will leave uninterrupted floor space for moving passengers (Fig. 7.4).



Fig. 7.4: Strategic Placing of Hanging Handgrips.

And lastly, with this multipurpose design, passengers can easily carry their luggage in front of them which is in accordance to the rule that says “keep your backpacks in front of you while inside the metro” (which is also frequently announced on the Public-Announcement speakers and is expected of the passengers to follow) (Fig. 7.5). The logic behind this rule is that people while standing near anything will always leave space in front of them for having some breathing room, so if there is always going to be space in front of them then why not bring their belongings in it as well. Instead of carrying their belongings at the back, then making space for minding them and then also leaving room in front leading to taking up double the space; just bringing your luggage in this already existing breathing space at the front will save a lot of space for other passengers. In a crowded commute passengers have to stand in contact with other passengers to make space and they have no major qualms about resting their shoulders and backs on anything, so it is better to have the shoulders and the back vacant at such times and let the front be covered by the luggage.



Fig. 7.5a: A Graphic Portraying Proper Way of Carrying Luggage in a Metro.



Fig. 7.5b: A Graphic from Social Media Describing Travelling Etiquette in a Metro.

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