iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** IV **Month of publication:** April 2024

DOI: https://doi.org/10.22214/ijraset.2024.59810

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

Design and Fabrication of Contactless Conveyor Using Air Pressure

PVN Sai Chandu[1], MR.Chandu Kurla[2], MR.Bhaskar Ranganagiri[3], MR.Prashanth Devaraya[4]
[1]*Associate professor,* [2, 3, 4]*Students of Hyderabad Institute of Technology and Management, Hyderabad, India*

Abstract: ***Nowadays due to rapid increase in technology everything has become automatic without much human interference. Conveyors are the things used in moving the objects from one section to another within an industry or a working place to increase the rate of working with less time cconsumption .Belts chains are the most commonly used components in conveyors as we know. Further upgradation for the technology of conveyors to increase speed and efficiency in working areas CONTACTLESS CONVEYORS can be into the action. Air is the main component with other components like holed sheet, side support rods/rails, conveyor legs, pipes and joints, base frame, supporting frame, mounts and joints, nuts and bolts, screws and joints makes the construction of these conveyors. With air pressure as the main motto Contactless Conveyor works.***

I. INTRODUCTION

The term contactless conveyor refers to as the most clean and efficient way of material transfer due to it's less wastage after the process happening .These are mostly used in packaging industries to transfer light weight products with less power consumption.The main motto in choosing Contactless Conveyors now a days is to minimize the power costs,machinery cost,maintainence cost that are very comman with the tradational conveyors like belt conveyors,chain conveyors,rubber conveyors.It is comman that these produce more wastage due to many components present in the equipment setup .when it comes to Contactless Conveyor there are very less components involved in the equipment setup,there is less possibility of wastage happens.Moreover the efficiency % of input and output are much better than other known conveyor types.Air is the main component involved in these Contactless Conveyor.The pressurized air here acts as the product moving element i.e,which is responsible for the motion and movement of the products for the given distance it meant to cover.All through the research conducted, now we are able to prepare a prototype of the Contactless Conveyor which uses pressurized air as the main component.

II. LITERATURE REVIEW

1) W Zhong, X Gu, X Li, and T Kagawa (2017) introduced a contactless air film conveyor system for transporting large, thin glass substrates using porous pads. Through experiments and modeling, they validated the flow rate characteristics with a modified Forchheimer equation and analyzed the pressure distribution and static stiffness, finding that decreased clearance improves bearing force and stiffness. Their findings, supported by both theoretical and experimental data, contribute to advancements in noncontact substrate transportation.
2) XF Brun and SN Melkote (2009) developed a model to predict the air flow, pressure, and lifting force of a Bernoulli gripper, using a Reynolds stress model and experimental validation to understand how variables like stand-off distance and air flow rate affect performance. Their findings, which align closely with experimental data, offer insights into optimizing the noncontact handling of diverse materials.
3) L Xin, W Zhong, T Kagawa, and H Liu, G Tao (2014) developed an innovative pneumatic sucker designed to efficiently handle rough-surfaced workpieces by employing a rotating air flow mechanism to create a unique suction force, distinguishing it from traditional and Bernoulli suckers. Their research demonstrates through experimental analysis that the device's performance, particularly in terms of suction force and energy efficiency, is significantly enhanced by optimizing a key design variable, the height of the annular gap passage, showcasing its potential in automating complex sorting and packing operations.
4) KC Fan, CC Ho, and JI Mou (2002) introduced innovative aerostatic air bearing and linear slide systems using a multiple-microhole design for improved surface roughness and utilized microfabrication for pad production. Their approach, validated by spectral element method simulations and laser interferometer assessments, showcases advancements in precision and performance over traditional porous-type bearings.

5) CJG Chandra et al. (1990) explored the effects of air film thickness variations on load capacity and air consumption in air bearings, using finite element analysis to compare different air hole patterns (central, triangular, square, hexagonal) on a flat, rectangular base, highlighting how eccentric load centers affect air film distribution and performance.
6) HG Lee (2006) developed a cost-effective air slit levitating conveyor for transferring large flat glass panels like LCDs and PDPs, reducing deflection and air consumption. The model's validity and efficiency were confirmed through experiments and optimization of conveyor dimensions, demonstrating its superiority over traditional porous pad systems in terms of cost and air usage.

III. PROBLEM IDENTIFICATION

There are many prolems we identified while constructing and during research about the conveyor systems of tradational types in use now a days.In comparison to the Contactless Conveyor,the below stated problems we witnessed in tradational type conveyors like belted conveyors,roller conveyors,slat conveyors,chain conveyor,chain driven live roller conveyor,motorized roller conveyor.

1) Damages in conveyor belts
2) less speed due to friction between belt surface and product surface
3) Excessive dust and stagnate formation
4) Maintenance cost is too high to run these conveyors
5) Higher rate of power consumption
6) Rollers and bearings used in gravity conveyors are quite expensive
7) Higher rate of power consumption
8) Efficiency of work is less

IV. CONSTRUCTION AND WORKING

In this project we are constructing a Contactless Conveyor to transport light weight objects with less power consumption and with less wastage,without the application of tradational conveyor belt.Here air pressure is the main concept to perform this experiment.The top surface of the conveyor is made up of Glosssy SS202 sheet with holes punched at specified intervals accordingly.This is firmly placed on the two layer metal sheets attached.On top is the light weight metallic sheet with parallel grooves,attached to the Glossy SS202 sheet.The second layer attached to the first layer metallic frame is been designed with a passage at the centre.This passage acts as the air flow passage to the top surface that's going to be in contact with the products.The passage is connected with a high power blower to produce pressurized air to move the objects.Next comes the supporting frame on which the entire components are been mounted.This supporting frame is made up of a firmly strong metal frame with the likes of stainless steel.

The working is performed with the power required for the connection of high pressure air blower.As the air Blower attached to the power supply starts,the required high pressure air flows through the air passage provided.This pressurized air is evenly distriuted along the grooves of the sheet.After which this pressurized air is been distriuted along the Glossy SS202 sheet top surface,where the product movement is been possible.

V. DESIGN CONSIDERATIONS

The following design considerations are been taken in constructing the above project of Contactless Conveyor using air pressure

1) The material movement should be free of ideal time with continuous flow throughout the process.
2) The material should be selected in a way it should be a standard one with moderate cost.
3) Proper assembly should be done to avoid errors in the project which makes the project unusable.

VI. MATERIAL SELECTION AND CONSIDERATION

Material should be selected by considering all parameters to have a smooth flow especially for the selection of the top Glossy SS202 sheet as it is the main component of the project.This is the area which comes in contact with the material surface.

1) Glossy SS202 sheet[holes encrypted sheet]
2) wooden plywood[groove plate frame]
3) wooden plywood[air passage frame]
4) Stainlesss steel[base frame]

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

VII. DESIGN MODEl AND SOFTWARE USED

Solidworks is the software used to construct below 3D assembly model,and the components with the required specifications

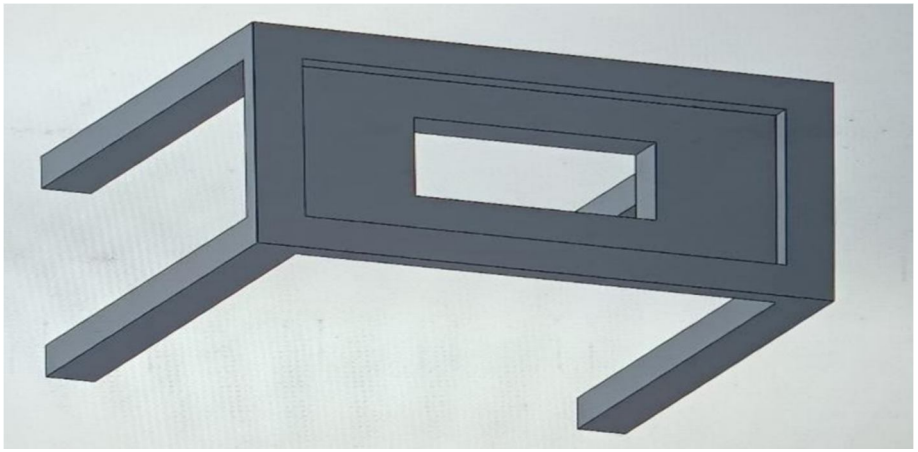


Figure 1-BASE FRAME

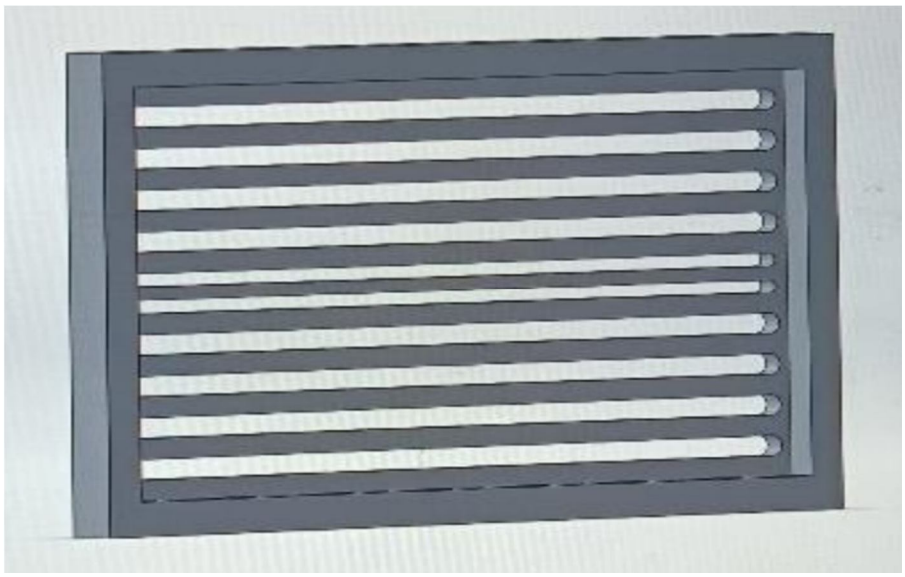


Figure 2-GROOVE PLATE FRAME

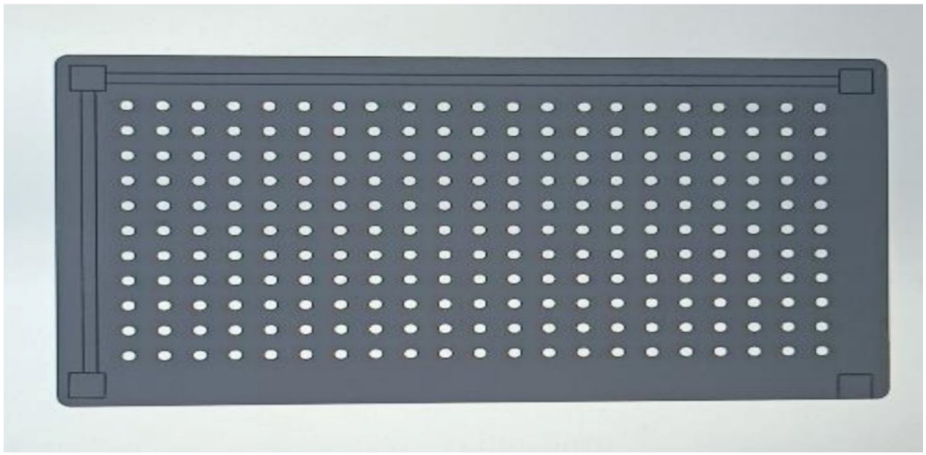


Figure 3-GLOSSY SS202 SHEET

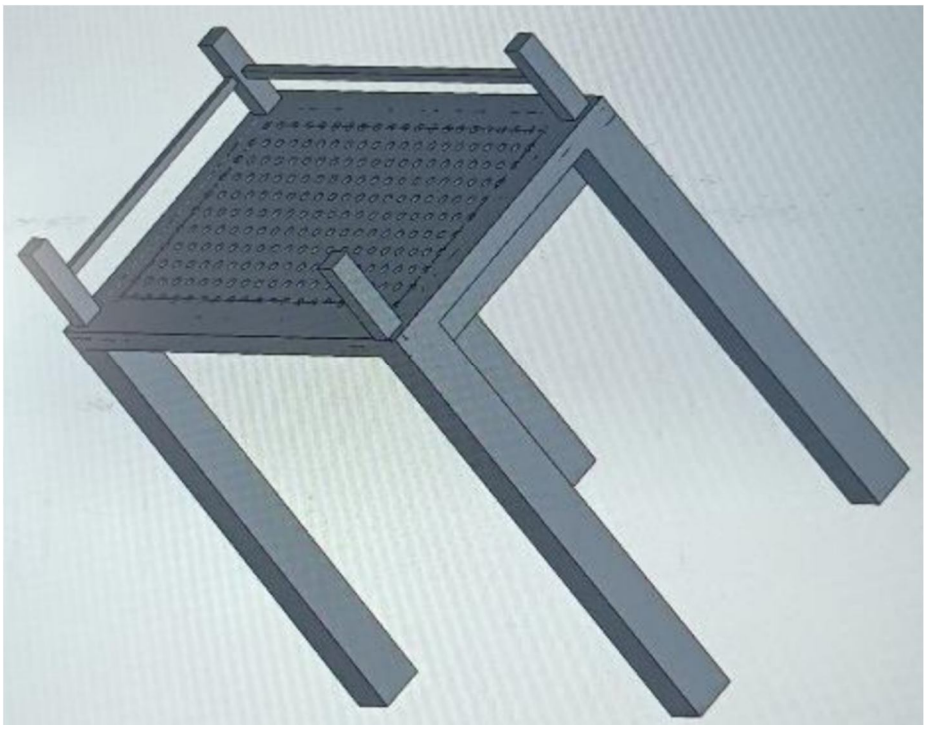


Figure 4-COMPLETE ASSEMBLY

VIII. RESULT

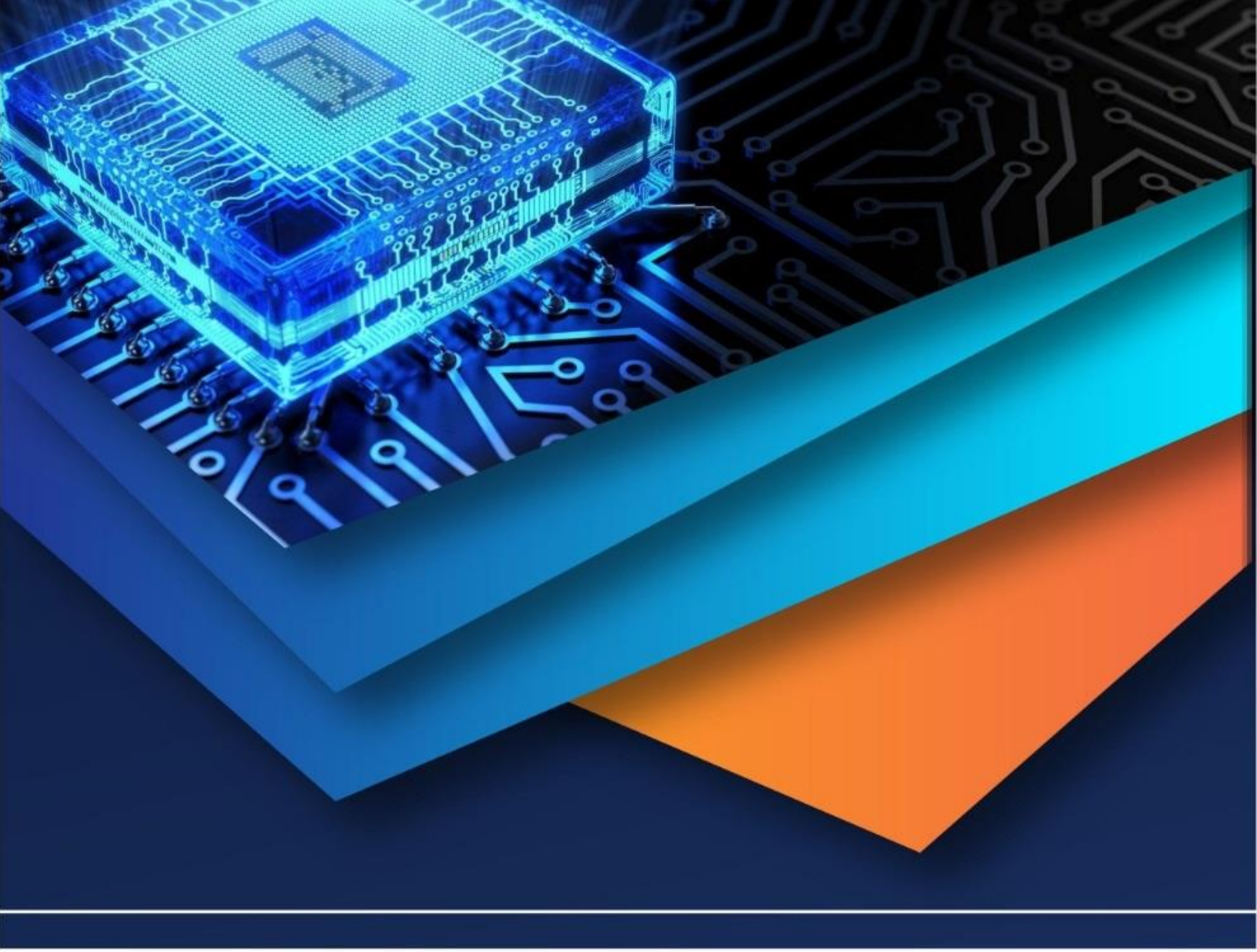
By this project we can move products weight ranges between 100gm-200gm without any ideal time.
Products with less weight and thickness than the above mentioned can move with higher speeds.Rectangle and square shaped ojects can be high preferable moving products

IX. CONCLUSION

By this we conclude Contactless Conveyor using Air Pressure is a clean and efficient way to transport light weight objects.which can be implemented in Packaging Industries seeking to have a clean product transport process,as power required and equipment cost is minimal in this type of conveyors.

REFERENCES

[1] Zhong W., Xu K., Li X., Kagawa T. Study on the basic characteristics of a noncontact air conveyor for large glass sheets. Adv. Mech. Eng. 2017;9 doi: 10.1177/1687814017697190. [CrossRef] [Google Scholar]
[2] Ren S., Cai M., Shi Y., Xu W., Zhang X.D. Influence of bronchial diameter change on the airflow dynamics based on a pressurecontrolled ventilation system. Int. J. Numer. Method Biomed. Eng. 2017;34 doi: 10.1002/cnm.2929. [PubMed] [CrossRef] [Google Scholar]
[3] Brun X.F., Melkote S.N. Modeling and prediction of the flow, pressure, and holding force generated by a bernoulli handling device. J .Manuf. Sci. E-Trans. ASME. 2008;131:351–358. [Google Scholar]
[4] Li X., Zhong W., Kagawa T., Liu H., Tao G. Development of a pneumatic sucker for gripping workpieces with rough surface. IEEE Trans. Autom. Sci. Eng. 2016;13:639–646. [Google Scholar]
[5] Fan K.C., Ho C.C., Mou J.I. Development of a multiple-microhole aerostatic air bearing system. J. Micromech. Microeng. 2002;12:636–643. doi: 10.1088/0960-1317/12/5/319. [CrossRef] [Google Scholar]
[6] Chandra C.J.G., Spinivas Y.L., Seetharamu K.N., Parameswaran M.A. Investigation of air film conveyor pressurized through multiple holes. Finite Elem. Anal. Des. 1990;6:235–243. doi: 10.1016/0168-874X(90)90029-E. [CrossRef] [Google Scholar]



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY