ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 15, March 2017

VERTICAL MATERIAL HANDLING SYSTEM

Sivabalan.KS
B Tech Student
Mechanical Engineering Department
Jai Bharath college of Management and Engneering Technology, Arackappady,perumbavoor,Ernakulam
sivabalanks96@gmail.com

Mathews M
Professor
Mechanical Engineering Department
Jai Bharath college of Management and Engneering Technology, Arackappady,perumbavoor,Ernakulam
Mathewsm265@gmail.com

ABSTRACT--*The purpose of this project is to introduce a new mechanism other than the very conventional methods used for material handling. Various manufacturing processes are carried out on multiple floors. The need of an efficient and compact material handling system in vertical direction is arising day by day which will transfer the material at higher rate than some existing material handling system. We have developed a system working on a mechanism which is obtained by fixing the cam of a single slider cam chain. The system is compact and works on inversion of single slider crank chain similar to piston cylinder arrangement in I.C. engine.*

Keywords—Cam Mechanism; Ver tical Material Transfer

I. INTRODUCTION

We are focusing on the material handling which takes place between two manufacturing stations which are placed one above the other. For doing so nowadays inclined conveyors are used. Conveyors consume more floor area to transfer material. Thus we have developed a system working on a mechanism which is obtained by fixing the cam mechanism. The system is compact and works on cam mechanism similar to piston cylinder arrangement in I.C. engine. The system transfers the material vertically in n number of steps. Each step consists of crank, connecting rod and piston arrangement. As the cam rotates piston reciprocates inside the guides provided. Height of piston is increased in every step. Here eight cams are mounted on one shaft at 180 degree to each other. The top of piston is inclined at an angle with the horizontal. The object is transferred from one piston to next piston after every 180 degree of crankshaft revolution. Thus after every step a certain height is achieved by object. After reaching the peak in every step the material is transferred to the next piston which is at its bottom most position. To move the material up, piston height is increased in every step by certain calculated value. The height achieved by piston in every step is equal to diameter of crank. To transfer the objects with small width this system is more effective. As the width of the object goes on increasing the length of system will also increase. The length can be reduced by increasing the crank diameter which will reduce the number of steps required and thus reduces the length..

II. MATERIALHANDLING

. Starting from the time, raw material enters the factory gate and goes out of the factory gate in the form of finished products, it is handled at all stages between, no matter it is in stores or on shop floor. It has been estimated that average material handling cost is roughly 20 to 60 % of the total cost. It thus, becomes clear that the cost of production of an item can be lowered considerably by making a saving in the material handling cost.

III. ACTUAL MECHANISMS

1	Conveyor	Large floor area required
2	Robotic Arm	High cost for components
3	Cranes	At a time only one material can be handled
4	Manual handling	Huge effort is required and also time consumption is high

CONVEYOR

Conveyors are used to transfer material from one station to another station.It needs more floor area.Consider the workers are working on ground and firstfloor. The scope of our system is to transfer the material from the conveyor on ground floor to theconveyor on first floor automatically and continuously.A storage and retrieval system is shown in figure. Our system can be used to transfer thematerial to

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 15, March 2017

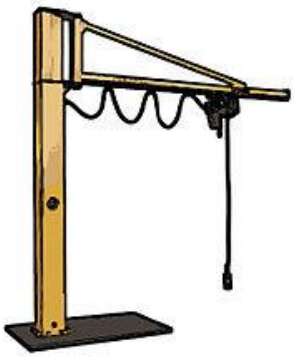
these multi-level racks. The system can be made mobile so that it can be moved.

ROBOTIC ARM

Whenever technically and economically feasible, equipment can be used to reduce and sometimes replace the need to manually handle material. Most existing material handling equipment is only *semi-automated* because a human operator is needed for tasks like loading/unloading and driving that are difficult and/or too costly to fully automate, although ongoing advances in sensing, machine intelligence, and robotics have made it possible to fully automate an increasing number of handling tasks.

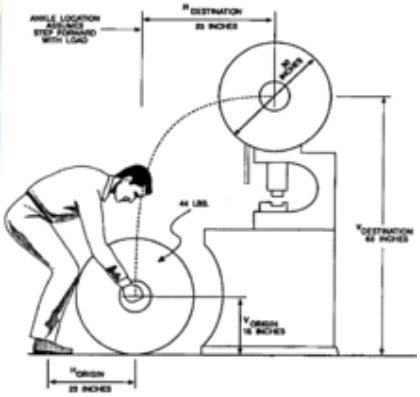
CRANES

Cranes are used to transport loads over variable (horizontal and vertical) paths within a restricted area and when there is insufficient (or intermittent) flow volume such that the use of a conveyor cannot be justified. Cranes provide more flexibility in movement than conveyors because the loads handled can be more varied with respect to their shape and weight. Cranes provide less flexibility in movement than industrial trucks because they only can operate within a restricted area, though some can operate on a portable base. Most cranes utilize trolley-and-tracks for horizontal movement and hoists for vertical movement, although manipulators can be used if precise positioning of the load is required.



MANUAL HANDLING

Manual handling refers to the use of a worker's hands to move individual containers by lifting, lowering, filling, emptying, or carrying them. It can expose workers to physical conditions that can lead to injuries that represent a large percentage of the over half a million cases of musculoskeletal disorders reported in the U.S. each year, and often involve strains and sprains to the lower back, shoulders, and upper limbs.



IV. CAM MECHANISM

In this system the rotation of the motor is to be stopped after every half revolution for certain time period so

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 15, March 2017

that the material gets transferred. Then motor should start and complete the next half revolution and again stop. To achieve this square cam mechanism is used.

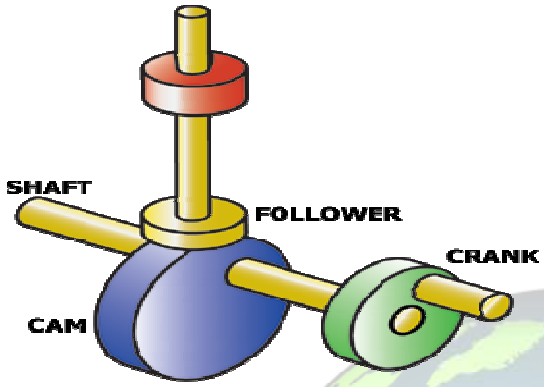


figure 1V.1 cam mechanism

V. WORKING PROCEDURE

Consider the smallest piston at the bottom most position it picks up the object to be transferred from lower level. Then its forward stroke begins when it reaches the top most position its top surface coincides with that of the next piston. At that time the second piston will be at its bottom most position. The crank rotation will stop until the object is transferred from first piston to second piston. As the transfer is complete the crank will start rotating and forward stroke of second piston starts. As the second piston reaches its top most position the object will slide down to third piston which will be at its bottom most position. Similarly material is transferred from one step to other till the last step. In this mechanism if the pistons at odd position are having bottom most position, the pistons at even position will have reached top most position and vice-versa. As explained above the crank rotation is to be stopped after every 180 degree of rotation. This is achieved by means of a limit switch arrangement which will stop the crank rotation for specified time after every 180 degree of crank rotation. The height achieved by the object will almost be equal to six times of crank diameter.

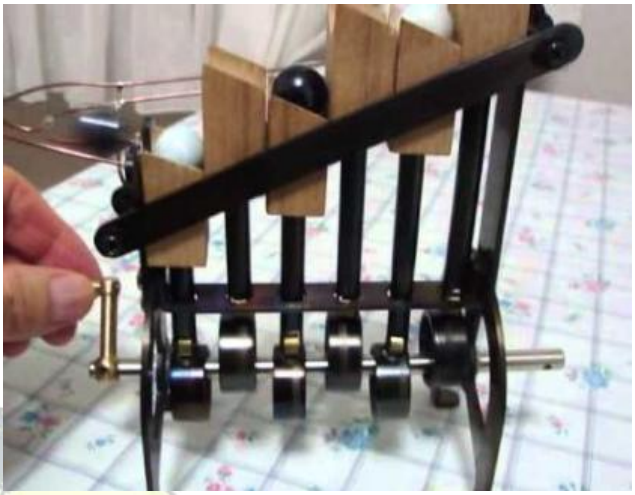


Figure 3.1 Working Model

VI. DESIGN CALCULATION

Specifications of system designed and manufactured by us are given in table 1.

1	Radius of cam	20
2	Weight carried by one piston	15N
3	RPM for Cam	30 RPM
4	Total surface area consumed	0.25 M^2
5	Total height achieved	0.75M
6	Number of steps required	8

SHAFT

It is made by wooden piece. Its dimension is 50mm diameter and 900mm long.This shaft is designed to transmit a power of 1375 Nm.The shaft is running 30rpm and deliver a power of 4.5 kw

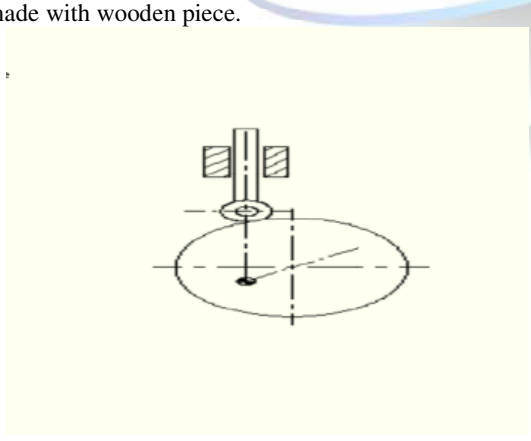
ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 15, March 2017

PISTON

The piston is a rectangular box.Which is made by the wooden piece.The working area of the piston is 200mm x 80mm.The top surface is inclined at an angle of 30 Degree.

CAM

The cam is made in a circular shape.And a hole is drilled eccentrically for obtaining the purpose of cam.From design section the diameter of shaft is obtained as 200mm.The cam is made with wooden piece.



CONNECTING ROD

The connecting rod is a square shaped rod of 50mm size.It is also to be made with wooden piece

VII. RESULT

From the above seminar paper it is clear that, The vertical material handling system is more effective than the other conventional mechanisms.Using this mechanism we can easily transfer material in vertical direction with less cost and more effectively.This system consume very less floor area as compared with conveyors.The cost of this system is also very less as compare with other conventional methods.The model which we have prepared lifts a 50 mm wide object to a height of 1150 mm consuming 0.5 meter horizontal length.

VIII. CONCLUSION

An efficient and fast system has been developed for material handling in vertical direction.The designing of each and every part has been carried out as per the standards used globally.The system is a better option for current methods used for material transfer in vertical direction such as inclined conveyors, lifts etc. which consume more space, time and money. The above section illustrates the disadvantages of a conveyor system. This system can be used to transfer fluids without spilling out.

REFERENCES

[1] Isam Jasim Jaber and Ajeet Kumar Rai, "Design and Analysis of I.C. Engine Piston And Piston-Ring Using Catia and Ansys Software" International Journal of MechanicaEngineering & Technology (IJMET), Volume 5, Issue 2, 2014, pp. 64 - 73, ISSN Print: 0976– 6340, ISSN Online: 0976 – 6359.

[2] Ali Salah Ameen and Dr. Ajeet Kumar Rai, "Analysis of Electronic Chips Microchannel By Using Ansys Software" International Journal of Advanced Research in Engineering & Technology (IJARET), Volume 5, Issue 7, 2012, pp. 47 - 56, ISSN Print: 0976-6480, ISSN Online: 0976-6499.

[3] Whaleed Khalaf Jabbar and Dr. Mohammad Tariq, "Analysis of An I.C. Engine Using Water Cooling Technique" International Journal of Advanced Research in Engineering & Technology (IJARET), Volume 5, Issue 4, 2012, pp. 68 - 87, ISSN Print: 0976-6480, ISSN Online: 0976-6499.