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Automated Storage and Retrieval System

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Abstract:- Automated Storage and retrieval System is known as ASRS which is controlled by a mechanical system. ASRS can be shown in the complete operation system where the system has been moving in very narrow places and in high quality orders. The system has introduced many advantages in the production, storage, distribution, and customer services. The project has three different directions based on X-axis, Y-axis, and Z-axis. ASRS proved its efficient work in world organizations and in world libraries using the specific mechanical motors. In this project we have designed, built and tested prototype ASRS depending on Servo Motor that has helped in moving different weights and sizes of packages from a place to another. The project has used the three types of axes to save time and to reduce the cost of manpower working in the storage tasks. In addition, in small areas and in libraries people need to transfer items from places to others and this project could have helped them without effort. Furthermore, special needs people have been going to use this project in simple methods with simple mechanical efforts.

I. INTRODUCTION

An automated storage and retrieval system AS/RS is an advance system that enables the user to get the storage and retrieval done by sitting in front of computer.

The system is used to use the floor area wisely and not just waste it for storing material. Big industries have big warehouse they have verticle racks for storing the material in that.

If these industry rely on human being for there storage and retrieval they will end up in wasting much of its time in storing and retrieving only . so in order to compensate the wastage of time automated storage systems are used.

They consists of a variety of computer-controlled systems for automatically placing and retrieving loads from defined storage locations. Automated storage and retrieval systems (AS/RS) are typically used in applications where.

- Large quantity of loads being moved into and out of storage.
- There is a space constraint for storage density.
- When the motive is only storing and retrieving.
- The materials are expensive that require precise movement.

An AS/RS can be used with standard loads as well as nonstandard loads, meaning that each standard load can fit in a uniformly-sized volume; for example the tools in a company for making particular type of product are placed in a standard box which is placed somewhere on the vertical rack whenever required the box is called by the AS/RS stacker.

II. AS/RS DESIGN

➢ *Major component of system*
- Storage Rack
- X axis assembly
- Y axis assembly
- Slide for Z-Axis movement

A. Storage Rack

The storage rack is a simple structure that is used to hold the inventory in verticle racks. The storage rack 3x3 no. of racks with aluminium angles to hold the container.

Let nx = number of load compartments along the length of the aisle = 3 and ny = number of load compartments along the height of the aisle = 3.
Therefore, capacity = nx × ny……..(i)
apacity = 3 × 3 = 9 storage compartments.
Width = z = 25 cm
Length = nx (x + b) ……(ii)
length= 2 (30+ 4) = 68 cm
Height = ny (y + c) ……(iii)
height= 2 (15 + 4) = 38 cm
Thus, the Storage Volume available = 9(25*30*15)= 90000cm3.

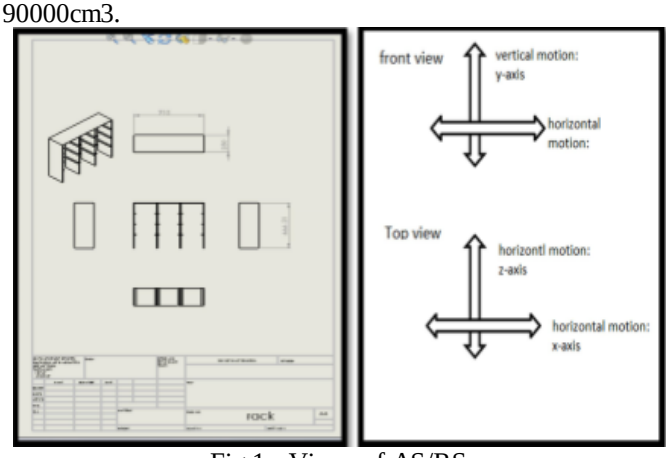

Fig 1:- Views of AS/RS

B. X-Axis Assembly

Chain sprocket assembly is used for horizontal movement(x axis). The width of the storage rack justifies the use of chain and sprocket assembly.

A horizontal carrer is used for the movement with 4 tyres , 2 on each side which runs on the aluminium guided channel in order to get precise and friction less movement.

F= friction force to overcome for sliding
F= 0.3*10*9.81
F= 29.43
Considering factor of safety
F=58.86
Now torque
T=58.86*0.08/2
T=2.35NM.

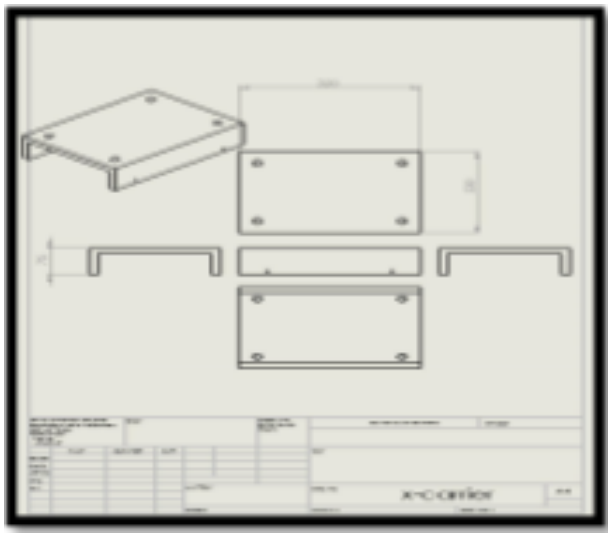

Fig 2:- X Career

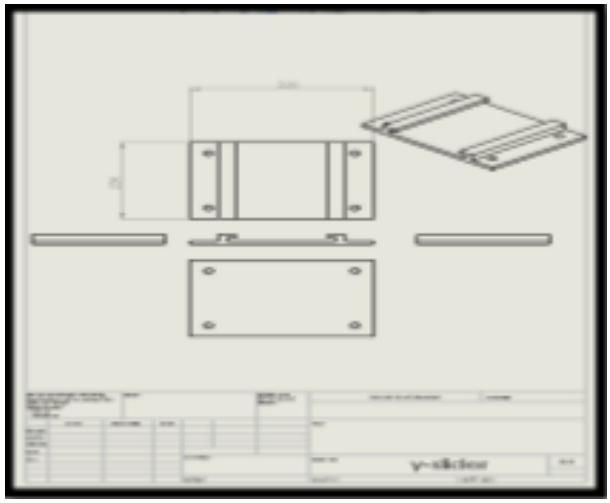

Fig 3:- Y Career

C. Y-Axis Assembly

Rope and pulley arrangement is used to get the motion in vertical direction . the vertical career is made with the nylon sheet with 4 holes in the career in which 4 holes are drilled to fix the linear bearing which aids in the smooth movement of the vertical lift .
T=F*D/2…….(iv)
F= Tension in the rope
T= Torque required
D= diameter of pulley Now,
F= weight of vertical career to be lifted
F= 2.5*9.81
F= 24.525
Taking safety factor into consideration
F=2*24.525
F= 49.05=50N
T= force *
radius……(v)
T=50*0.03= 15NM

D. Slide for Z Axis

The z axis is equipped with the rack and pinion for its movement . the rack is feixd on the bottom of the z axis career. Also on the bottom of the career 2 sliders are fixed of 20'' inch length that holds the career for any deflection and provides asmooth movement to the slide.
F= friction force……..(vi)
F= 2.5*0.3*9.81
F= 7.35N
Taking Safety factor into consideration
F= 2*7.35N
F= 15
N Required Torque
T= force * radius of pinion
T= 15*0.03
T= 0.45NM

III. FINAL ASSEMBLY

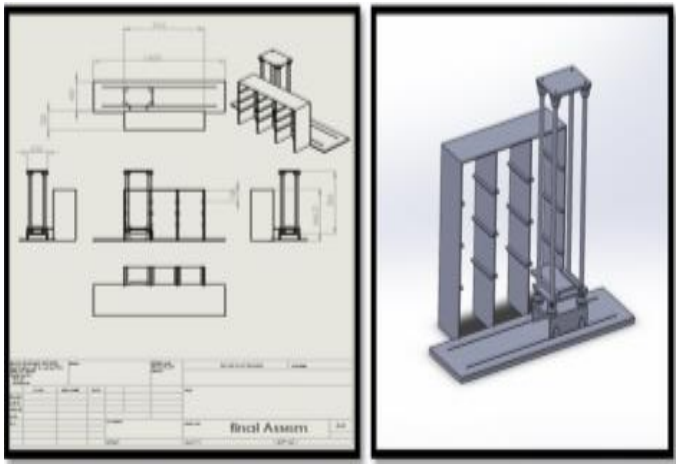

Fig 4:- Final assembly

IV. CONCLUSION

This research summarizes our attempt at designing an Automated Storage and Retrieval System. The most optimum design and methodologies have been presented here. This can be further used to make working models of what is now on paper. Variations in the design as per requirement can be done, with proper implementation of mechanical and electronic components, variety of automation can be achieved, which can be as complex, versatile. This model can serve as a reference for various applications, some of which are automatic car parking system, automatic baggage handling for loading/unloading at airports, inventory and raw material management in large industries, automated parcel sorting in postal services, books management.

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