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FABRICATION OF HAY BUCKING MACHINE

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Abstract
Bucking is an act of throwing hay bales up to a higher level. "**Hay Bucking**" is a type of manual labor where hay bales, are stacked by hand on a vehicle for transportation, the work is very strenuous and physically demanding, to reduce the fatigue of the worker we use a machine which can carry the hay bales vertically and drop them onto a vehicle. Hay is carried by carriers welded on a chain drive mechanism which is driven by a motor. This is a **prototype** and in actual the carrying capacity of the machine can be further increased by increasing the motor capacity.

Keywords: Mechanical Advantage, hay bucking.

Introduction

From about 9400 years ago humans have been growing paddy and harvesting rice every year for human survival. Since its spread, rice has become a global staple crop important to food security and food cultures around the world. After harvesting this paddy, hay gets left over in the fields. This hay is widely used in feeding livestock across the globe.

Hay is one of the most important foods for many animals. All the cattle mostly consume hay as food to survive. This hay is transported from agricultural fields to the animal farms through vehicles. Hence this hay plays a vital role in balancing our daily food chain. This hay before being transported is loaded onto the vehicles this is being done manually from ages and still, we haven't advanced ourselves in this process.

Hay – alfalfa, grasses, clover or legumes – is a great source of protein for feeding animals. In the 1940s, there were major advances in the machinery that cut, dried, processed stored and fed the crop. In the late 1800s, horse-drawn sickle mowers would begin the haying process by cutting the crop. Rakes gathered the hay into "windrows" where the moving air could dry the crop. Then, the hay was piled up into house-shaped haystacks, sometimes as high as 30 feet. The hay on top would shed rain and snow and protect the hay in the middle from rot.

On other farms, the hay was gathered onto wagons, and moved to the base of the barn. There, a grappling hook was lowered from the roof beam. The hook grabbed huge clumps of hay. Horses would pull a rope and lift the hook and the hay to the second story haymow. Then, farm hands inside would distribute the hay around the mow with pitchforks. When it was needed, the hay could be dropped down to the horses and cows on the first floor.

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This method was inefficient and required huge barns. It took about 800 cubic feet of space to hold 1½ tons of loose hay. A cow can eat around 30 pounds of hay per day, so it could take 2 to 2.5 tons of hay per cow to get through the winter.

Literature study

At the turn of the 20th Century, stationary balers were introduced. Hay would be pitched into these horse-powered units where it would be compressed and tied into bales. Later, the baler was put on wheels so it could be taken to the hay rather than the other way around. But it still took three or four men to bale – one to drive the tractor, a baler operator to push hay into the bale chamber and one or two people to tie twine around the bales.

Bucking thus rolled bales into a tractor or vehicle is still being done manually and involves a great deal of manual effort in it.

Methods Used

Hay bucking is mostly done manually across our country, few machines which are helpful in doing the similar operation i.e., lifting the loads from ground to a higher level are shown below. Machine shown in Fig 1.2 is mostly used in construction fields to lift loads and is very much costly. Machine in Fig 1.3 performs a similar operation but has a limitation as this is a reciprocating mechanism it has only one useful cycle to lift our load and when it comes down from top entire cycle is idle and mostly useless, to overcome these problems we are going to make a "HAY BUCKING MACHINE" to lift the load having a rotary cycle and is also at a cheaper price when compared to other machines available.

Working of CNN

A pillow block usually refers to a housing with an included anti-friction bearing. A pillow block refers to any mounted bearing wherein the mounted shaft is in a parallel plane to the mounting surface, and perpendicular to the centre line of the mounting holes, as contrasted with various types of flange blocks or flange units. A pillow block may contain a bearing with one of several types of rolling elements, including ball, cylindrical roller, spherical roller, tapered roller, or metallic or synthetic bushing. The type of rolling element defines the type of pillow block. These differ from "**plumber blocks**" which are bearing housings supplied without any bearings and are usually meant for higher load ratings and a separately installed

Design of parts using CATIA V5

Designing is the key main key to give outline of any idea or project. Without designing and drawings, one's project is incomplete and even not able to imagine. So, to give a shape to our thoughts, one must do the designing and drawing.

You may be heard of Leonardo Da Vinci the great artist, who gave a shape of aircrafts in his drawings before its invention. Later on, the shape of the aircraft is adapted from there.

Now a days, there are so many software available in the market which are helpful in giving shape to our thoughts, and predicts the outcome of the input before putting it into real practice.

Solid works, CATIA, PRO-E, ANSYS etc., so many software's are available in the market which helps us not only in designing but also in simulation and analysis.

In this context, we are using CATIA – V5 for its design. Here, let's get some brief introduction about the software.

CATIA (computer-aided three-dimensional interactive application) is a multi-platform software suite for computer – aided design (CAD), computer – aided Manufacturing (CAM), Computer – aided Engineering (CAE), 3D modelling and Product lifecycle management (PLM), developed by the French company Dassault Systems.

CATIA started as an in-house development in 1977 by French aircraft manufacturer Avions Marcel Dassault to provide 3D surface modelling and NC functions for the CADAM software they used at that time to develop

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the Mirage fighter jet. Initially named CATI (**conception assistee tri dimensionnelle interactive** – French for **interactive aided three-dimensional design**), it was renamed CATIA in 1981 when Dassault created the subsidiary Dassault Systems to develop and sell the software, under the management of its first CEO, Francis Bernard. Dassault Systems signed a non-exclusive distribution agreement with IBM, that was also selling CADAM for Lockheed since 1978. Version 1 was released in 1982 as an add-on for CADAM.

During the eighties CATIA saw wider adoption in the aviation and military industries with users such as Boeing and General Dynamics Electric Boat Corp.

Dassault Systems purchased CADAM from IBM in 1992, and the next year CATIA CADAM was released. During the nineties CATIA was ported first in 1996 from one to four Unix operating systems, and was entirely rewritten for version 5 in 1998 to support Windows NT. In the years prior to 2000, this caused problems of incompatibility between versions that led to $6.1B in additional costs due to delays in production of the Airbus A380.

With the launch of Dassault Systems **3DEXPERIENCE** Platform in 2014, CATIA became available as a cloud version

DESIGN OF FRAME

A frame is a rigid structure, no parts in a frame can move relative to the other parts. To fabricate a machine, we build a base or a frame upon which all other components are mounted and frame takes all the load applied on the machine. Hence in order to design a safe and strong frame, we designed the below model using CATIA software.

All the dimensions used to design resemble the dimensions of the frame which is fabricated. An I-Section is used at the centre of the frame to join the frame from both ends. Height of the entire frame is 100cm, beams are provided in the frame to facilitate the mounting of pillow block bearings on the frame.

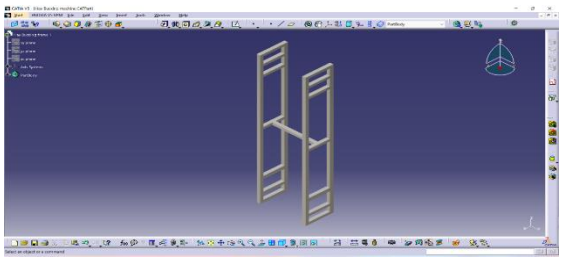

Fig .1 Catia design of Frame

DESIGN OF PILLOW BLOCK BEARINGS

A **pillow block bearing** is a pedestal used to provide support for a rotating shaft with the help of compatible bearings & various accessories. The assembly consists of a mounting block which houses a bearing. The block is mounted to a foundation and a shaft is inserted allowing the inner part of the bearing / shaft to rotate. We designed the below bearing with inner diameter of 25mm in CATIA software.

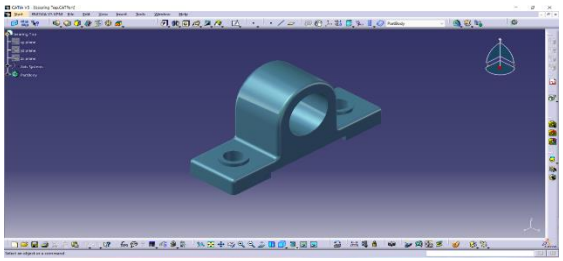

Fig 2. Catia design of pillow block bearing

DESIGN OF SHAFT

A **shaft** is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power. In this context, shaft is designed to transmit motor power to the sprockets, shaft with 25mm diameter is designed using CATIA software

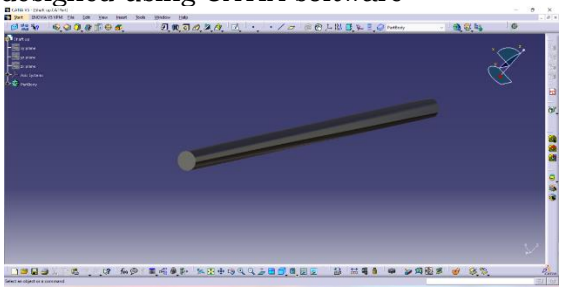

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Fig 3 Catia design of Shaft

COMPLETE ASSEMBLY

The parts drawn in different part drawings are assembled in **Assembly design.** All the components are selected and opened in assembly design and proper manipulation commands are used to mate the parts in proper positions. Finally assembled part is designed as below in CATIA software

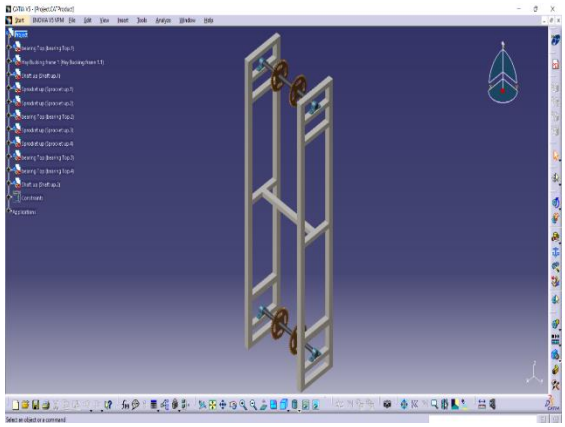

Fig 4. Catia design of complete assembly

Conclusion

Hay bucking is a process which involves huge human effort, we have tried to reduce the same with our machine which can lift the hay bales and in-turn load them thus, reducing the human fatigue. It requires few improvements which we have mentioned clearly in this document.

Weight Lifted: We tried to present the model to our best, in this process we have **"Scaled down"** our model from the actual size so, the model is successfully able to lift 1 Kg of the Hay bales load. With the constraint of size and budget the project performs excellent in its parameters,learning ability. Our project has been successfully completed with 91.4% accuracy. In conclusion, we believe that the method proposed in this project has a potential to detect the watermark in the chosen image efficiently.

Future Scope

As the project has been based on the baseline to reduce human fatigue and to reduce the working time for better productivity. Therefore, it covers many sections of proportionate benefits to the whole sphere of our present life. Explaining all the present benefits in respective category.

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