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A Review on Three Direction Dropping Dumper

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ABSTRACT: A dumper is a vehicle use for carrying various materials from one place to another and dump to a specific place. A Dumper is a vehicle designed for carrying bulk material, often on building sites such gravels, sand, debris or rubbles. Dumper are distinguished from tippler trucks by configuration: a dumper is usually an open 4-wheeled vehicle, has its cab in front of the load. A typical dump truck is equipped with an open-box bed, which is hinged at the rear and equipped with hydraulic pistons to lift the front, allowing the material in the bed to be deposited ("dumped") on the ground behind the truck at the site of delivery. The existing dump truck drop the material in backside only. But there is a problem when we want to put the material in right and left side of tippler at congested place or area.

So In this project, we made the dumper which can unload the material in the three direction (within 180°) i.e. back, right and left with the help of hydraulic actuator, stepper motor, hydraulic pump and rotating mechanism i.e. Chain drive.

KEYWORDS: Chain Drive Mechanism, Hydraulic Actuator, Hydraulic pump, Stepper motor, 3-Directional Control Valve.

I. INTRODUCTION

For the reason of having problem while unloading the material in congested place or at the specific place as appropriate for work, will result in decrease in manpower. Our survey in the regards of several construction sites, revealed facts that most of the difficulty comes under unloading phase as conventional dumper cannot facilities the specific unloading position because of its limitation of one direction unloading and hence this problem of conventional dumper, we are overcoming to facilities the freedom of unloading with our project.

So the project has mainly concentrated on this difficulty and hence we have designed a suitable mechanism with use of electronic devices. Such that the dumper can unload the material in three directions (i.e. within 180°) from the neutral position of bed. The bed is fixed on the separate frame which is welded on bigger sprocket of chain drive. So it can rotate with the help of chain drive. For the lifting purpose, hydraulic actuator is placed in the separate frame pivoted by a hinge joint, so it can move according to bed. To control the movement of hydraulic actuator 3-way DC (Direction Control) valve is provided, so it can give smooth up and down movement of bed with controlled action. To operate the hydraulic actuator, pressurized hydraulic fluid is needed, hence hydraulic pump is provided with sump to pump the pressurized fluid in actuator. Chain drive is designed according to the space availability and the load capacity. In chain drive, the bigger sprocket is mounted on shaft which is welded on chassis and smaller sprocket is mounted on stepper motor shaft, this sprockets are attached by chain. The separate frame is welded on the bigger sprocket, which carries the bed and make it move according to bigger sprocket.

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A dumper plays very important role in any construction work and hence its simplicity, flexibility, and freedom of doing work needs to be more. The problem have considered with dumper, that is for setting the huge dump in the proper direction or at specific place and hence to solve this problem, we are designing a project which about 3-direction dropping dumper which can dump the material in 3-directions and front direction(cabin side) is exempt from unloading.

II. LITREATURE REVIEW

In this paper on Design and Development of 3-way Dropping Dumper by Ganesh Shinde, PrachiTawele, LaukikRaut. The author's says, Modern 3 ways dropping dumper' has been conceived by observing the difficulty in unloading the materials. The survey in this regards in several automobile garages, revealed the facts that mostly some difficult methods were adopted in unloading the materials from the trailer.



Fig. 1- fig show prototype view of project

Fig.1 shows the side view of 3-way dropping dumper. As figure shows various components and moment of bed with the help of hydraulic actuator. This paper has mainly focused on above difficulty. Hence a prototype of suitable arrangement has been designed. The vehicles can be unloaded from the trailer in three axes without application of any impact force. The Direction control valve which activates the ram of the hydraulic cylinder which lifting the trailer cabin in require side. Further modifications and working limitations will put this work in the main league of use. This concept saves time & energy which leads to efficient working.

In the paper on Development of three axes lifting modern trailer by N.EswaraPrasath, S.Shanmugam and C.MathalaiSundaram researched on existing system and will be improvements in tipper. In existing system, tipper can unload only in one side by using pneumatic jack or conveyor mechanism. By this research it is easy for the driver to unload the trailer and also it reduces time and fuel consumption. For making tipper mechanism with such above conditions hydraulic jack mechanism can be used. This paper has mainly focused on above difficulty.



Fig. 2- Photographic view of lifting of trailer in one direction

As fig.2 shows the actual view of three axis lifting modern trailer, which can lift and drop material in three direction. Hence a prototype of suitable arrangement has been designed. The vehicles can be unloaded from the trailer in three axes without application of any impact force. The Direction control valves which activate the ram of the hydraulic cylinder which lifting the trailer cabin in require side. By this research it is easy for the driver to unload the trailer and it reduces the time.

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In the paper of Design and Fabrication of Unidirectional Dumper by Prof. Mrs. R. S. Tupkar, Aditya R. Malewar and Rohit A. Ramteke. They designed the dumper for unidirectional dumping. The prototype of unidirectional dumper is thoroughly based on pneumatic system for light weight load and for heavy weight load pneumatic system is suitable. This prototype model consists of Air compressor, air reservoir, Pressure gauge, 5/3 solenoid valve, pneumatic cylinder, DPDT (Double pole double throw), etc.

In this paper on Design and Fabrication of multi-directional lifting dumper by Shubham S. Ganar, Akshay D. Kakde, Rahul R.Pali1, Shubham D. Kolhe, Mr. A.S Deshmukh. They modified the design of Normal dumper vehicle unload materials only in one direction that to only at the backside of the tipper by using various powerful pneumatically operated cylinder, which may cause the problems of blockage when the work area is limited. The Multidirectional dumper overcomes the problem of unloading the vehicle on side way by using Pneumatic cylinder in our prototype but pneumatic cylinder are going to be used in main vehicle . By using cylinder and chain drive the material can be unloaded in 1800 as per requirement.

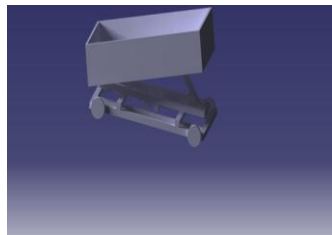


Fig.3- fig show design view of multidirectional dumper

Fig.3 shows the design view of multidirection dumper, with the lifting action of bed which is connected to the actuator and linked with the chassis. The Multidirectional dumper is developed and tested for its movement in all three axis possible angle to unload the materials in the tipper trolley and monitor the inclinations for its gradualism (linearity).

In this paper on Design and Development of Multistage Dumping Trolley by OmkarBagade, VaibhavDeokar, A.H.Pawar. They redesigned, Conventional dumping trolley operates on hydraulic system to dump the material on back side only. The areas where limited space is available, one side dumping is not feasible. So provision of dumping on either side is developed through the concept of Multistage Dumping Trolley (MSDT). This paper presents design and development of MSDT operates on pneumatic system.



Fig.4- fig show actual view of multistage dumping trolley

Fig.4 shows actual view of multistage dumping with the view of different frames. The multistage dumping is accomplished by design of frame locking mechanism. It consists integrated chassis design for multi-side dumping. This Multistage Dumping Trolley is in developing stage. Development of multistage dumping trolley is achieved by integrated chassis design which includes locking mechanism of frames. The frame locking mechanism operates on

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Vol. 6, Issue 3, March 2017

pneumatic system gives easy and effective locking of frames to accomplish multistage. Thus it saves energy as well as time required for dumping with efficient working of trolley.

In this paper on Design and Fabrication of Three Way Trolley Mechanism by Prof. Akshay Pachpore, Shahapur, Ajinkya Gharote, Virendra Paulzagade. This tipper mechanism can do a great job by unloading the goods in three direction as nowadays trailers unload in only one direction. Existing trailers require more space, time and fuel so to overcome these problems we want to introduce the three way tipper mechanism so that the device is economical and efficient. This tipper mechanism generally relates to ball socket joint for unloading the material in left side or in right side direction and use of hydraulic jack in back side. The ball socket joint is used to provide motion in three direction.



Fig.5- fig shows three way trolley

Fig.5 shows tilted view of three view trolley, which is controlled and moved by hydraulic cylinder. In this mechanism, the relative motion of ball socket joint and trolley moves in left and right direction. To unload the material in right side or in left side, we have fix the one side by hinge joint using pin.

In this paper on Development of a Micro Drive-Under Tractor -Research and Application. They concluded that the in-plant transport of goods is increasingly becoming automated. All reasons that argue for automation result in a better cost effectiveness. To fulfil these specifications the paper at hand presents the development and realization of a new type of Automated Guided Vehicle that is optimized for the transportation of small goods.

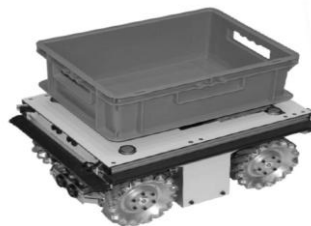


Fig.6- fig shows design view of micro driver

In the constructional view of micro driver in fig.6. The construction is carried out as an omnidirectional drive-under tractor in compact dimensions. The main purpose of the vehicle is the automated towing of trailers. As figure shows, it is very compact but very precise in work.

In this paper on modern three axis hydraulic trailer by Vivek S. Dhage, Nikhil B. Ingle, Akshay S. Kale, Nikhil R. Chikte. They showed modern concept of trailer. In most cases where road width is not sufficient, trailers face the problems while unloading the material. It takes a lot of time to unload a single trolley as all material cannot be unloaded at same place. Hence additional time is required for turning of vehicle in highly congested area. Also in case of large trolleys, if all the material is unloaded at one place additional manpower is required to arrange the material properly which finally increases material handling cost. At the same time, the trailers unload the material backside i.e. in one axis only.

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Fig. 7- fig shows modern three axis hydraulic trailer

Fig.7 shows modern three axis hydraulic trailer incorporates the hydraulic cylinder. It is used to lift the load with help of Hydraulic cylinder. The main purpose of this project is to unload the material in three directions instead of conventional trailer system in which the unloading is done in one direction.

In this paper on Design of Multisided Tipper Tilting Mechanism by Hemant A. Gaikwad, Nilesh P. Awate. As everyone knows that tipper is mostly used for unloading loose material on construction site, mines and dump yards. The Existing system available is to unload material on back side. To overcome one side tilting of trolley, multi-side tilting mechanism is come into focus. This will help to reduce the efforts to unload loose material one side of tipper. Propose work is on placing three hydraulic cylinders each on front side, right side and left side of trolley to unload loose material on back side, left side and right side of trolley respectively. Fig.8 shows design view of multisided tipper in all respected sides.

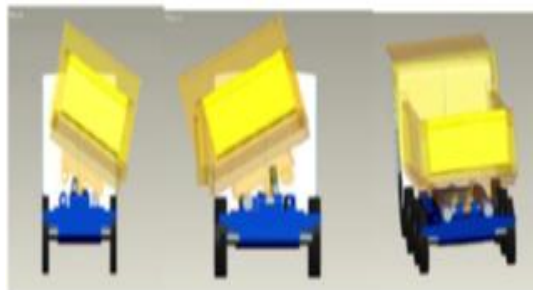


Fig.8- fig shows design view of tipper

In this work area of concentration is to design of tipper mechanism to facilitate multisided tilting of trolley, which will help to unload material on all three side of tipper i.e. on back, left and right side of tipper. For this CAD model of the tipper is design, and according to new design instead of using one hydraulic cylinder as per tilting the design requirement three hydraulic cylinders are use.

In this paper on Three Axis Pneumatic Modern Trailer By Using Single Cylinder by Deshmukh.S.A, LonkarPradip P, BhongTushar H, Kale Dadaso B. This project work has been conceive having studied the difficulty in unloading the materials. Our survey in the regard in several automobile garages, revealed the facts that mostly some difficult methods were adopted in unloading the materials from the trailer. The trailer will unload the material in only one single direction. It is difficult to unload the materials in small compact streets and small roads. In our project these are rectified to unload the trailer in all three sides very easily. Now the project has mainly concentrated on this difficulty, and hence a suitable arrangement has been designed

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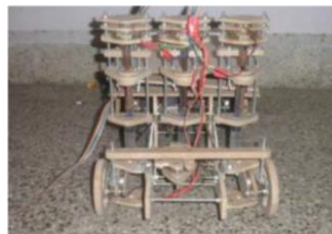


Fig.9- fig shows rear view of pneumatic trailer

Fig.9 shows rear view of three axis pneumatic modern trailer, which is prototype model made. It shows the work on process concept. It can lift the bed of truck easily with its powerful power pack system as pneumatic, which gives it the reliability of lifting load.

III. CONCLUSION

Three Directional dropping dumper mechanisms is the modification of existing conventional dumper mechanism. According to the various extent researched, history and design theory of project, this project will help the process of dumping. Hence with the help of this mechanism one can reduce the time of unloading the material in space constraint area. It prevents the blockage of roadways because of its speedy and easy working and it also have the provision of bed movement within 180°. Bed moves very smoothly with the use of chain drive. Actuator is controlled by D.C.valve and hydraulic pump. So these all equipment help our dumper to act smoothly, precisely, easily and accurately.

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