

AUTOMATIC GROUND CLEARANCE ADJUSTMENT SYSTEM

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ABSTRACT

This Paper converse about the study of Automatic Ground Clearance Adjustment System. The handling of vehicle depends upon the various parameters, centre of gravity of the vehicle is one of them. For better handling of the vehicle we need to keep centre of gravity as low as possible. For sport cars it is always kept low but for the passenger cars it compromises with its ground clearance. The designers prefer to maintain fixed ground clearance and design the system to acquire requisite suspension parameters. We need an adjustable ground clearance system in the vehicle to have optimum performance. Here this paper introduces the pneumatic lifting technique which is used to provide the higher ground clearance at the time of rough roads/breakers and lower the same to get proper ground clearance to maintain the stability at high speed on smooth roads.

KEYWORDS: Ground Clearance, Hydraulic Lift, Hydraulic Piston, Cylinder Assembly, Centre of Gravity, Pneumatic Lifting.

1. INTRODUCTION

Road conditions are not similar at all places, it changes with application, environment and climate. In city at different sectors like school, hospital, there are speed breakers of different dimensions. At certain condition road goes straight without any pits else we found irregularity. Most of the people buy only one four wheeler which they use that at all this condition. Hence it's necessary to give some standard ground clearance to the vehicle. But still there are some obstructions while driving the car on highway and in city. It is not possible for the off-road vehicle to run at high speed on its standard ground clearance provided considering the city obstacles and on-road cars to run over the rough terrain with its lower ground clearance. To obtain the good performance at high speed and low speed it is necessary to build one system which can vary the ground clearance. This can be achieved by changing the suspension height so that the chassis height can be adjusted with respect to the speed and the quality of roads. Suspension systems plays vital role while designing the car for good stability and road holding ability. It is very difficult to achieve this ability at all road condition with passive suspension system only. This problem can be solved by active suspension system but this is not widely used because it required more external energy and additional controlling system which affects the cost of the vehicle. With a view to reduce the complexity and the cost while improving ride, handling and performance we can use the combination of active and passive suspension system. In this paper various parameters are discussed which are related to the ground clearance and suspension system and its control. This gives the idea about the vehicle characteristics like ride control, height control, roll control, road holding etc. and its effect on vehicle performance. Ground clearance is the position of the vehicle body (sprung mass) above the basic ground level. It is an important parameter in off-road vehicle. For a certain car's weight, there is a certain

amount of mechanical down force which act on tires, and therefore the grip of tires is constantly changing during running condition. The whole weight of vehicle is concentrated at a point known as centre of gravity. At the lower ground clearance, we get the location of centre of gravity near the ground level. This reduces weight transfer during cornering, accelerating, and braking and increase the vehicle performance. Also, by lowering the front end and raising the rear end, we can improve high speed stability. Since the centre of gravity has an influence on most of the parameters during running of the vehicle. We need a location of centre of gravity at a high level as well as at lower level according to road conditions. We have designed a simple pneumatic linkage mechanism for ground clearance adjustment.

The adjustment is possible with the help of an active and a passive suspension which are linked together in series. Active suspension is placed below the passive suspension. With the help of this system we can vary ground clearance of the vehicle up to 200mm. Pneumatic cylinders are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion. Like in hydraulic cylinders, something forces a piston to move in the desired direction. Thus it produces a lift in desired direction. Air compressor is utilized to produce a pneumatic lift to increase the ground clearance whenever required otherwise it brings the chassis down to its position to have standard ground clearance by acting as an active suspension system.

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II. PROBLEM STATEMENT

Higher ground clearance almost always means the vehicle has a relatively higher centre of gravity. In general, this tends to poorly affect handling, because it creates a larger moment about an axis on the ground plane. If its ground clearance high then it affect on engine efficiency causes less fuel economy.

For lower ground clearance car, its passed from on any obstacle then it easily dented.

III. COMPONENTS OF SYSTEM

ULTRASONIC SENSOR

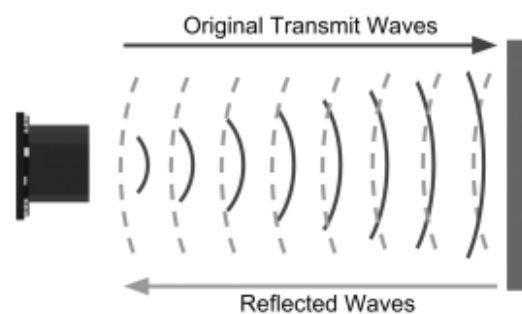


Fig.Ultrasonic Sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns. Ultrasonic sensing is one of the best ways to sense proximity and detect levels with high reliability. Ultrasonic sound vibrates at a frequency above the range of human hearing. Transducers are the microphones used to receive and send the ultrasonic sound. Ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse. The working principle of this module is simple. It sends an ultrasonic pulse out at 40kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By

calculating the travel time and the speed of sound, the distance can be calculated.

PNEUMATIC CYLINDER



Fig. Pneumatic Cylinder

Pneumatic cylinder is mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion. Like hydraulic cylinders, something forces a piston to move in the desired direction. The piston is a discor cylinder, and the piston rod transfers the force it develops to the object to be moved. Engineers sometimes prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts of space for fluid storage. Because the operating fluid is a gas, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement. For example, in the mechanical puppets of the Disney Tiki Room, pneumatics are used to prevent fluid from dripping onto people below the puppets.

MOTOR



Fig.Motor

An motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of rotation of a shaft. Electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as a power grid, inverters or electrical generators. An electric generator is mechanically identical to an electric motor, but operates in the reverse direction, converting mechanical energy into electrical energy. Electric motors may be classified by considerations such as power source type, internal construction, application and type of motion output. In

addition to AC versus DC types, motors may be brushed or brushless, may be of various phase (see single-phase, two-phase, or three-phase), and may be either air-cooled or liquid-cooled. General-purpose motors with standard dimensions and characteristics provide convenient mechanical power for industrial use. The largest electric motors are used for ship propulsion, pipeline compression and pumped-storage applications with ratings reaching 100 megawatts. Electric motors are found in industrial fans, blowers and pumps, machine tools, household appliances, power tools and disk drives. Small motors may be found in electric watches.

IV. DESIGN

CAD

Computer Aided Design (CAD) is the use of computer systems (or workstations) to aid in the creation, modification, analysis, or optimization of a design. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing. CAD output is often in the form of electronic files for print, machining, or other manufacturing operations. The term CADD (for Computer Aided Design and Drafting) is also used.

Its use in designing electronic systems is known as Electronic Design Automation (EDA). In mechanical design it is known as mechanical design Automation (MDA) or Computer-Aided Drafting (CAD), which includes the process of creating a technical drawing with the use of computer software.

CAD software for mechanical design uses either vector-based graphics to depict the objects of traditional drafting, or may also produce raster graphics showing the overall appearance of designed objects. However, it involves more than just shapes. As in the manual drafting of technical and engineering drawings, the output of CAD must convey information, such as materials, processes, dimensions, and tolerances, according to application-specific conventions.

CAD may be used to design curves and figures in two-dimensional (2D) space; or curves, surfaces, and solids in three-dimensional (3D) space.

CAD is an important industrial art extensively used in many applications, including automotive, shipbuilding, and aerospace industries, industrial and architectural design, prosthetics, and many more. CAD is also widely used to produce computer animation for special effects in movies, advertising and technical manuals, often called DCC digital content creation. The modern ubiquity and power of computers means that even perfume bottles and shampoo dispensers are designed using techniques unheard of by engineers of the 1960s. Because of its enormous economic importance, CAD has been a major driving force for research in computational geometry, computer graphics

(both hardware and software), and discrete differential geometry.

The design of geometric models for object shapes, in particular, is occasionally called Computer Aided Geometric Design (CAGD).

V. PROCESS SHEET

CUTTING

This operation is performed to cut the material as our required size. The machine used for this operation is power chop saw. A power chop saw, also known as a drop saw, is a power tool used to make a quick, accurate crosscut in a work-piece at a selected angle. Common uses include framing operations and the cutting of molding. Most chop saws are relatively small and portable, with common blade sizes ranging from eight to twelve inches. The chop saw makes cuts by pulling a spinning circular saw blade down onto a work-piece in a short, controlled motion. The work-piece is typically held against a fence, which provides a precise cutting angle between the plane of the blade and the plane of the longest work-piece edge. In standard position, this angle is fixed at 90°. A primary distinguishing feature of the miter saw is the miter index that allows the angle of the blade to be changed relative to the fence. While most miter saws enable precise one-degree incremental changes to the miter index, many also provide "stops" that allow the miter index to be quickly set to common angles (such as 15°, 22.5°, 30°, and 45°). The time required for this operation is 50 minutes.

FINISHING

This operation is performed to finish the edges with grinder using grinding wheel. The machine used for this operation is hand grinder. An angle grinder, also known as a side grinder or disc grinder, is a hand-held power tool used for cutting, grinding and polishing. Angle grinders can be powered by an electric motor, petrol engine or compressed air. The motor drives a geared head at a right-angle on which is mounted an abrasive disc or a thinner cut-off disc, either of which can be replaced when worn. Angle grinders typically have an adjustable guard and a side-handle for two-handed operation. Certain angle grinders, depending on their speed range, can be used as sanders, employing a sanding disc with a backing pad or disc. The backing system is typically made of hard plastic, phenolic resin, or medium-hard rubber depending on the amount of flexibility desired. The time required for this operation is 20 minutes.

WELDING

This method is used to weld square pipes of different lengths to make frame. The machine used for this operation is electric arc welding. Electrical arc welding is the procedure used to join two metal parts, taking advantage of the heat developed by the electric arc that forms between an electrode (metal filler) and the material to be welded. The welding arc may be powered by an alternating current generator machine (welder). This

welding machine is basically a single-phase static transformer suitable for melting rutile (sliding) acid electrodes. Alkaline electrodes may also be melted by alternating current if the secondary open-circuit voltage is greater than 70 V. The welding current is continuously regulated (magnetic dispersion) by turning the hand wheel on the outside of the machine, which makes it possible to select the current value, indicated on a special graded scale, with the utmost precision. To prevent the service capacities from being exceeded, all of our machines are fitted with an automatic overload protection which cuts off the power supply (intermittent use) in the event of an overload. The operator must then wait for a few minutes before returning to work. This welding machine must be used only for the purpose described in this manual. Read the entire contents of this manual before installing, using or servicing the equipment, paying special attention to the chapter on safety precautions. Contact your distributor if you do not fully understand these instructions. The time required for this operation is 120 minutes.

POLISHING

This operation is performed to polish the welded joints with hand grinder using grinding wheel. The machine used for this operation is hand grinder. With refinement, grinding becomes polishing, either in preparing metal surfaces for subsequent buffing or in the actual preparation of a surface finish, such as a No. 4 polish in which the grit lines are clearly visible. Generally speaking, those operations which serve mainly to remove metal rapidly are considered as grinding, while those in which the emphasis is centred on attaining smoothness are classified as polishing. Grinding employs the coarser grits as a rule while most polishing operations are conducted with grits of 80 and finer. If polishing is required, start with as fine a grit as possible to reduce finishing steps. There is a wide range of grinding and polishing tools on the market and advice is available from ASSDA members to assist in particular applications. Polishing operations are conducted with the abrasive mounted either on made-up shaped wheels or belts which provide a resilient backing. The base material may be in either a smooth rolled or a previously ground condition. If the former, the starting grit size may be selected in a range of 80 to 100. If the latter, the initial grit should be one of sufficient coarseness to remove or smooth out any residual cutting lines or other surface imperfections left over from grinding. In either case, the treatment with the initial grit should be continued until a good, clean, uniform, blemish-free surface texture is obtained. The initial grit size to use on a pre-ground surface may be set at about 20 numbers finer than the last grit used in grinding, and changed, if necessary, after inspection. Upon completion of the initial stage of polishing, wheels or belts are

changed to provide finer grits. Polishing speeds are generally somewhat higher than those used in grinding. A typical speed for wheel operation is 2500 meter per minute. The time required for this operation is 20 minutes.

VI. CONCLUSION

This innovation can help driver to choose the ground clearance with his comfort of driving according to terrain. Riding off-road becomes easier and vehicle can fuel efficient by lowering ground clearance while driving onroad. For the off-road tracks, one can have highest clearance and move along the course of the road with better handling. On other hand for on road tracks, by lowering ground clearance we can enjoy the pleasure of being in an on-road vehicle. This system help in under steering of the vehicle. The system is very user friendly. This system will increase the economy of a vehicle. The results in increased complexity. The system proves that the Adjustable Ground Clearance Mechanism is a good innovative system for better performance of off-road vehicles. Since the system is more user friendly and at the same time increase the performance, this will have good market potential. The ground clearance can be easily adjusted by the driver itself at any place. The system is very much reliable in operation. This system is cheaper in initial as well as running costs.

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