Modern Remote Jack

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Abstract- *This is an engineering project which reveals an advance level of electric jack by its efficiency and easy to work with load. A 12 V battery is the source used in the modern jack and controlled by remote through the sensors. This project is obviously developed for the society by its smooth and easy operation. Safer and more reliable in order to save individual internal energy and reduce health risks especially back ache problems while doing work in a bent or squatting position for a long period of time. Even the old people and physically challenged can also use this modern jack easily. This is an electro mechanical device operated by an electrical power to lift the load easily.*

I. INTRODUCTION

This is a jack structured as similar as electric jack already being used by the society. But this project challenged the electric jack as well the mechanical jack by it advancement for which it is operated through a remote and sensor. The man can operate this system from minimum of 15 feet away from the load to be lifted. And the jack has no hardness to operate and eliminate physical contact of the operating with person which both the jack and load. This is very compact,

Heavy load carrying capacity and working with less skill of a human being.

Now a days there is a lot of device working with the help of electronic means to ease the hard operation and need the less skilled. In this connection our project, the modern remote jack is also used by electronic means and remote to reduce the direct contact of the person with the device and hard work. This jack may bemodified by its size and load carrying capacity by altering capacity of the electrical source.

The height of the jack is 5inches which lifts the load from 5 inches to 15 inches that is 10inch in total. The advantage of this project is to avoid the risk and danger of the operating person with the negligible hike in amount when comparing with electric jack

II. COMPONENTS USED

1. Motor
2. Lead screw
3. Worm gear
4. Relay
5. RF module
6. PCB board
7. Buck convertor
8. Remote controller
9. Cigarette lighter receptacle

1. MOTOR

An electric motor is an electric machine that converts electrical energy into mechanical energy. In normal motoring mode, most electric motors operate through the interaction between an electric motor's magnetic field and winding currents to generate force within the motor. In certain applications, such as in the transportation industry with traction motors, electric motors can operate in both motoring and generating or braking modes to also produce electrical energy from mechanical energy.

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 from the power grid, inverters or generators.

MOTOR CONSTRUCTION

A- Rotor

In an electric motor, the moving part is the rotor which turns the shaft to deliver the mechanical power.

B- Stator

The stationary part is the stator, usually has either windings or permanent magnets.

C- Air gap

In between the rotor and stator is the air gap. The air gap has important effects, and is generally as small as possible, as a large gap has a strong negative effect on the performance of an electric motor.

D- Windings

Windings are wires that laid in coils, usually wrapped around a laminated soft iron magnetic core to form magnetic poles when energized with current.

E- Commutator

A commutator is a mechanism used to switch the input of certain AC and DC machines consisting of slip ring segments insulated from each other and from the electric motor's shaft. The motor's armature current is supplied through the stationary brushes in contact with the revolving commutator, which causes required current reversal and applies power to the machine in an optimal manner as the rotor rotates from pole to pole.

STEPPER MOTOR

Stepper motors are a type of motor frequently used when precise rotations are required. In a stepper motor, an internal rotor containing PMs or a magnetically soft rotor with salient poles is controlled by a set of external magnets that are switched electronically

2. LEAD SCREW

A lead screw also known as a power screw or translation screw is a screw used as a linkage in a machine, to translate turning motion into linear motion Because of the large area of sliding contact between their male and female members, screw threads have larger frictional energy losses compared to other linkages.

There are some main advantages in lead screw are the large load carrying capability, Compact, Simple to design, Easy to manufacture, no specialized machinery is required, Precise and accurate linear motion, Smooth, quiet, low maintenance, Minimal number of parts, Most are self-locking

3. WORM GEAR

A worm drive can reduce rotational speed of transmit high torque. There are three different types of gears that can be used in a worm drive. The first are non-throated worm gears. These don't have a throat, or groove, machined around the circumference of either the worm or worm wheel. The second are single-throated worm gears, in which the worm wheel is throated. The final type are double-throated worm gears, which have both gears throated

4. RELAY

It works on the principle of an electromagnetic attraction. When the circuit of the relay senses the fault current, it energizes the electromagnetic field which produces the temporary magnetic field. The current flows through the coil produces the magnetic field around it

Relays are used to provide time delay functions. They are used to time the delay open and delay close of contacts. Relays are used to control high voltage circuits with the help of low voltage signals. Similarly they are used to control high current circuits with the help of low current signals.

A single pole switch is often denoted by the letters SP, and a double pole by DP. Relays can have one, two or more poles. Throw: The number of throws on an electrical switch is the number of positions that are available. For an electromechanical relay, there are normally only one or two throws.A range of manufacturing and production processes rely on current-operated relays to provide a continuously adjustable trip-current setting. They are able to protect mechanical apparatus from jam-up or other overloading conditions that result in measurable increases in motor current.

5. RF MODULE

An RF module (short for radio-frequency module) is a usually small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communicationor through radio-frequency (RF) communication. For many applications, the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitterand a receiver. They are of various types and ranges. Some can transmit up to 500 feet. RF modules are typically fabricated using RF CMOS technology.

Radio frequency (RF) is a rate of oscillation in the range of about 30 kHz to 300 GHz, which corresponds to the frequency of radio waves, and the alternating currents which carry radio signals. Suggest new RF Full Form. RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry

They are sometimes used to replace older infrared communication designs as they have the advantage of not requiring line-of-sight operation. Several carrier frequencies are commonly used in commercially available RF modules, including those in the industrial, scientific and medical (ISM) radio bands such as 433.92 MHz, 915 MHz, and 2400 MHz.

These frequencies are used because of national and international regulations governing the use of radio for communication. Short Range Devices may also use frequencies available for unlicensed such as 315 MHz and 868 MHz

6. PCB BOARD

A basic PCB consists of a flat sheet of insulating material and a layer of copper foil, laminated to the substrate. Chemical etching divides the copper into separate conducting lines called tracks or circuit traces, pads for connections, vias to pass connections between layers of copper, and features such as solid conductive areas for electromagnetic shielding or other purposes. The tracks function as wires fixed in place, and are insulated from each other by air and the board substrate material.

The surface of a PCB may have a coating that protects the copper from corrosion and reduces the chances of solder shorts between traces or undesired electrical contact with stray bare wires. For its function in helping to prevent solder shorts, the coating is called solder resist or solder mask

7. BUCK CONVERTOR

The main working principle of buck converter is that the inductor in the input circuit resists sudden variations in input current. When switch is ON the inductor stores energy in the form of magnetic energy and discharges it when switch is closed. The capacitor in the output circuit is assumed large enough that the time constant of RC circuit in the output stage is high. The large time constant compared to switching period ensures a constant output voltage V_o (t) = V_o (constant)

The buck converter can be operated in two modes

Continuous conduction mode in which the current through inductor never goes to zero i.e. inductor partially discharges before the start of the switching cycle.

Discontinuous conduction mode in which the current through inductor goes to zero i.e. inductor is completely discharged at the end of switching cycle.

The buck converter is a ubiquitous DC-DC converter that efficiently converts a high voltage to a low voltage efficiently. Efficient power conversion extends battery life, reduces heat, and allows for smaller gadgets to be built. The buck converter can be used in lots of cool applications.

The application of the buck is widely used in low power consumption small electronics to step-down from 24/12V down to 5V. They are sold as a small finish product chip for well less than $1 USD having about 95% efficiency

8. REMOTE CONTROLLER

In electronics, a remote control or clicker is an electronic device used to operate another device from a distance, usually wirelessly. For example, in consumer electronics, a remote control can be used to operate devices such as a television set, DVD player or other home appliance, from a short distance. A remote control is primarily a convenience feature for the user, and can allow operation of devices that are out of convenient reach for direct operation of controls.

9. REMOTE CONTROL

It worked by shining a beam of light onto one of four photoelectric cells, but the cell did not distinguish between light from the remote and light from other sources. The Flashmatic also had to be pointed very precisely at one of the sensors in order to work.

Most commercial remote controls at that time had a limited number of functions, sometimes as few as three: next channel, previous channel, and volume/off. This type of control did not meet the needs of Tele text sets, where pages were identified with three-digit numbers. A remote control that selects Teletext pages would need buttons for each numeral from zero to nine, as well as other control functions, such as switching from text to picture, and the normal television controls of volume, channel, brightness, color intensity, etc.

The main technology used in home remote controls is infrared (IR) light. The signal between a remote control handset and the device it controls consists of pulses of infrared light, which is invisible to the human eye but can be seen through a digital camera, video camera or a phone camera. The transmitter in the remote control handset sends out a stream of pulses of infrared light when the user presses a button on the handset.

III. CIGARETTELIGHTER RECEPTACLE

The cigarette lighter receptacle in an automobile was initially designed to power an electrically heated cigarette lighter, but became a DC connector to supply electrical power for portable accessories used in or near an automobile. While

the cigarette lighter receptacle is a common feature of automobiles and trucks, as a DC power connector it has the disadvantages of bulkiness, relatively low current rating, and poor contact reliability.

IV. WORKING PRINCIPLE

An Electrically operated jack is easily handle and operate through car battery and controlled by the remote which makes it very comfortable to the uses.

An electric jack includes a base frame or hoisting that is adapted to be placed on the ground underneath the car to be lifted. The hoisting includes motor connected to drive arms connected to a load bridge and plate. The bridge is typically mounted within the drive arms by rods located within slots on the arms enabling the bridge to move upward and downward while being retained within the drive arms.

The drive arms typically include drive wheels that rotate and are coupled together by a chain mechanism that assure the couple moves uniformly. Typically, the motor are operated by the car's battery.

This jack is controlled by remote unit. The remote unit contains two relay each have 30 amps normally the open load capacity and 20 amps normally the closed load capacity.

This two relay are connected to the form of h bridge. H Bridge is design for the forward and reverse control function of motor.

RF module are used in the capacity of 5 volts and it can activated by the RF remote and it act has a transmitting and receive the signal from the remote.

The buck convertor used to control the fluctuation and linearly send the 2 to 5 voltage to the RF board to control the lifting and unlifting by the remote.

V. ADVANTAGE

- Transmission of power is easy.
- Easy to lift without man power.
- High effectiveness.
- High durability.
- Simple in design.
- Easy to control.
- It is very safe to operate.
- Mainly used for physically challenged and elder people.
- It can lift upto five tons of load by its size.

VI. APPLICATION

- It can be widely used in automobile industry.
- It can be used in remote area.
- It can be used by physically challenged person

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