Study on Single Motor Double Door Mechanism Used In Household Applications- An Overview

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Abstract- Many large entrances have two doors each. It is harder to automate two open doors than it is to automate one. Two motors are required for each door to open, but results in two problems: First, coordinating the operation of the two sets of doors, and, of course, the increased expense. Using a single motorized mechanism, we resolve this issue. Simultaneous opening solves both problems at the same time, while the system uses only one motor; it is also less expensive as both mechanisms open together.

Keywords – Single Motor, Double Door, Mechanism, Analysis

I. INTRODUCTION

Over the last two decades, the world's megacities have been growing at significant rates because of their large population densities and increased need for open space. Some of these doors have difficulties getting used because of their manual usage. Manual doors can be tough to open for full-handed/pushing efforts or while pushing strollers, but they can also cause children to jam in and bounce around while being opened by bouncing against them. This design places greater problems in the way of them installing the doors in the safe and easy reach positions, therefore requiring the use of advanced and specific skills to solve, especially because of the advanced hinges and hardware needed. Automating the door and door exit operation can also cut costs staff time and labor costs associated with opening and closing the door, and reducing those costs allows staff to increase productivity. This proposal investigated a single motor and two-motor control and double-door mechanism [1-4]. The various mechanical, wear and surface morphologies investigated in the natural fiber-reinforced composed materials and metal matrix composites [13-24].

II. PRINCIPLE OF OPERATION

The process used to expand the magnetic domains is similar to that of an electromagnet. When a current flows through a conductor, a magnetic field is generated in the same direction as the current and in the conductor. The magnitude of this magnetic field is generated by this effect is equal to the strength of the conductor's current and external field, while the direction is the opposite of the conductor's and external field. Reacting with magnets as a child, you may have learned, the facts of magnetic force generally inverse; in other words, polarities that are situated at opposite locations tend to draw toward each other. The magnetic connection between a current-carrying conductor and a magnetic field for driving the device provides a mechanism that allows the configuration of a current-carrying conductor to expand.[5-8]

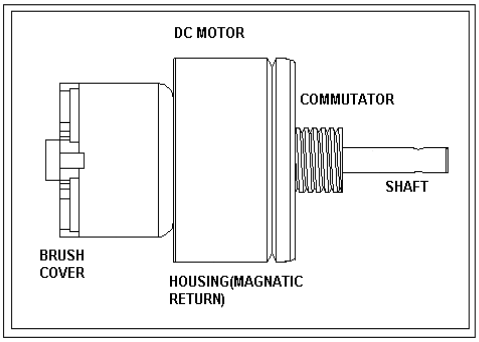

Figure 1. DC motor

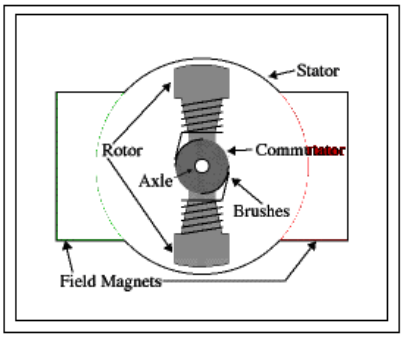

Figure 2. Stator,Commutator and rotors parts

A very simple 2-pole electric motor will give us a good starting point to begin with (here red represents a magnet or winding with a "North" polarization, while green represents a magnet or winding with a "South" polarization).[9].Figure 1 and 2 (source: Internet) shows that the dc motor overview and its components.

2.1 DC Motor Components

Every DC motor has six essential components: the axle, the stator, the rotor, and at least one magnetic field, and the commutator field In the majority of DC motors, the external magnetic field is produced by strong, or powerful, permanent magnets. The stator is the stationary component — the outer housing, as well as two or more permanent magnet pieces, is called the component, called "pole pieces". At the same time, the stator (connected to the rotor and the axle) rotates, in turn, around the stationary commutator. the rotor is constructed from windings (usually on a core), these windings are then connected to the commutator. However, this motor has relatively uncommon motor configurations. The above diagram depicts a common motor configuration: The stator (magnets) inside the rotor.[10]

2.2 Motor Geometry

The geometry of the brushes, commutator contacts, and rotor windings is such that when power is applied, they have such a pronounced pole that the polarities of the rotor and stator will be forced to be opposed and the poles of the stator will move until nearly-aligned, thus making the rotor rotate until it reaches its designed position. The rotor reaches commutator alignment, the brushes move to the next coil to engage the commutator and turn on the next winding. The use of our example two-pole motor gives rise to a reversal of the motor's polarity, causing the rotor to begin rotating in the opposite direction of the flow of current, leading to "flipping" action.[11]

2.3 Windings of the DC motor

The three real-world implications of DC motors are that they have more than two poles (three is a very common number). in particular, the commutator here avoids many "dead points" locations A motor that is positioned right in the middle of its rotation (perfectly aligned with the field magnets will be "stuck" on the field"). It also occurs during the commutator neutral power-ground operation, where the short-circuit contacts the power supply. This would all cause the motor to use energy and disrupt the power supply, as well as being potentially damaging it. It is another disadvantage of a motor of this simple design that it will exhibit a high amount of torque ripple since that is, it has no magnetic, toroidal, or voltaic forces within its primary windings (the amount of torque it could produce is cyclic with the position of the rotor). Among these, a few specific facts are the fact that a single-pole may be plugged in at a time (but two others are "partially" energized). When each brush transitions from one field collapsing, the other will rapidly charge (this occurs within a few microseconds). You can also see that this happens because of the coil's winding series connection: We'll be hearing more about the outcome of this later, but for now, you can see that this is a direct result of the coil's connection.[12].Figure 3 (source: Internet) shows that the windings of the DC motors.

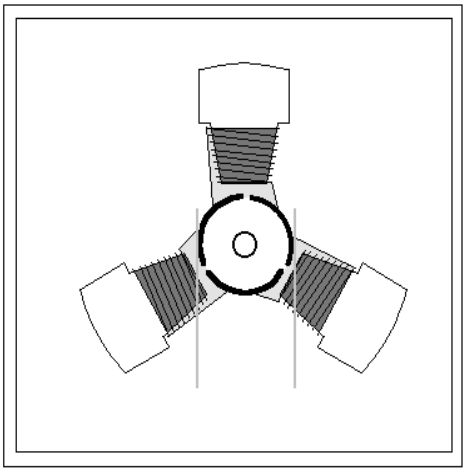

Figure 3.Windings of the DC Motor

2.4 Principle of operation

Taking apart one is the ordinary DC motor and looking inside gives you a better understanding of how the general class of motors works put into motion Thus, destroying perfectly good motors while attempting to expand would make things far more difficult, and time-consuming. Very easy to expand; a Mabuchi FF-030-PN motor (the same model that Solarics offers) is offered on paper as part of an expansion pack (has 12 cm shaft diameters and 16 turns of motor turns)." There are three poles in this basic DC motor, and two brushes, as well as two commutator contacts. M and the common use of an iron armature (as in Mabuchi) are frequently used and have several advantages. The key advantage of iron is that it provides robust support for the windings since that is particularly important for those motors that exert high torque. The motor core is the inner part of the rotor, which conducts heat away from the windings, allowing the motor to operate at higher loads than is expected. In contrast to other construction methods, iron construction is not only relatively inexpensive but also quick and simple to implement and low-maintenance. , To a certain extent, iron-core construction also has several disadvantages. Due to the high inertial mass, the iron arched armature is slower to change motion. As well as resulting in high inductances in the winding inductances, this construction limits commutes a commutator life. [9]

A variety of designs are used for small motors, even in which the armature winding is not being used. It is possible that if the wire used in this design holds up, the structure could fail. So as a result, the armature is completely hollow, and the permanent magnet is therefore mounted inside the rotor's coil. Coreless DC motors have higher armature current than those of comparable size, as well as lower magnet, induct, thus resulting in greater brush and commutation life.[13]Figure 4 (source: Internet) shows that the assembly of the DC motor.

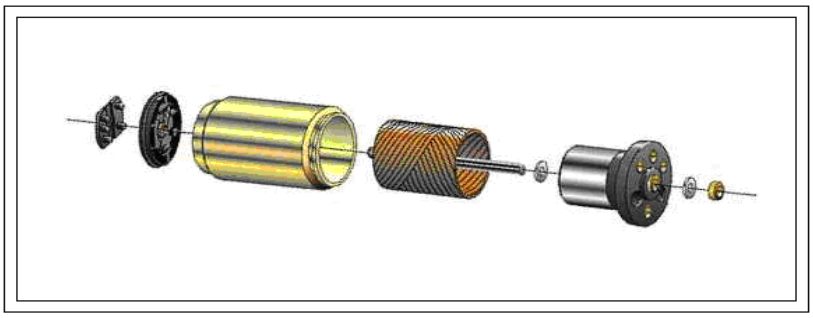

Figure 4. Assembly Parts of DC Motor

2.5 Functions of Coreless Design

Additionally, coreless motors allow for smaller bore sizes. Coreless motors run hotter than those with their iron cores because of their lack of iron in the rotor, resulting in the danger of overheating. Ranging from 0.2 kW to 20 kW, this design is used in just small, low-power motors. In many cases, beamers, the motor is also is coreless, though the case is typically not visible. Still, The reference to a “my hapless victim” being paged by a pager is a helpful reminder here: It was my hapless victim who was paged again. Everything inside this motor, including the spinning mechanism, is available in a cut-away diagram (to one dot per centimeter). This motor was a (or in the past was) a 3-pole coreless DC motor, but it no longer works.[5-6]

2.6 Working Principle

With this, the shaft has a link connected mechanisms is integrated, the motor runs a single length of a machine that works with both the "primary" and "secondary" gears, which distributes the load. Now the shaft of the motor is connected to 2 lugs which are set at 45 degrees next to each other. The L rods were previously linked to these two doors at single ends, non-rotating ends, and have now been connected with rotating connections, bringing the doors together to form a single L. Thus the connected 2-geared motor shaft drives the other 2 connecting rods, which rotate at the same rate and at the same time and at the same time, in turn, to open the doors simultaneously. To expand on this, rotating in the opposite direction, in either clockwise or counter-clockwise rotation both doors will also travel at the same speed. By doing so, we can successfully produce a simple and highly coordinated two-stage door opening and closing mechanism.[7]

2.7 Used Materials

The two toothed gears rotate against each other, and the cutters interlock or mesh with other gears to transfer torque It is defined as two or more gears working together that is referred to as simple because of their function of using a ratio and yields mechanical advantage, and this results in classifications being given to it. Geared devices can increase, decrease, or shift the amount of force applied to a power source. The most common error is when a rotary joint connects to another, but non-rotating elements, such as a rack or pulley. There are rare cases when the rotary gear is attached to a non-pulley, and when attached to a nonrotational component. When comparing different wheel pulleys, a transmission's gears are comparable to a gear set of wheels. Gear has the advantage of less wear since its teeth are in a gear that will not slip. For any pair of gears whose numbers of teeth ratio is less than 1:1,

the mechanical advantage is obtained when their rotational speeds differ by a simple ratio, and the torques produced by each one of the gears differ.[4-5]

The gear ratio that the vehicle or group of the vehicle uses is a different concept when it first than in motion does not have to be materialized, such as a bicycle or vehicle." Additionally, it has been commonly been used to describe systems that use similar devices even when they are not designed as discrete gear systems or those which feature continuously variable transmission. According to Hero of Alexandria, the earliest reference to gears is in a book called "The Outworkings of a Craftsman" from the 3rd century B.C., but they had already been prominent in the works of the Greek mathematician Archimedes, the discovery of this mathematical breakthrough can be dated to 287 BC and his age as a polymath. as evidenced by the Antikyst mechanism, which is a complex gear-driven device from the third century BC which calculates longitude with incredible precision. According to archaeologists, the Great Pyramid of Giza was built during the New Kingdom, between approximately 150 B.C.C. and 100 B.C.[2]Figure 5 (Source: Internet) shows that the gear tooth profile.

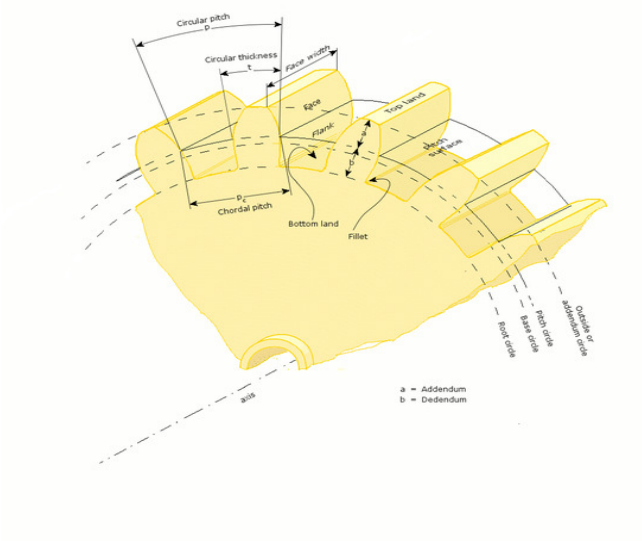

Figure 5. Gear tooth Profile

The definite velocity ratio that arises from having teeth gives gears an advantage over other drives (such as traction belts) in precision machinery, such as timepieces that are made. When the driver and follower implements are found in adjacent designs, the negative is that they are more expensive to make and have a greater operational cost. The benefit is that fewer parts are required in the device and it and less maintenance are required. Such as two- or four- or five- or six-speed ratios can be specified by the transmission.[1].Figure 6 (Source; Internet) shows that the automobile transmission gear mechanisms.

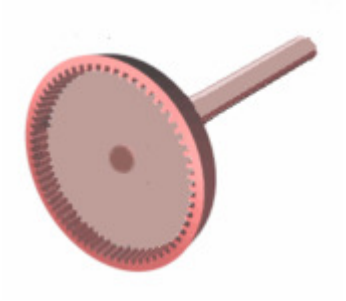

Figure 6. Automobile Transmission

A ball-headed gear is one where the gear teeth are built on the outside of a sphere or cylinder. Also, an internal gear has the gear is a gear, the inner gear's teeth are formed on the surface of the internal cone or cylinder. a bevel gear consists of a gear that has a pitch that is higher than ninety degrees in its inner workings. Reversing may or may not be caused by internal gears.[3]

On the other hand, straight-cut gears are the most basic. These circular saws have the teeth protruding radially, and although their shape is not linear, the edge of each tooth also acts as a kind of turbine, turning with the same force along the axis of rotation. These gears will only fit together if they are on the same shaft are parallel.[5]

2.8 Functions of the Battery

Using a secondary battery type in our project This battery is rechargeable. An energy battery is a cell, which supplies energy in the form of an electric current. And they both produce electrical energy from chemical energy, but of course, only primary cells are designed to be thrown away. The chemicals in a primary battery can be used once because of the irreversible reaction it causes. In conventional batteries, the chemical reactions can be reversed; it is merely necessary to pass charging current through the battery to get it to be recharged. Secondary batteries are long-lasting but can be recharged many times. You can wear out batteries; they are made to do so by design.

Portability has grown with the introduction of batteries as they became widely applicable. Battery use has caused environmental issues, such as the use of toxic metals. A battery is a group of cells that changes chemical energy to electrical energy. A voltaic cell is a set of two half cells that are connected with an electrolyte conducting circuit. There are two halves to a cell: the negative and the positive electrodes. Instead of touching each other, the electrodes are connected by the electrolyte. The voltage generated by a battery depends on the resistance of the load, the load ratio of the internal resistance.

The battery's internal resistance is low when it is new, so the voltage applied to the load is equal to the voltage of the battery's supply. As the battery's internal resistance decreases, the voltage drop also increases, which means that the load receives less voltage. Solar power is generated by photovoltaic panels and used by batteries. Lead-acid type batteries have a capacity of 12V 2.5A Secondary cells with lead-acid batteries are almost always the most economical. When it is ready, the plates will be in a dilute sulphate (Sulphuric) solution of 1.28 specific gravity. The positive (anode) plate is lead oxide and the negative (cathode) is lead.

When the cell makes current flow to a load, lead (PbSO) is formed in the electrolyte. The electrodes reach the same specific gravity of the electrolyte after a certain amount of energy has been removed from the cell. Following this, the cell is said to be discharged. Several methods exist to find out whether the cell is in the discharged state: The cell is charged in the opposite direction as the current. During the process of formation, the plate now has lead oxide (PbO) on the outside and silver oxide (AgO) on the inside. In the same manner, H2SO4 is produced by the reduction. The various chemical transformations that will occur

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2.9 Design and development of single motor double door mechanism

The Single Motor Double Motor Expandor, which has all the functions required for a fully functioning machine, has the following components to fulfill the standards for the industry.

- ✔ Geared Motor
- ✔ Shaft Rod
- ✔ Motor Mount
- ✔ Connecting Rods
- ✔ L Angles
- ✔ Mounts and Joints
- ✔ Supporting Frame
- ✔ Screws and Bolts

This platform on which the components are placed are bolted or welded in a fixed position is known as a through the trade as a mounting platform.

2.9.1 Applications

The single motor/multi-motor opener mechanism can be applied in almost all kinds of buildings, among residences, shopping centers, as well as various factories, cinemas, and warehouses [1-12].

IV.CONCLUSION

Using a single motorized mechanism, we resolve this issue. This mechanism deals with both problems at the same time as both doors operate in coordination, but it costs less due to only using one motor power source. It has a shaft integrated with a linkage, so the mechanism moves as the motor rotates. It has been positioned at a 45-degree angle to the shaft now. To permit the doors to move in one direction while limiting their motion in the other, these two linkage rods have been joined at an L angle. Thus, the connected gears in the geared motor rotate the rod which, in turn, rotates another rod connected to the doors, which causes both to open simultaneously and at the same speed and for the same duration. Similarly, both doors operate in a self-similar manner when the motor rotates in the opposite direction.

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