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Design and Refabrication of Advanced Mechanism for Indian Toilet Cleaning

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Abstract: *As per technical evolution and latest trends take into consideration here effective created an advanced system i.e.* ***Design and Refabrication of Advanced Mechanism for Indian Toilet Cleaning****. This system uses a controlled cleaning process and can be able to move anywhere so as to wash another toilet. This project uses multiple geared rack and pinion structures to enter into the toilet seat for cleaning. These rack and pinion arrangements are processed by a high torque motor. There is a brushing arrangement for cleaning along with to and fro movement with the help of a combinational arrangement of rack and pinion link. This project uses a high torque motor, long geared racks, geared pinion, pump, and related arrangements. This project can be useful in public toilets. This project is shock resistant as here used electricity for the motor. This project can be moved anywhere with an optimistic design. This project is easy to operate and has less maintenance so can be used anywhere. In this project, there is rearranged management for water cleaning and rotating brushing system so that all other queries can be sorted out. This complete assembly works on stored power so that where there is no the availability of electricity, we can use it according to application. As this system uses low-power devices so power requirement will be less.*

Keywords: Human Hygiene, Toilet Cleaning, Resource Optimization, Portability.

I. INTRODUCTION

As per the latest requirement, Indian toilet seat required one advanced cleaning system so that with the use of controlling switch everyone can able to use it. This project uses 2 different mechanisms

1. Vertical Movement with rotary motion for cleaning.
2. Horizontal Movement with rotary motion for footrest cleaning.

This system uses controlled cleaning process and can be able to move anywhere so as to wash another toilet. This project uses multiple geared rack and pinion structure to enter into toilet sheet for cleaning. These rack and pinion arrangement processed by high torque motor. There is brushing arrangement which is in rotary motion in 360 degree for cleaning purpose. This project uses high torque motor, High speed motor, long geared racks, geared pinion, Pedestal bearing, pump and related arrangement. This project can be useful in Public Toilet. These project is shock resistant as here used electricity for motor. This project can be move anywhere with optimistic design. This project is easy to operate and having less maintenance so can be use anywhere. This project is based on Indian toilet sheet cleaning along with basement cleaning system. This system uses following resources

1. Two Nylon brush for footrest cleaning.
2. 360degree Nylon brush for cleaning.
3. Geared Rack and pinion arrangement for to and fro movement.
4. Pedestal Bearing for holding the shaft.
5. Motors for rotation.
6. DPDT switches for controlling.
7. Pre-programmed Kit

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II. LITERATURE SURVEY

With the advancement of technology, robots are getting more attention from researchers to make the life of humanity comfortable. This paper presents the design, development, and fabrication of prototype Smart Floor Cleaning Robot (CLEAR) using IEEE Standard 1621 (IEEE Standard for User Interface Elements in Power Control of Electronic Devices Employed in Office/Consumer Environments). The subject robot operates in autonomous mode as well as in manual mode along with additional features like scheduling for a specific time and bagless dirt container with auto-dirt disposal mechanism. This work can be very useful in improving the lifestyle of humankind.

Founded by the Massachusetts Institute of Technology roboticists with the vision of making practical robots a reality, iRobot has sold more than 20 million robots worldwide. The company has developed some of the world's most important robots and has a rich history steeped in innovation. Its robots have revealed mysteries of the Great Pyramid of Giza, found harmful subsea oil in the Gulf of Mexico and saved thousands of lives in areas of conflict and crisis around the globe. iRobot inspired the first Micro Rovers used by NASA, changing space travel forever, deployed the first ground robots used by U.S. Forces in conflict, brought the first self-navigating FDA-approved remote presence robots to hospitals, and introduced the first practical home robot with Roomba, forging a path for an entirely new category in home cleaning. With more than 25 years of leadership in the robot industry, iRobot remains committed to building robots that provide people with smarter ways to clean and accomplish more in their daily lives [1].

Manual work is taken over the robot technology and many of the related robot appliances are being used extensively. Here represents the technology that proposed the working of robots for Floor cleaning. This floor cleaner robot can work in any of two modes i.e. "Automatic and Manual". All hardware and software operations are controlled by the AT89S52 microcontroller. This robot can perform sweeping and mopping tasks. RF modules have been used for wireless communication between remote (manual mode) and robot and having range 50m. This robot is incorporated with IR sensor for obstacle detection and automatic water sprayer pump. Four motors are used, two for cleaning, one for water pump and one for wheels. Dual relay circuit used to drive the motors one for water pump and another for cleaner. In previous work, there was no automatic water sprayer used and works only in automatic mode. In the automatic mode robot control all the operations itself and change the lane in case of hurdle detection and moves back. In the manual mode, the keypad is used to perform the expected task and to operate robot. In manual mode, RF module has been used to transmit and receive the information between remote and robot and display the information related to the hurdle detection on LCD. The whole circuitry is connected with 12V [5].

Domestic service robots have long been a staple of science fiction and commercial visions of the future. Until recently, we have only been able to speculate about what the experience of using such a device might be. Current domestic service robots, introduced as consumer products, allow us to make this vision a reality. This paper presents ethnographic research on the actual use of these products, to provide a grounded understanding of how design can influence human-robot interaction in the home. We used an ecological approach to broadly explore the use of this technology in this context, and to determine how an autonomous, mobile robot might "fit" into such a space. We offer initial implications for the design of these products: first, the way the technology is introduced is critical; second, the use of the technology becomes social; and third, that ideally, homes and domestic service robots must adapt to each other [9].

The operating room cleaning robot provided with ‘Manual’ and ‘Automatic’ control is used for operating room cleaning purposes. The cleaning procedure comprises of vacuum suction of dust, disinfecting the area followed by mopping. The cleaning is done for both horizontal and vertical surfaces of the operating room. This battery-driven robot has the capability to store the overall dimensions of the operating room along with the predetermined path that it is being trained off to follow during the cleaning process. It can be manually controlled using the remote control in order to have

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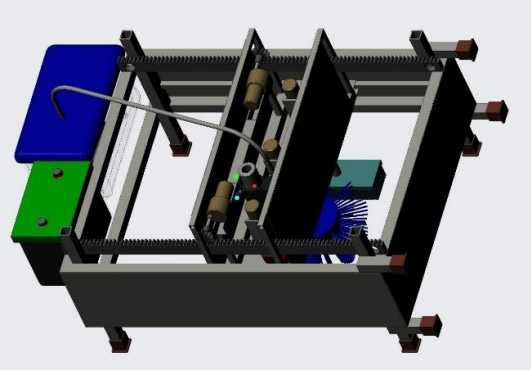
some specific function done apart from the normal trained cleaning. It is equipped with ultrasound sensor for obstacle detection thus do not cause harm to any objects or persons around [10].

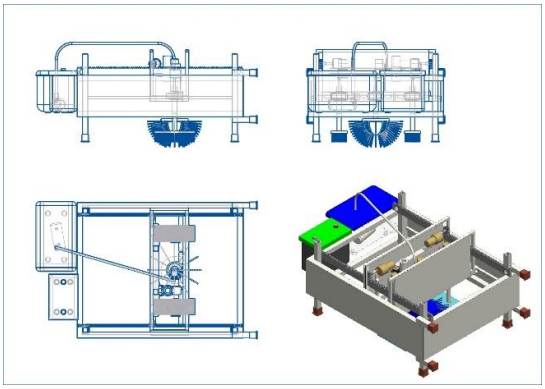
III. WORK DONE

3.1 Working Principle

This project is based on cleaning of washroom floor and dome with minimum power arrangement. This project uses rack and pinion arrangements for horizontal movement for cleaning purposes. This project uses 3 systems, the first system for footrest cleaning with horizontal movement along with rotary brush arrangement, another system for dome cleaning, and the as the system for horizontal movement of the structure. All the system uses motor arrangements with alignment unit for proper rotation. The horizontal system uses rack and pinion arrangement along with alignment assembly to make horizontal rotation with the help of high torque motor. This complete system controlled by wired controller with multi-layer switch. In this project, for dome arrangement is having to and from movement for dome cleaning. This system uses water for cleaning which uses minimum power motor. The programming kit is used to set the programme by which all the operations is done in proper interval of time.

3.2 CAD Model





3.3 Components and Specification

This project is based on Indian toilet sheet cleaning along with basement cleaning system. This system uses following resources

- Two Nylon brush for footrest cleaning
- 360 degree Nylon brush for dome cleaning.
- Geared Rack and pinion arrangement for to and fro movement.
- Pedestal Bearing for .
- Motors for rotation.
- DPDT switches for controlling.

As per latest requirement, Indian toilet seat required one advanced cleaning system so that with the use of controlling switch everyone can able to use it.

This project uses

- Horizontal Movement for seat cleaning along with rotary motion

For Horizontal rotation here used rack and pinion arrangement which works on high torque motor.

This complete system uses motor as per above

- 2 motors for footrest cleaning system.
- 1 motor for Dome cleaning system.
- 2 motors for horizontal rotation of pinion on rack.
- High torque motor for water arrangement.

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Geared Rack

- Length of Geared Rack = 24 inch
- Teeth of Geared Rack = 82 Teeth

Real View of Pinion

- **Pinion Gear – High Carbon Steel**
- Outer most diameter (Including teeth) – 13 mm,
- Number of Teeth – 11

Motors Used for Footrest Cleaning and Dome Cleaning

- Motor = 12V, 2A
- Speed = 300RPM
- Shaft Diameter =6mm (For internal hole)
- Torque = 8kgcm =748.8 Nmm

Motors used for Rack and Pinion Mechanism

- Motor Used = 12V, 2A
- Speed = 10RPM
- Torque = 46 kgcm =4512.6Nmm
- Shaft Diameter =6mm (For internal hole)

Valve Used for Pressure Control the water Supply

- Valve Used = Solenoid Valve

Bearing

- Bearing Used = Pedestal Bearing (UCB 204)
- Inner Bore Diameter = 20 mm

Programming Kit

- Preprogrammed Kit Used = Arduino UNO

Brush Used for Dome Cleaning

- Brush Used = 360 degree Nylon Brush

Brush Used for Footrest Cleaning

- Brush Used = Wooden Nylon Brush
- Weight = 100gm
- Length = 15cm
- Breadth = 6.5cm

DPDT

Adding another pole to the SPDT creates a double-pole, double-throw (DPDT) switch. Basically, two SPDT switches, which can control two separate circuits, but are always switched together by a single actuator. DPDTs should have six terminals.

Shaft Used

- Shaft Material Used = Bride Bar
- Diameter Of Shaft = 20mm

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Steel Bar Used for Making Frame

- Steel Bar = Stainless Steel
- Dimension = 0.75*0.75 inches

Motor Used:

This complete system uses motor as per above

- 2 motors for footrest cleaning system.
- 1 motor for Dome cleaning system.

2 motors for horizontal rotation of pinion over rack.

IV. CONCLUSION

In this manner, we finished the work on the advanced mechanism for Indian toilet cleaning with multi washer assembly and addressed the issue of manual scavenging.

The following are the benefits of the model:

- Time consumption of each operation is greatly decreased.
- lack of labour availability is overcome.
- used in rural places where electricity is not readily accessible in public toilets.

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