



Design and Fabrication of Bore Well Rescue Robot

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Abstract:

In the past few years, there have been several accidents of children falling into abandoned bore wells in India. Abandoned bore wells that have turned into death pits for children. The problem is all over India. Rescue teams spend hours and sometimes days in futile attempts to save these little kids. A lot of money is also spent in these missions. In most cases they are unable to save the kids. Such events have happened umpteen times in the past, and every time either the government or the bureaucracy is blamed. The rescue process to save the child from bore well is a long and complicated process now. The rescue team tries to approach the victim from a parallel well that take about 20-60 hours to dig. This complicated process makes 70% of the rescue operations fail. The design of handling system is made in such a way that the baby/victim never gets hurt and the robot itself provides some pretreatment to make the baby survive till the end of operation. Our Robot design constitutes a best Ergonomic Design and performs safest rescue operation.

Keywords: Bore well rescue robot, Life saviour robot, Child trapped inside borehole.

1. INTRODUCTION

Water well or Bore well is an excavation or structure created in the ground by digging, driving, boring, or drilling to access groundwater in underground aquifers. The well water is drawn by a pump, or using containers, such as buckets, that are raised mechanically or by hand. Now a days it's quite often we see unused bore wells left open after the use. Growing water scarcity is being recognized as an important problem facing India. These bore wells are left unclosed after identifying that ground water is not abundant at the place. This resulted in vast increase in number of bore wells. Drilled wells with electric pumps are used throughout the world, typically in rural or sparsely populated areas, though many urban areas are supplied partly by municipal wells. Most shallow well drilling machines are mounted on large trucks, trailers, or tracked vehicle carriages. Water wells typically range from 3 to 18 meters (9.8-59 ft.) deep, but in some areas can go deeper than 900 meters (3, 000 ft.).

2. DESIGN LAYOUT

This system has a M.S (Mild Steel) 3 rods arranged in a triangular manner which consist of large dia pulley. This arrangement at one end is connected with a rod through pulley at the other end. The other end consists of a hanging disc which is rotatable with the help of the dc motor.

This disc also consists of a clamp arrangement which consists of a pair of claws. This disc also consists of a hanging balloon arrangement which is in a deflated form when it reaches the child. The supply to the balloon is given through the pump. The disc also consists of a VGA cam through which the position of child is notices in the display. There is also a 42 inch bore well of 10 inch dia. All this is controlled by a string. The material of big pulley is wood and other two is mild steel.

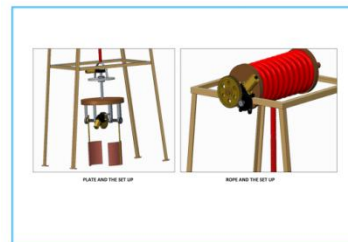


Figure.1. Block diagram of the model

Working: This DC or direct current motor works on the principal, when a current carrying conductor is placed in a magnetic field, it experiences a torque and has a tendency to move. This is known as motoring action. If the direction of electric current in the wire is reversed, the direction of rotation also reverses. When magnetic field and electric field interact they produce a mechanical force, and based on that the working principle of dc motor established.

3.FABRICATION

Various tools and equipment's are used to fabricate the modified split air conditioner unit.

Equipment's	Specifications
DC Motor	12V
Pump	12V
Adapter	1.5A
Arms	2
Joystick	1
Pulley	3
Cable wire	1
Bore well	42 inch
Safety Balloon	1
VGA cam	1
Resistance	4
Display	14 inch

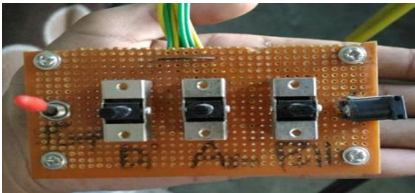
The primary components of the rescue robot system are:

a) DC Motor

There are 2 dc motors used in this system. One to rotate the disc, and one to operate the arm. The disc has dc motor of 12V which rotates with 10 rpm and arm has a motor of 12V and 40 rpm.



b) PCB controller: - The controller used is ~40A, 48V output, which is spring loaded DPDT (double pole double through). It uses a D.C socket as a switch which is SPDT (single pole double through). It has the power supply through the adapter. It has 4 controls, 1st is for pump to induce the air in the pump. The 2nd is for disc which is used for the rotation of the disc. The third one is to operate the arm for opening and closing of the arm.



c) Pump: - Basically a vacuum pump is a device that removes gas molecules from a sealed volume in order to leave being a partial vacuum. The first vacuum pump was invented in 1650 by Otto Von Guericke, and was preceded by the suction pump which dates to antiquity.

The DP 0105 pumps belongs to the E or equivalent class for coil insulation. Features include a voltage of 12-24v, max. Pressure of 25 bar, 2.8 l/min free air displacement and a 666mbar attainable vacuum.



d) Adapter: - In this system we use a switch power AC adapter of 12V supply, 5A.

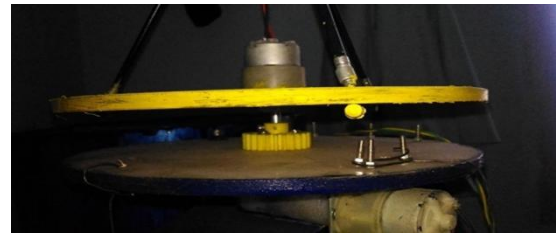
AC adapter is a type of external power supply used with electrical device that requires power but do not contain internal components to drive the required voltage and power from mains power. The internal circuitry of an external power supply is very similar to the design that would be used for a built in or internal supply



e) Disc: - The disc here is used to position the camera such that the position of the child can be examined. The disc is made of hard nylon cover which is light weighted and easily operable. There are total 2 discs used in this arrangement placed vertically parallel with a gap of 3.5 cm between them. The discs are of dimension 11 inch diameter and 6 mm thickness separately.

The upper disc is fixed with the wiring tied with the string coming through pulley. The lower disc is rotating which is connected to the motor held vertically perpendicular to the disc.

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f):-Arms: - The arms here are used as a clamping device which is used to hold the child when the child is at the extreme bottom. The arms are in pair of which one is fixed and one is movable. The movable one is connected to the motor which comes close to each other to clamp the child.

The material of the arms is th

The arm is connected to the dc motor which moves with 40 rpm, max. Torque produced is 20 kg. And the current used is 9A.



g) Joystick: - The joystick is available on the pcb controller to control the different system. Here the joystick is spring loaded DPDT (double pole double through) is used for easy mechanism.

There are 2 controls to operate the different system. One is for disc, and one is for arms. This helps in reverse movement of the system that can be in opposite direction. The supply is given by the adapter such that it is easily operable.

h) Safety balloon: - The safety balloon is an air-filled disc that has a unique dome shaped top. The safety balloon disc is 8" in maximum diameter. It is initially in the deflated condition, fitted

with the nozzle. It is inflated, when this safety balloon is in the right position under the baby. It is used to provide support for the baby operation, the motions allowed, or to the directions of the loads (forces) applied to the parts. External power supplies are used both with equipments with no other source of power and with battery powered equipment where the supply, when plugged in, can sometimes charge the battery in addition to improve the equipment.



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Working:

The rope is connected to the top of the robot. As the robot is sent into the bore-well hole, electric wires for the motor from the control unit is attached along the rope. The pump hose is fixed to the upper plate of the robot. Depending on the robot movement, the hose length is adjusted from outside the bore-well. The air hose is carried out from the pump which is located on the 3 bar rod system. Using the special features of the camera, the baby position is seen through a computer. At the appropriate position, the disc will go into the bore-well wall using the motor connected to the pcb controller setup on the upper plate. If the baby is trapped in the middle of bore-well, using the motor connected at the lower end of the hollow tube, the lower plate is rotated in such a way the safety balloon gas tube is in the gap between bore-well and the baby. Initially the air tube is above the end of robot hands. It will avoid stabbing of air tube on the baby.

Then the robot is moved down in such a way that the robot hands free to hold the baby head or middle of the body. Then the safety balloon is inflated by using the air compressor through vacuum pump. The camera is placed below the lower disc. After the safety balloon reached the exact pressure, the pump/vacuum supply is cut off. Then the safety balloon is moved upward using motor connected to the pulley setup till the safety balloon completely supports the baby. Now the baby is completely in robot control. The baby movements see through the lower camera. Then slowly, the baby is moved upward. by pulling the rope using the pulley control system. . When the robot is pulled out, the rope is cut off. The robot is taken outside carefully from the stand. The hands are loosened by the motor control and the baby is taken for treatment. Each and every control of the system

is done by the pcb controller which has the spring loaded joystick. It has various control units.

4. PRECAUTIONARY STEPS:

- When baby accidentally fell into the bore-well, first inform to the rescue team in fire station.
- The people should not do anything in the bore-well hole.
- It will help in preventing foreign bodies entering into the bore-well hole like soil, small stones, and wooden pieces.etc.
- The people can help the rescue team by removing obstacles around 5 meter of bore-well without disturbing the bore- well hole as said in previous step.
- They must prevent the people entering bore-well area around 10 meter diameter in order to prevent the disturbances during rescue operation.

5. ADVANTAGES:

- 1) The robot is computerized Digital control system.
- 2) The camera used is highly advanced as mentioned earlier.
- 3) The thermometer setup will more useful in the pre planning of medical team.
- 4) The safety balloon is more safety in case of avoiding further falling of baby during the rescue operation.

Eco – friendly - This robot is totally eco friendly as no usage of such harmful gases.

Economical – This method is relatively cheap from the initial method of rescuing through digging a parall

Safety – the bore well rescue robot is prone to safe zone as Easy maintenance

5. RESULTS & CONCLUSION

In future we can use this project in several applications by adding additional components to this project. By connecting temperature sensor to the robot we can get the temperature of dangerous zones in personal computer itself instead of sending human to there and facing problems at the field, we can send robots to there and sensor will detect the temperature and it gives information to the Microcontroller and microcontroller gives the information to the transceiver from that we can get the data on the PC side. By connecting smoke sensor to the robot we can get the information related concentration of smoke or gases in respective field's i.e (coal mines, dangerous zones, etc.) Sensor sense the information and it gives to the microcontroller and its gives to the transceiver and from that we get the information on personal computer.

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