Fabrication of Mechanical Device for Lifting Child from Bore Well

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Abstract— The rescue operation mainly consists of three processes; Approaching the Child, Handling the body, Taking child out of the well. In the past few years, there have been several accidents of children falling into abandoned bore wells in India. Abandoned bore wells have turned into death pits for children. 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 numerous 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. 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. Very few of the victims have been saved in such accidents. Recently some autonomous robots came on to screen to take out the trapped body in a systematic way. But the question rises, why these bots are not in action in the real world. This brings out safety that how far the robot handles the child safely.

Key words: Air Bag, Robot Rescuing Machine, HD Camera, Child Rescued from Bore Well, Bevel Gear, Pneumatic Cylinder

I. INTRODUCTION

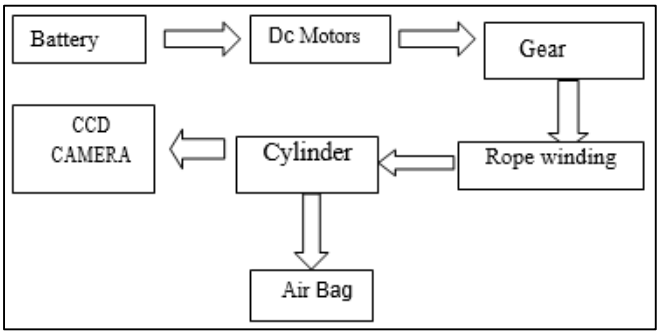
At present context, clean water scarcities are leading for construction of underground bore-wells to get water. And the number of bore-wells are increasing day by day. If there is no availability of water in the bore-well then it is left as it is by the constructors in most cases, which is the reason why those life taking bore-wells exist. In other cases, children unaware of such bores, and children playing carelessly around such uncovered bore-wells become its victim.

There is no proper equipment available for handling rescue operation. Usually, conventional method i.e., parallel digging is used to rescue the child from bore-wells. It takes a lot of time and resources to perform such operation. In most cases, the child is found dead, because of long operation time and falling of foreign materials on the child which harms the child breathing.

In the world of technological advancement, we can ease our work by creating machines and equipment according to our requirement. Man has created from simple machines such as lever, pulley to complex robots and spacecraft. As we can find variety of materials and components in the market to create our own machine, why not create a rescuing device that can lift a trapped child out of bore-well. So we have built a device that is simple in making, easily operable and takes less energy for operation.

We have designed a light weight device so that it can be transported from one place to another easily due to the fact that there may be trapped victims at different locations at different time. This device can overcome the difficulties of adopting parallel digging, such as more time consumption, more rescue personnel, and yet very less chance of success in saving child's life.

II. BLOCK DIAGRAM



III. LITERATURE SURVEY

Bharathi1, B et. al [1] described the designing a robot for rescue a child from inside bore well, which was capable of moving inside the bore well, according to the human comment by PC and also pick and placing based on arm design. The robot was operated through PC using wireless Zig-bee technology and using wireless camera could view both audio and video on the TV. This robot had a high power LED which acted as a light source when light intensity inside the pipe is low.

Palwinder Kaur et. Al [2] described the rescue operations without human intervention. Here the wheeled leg mechanism was designed to go inside the pipe and the legs are circumferentially and symmetrically spaced out apart. The robot could adjust its legs according to the pipeline dimensions. The robot consisted of power supply, switch pad, and gear motor. The child position was captured from bore well with USB Camera and monitored on PC. The temperature sensor and LCD were interfaced with microcontroller to sense and displayed on monitor.

S. Gopinath et-al[3]transferring between victim in bore-well and recovery team in earth surface, vacuum cup is used to adjust the child position, the arm movement of robot is controlled by stepper-motor, BLDC motor is used to lift the child from bore-well, camera along with LED light is used to visualize the victim and operated by control unit and finally simulation result is obtained by using the software Keil C-describes the system used for rescue child from bore-well. This consists of Zig Bee technology for data.

A. Working

Firstly we should roll all the rope over the rod pivoted in the frame then we should tie the rope to machine with the lever presented side of the frame so that we can control the motion of the machine.

Now we discuss about the working of the machine itself. As it go deeper we can visualize the position of the child with respect to the position we can stop the machine at the required height and lock it with help of bevel gear and screw mechanisms. After the lock we should adjust the position of the pneumatic cylinder with help of spur gear arrangement and then after arranging the cylinder with help of solenoidal value we actuate the cylinder and fill the air bag after the air bag is filled the baby can conveniently sit on the bag and then by reversing the positive and negative of the battery the lock gets opened. So by using the lever we can lift the machine slowly and get out of the well. So by these we can save the life of the child.

IV. FABRICATION

We used many tools to fabricate the below tabulation shows it.

S.No	Materials	Quantity
1	Screw Rod	1
2	Rope	1
3	Dc Motor	2
4	Disc	2
5	Air Bag	1
6	Spur Gear	1
7	Tube	1
8	Nut Set	2
9	Rope Roller	1

Table 1: Components Used

A. D.C Motor

There are 2 dc motors used in this system. One to rotate the bevel gear, and one to operate the spur gear. The disc has dc motor of 12V which rotates with 30 rpm and spur gear has a motor of 12V and 10 rpm.

Fig. 3: D.C Motor

B. Disc

The disc here is used to position the camera such that the position of the child can be examined. One disc of made of mild steel and other is aluminum alloy. 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 and also consists of the whole bevel gear setup.. The lower disc is rotating which is connected to the motor held vertically perpendicular to the disc. We use an external battery to run these motors.

Fig. 4: Disc

C. Lifting Elements

The lifting elements consist of rope, rope roller and automated rope winding shaft. The material of rope is Nylon. There are lot of lifting elements available in the market but they have their own limitations. For example, we could have used chain and sprocket or gear drive as lifting element. But the main problem of chain and sprocket and gear drive is that they are fixed drives. Whereas, rope is flexible enough to be used in short depth as well as long depth as they can be wounded around for lifting and releasing. Moreover, rope is quiet lighter in weight and smaller in cross section than other lifting elements which is very advantageous in our project where size and weight are two major factors.

Fig. 5: Rope

D. Air bag

It is main component of the project as it is the one which gives the support for lifting the child. So the air that we used is capable of lifting around 50kgs so that as child will be maximum of 10 kg so it is more sufficient

E. Ball Bearing

Ball bearing are extremely common because they can handle both radial and thrust loads, but can only handle a small amount of weight. They are found in a wide array of applications, such as roller blades and even hard drives, but are prone to deforming if they are overloaded.

F. Spur gear

Spur gears are gears where the axes of the two shafts are parallel and they have straight teeth.

Fig. 7: Spur Gear

G. Pneumatic Cylinder

Pneumatic cylinder(s) (sometimes known as air cylinders) are 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 desire direction. The piston is a disc or 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

Fig. 8: Pneumatic cylinder

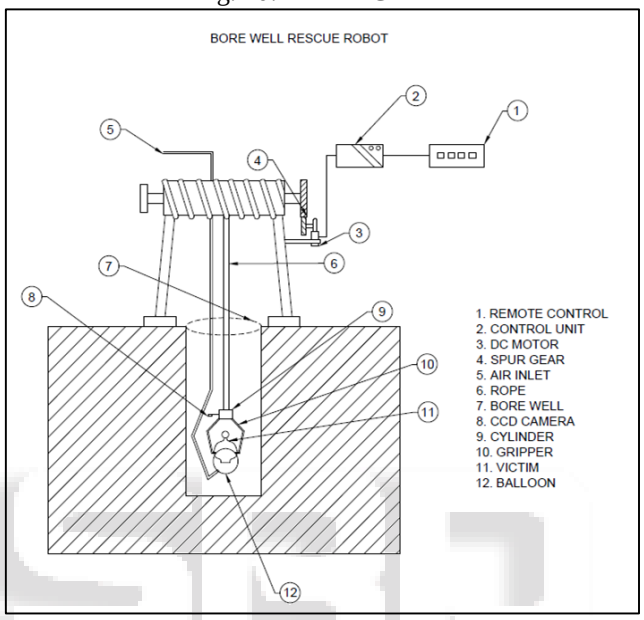
H. Battery

This sealed lead acid battery is ideal for alarm systems, emergency lighting, UPS systems or similar standby applications. When matching the replacement to your existing battery, pay special attention to size and voltage and try to match capacity (AH) as close as possible. We used the 12V battery.

Fig. 9: Battery

I. Grasper

Fig. 10: 2D DIAGRAM



V. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

A. Advantages

- Simple in construction.
- Easy to fabricate.
- The components used are easily available.
- Efficient method of saving the victims from the bore wells.
- No need of skilled operators to operate this system.
- Safe operation can be achieved.
- Highly reliable.

B. Disadvantages

- More number of moving parts.
- Only ropes can be used for lifting the victims up and the rope must be strong enough the bear the weight.
- The cost of the system is slightly high.

C. Applications:

- Highly suitable for rescuing victims from th bore wells.
- Suitable for construction fields.

VI. CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We

feel that the project work is a good solution to bridge the gates between the institution and the industries.

We are proud that we have completed the work with the limited time successfully. The DESIGN DESGIN FABRICATION OF BORE WELL CHILD RESCUE MACHINE is working with satisfactory conditions. We can able to understand the difficulties in maintaining the tolerances and also the quality. We have done to our ability and skill making maximum use of available facilities.

In conclusion remarks of our project work, let us add a few more lines about our impression project work. Thus we have developed a "DESIGN DESGIN FABRICATION OF BORE WELL CHILD RESCUE MACHINE" which helps to design a robot. In this project, we have combined the mechanisms of robotic and monitoring systems using an electronic control units which actually moves and records the instants of the soil report and feeds it back to the control unit.

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