

The V.A.D.E.R

As you hear the heater turn on, you once again hear the mysterious rattling from the underground air return duct in the corner of the room. What is it? How do you find out what it is? You need the V.A.D.E.R.

The Vex Air Duct Exploring Robot (V.A.D.E.R.) is a remote controlled robot for exploring air ducts and tight places. It is very compact and makes use of a camera, light, winch, and claw to explore air ducts and see and grab objects.

Chassis

In order to fit within a 15" air return duct, everything needed to be packed onto the frame as tightly as possible. The gears were designed to be offset so as to allow tight positioning by overlapping. All four of the drive wheels are Omni-wheels so the robot will stay level in the tunnel. The front two Omni-wheels are powered by 269 two-wire motors. The final robot easily fits within the duct.

Light and Camera

The main function of the robot was to allow a human operator to see what was down in the air return duct, so I attached a Vex color camera and a Vex flashlight to the chassis.

Winch

The robot needed a winch so that it could lift itself in and out of the air return duct, as well as for safety in case of an accident such as a dead battery. I considered using the vex winch kit, but decided that it did not have a long enough string. The final winch was built by connecting two 82 tooth gears with standoffs. The gears and two 393 motors were attached to the back of the robot chassis.

Arm

I added a motorized arm with a Vex claw kit and a wrist kit to allow the operator to see and manipulate any objects the robot finds. The arm can fold into a Z shape if the robot needs to turn a tight corner. The claw and the wrist are powered by VB-1 motors, and the arm is powered by a 393 two-wire motor. The claw can also be used to do other things such as hold a vacuum hose or carry a magnet to pick up screws.

Conclusion

I used Autodesk Inventor to design the V.A.D.E.R. I started by creating two drive assemblies (left and right). Then I created assemblies of the arm and winch. After that I connected the drive assemblies in a new assembly and added the Cortex controller, the vision system, and the motors to power the arm and winch. Finally, I added in the arm and winch assemblies.

I found the bend tool very helpful for making the battery straps. However, the tool I found most helpful was the split tool. Due to the need to keep the robot small, there were many plates, beams, and axels that I needed to cut. I also found the system for creating mechanical drawings very easy to use and it produced excellent results.