ME225 – MECHANICAL WORKSHOP

Project by:

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Detailed CAD model of drilling machine with motion analysis

Overview of the project

- Drilling Machine Explanation
- Different types of drilling machine
- Detailed CAD model of the drill base machine
- Simulation of all the possible motion of the drill machine
- Axis of rotation of the drill machine
- Revolute and prismatic joints of the drilling machine
- Degree of freedom of the drilling machine

Drill Machine

- A drill or drilling machine is a tool primarily used for making round holes or driving fasteners. It is fitted with a bit, either a drill or driver, depending on application, secured by a chuck. Some powered drills also include a hammer function.

- Drills vary widely in speed, power, and size. They are characteristically corded electrically driven devices, with hand-operated types dramatically decreasing in popularity and cordless battery-powered ones proliferating.

- Drills are commonly used in woodworking, metalworking, construction, machine tool fabrication, construction and utility projects. Specially designed versions are made for medicine, space, and miniature applications.

Some types of Drilling Machines

- Power Drills
  - Pistol-grip drill
  - Right-angle drill
  - Hammer drill
  - Drill press
  - Rotary hammer

Pistol-grip drill

Right-Angle drill

Hammer drill

Rotary Hammer

The drill made and analyzed by us.

Drill Press

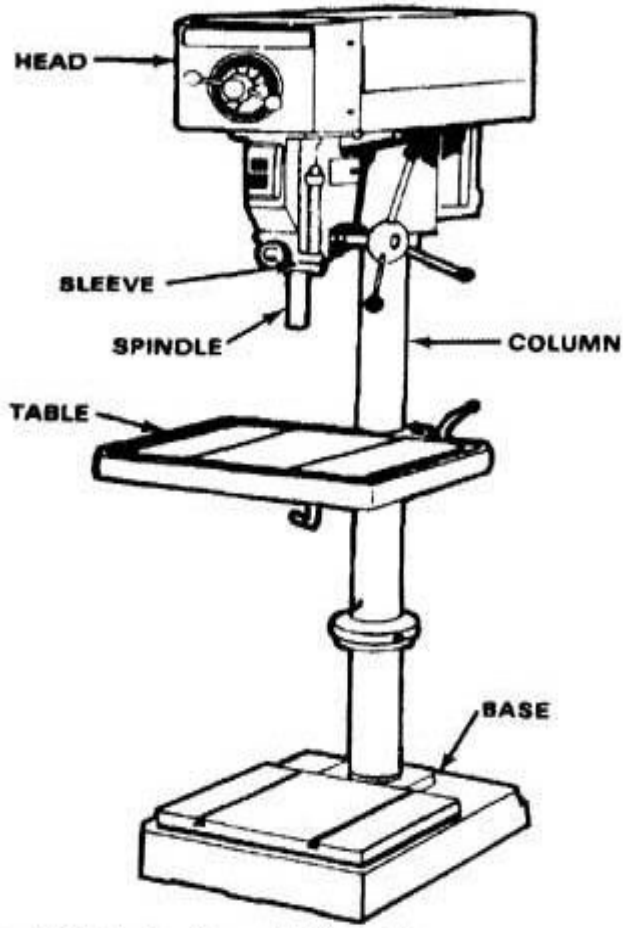
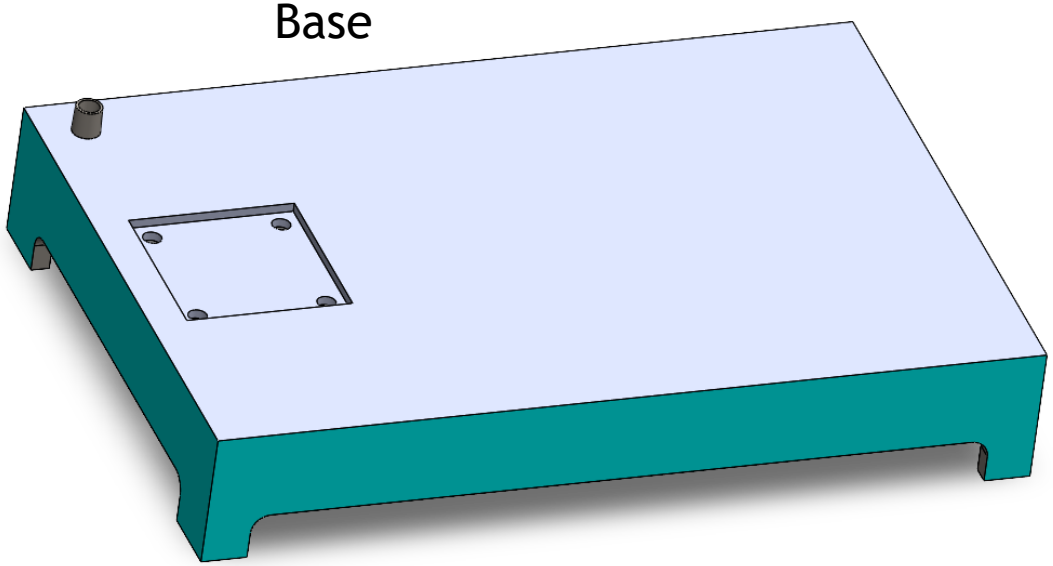
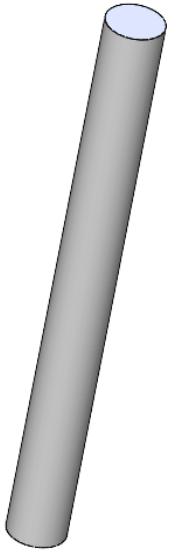


Figure 4-4. Construction of an upright drilling machine.

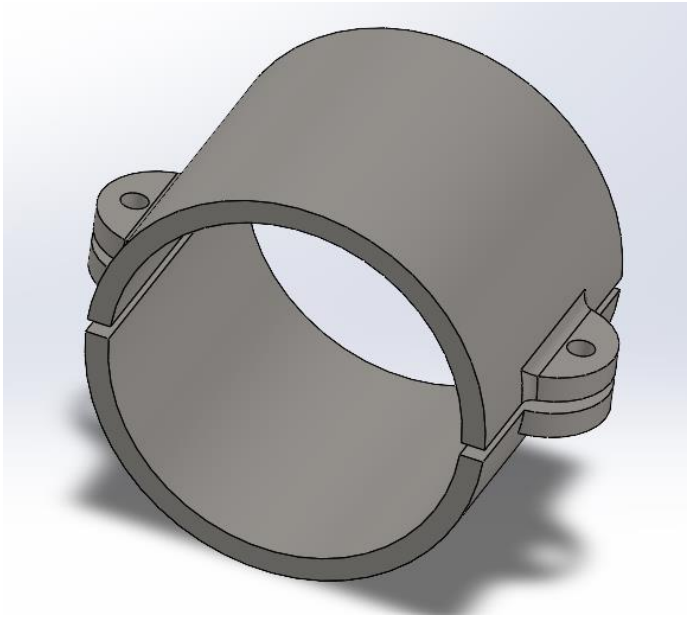
Parts Images

Base

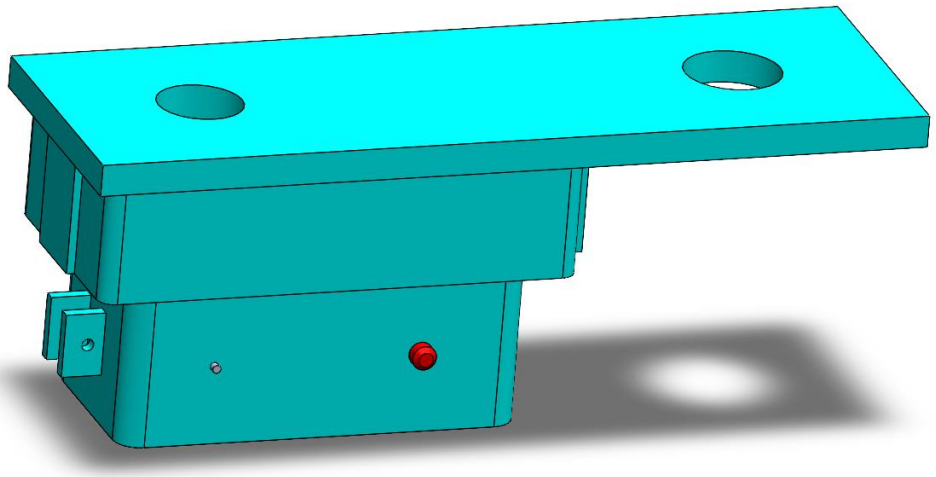




Column

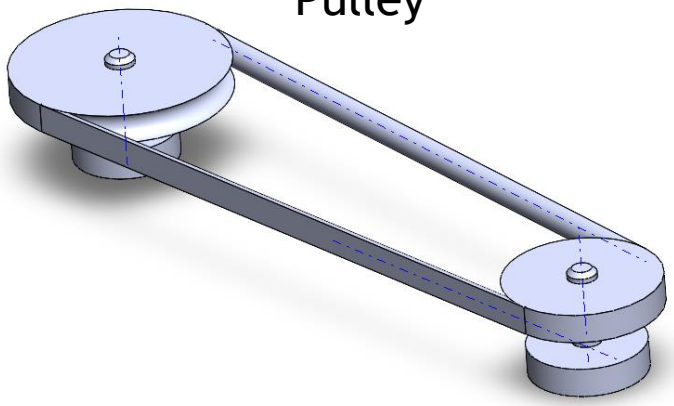


Column bracket



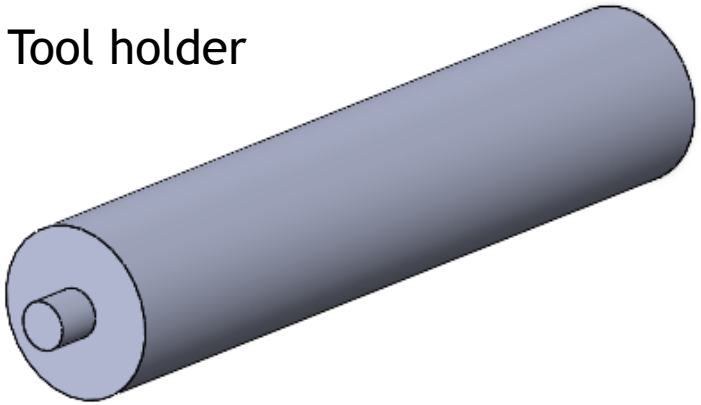
Upper part

Pulley

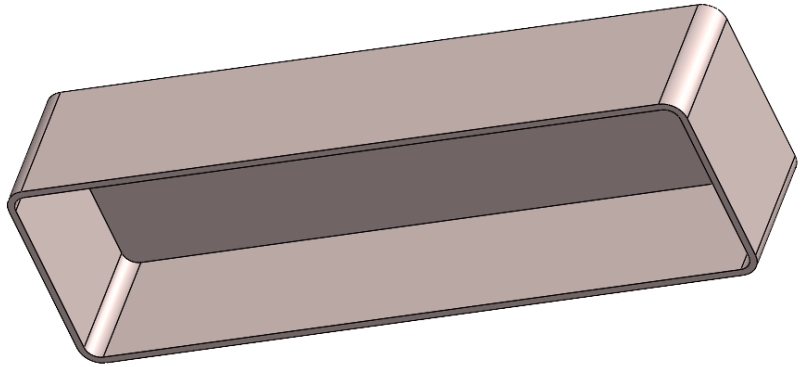


Motor

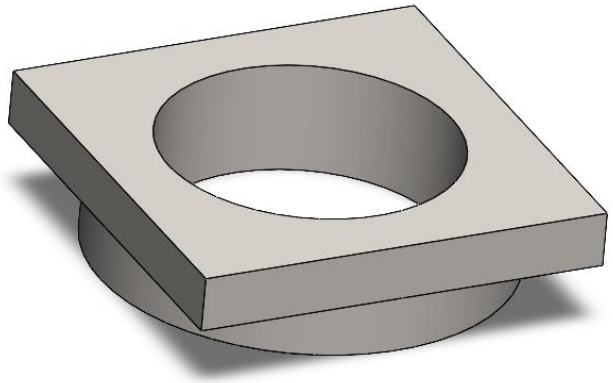
Tool holder

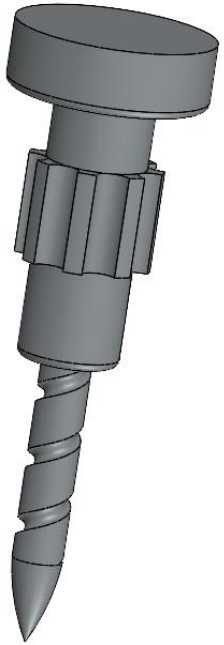


Upper cover



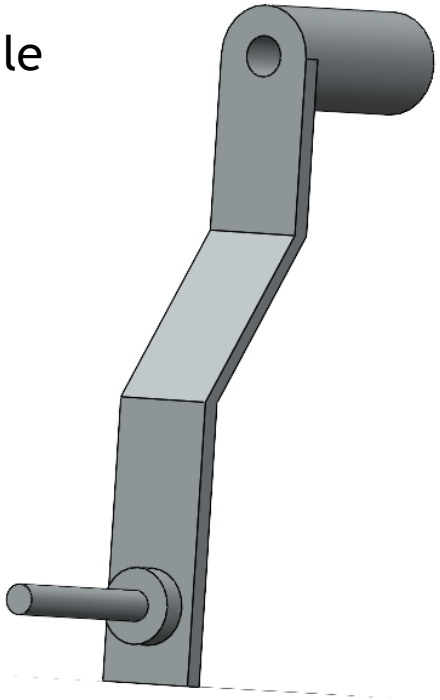
Tool connecting part

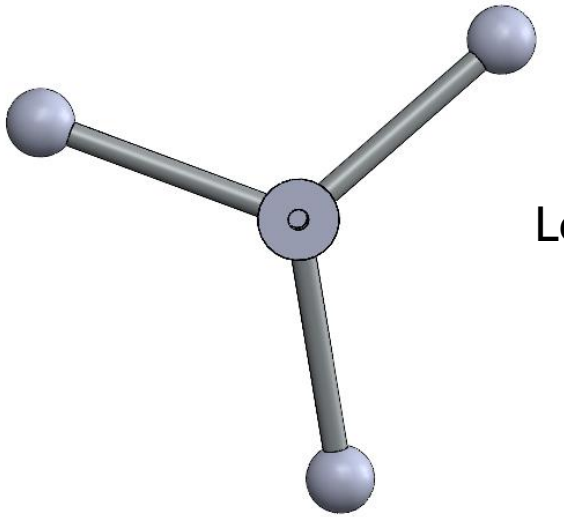




Tool

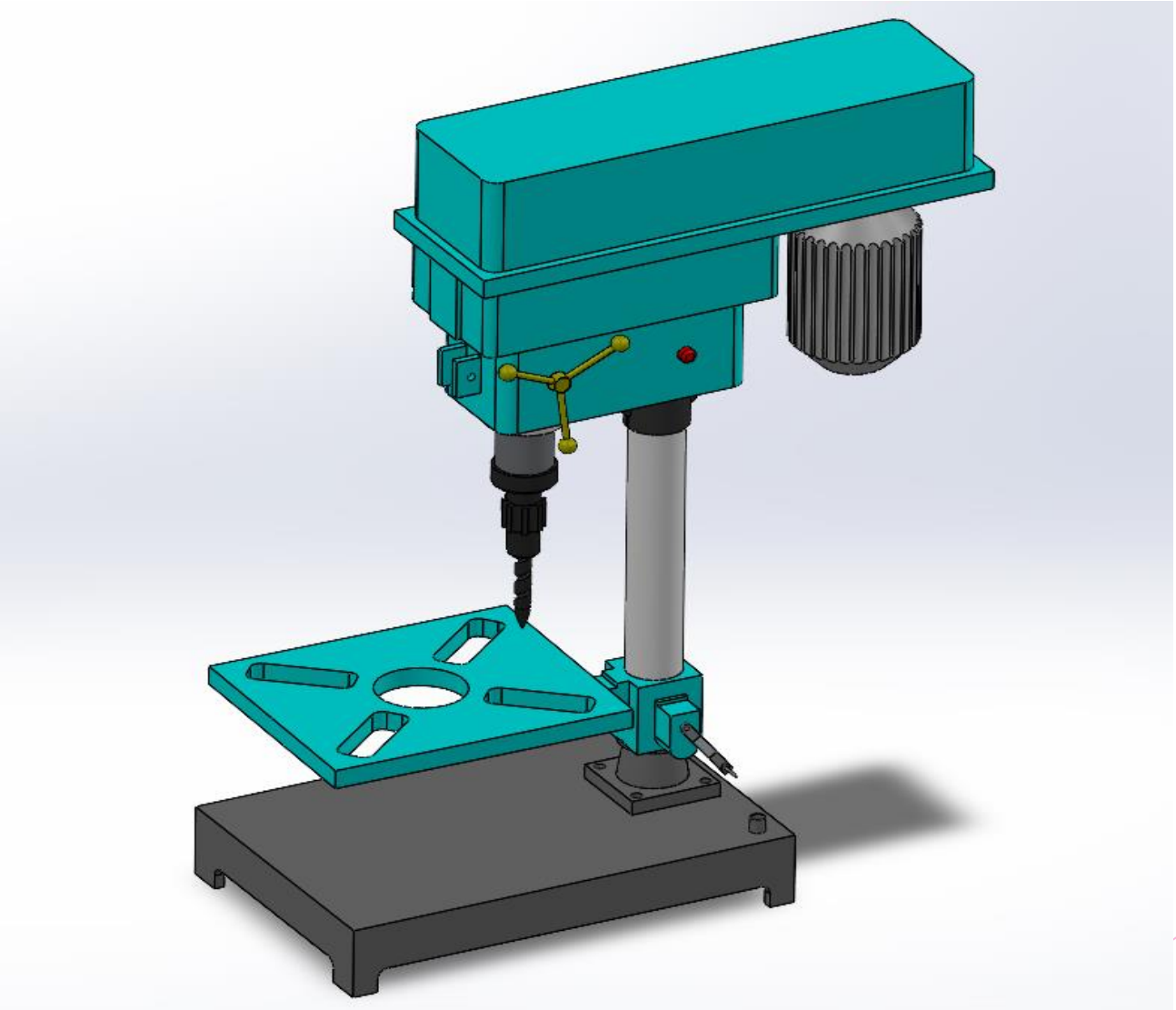
Handle





Lever

CAD Model

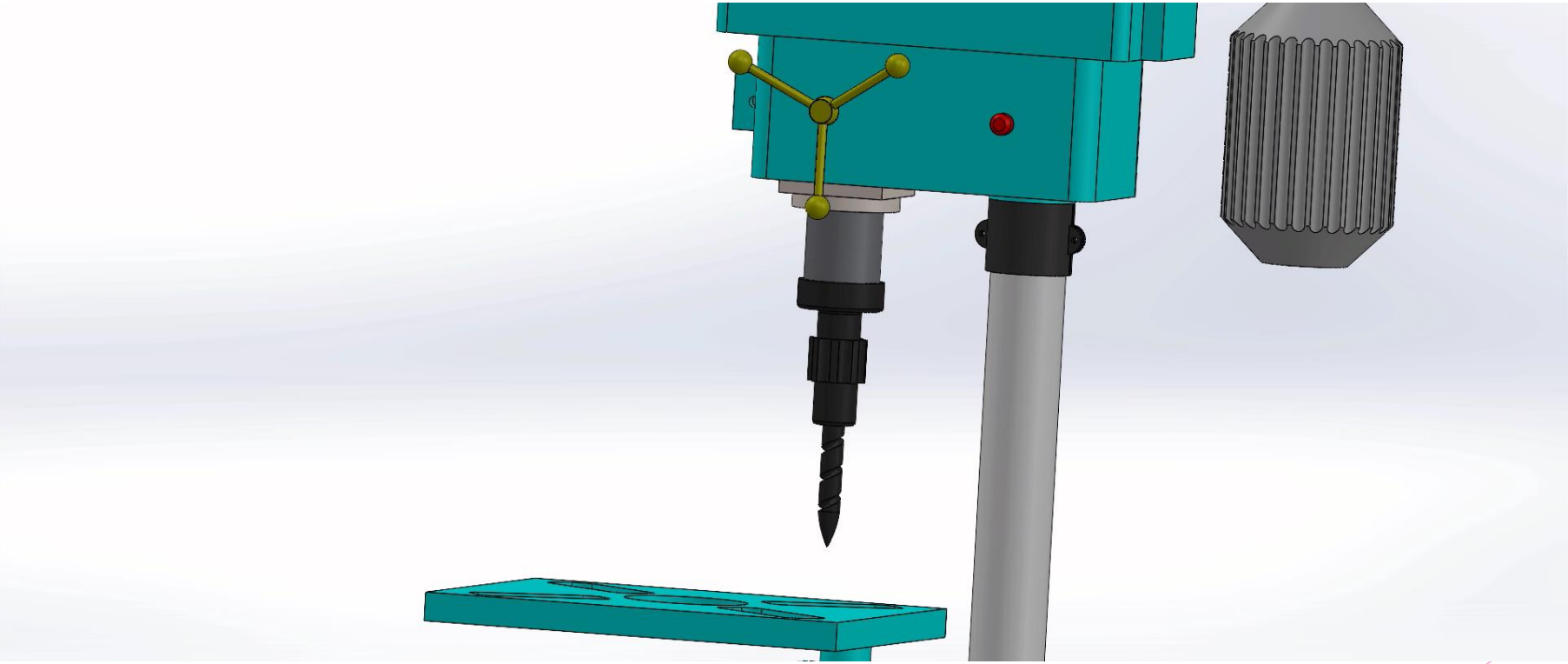


Things we analyzed in the motion study

- Simulation of all the translation and rotation joints
- No. of axis of rotation of drill machine
- Degree of freedom of the drill machine

Simulation of all the translation and rotation joints

Spindle Rotation Simulation



Up and Down Motion of Drill Simulation

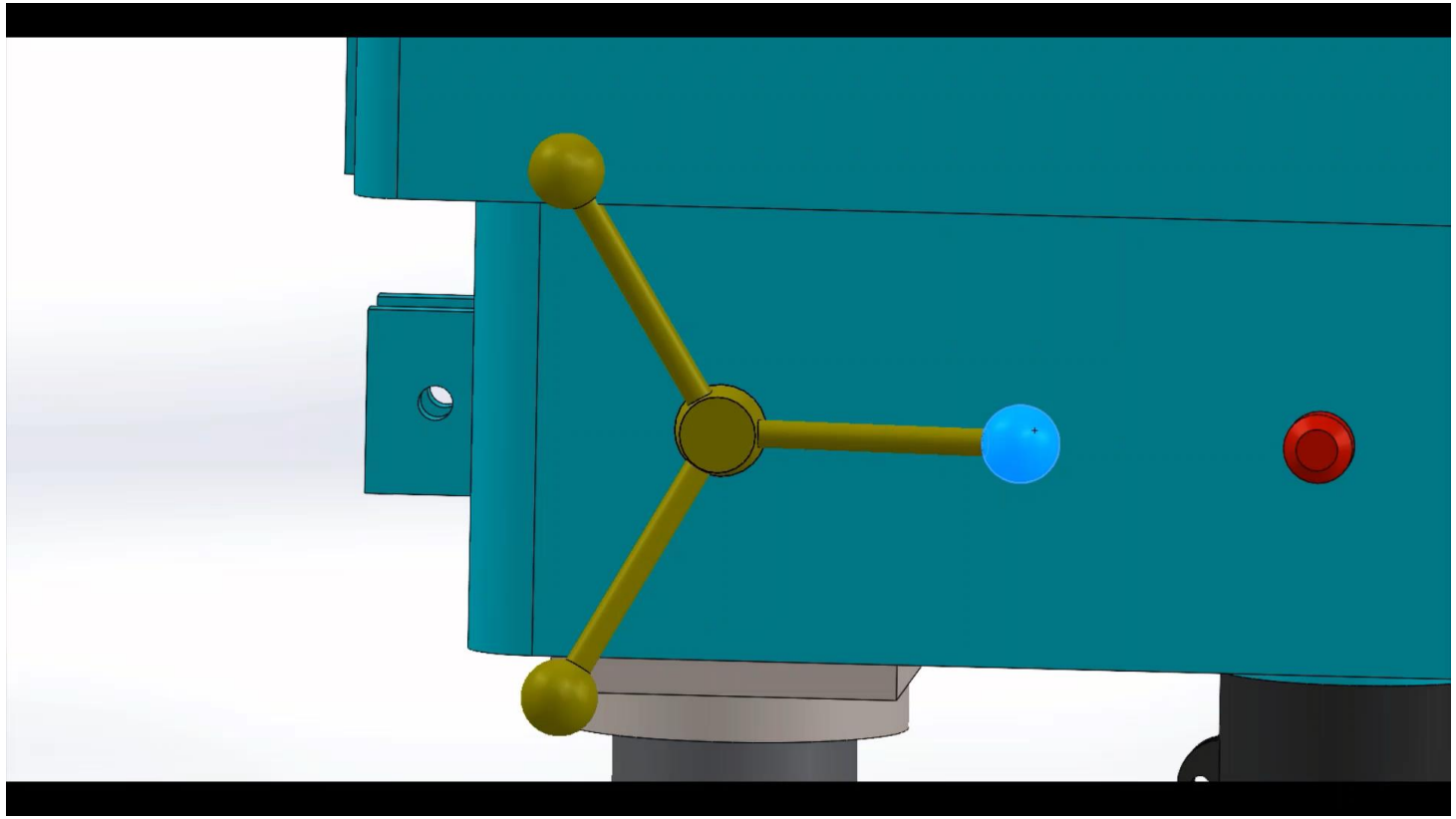
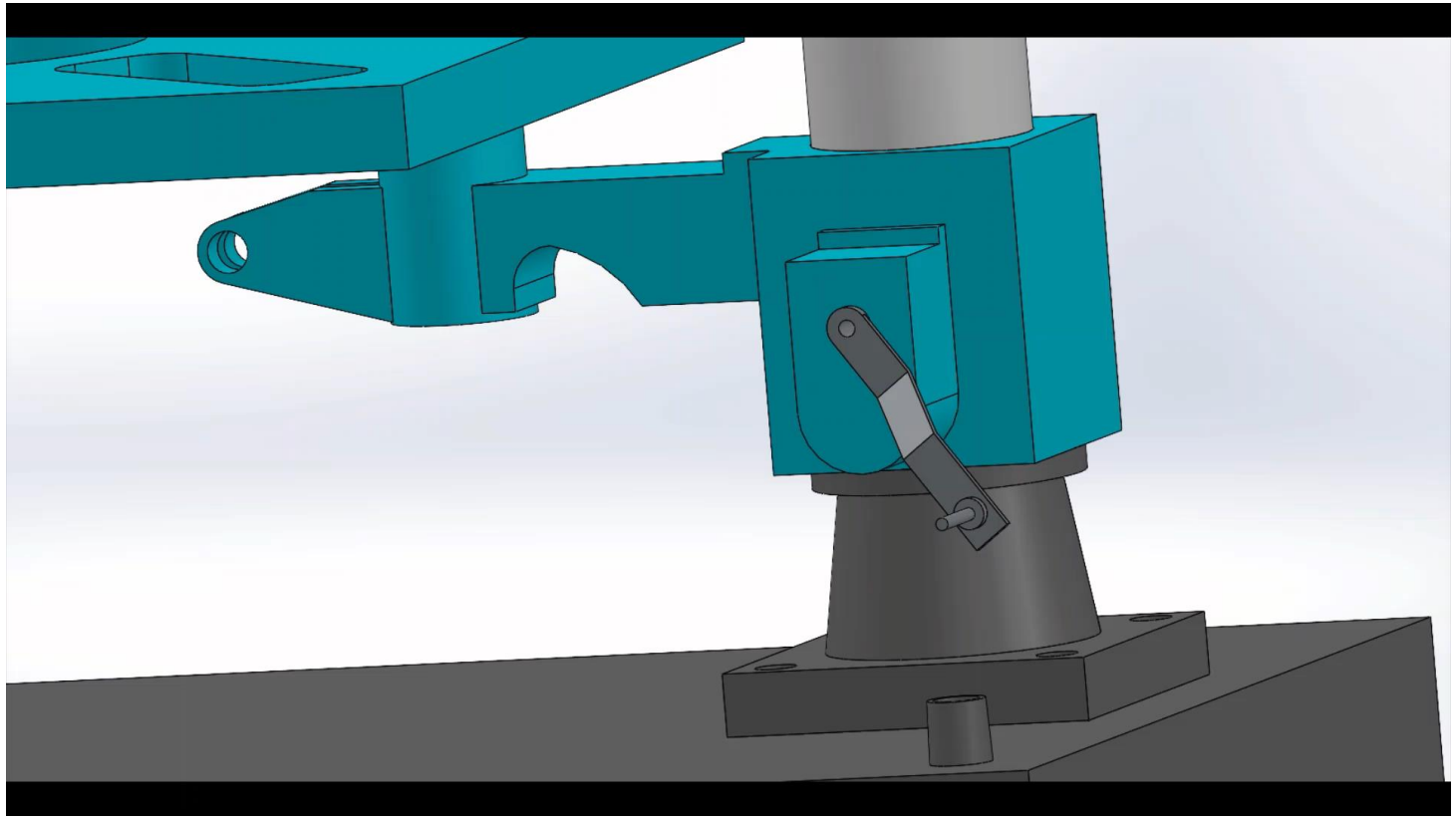
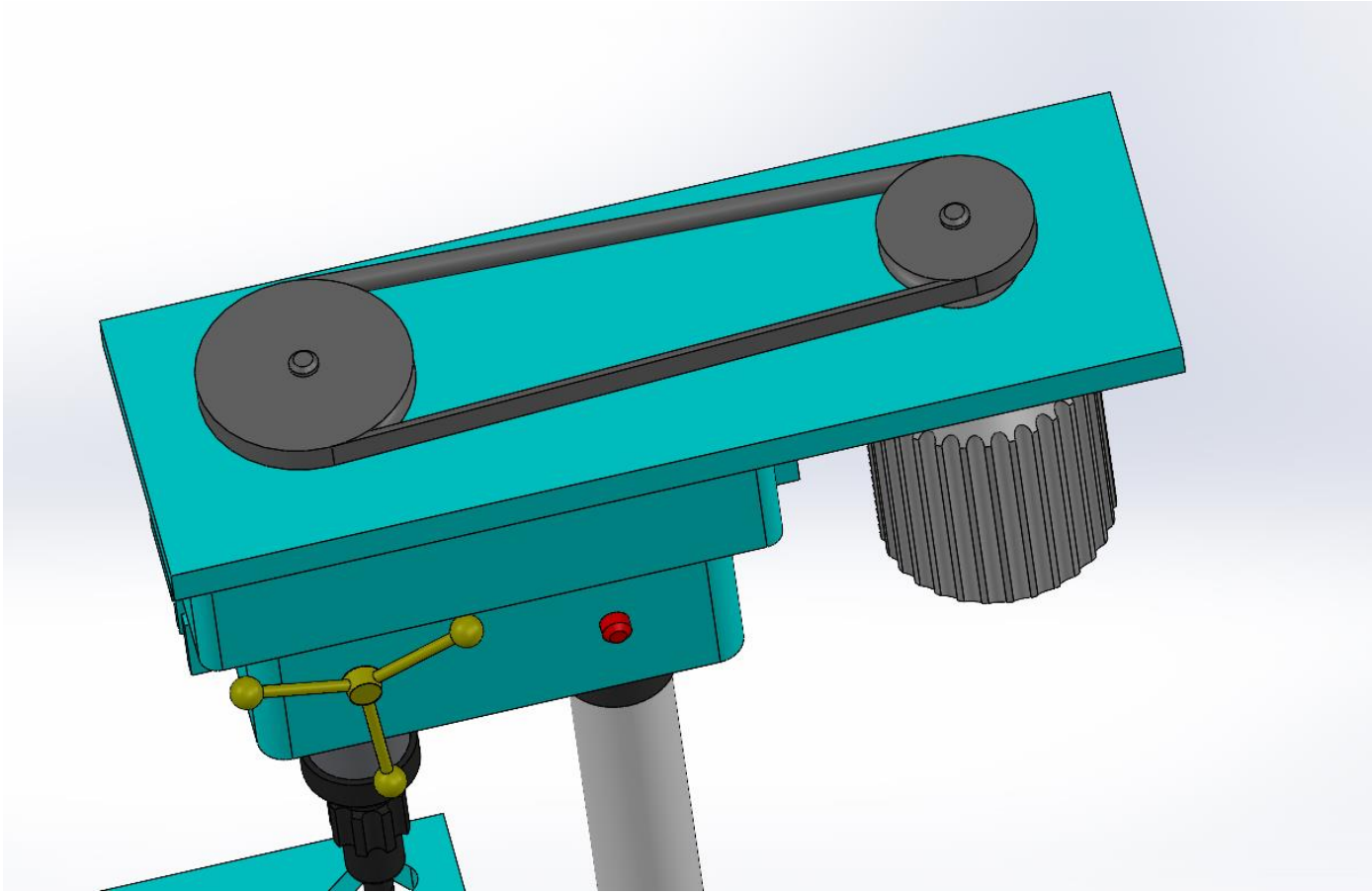


Table Tight and Loose Simulation



Motor Rotation

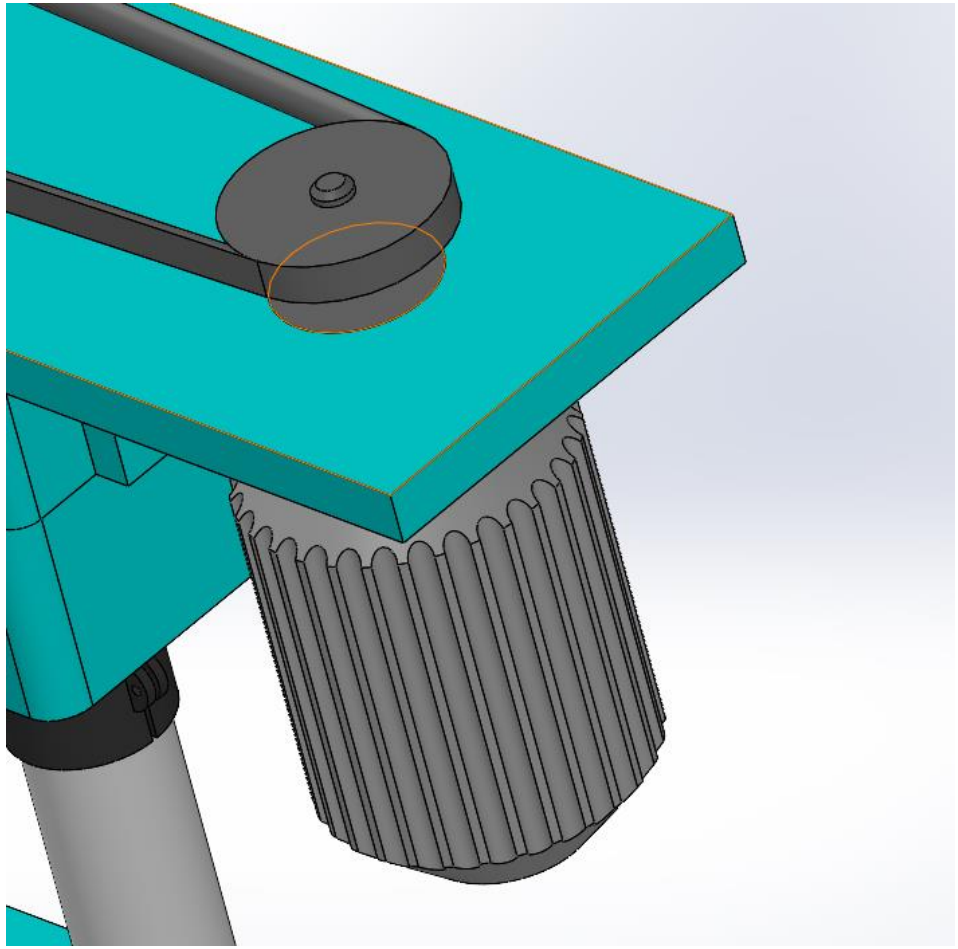


No. of axis of rotation of drill machine

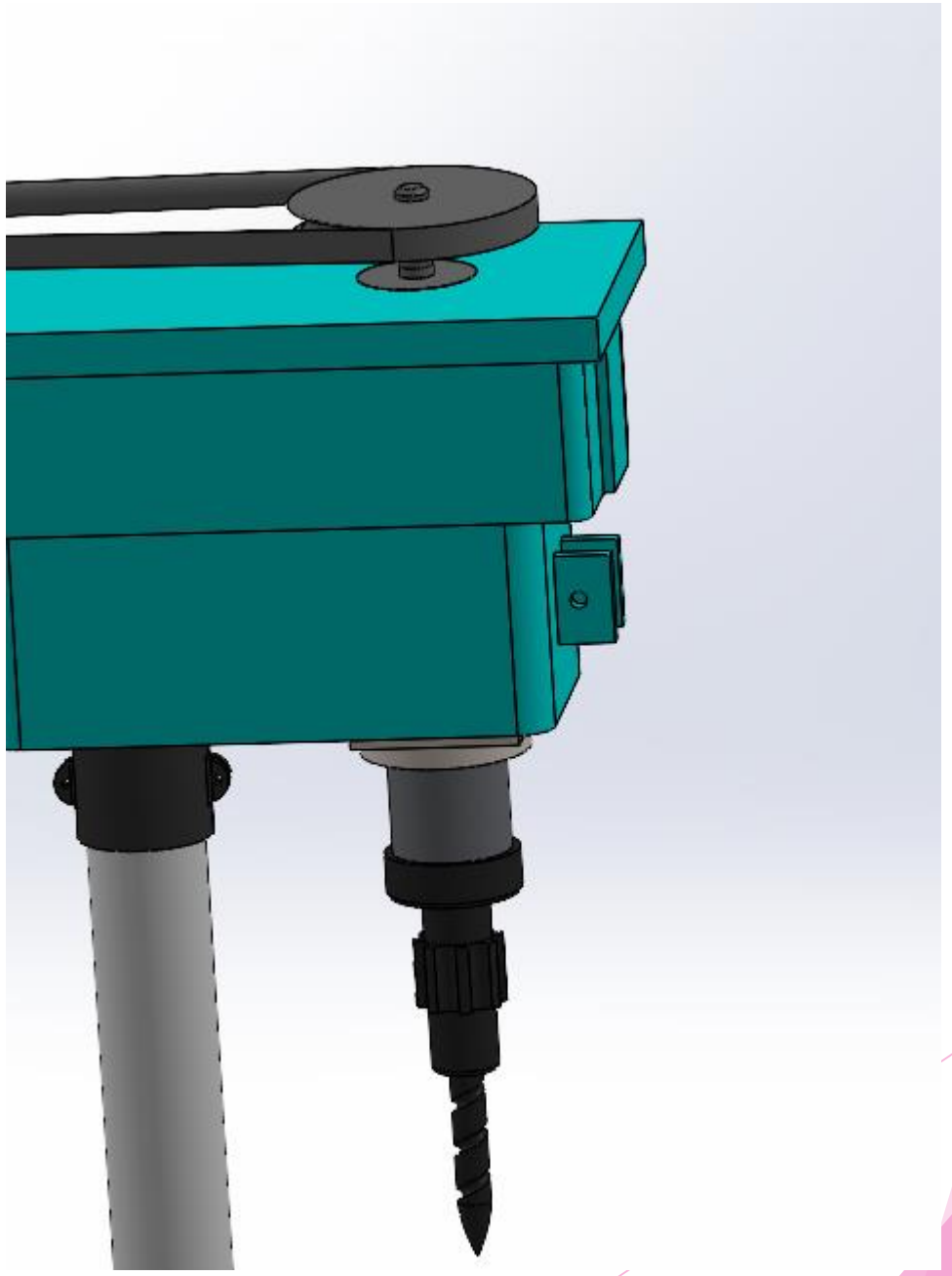
5 Axis of Rotation

- Along the axis of motor
- Along the axis of spindle
- Along the up and down Key
- Along the table lock key
- Along the table

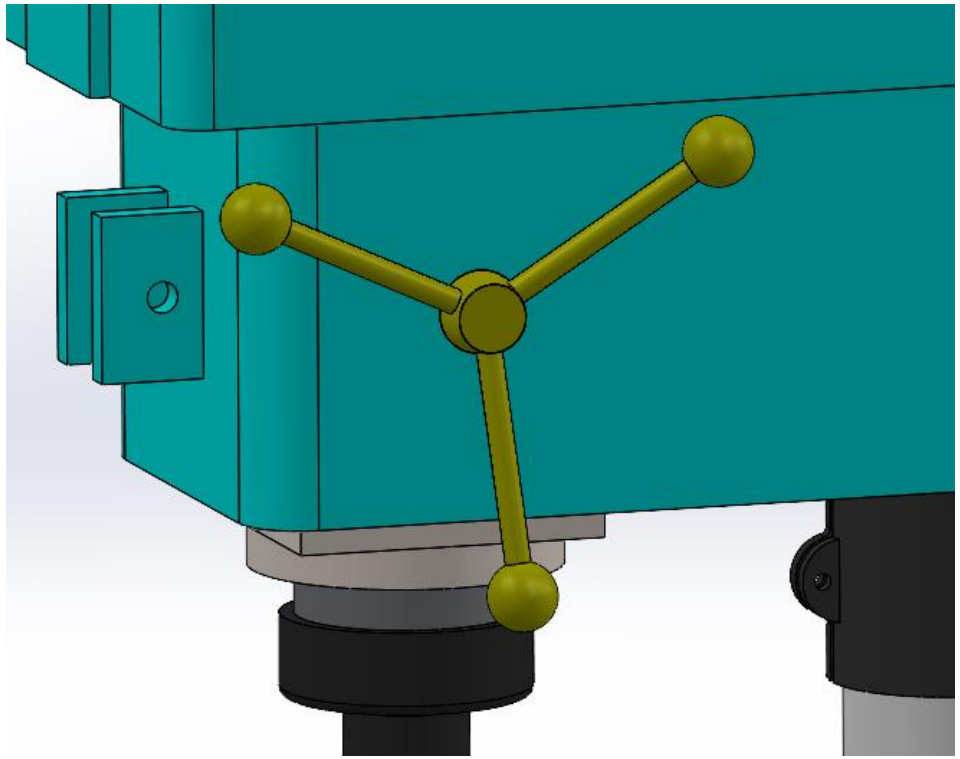
Along the axis of motor



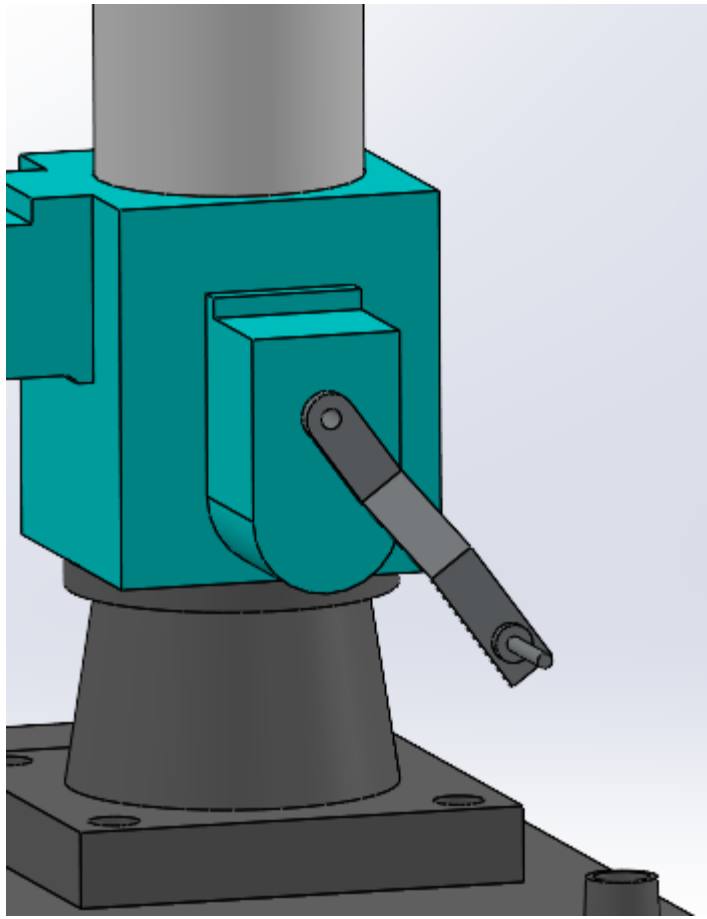
Along the axis of Spindle



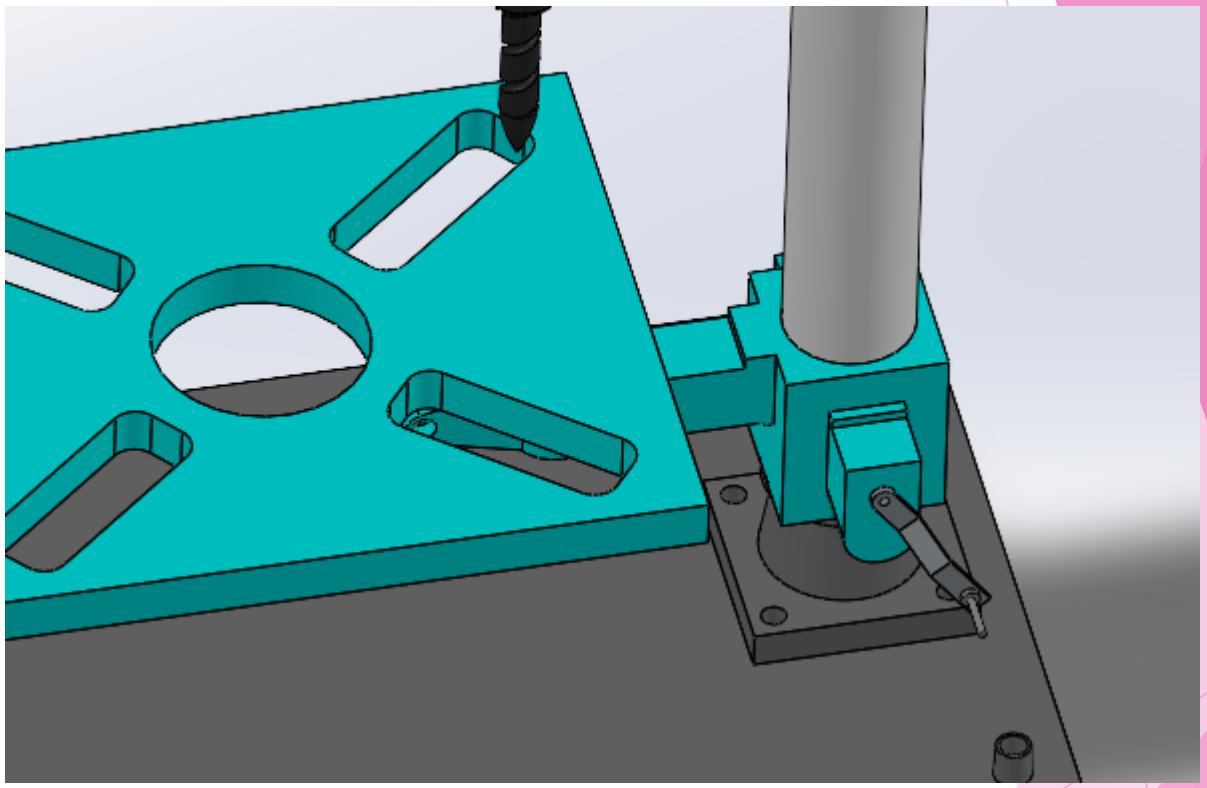
Along the up and down Key



Along the table lock key

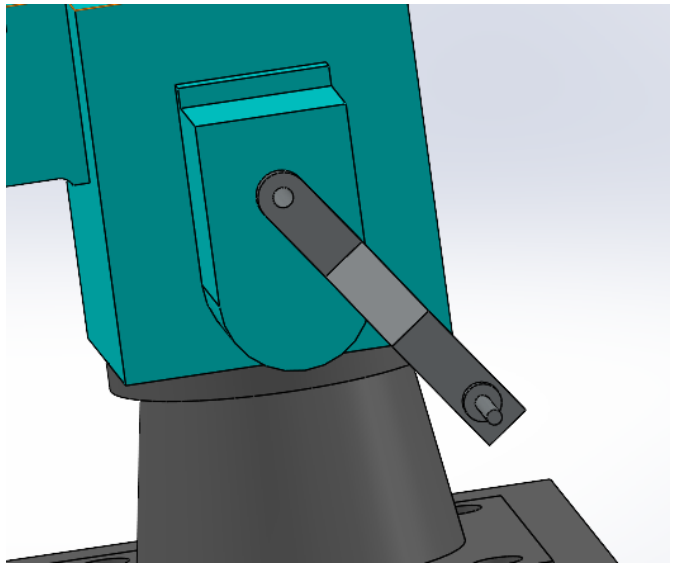


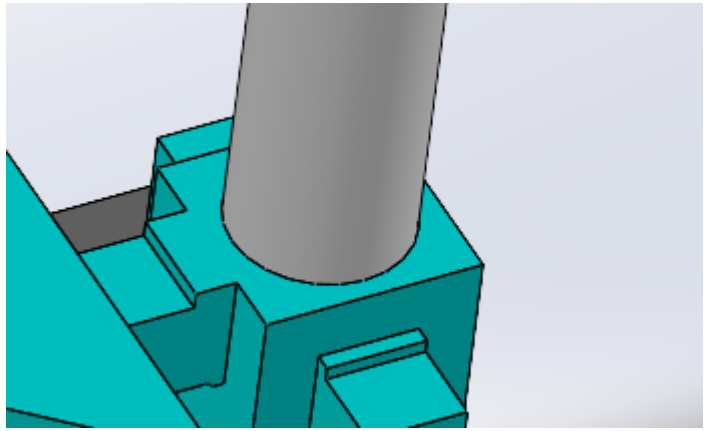
Along the table

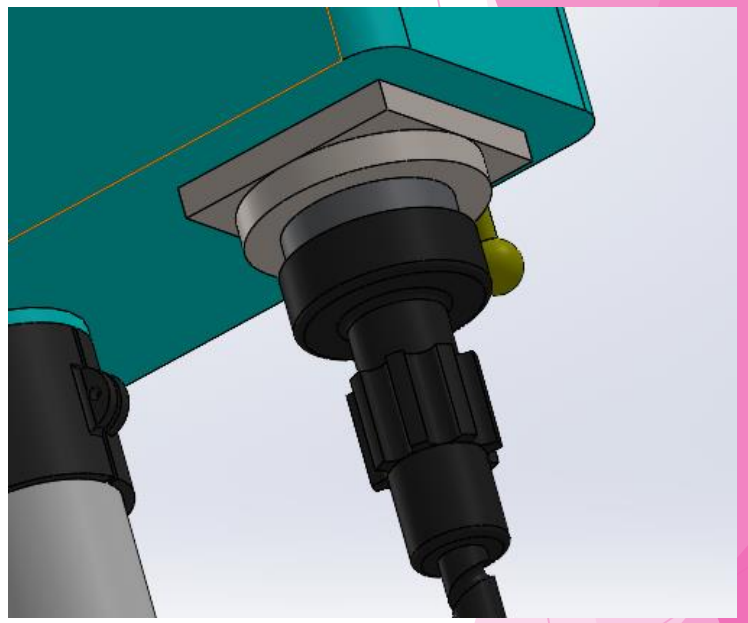


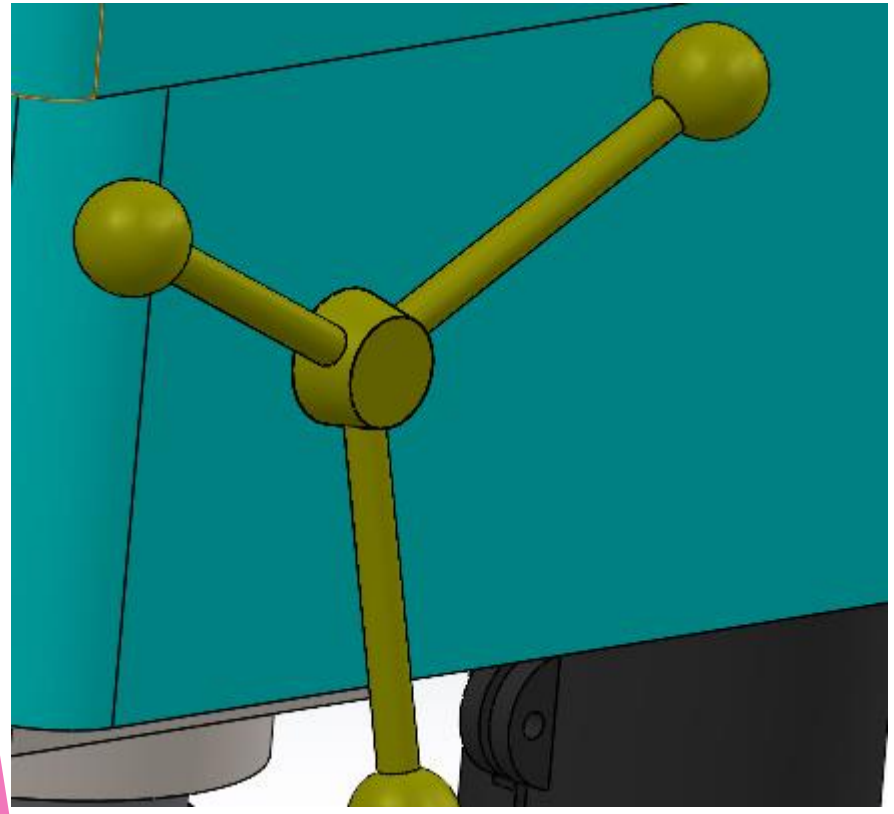
Motion Joints

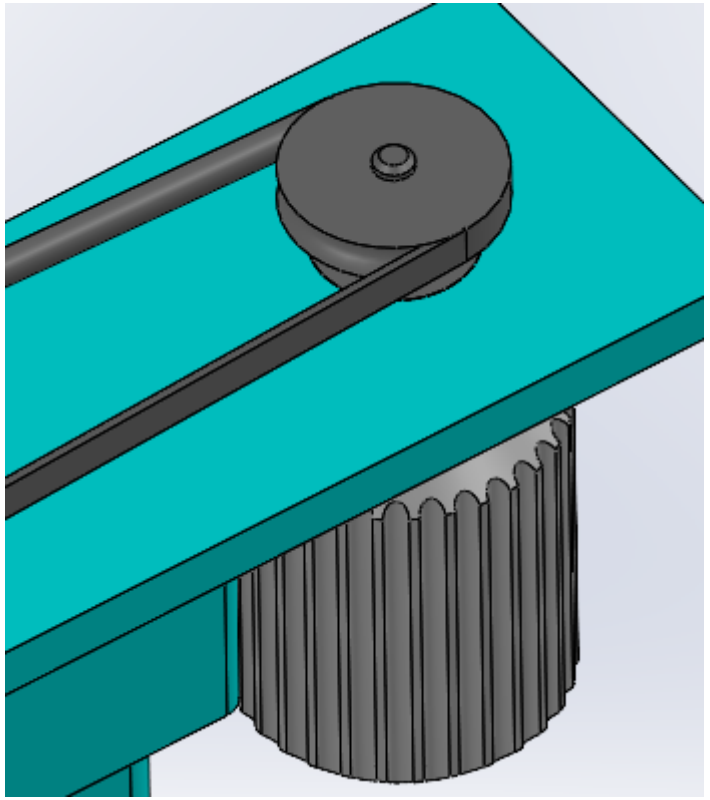
Revolute Joints

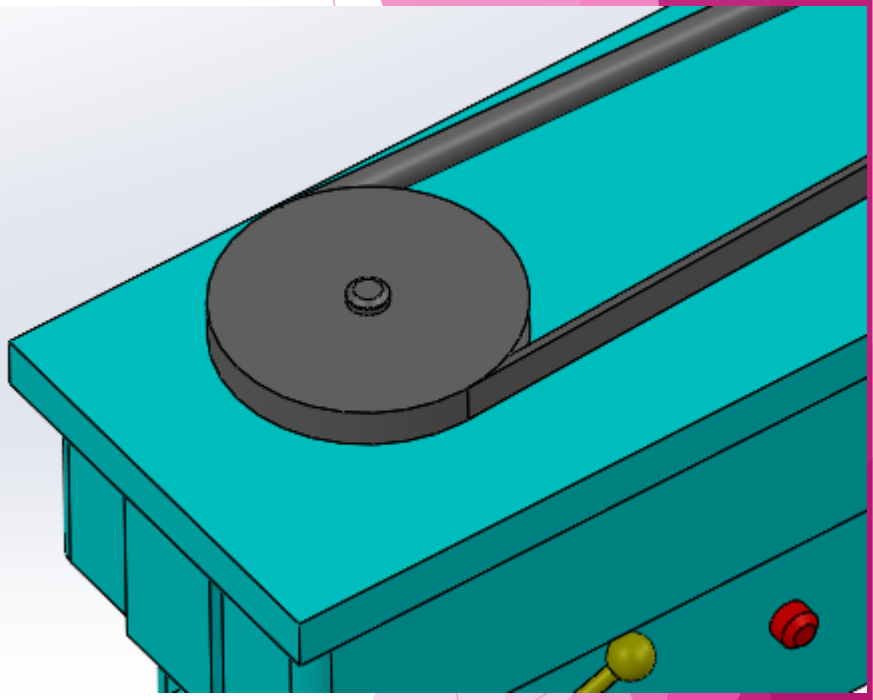




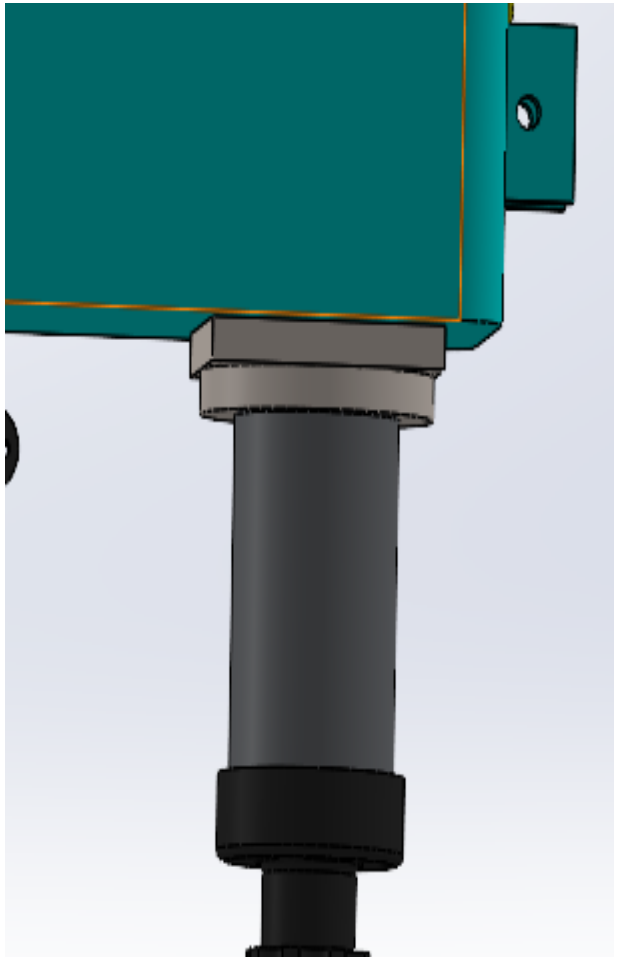


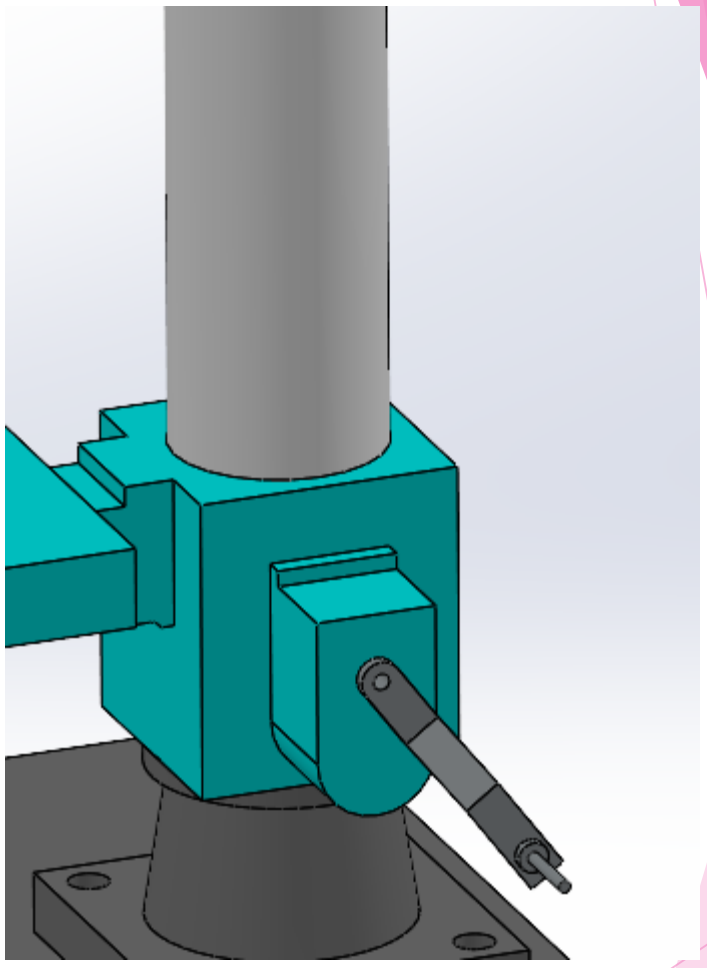






Prismatic Joints





Degree of Freedom

If the table is fixed

- If the table is fixed then only spindle can move along with motor but they are constrained motion.
- DOF = 2

If the table is not - fixed

- If the table is not fixed then along with spindle table motion also comes into picture.
- DOF = 5

Individual Contribution

- Rahul Aggarwal – 190103120
  - Some parts of the CAD model
  - Assemble the CAD model
  - Simulation of all the motion of the drill machine
  - Degree of freedom of the drill machine
- Dheeraj Nahar - 190103035
  - Some parts of the CAD model
  - Axis of rotation analysis
  - Revolute and prismatic joints analysis