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Part Drawing and Process Sheet for Design of Toggle Jack

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ABSTRACT

Design of any mechanical component is most important and at the same time one of the challenging task. Design engineer have to consider various factors while designing even a single component having simple geometrical attributes. Toggle jack consists of various parts and it requires special attention while designing every part of toggle jack. This paper describes the design considerations with respect to part drawing and process sheet. We have tabulated design of toggle jack parts including tool used and time required for process to carry out along with part drawing in process sheet.

Keywords: Design, Geometrical attributes, Toggle jack, Part drawing, Process sheet, Tool, Time required.

INTRODUCTION:

There are many applications where we need to use Toggle jack. Proper Design fundamental defines the capability of every component, device or system in application. Design engineer need to go through all the adverse possibilities while designing the components and accordingly it is necessary to do safe design. In Toggle jack device we use a power screw mechanism and trolley mechanism. Power screw are used to convert rotary motion into translatory motion , for example in case of lead screw of a lathe machine, rotary motion available but tool has to be advanced distance in direction of cut against the cutting resistance of a material. In case of screw small force applied in horizontal plane is used to raise or lower the large load [1]. Power also used in toggle jack, screw jack, vice, material testing machine etc. In a toggle jack it has an axial motion against resisting axial force while screw rotates in a stationary bearing. In screw jack, a screw rotates and moves axially against resisting force while nut is stationary.

1. Part Drawing & Process Sheet:

A. Screw:

Part Name: - Square Threaded Power Screw

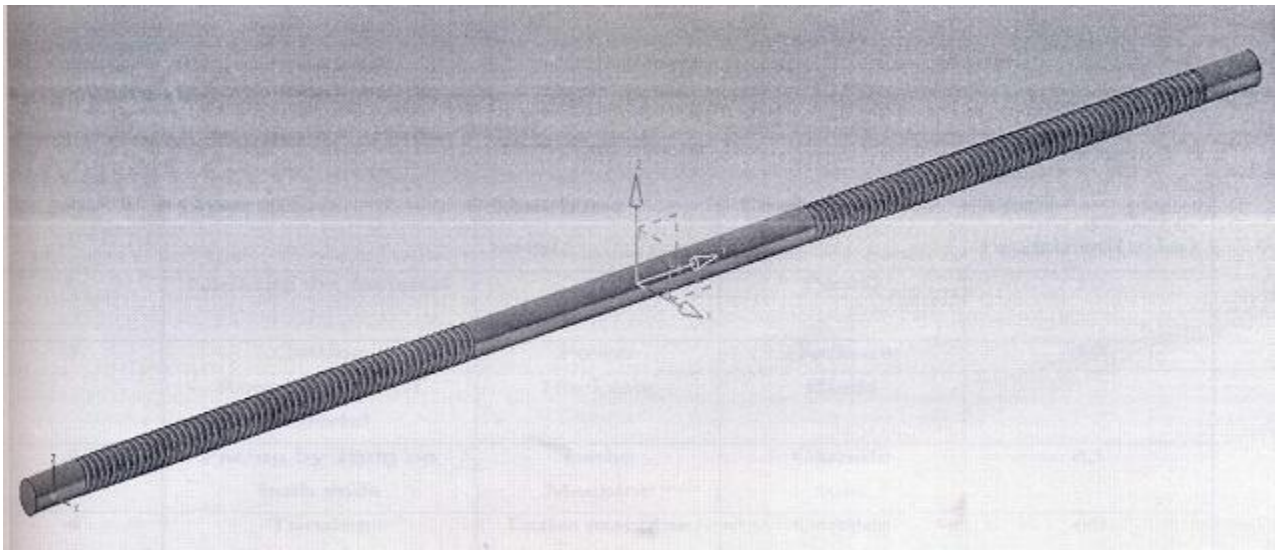

Figure 1: Square threaded power screw

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Part No: - 1
Material: - EN 24
Quantity: - 1
Size: - Ø 25 mm
Length: - 1105 mm

Table 1: Process Sheet

Sr. no.	Operation	Machine used	Tool	Time required(min)
1	Marking the material	-	Pencil	10
2	Cutting	Power	Hacksaw	30
	Required size of	Hacksaw	Blade	
	material			
3	Facing by Imm on	Lathe	Carbide	45
	both ends	Machine	tool	
4	Turning	Lathe machine	Carbide	60
	Required size		Tool	
	i.e. & 23mm.			
5	Threading	Lathe	Threading tool	240
	&23mm (6mm pitch at			
	length			
	350*2mm).			
6	Finishing of non		Smooth file	30
	threaded pert			
			Total time	415min.

B. Slider Link:

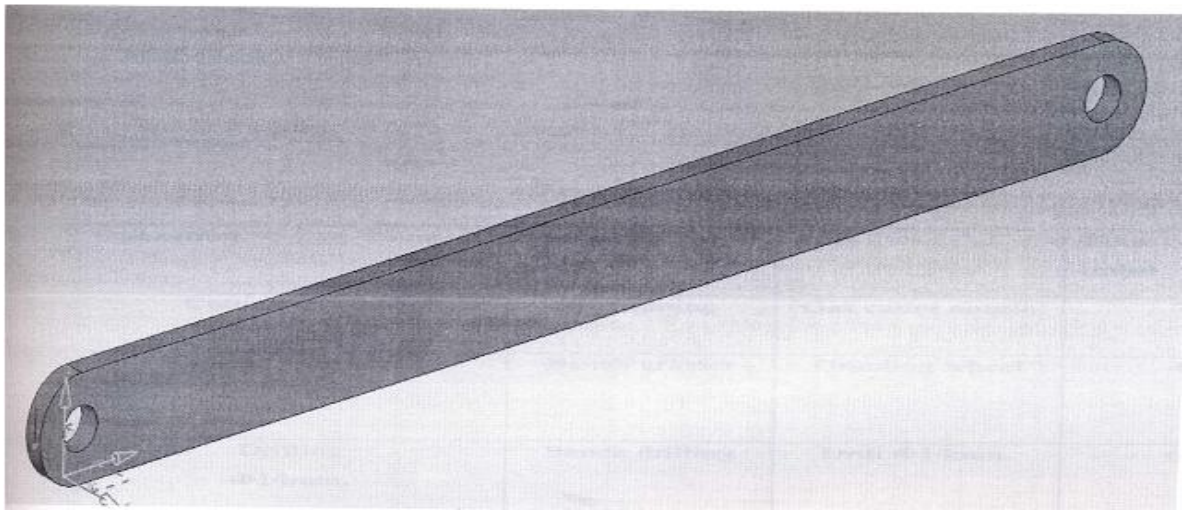

Figure 2: Slider link

Part name:-Slider link
Part no:-2
Material:-M.S. black
Quantity:-8
Size:-400*35*8mm

Table 2: Process sheet

Sr. No.	Operation	Machine used	Tool	Time required (min)
1	Cutting Of plate 400*35*8mm.	Gas cutting	Gas cutter nozzle	70
2	Radius Grinding R17.5mm.	Bench grinder	Grinding wheel	45
3	Drilling Φ14mm.	Bench drilling	Drill <1> 14mm.	60
4	Finishing	Portable hand Hand grinder	disc Grinding wheel	50
			Total time	225min.

C.H-Section:

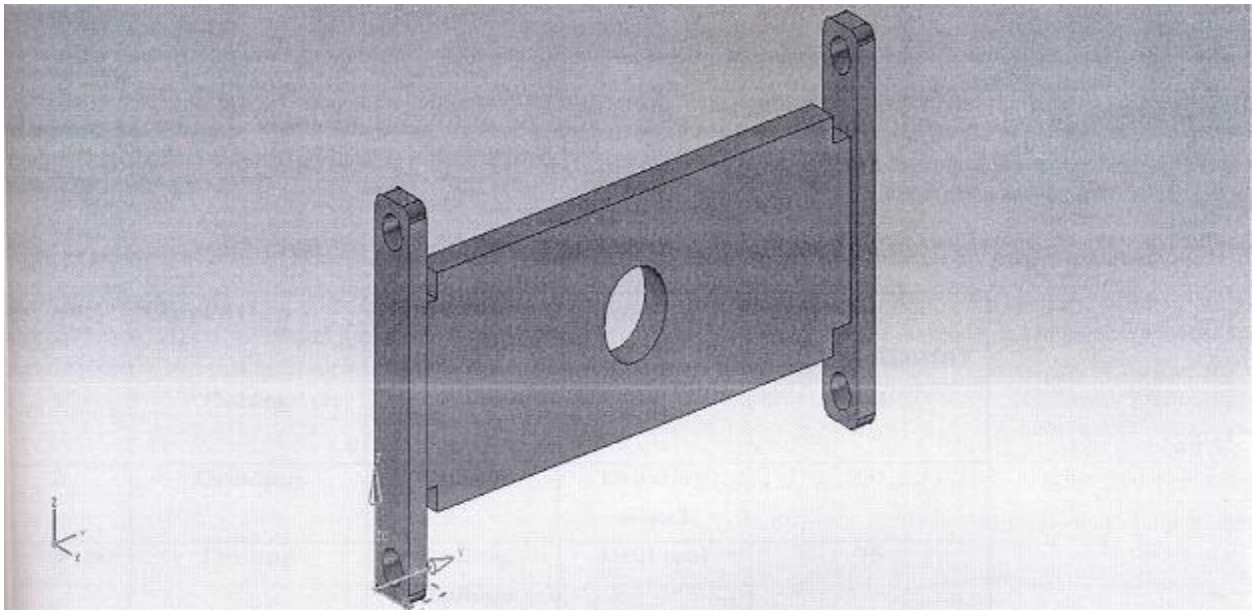

Figure 3: H- Section

Part Name: - H – Section
Part no:-3
Quantity:-2
Material:-M.S. black
Size:-280*90* 15

Table 3:

Process sheet				
Sr. no.	**Operation**	**Machine used**	**Tools**	**Time required(min)**
1	Cutting	Bench saw	-	90
2	Grinding	Grinder	Grinding wheel	60
3	Drilling	Drilling Machine	Drill tool	75
4	Boring	Lathe machine	Internal Boring tool	65
5	Finishing		Smooth file	45
			Total time	335min.

D. Pin Rod:

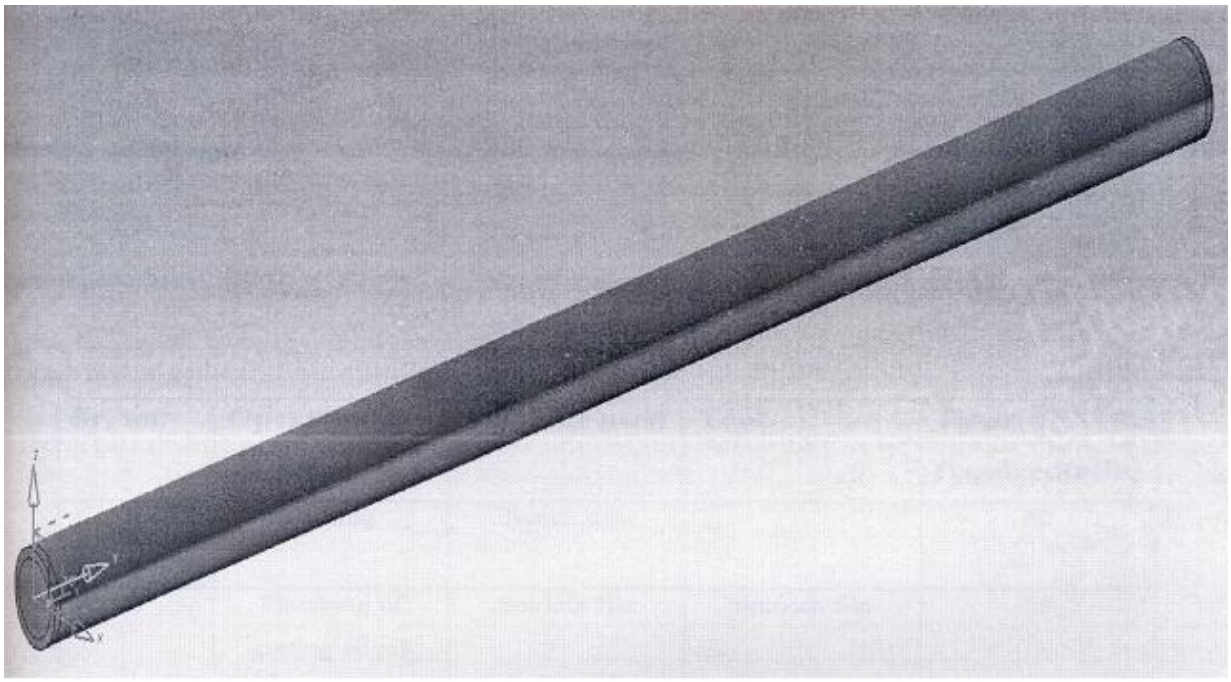

Figure 4: Pin rod

Part Name: - Pin Rod
Part No: - 4
Quantity: - 8
Material: - M. S. Bright
Size: - Ø 14 mm
Length: - 285 mm
Process Sheet

Table 4:

Sr. no.	Operation	Machine used	Tool	Time required(min)
1	Cutting	Bench saw		60
2	Finishing of cutting edges	Smooth file	Smooth file	65
3	Facing	Lathe machine	Facing tool	90
4	Turning	Lathe machine	Turning tool	200
5	Chamfering	Lathe machine	Turning tool	45
6	Finishing	Smooth file	Smooth file	45
			Total time	505min.

E. Nut:

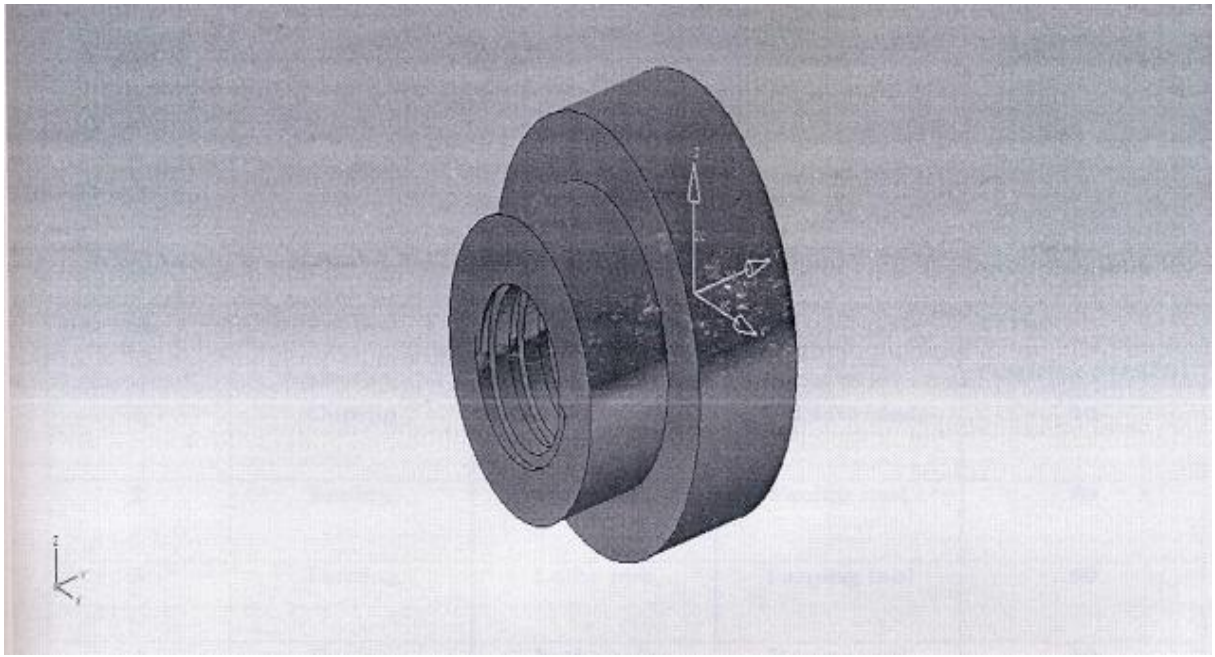

Figure 5: Nut

Part Name: - Nut
Part No: - 5
Quantity: - 2
Material: - C. I.
Size: - Ø 35 * 25 mm
Process Sheet

Table 5:

Sr. no.	Operatin	Machine used	Tool	Time required(min)
1	Cutting	Power hacksaw	Hacksaw blade	30
2	Facing	Lathe m/c	Facing tool	40
3	Turning	Lathe m/c	Turning tool	50
4	Boring	Lathe m/c	Boring tool	50
5	Threading	Lathe m/c	Threading tool	45
			Total time	215Min.

F. Upper frame:

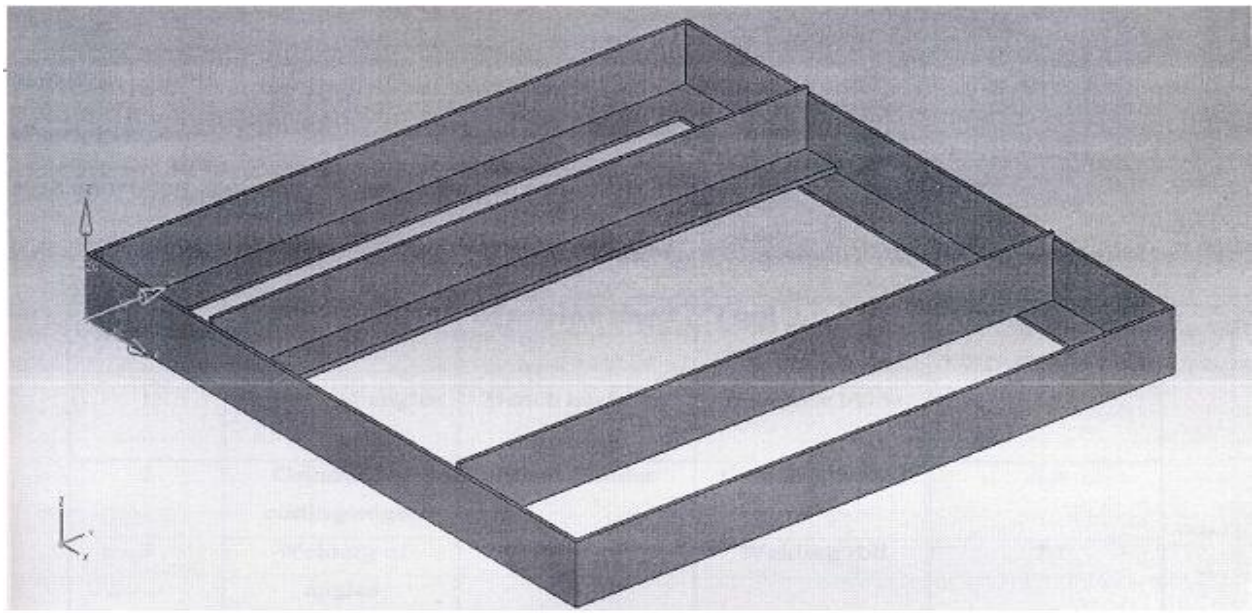

Figure 6: Upper frame

Part Name: - Upper Frame
Part No: - 6
Quantity: - 1
Material: - M. S.
Size: - 450* 450* 30 mm
Process Sheet

Table 6:

Sr. no.	Operation	Machine used	Tool	Time required(min)
1	Cutting of angles	Bench hacksaw	Hacksaw blade	45
2	Grinding of cutting edges	Hand grinder	Grinding wheel	35
3	Welding of angles	Welding m/c	Welding rod	70
4	Grinding	Hand grinder	Grinding wheel	35
5	Finishing		Chipping hammer	15
			Total time	200Min.

G. Lower Frame:

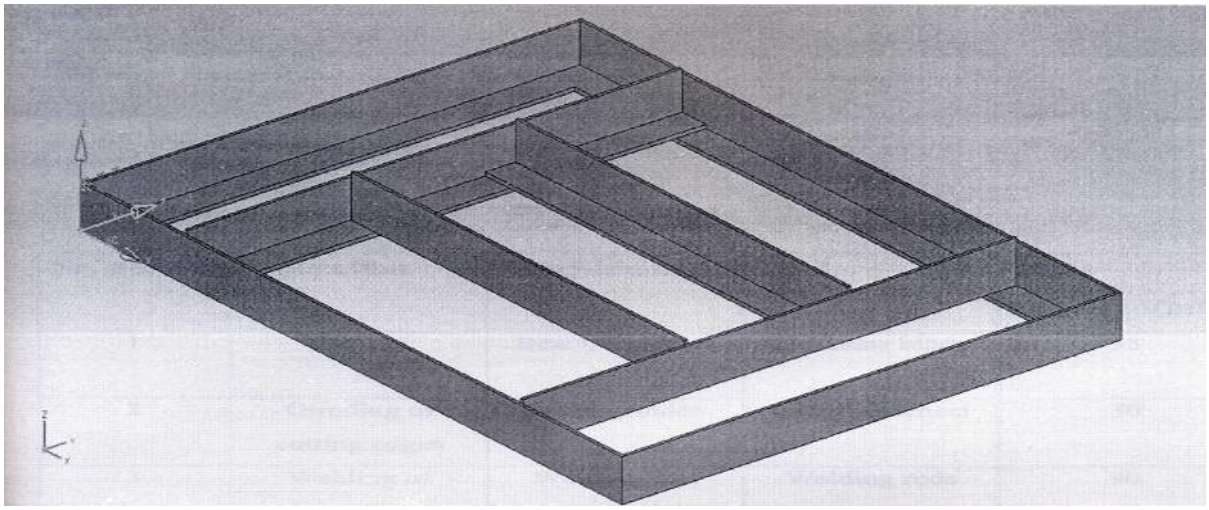

Figure 7: Lower frame

Part Name: - Lower Frame
Part No: - 7
Quantity: - 1
Material: - M. S.
Size: - 600*450*30 mm
Process Sheet

Table 7:

Sr. no.	Operation	Machine used	Tool	Time required(min)
1	Cutting	Bench hacksaw	Hacksaw blade	35
2	Grinding of cutting edges	Hand grinder	Grinding wheel	30
3	Welding of angles	Welding m/c	Welding rods	90
4	Grinding	Grinder	Grinding wheel	30
5	Finishing		Chipping hammer	25
			Total time	210Min.

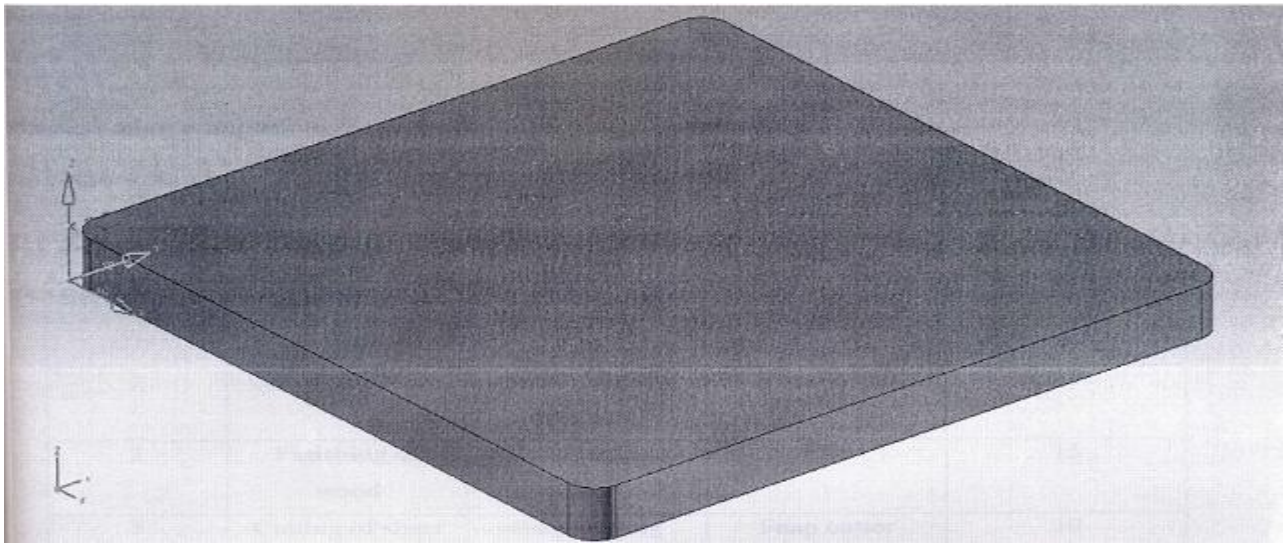

Figure 8: Working table

Part Name: - Working Table
Part No: - 8
Quantity: - 1
Material: - Play wood and M. S. Sheet
Size: - 480*480 mm

Table 8:

Sr. no.	Operation	Machine used	Tool	Time required(min)
1	Cutting of wood	Wood cutting machine	Wood cutter	45
2	Finishing of wood		File	15
3	Cutting of sheet metal	Snap cutting mlc	Snap cutter	30
4	Bending		Bench vice	60
			Total time	150Min.

I. Lever:

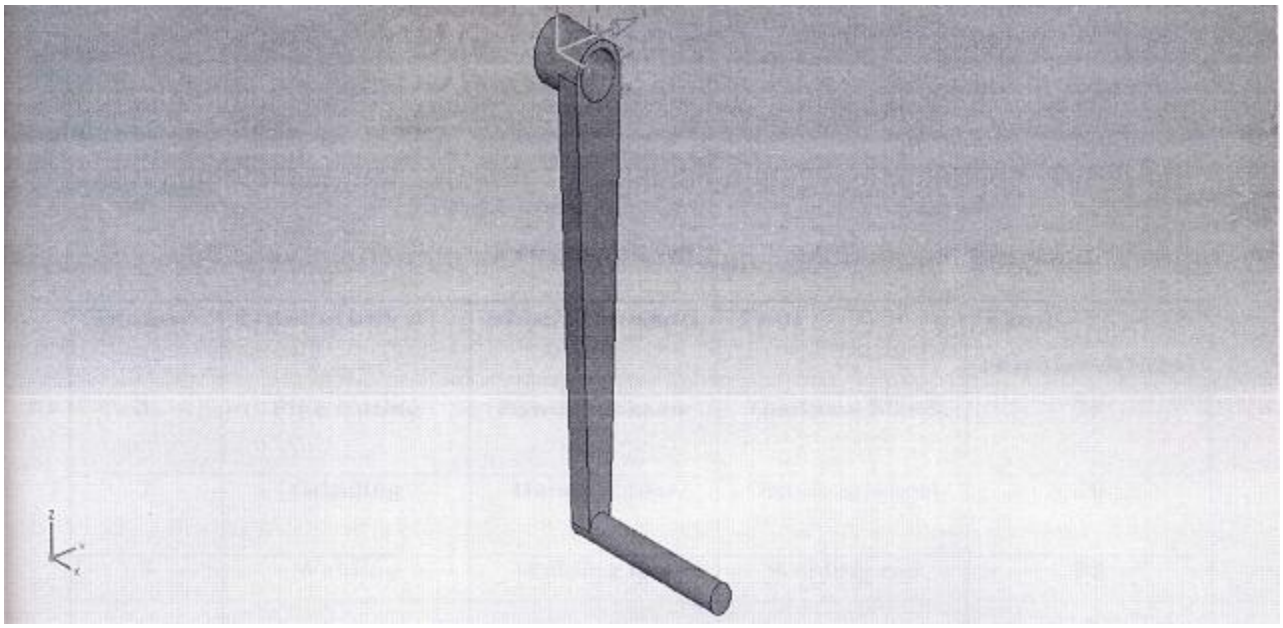

Figure 9: Lever

Part Name: - Hand Lever
Quantity: - 1
Material: - M. S.
Size: - Ø 20* 250 mm

Table 8

Sr. no.	Operation	Machine used	Tool	Time required(min)
1	Pipe cutting	Power hacksaw	Hacksaw blade	25
2	Grinding	Hand grinder	Grinding wheel	20
3	Welding	Welding m/c	Welding rod	35
4	Grinding	Hand grinder	Grinding wheel	20
5	Finishing		Chipping hammer	15
			Total time	115Min.

3. CONCLUSION:

This paper describes the details of nine important components of Toggle jack viz; Screw, Slider Link, H-section, Pin Rod, Nut, Upper Frame, Lower Frame, Working Table and Lever. The process sheet covers every important aspect of design fundamentals, which will be useful for further design considerations in future.

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