

**MINISTRY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF TECHNICAL AND VOCATIONAL EDUCATION
TECHNOLOGICAL UNIVERSITY, MAWLAMYINE**

DEPARTMENT OF MECHANICAL ENGINEERING

**PROJECT REPORT ON
PARALLEL CLAMP**

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(DEMONSTRATOR)**

July, 2007

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**PROJECT REPORT ON
LIGHTING SYSTEM OF AN AUTOMOBILE**

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**PROJECT REPORT ON
APPLICATION OF PRACTICAL SHOP PROCESSING**

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CO-SUPERVISOR - U HTIN AUNG

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July,2007

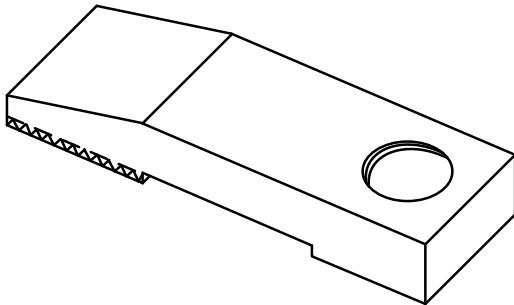
OBJECTIVE:

A parallel clamp must position or locate a work piece in a definite relation to the cutting tool and must withstand holding and cutting forces while maintaining that precise location. The locating element positions the workpiece, the structures withstand the forces, brackets attach the work holder to the machine and clamps, screws and jaws apply holding forces.

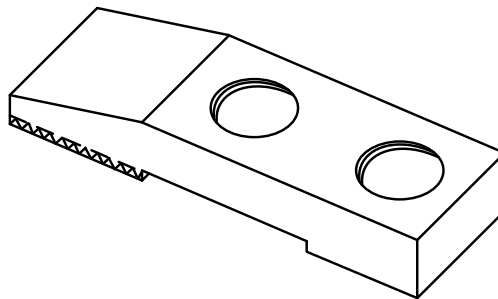
USEFULNESS:

Parallel clamp is used to clamp work piece and to hold parts together when making a layout and for machining operation such as drilling, cutting, etc. A standard shop tool, opposite side parallel, adjacent sides square is very useful in face plate work when used in connection with the parallel strip.

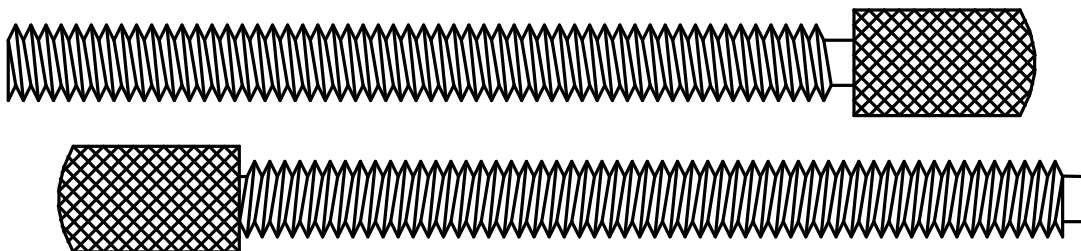
COMPONENTS:



Fixed Jaw



Adjustable Jaw



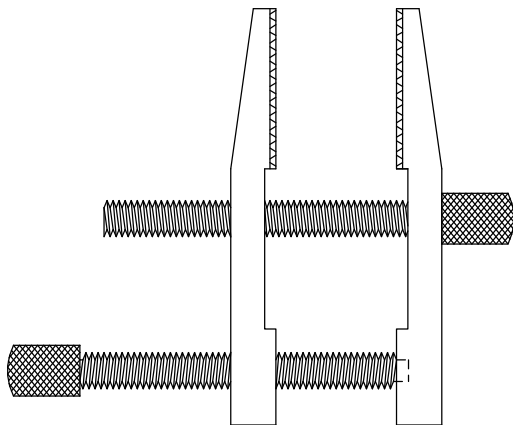
Screw with Handle

APPARATUS OR USED MACHINES

Piece of mild steel and two mild steel rods are used as primary raw materials. Apparatus or used machines are:

- ✚ power hack saw
- ✚ hand saw
- ✚ knurling holder
- ✚ tap tool
- ✚ shaper machine
- ✚ drilling machine
- ✚ lathe machine.

CONSTRUCTION: (WORKING PROCEDURE)



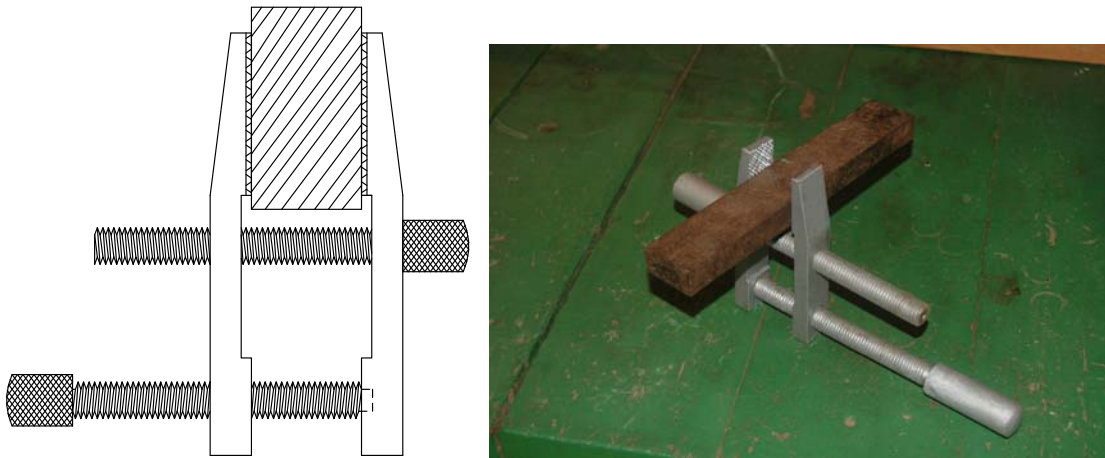
Constructed Parallel Clamped

When we make a parallel clamp, we need a piece of mild steel material and two mild steel rods. And then, we cut this mild steel material by using power hack saw. We make a fixed jaw and adjustable jaw by using shaper machine and drilling machine. To form the mesh groove on the surface of these two jaws by using hand saw. On the fixed jaw, we make one sliding hole and a circular groove for clamp by using drilling machine. On the adjustable jaw, we make two holes by using drilling machine and to get internal thread (B.S.W, 11-tpi) in these two holes by tap tool. Next, we get two mild steel rods and to form the combining of screw and handle by lathe machine. We want to form the screw in B.S.W (11-tpi) thread, use in

lathe machine. And then, we make the knurling on the handle surface by using knurling holder.

When we construct a parallel clamp assembly, we get a fixed jaw and place at the end of jaw screw. And then, adjustable jaw is moved by the screw thread turning towards the fixed jaw. Next screw with handle is turning into the adjustable jaw towards the fixed jaw circular groove.

OPERATION:



Operation of Parallel Clamped

In the operation of parallel clamp, the screw is turning by the handle to get approximate workpiece size. The operated workpiece is placed between the fixed jaw and adjustable jaw and then fitted by the two screws with handle. When the two jaws are closed, the workpiece is hold and made by cutting, drilling, machining, etc. The operation of workpiece is finished; the two jaw is opposite slide by the two screws with handle.

REQUIRED CALCULATIONS FOR MACHINING

Machining Time and Cutting Speed

Shaping for Fixed Jaw and Adjustable Jaw,

$$L_w = \text{length of part in the direction of feed} = 23\text{mm} + 23\text{mm} = 46\text{mm}$$

$$L = \text{length of stroke} = 52\text{mm}$$

d = depth of cut = 2mm

$$\begin{aligned} B_w &= \text{width of the part in the direction of feed} \\ &= 136 - (29 + 44) \\ &= 63\text{mm} \end{aligned}$$

We take, f = feed per stroke = 1mm

$$m = \frac{\text{time for one return stroke}}{\text{time for one forward stroke}}$$

N = number of complete stroke per minute = 40

$$V = \text{cutting speed} = \frac{NL(1+m)}{1000} = \frac{40 \times 52 \times (1+0.6)}{1000} = 3.328\text{m/min}$$

$$T_m = \text{machining time} = \frac{B_w}{fN} = \frac{63}{1 \times 40} = 1.575\text{min}$$

d = depth of cut = $44 \times \tan 11^\circ = 8.5527\text{mm}$

$$B_w = \text{width of part in direction of feed} = \frac{44}{\sin 11^\circ} = 44.8233\text{mm}$$

V = cutting speed = 3.328m/min

$$t_m = \text{machining time} = \frac{B_w}{fN} = \frac{44.8233}{1 \times 40} = 1.125\text{min}$$

Drilling and threading for fixed Jaw,

D_r = drill diameter = 16mm

L_h = depth of hole = 12mm

We take,

f = feed rate = 0.15mm/rev

N = spindle speed = 850rpm

$$V = \text{cutting speed} = \frac{\pi D_r N}{1000} = \frac{\pi \times 16 \times 850}{1000} = 42.7256\text{m/min}$$

$$t_m = \text{machining time} = \frac{L_h}{f \times N} = \frac{12}{0.15 \times 850} = 0.0941\text{min}$$

D_r = drill diameter = 13mm

L_h = depth of hole = 7mm

$$V = \text{cutting speed} = \frac{\pi D_r N}{1000} = \frac{\pi \times 13 \times 850}{1000} = 31.7145\text{m/min}$$

$$t_m = \text{machining time} = \frac{L_h}{f \times N} = \frac{7}{0.15 \times 850} = 0.0549\text{min}$$

For threading of $\phi 16\text{mm}$ hole;

L_t = threading length = 12mm

N = spindle speed = 95rpm

n = number of cuts = 10

$$V = \text{cutting speed} = \frac{\pi D_r N}{1000} = \frac{\pi \times 16 \times 850}{1000} = 4.775\text{m/min}$$

$$t_m = \text{machining time} = \frac{(L_h + 7\text{mm}) \times n}{\text{Pitch} \times \text{spindle speed}} = \frac{(12 + 7\text{mm}) \times 10}{2 \times 95} = 1.0\text{min}$$

Drilling and threading for Adjustable Jaw,

For ϕ 16mm hole;

$$V = 42.7256\text{m/min}$$

$$t_m = 0.0941\text{min}$$

threading,

$$V = 4.775\text{m/min}$$

$$t_m = 1.0\text{min}$$

For ϕ = 13mm hole for drill

$$V = 34.7145\text{m/min}$$

$$t_m = \frac{L_h}{f \times N} = \frac{14}{0.15 \times 850} = 0.1098\text{min}$$

threading,

$$V = \frac{\pi \times 13 \times 95}{1000} = 3.8798\text{m/min}$$

$$t_m = \frac{(L_t + 7\text{mm}) \times n}{P \times N} = \frac{(14 + 7\text{mm}) \times 10}{2 \times 95} = 0.1105\text{min}$$

Machining time for two screw with Handle,

For turning ϕ = 23 mm to ϕ = 16 mm,

$$\text{total depth} = \frac{23 - 16}{2} = 3.5\text{mm}$$

We take,

$$f = 0.38\text{mm}$$

$$N = 350\text{rpm}$$

$$V = \text{cutting speed} = \frac{\pi \times 23 \times 350}{1000} = 25.2898\text{m/min}$$

$$t_m = \frac{L}{f \times N} = \frac{153}{0.38 \times 850} = 1.1503\text{min}$$

Two Handles,

$$2 \times t_m = 2.3007\text{min}$$

For threading ϕ = 16mm,

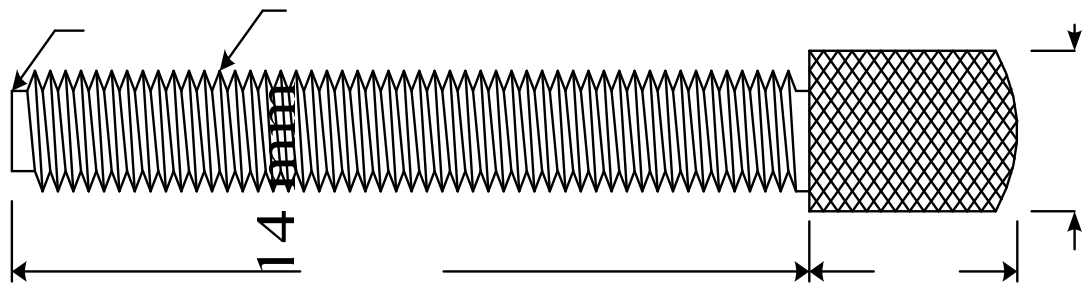
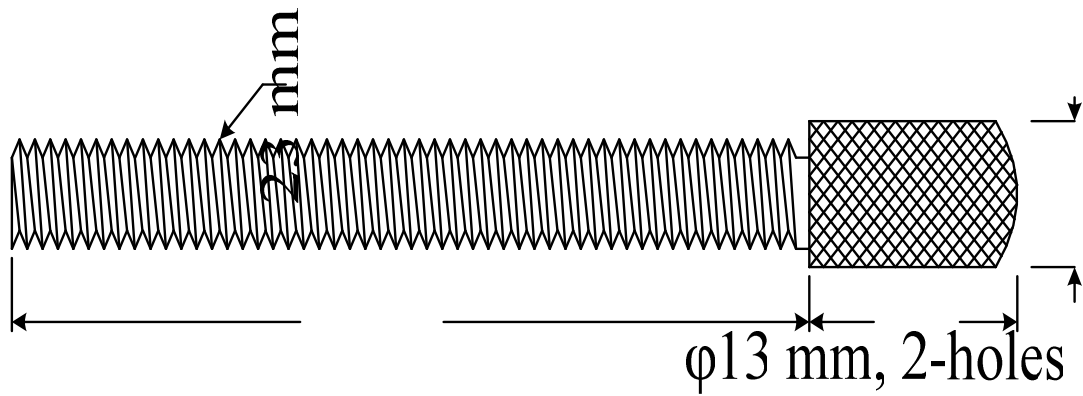
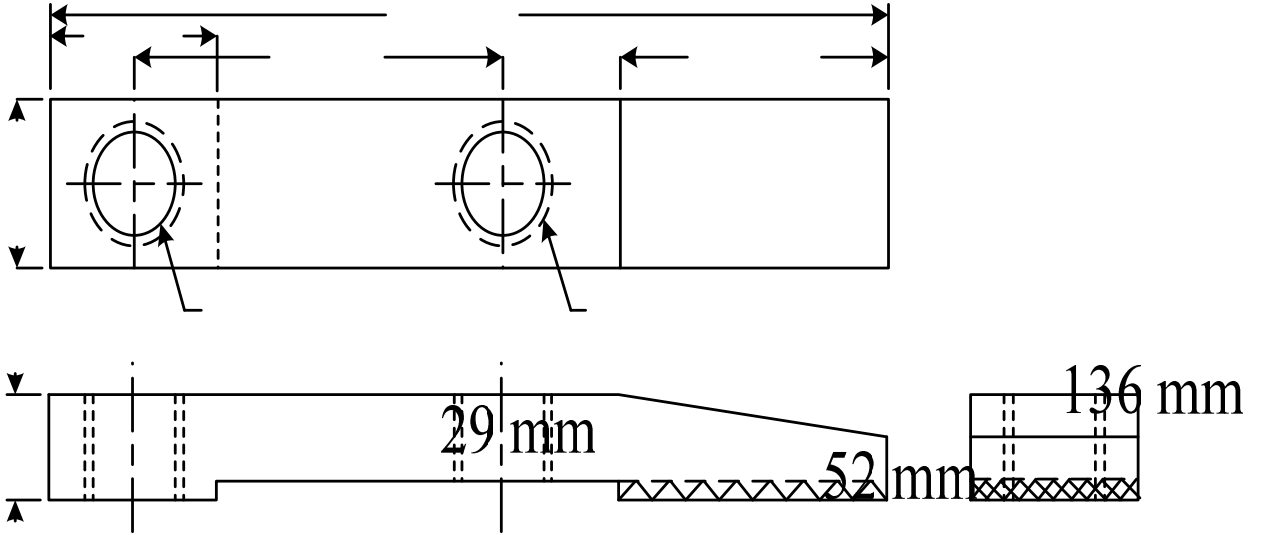
$$V = \frac{\pi \times 16 \times 95}{1000} = 4.7752\text{m/min}$$

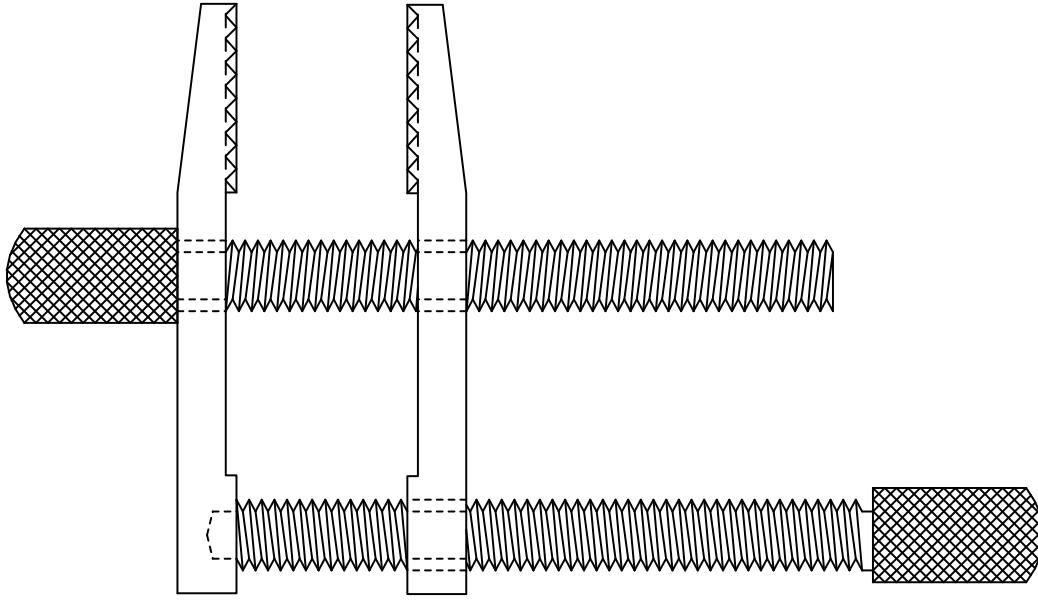
$$t_m = \frac{(L_t + 7\text{mm}) \times n}{P \times N} = \frac{(153 + 7\text{mm}) \times 10}{2 \times 95} = 8.421\text{min}$$

Two Handles,

$$2 \times t_m = 16.8412\text{min}$$

REQUIRED DETAIL DRAWINGS





Assembly Drawing

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