KEYS

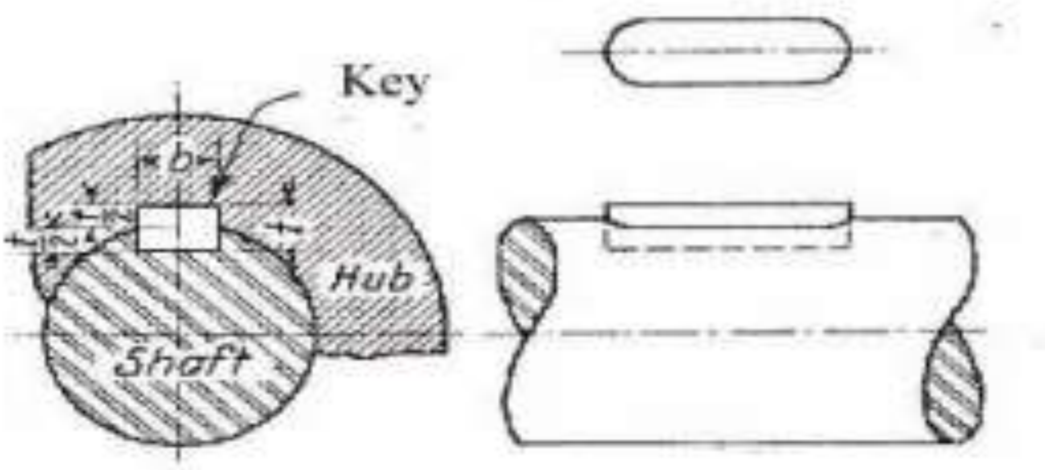
A **key** is a machine element fitted in an axial direction into the mating member, such as pulleys, gears. The primary function of the key is to prevent the relative rotation between the shaft and mating member.

Types Of Keys:

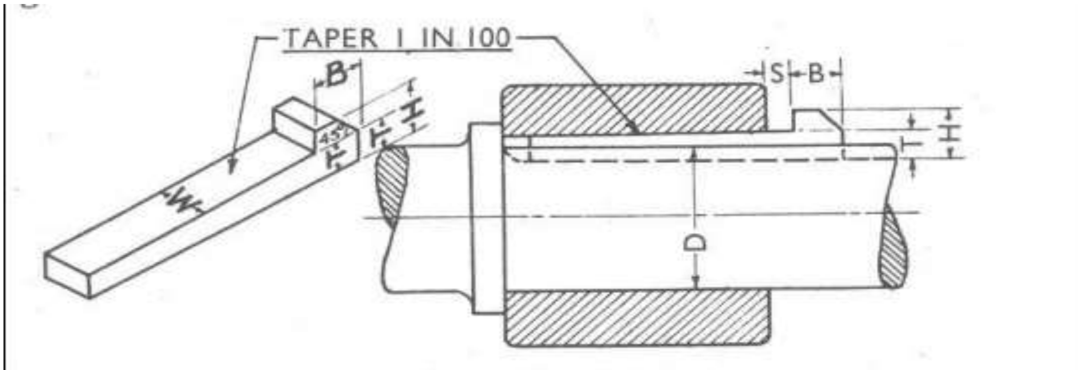
There is a large variety of machine keys and they may be classified under four broad headings:

- ***Sunk keys,***
- ***Flat keys,***
- ***Saddle keys***
- ***Pins or round keys***

1- Rectangular sunk keys;_

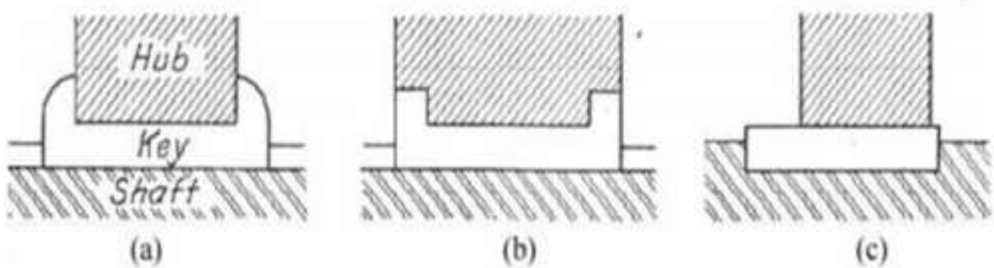


(b) Gib head sunk keys



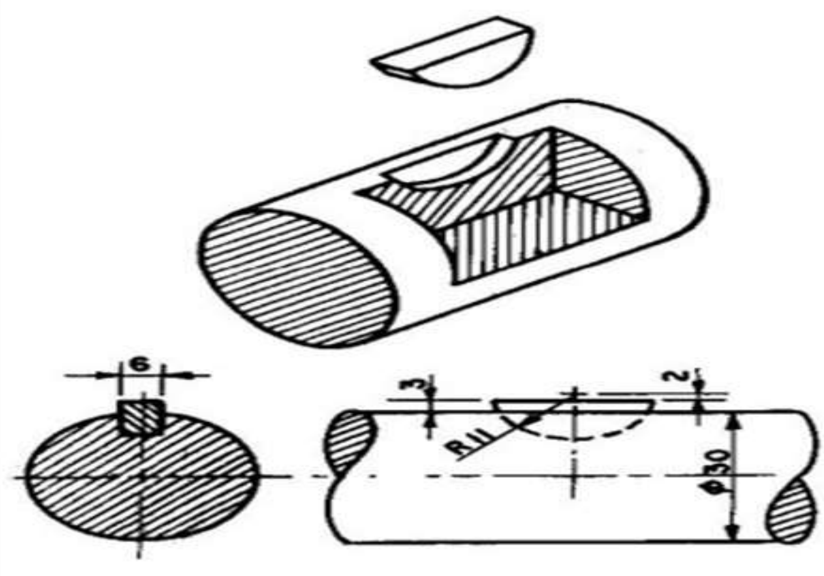
Key with gib-head

c) Feather keys

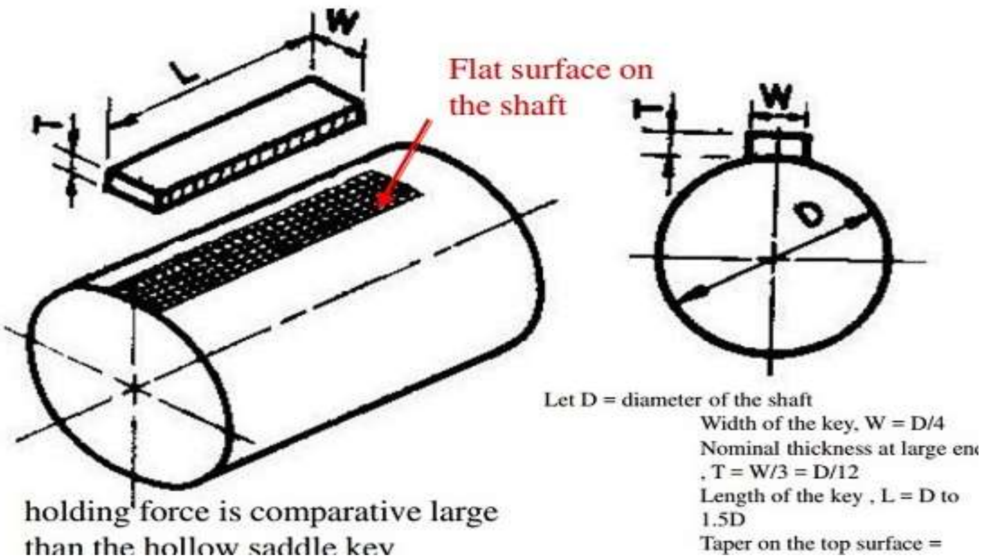


Some feather key arrangements

Woodruff keys:-



Flat keys:-



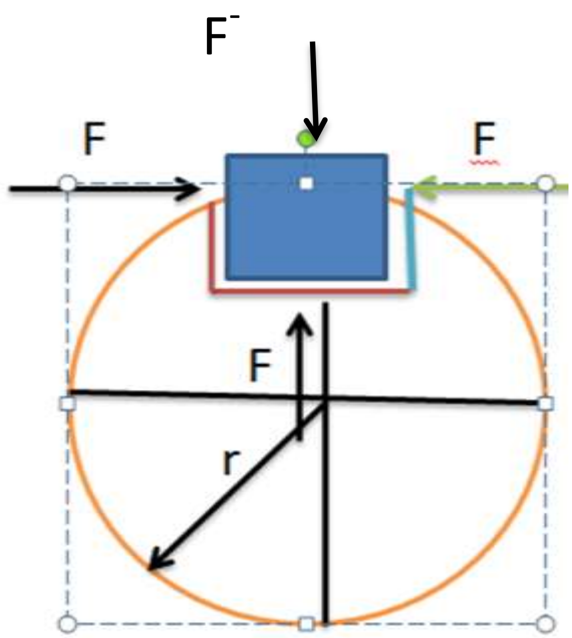
<u>Design of square & flat key:-</u>

Design for-

1-shear stress.

2-compressive stress.

3-torque to be transmitted .



F^{-},F^{-}= Coupling to prevent the key from tending to roll in the fitted key away.

F ,F =Tangent force them to the surface of the shaft.

F= Fr (Torque).

F=Tangential force (kg)(N).

r=reduces of the shaft (mm).

<u>1-Shear Stress(SC):-</u>

SC= $\frac{F}{bL}$ =$\frac{Fr}{bLr}$ =$\frac{T}{bLr}$ --------------------(1)

L=length of the key.

In shearing the Torque (TS)-

TS= SC b L r --(2)

2-<u>Compressive stress(SC)-</u>

CS== $\frac{F}{\left(\frac{t}{2}\right)L}$ =$\frac{F\,C}{\left(\frac{t}{2}\right)Lr}$------------------------------(3)

TC=CS (t/2)L r--(4)

<u>Note:-</u>

CS= 2SC--(5)

<u>EX1;-</u> Prove that square key is equally stronger in shear and compression.

<u>Sol</u>:- TC = CS(t/2) Lr

TS = Ss b L r

Where TC =TS

Cs(t/2) Lr = Ss b L

2Ss (t/2) Lr = Ss b L r

Ss b L r =2/2 Ss b L r

Ss b L r= Ss b L r--------------(1)

Ex2:-

Determine the required length of a square key. If the key and shaft are to be same iatrical and equal strength (key 25%).

Sol:-

KEY=25%

T=0.75 πd^3 Sc/16

0.7 $\pi d^{\,3}$ Ss/16= Ss b L r

0.7 $\pi d^{\,3}$ $Ss/16$ =Ss d/4 L r L=

EX3:-

Determine the required length of the key and to transmit the power from shaft to pulley. If the data are;_ CS=6000 kg/cm^2

d=300mm(of shaft)

t= 250 (of key)

TC=18000kg/cm^2

Sol:- TC=CS (t/2) Lr

18000= 6000(0.25/2) L 0.15

L= $\frac{18000}{112.5}$ = 16cm.

EX4-Determine the required length of the key used to transmit the power from shaft to pulley .if the data are;-

$Cs=20$ _kg/cm^2

d=3 cm (of shaft)

t= 1.5 cm (of key)

TC= 120 kg/cm^2

Sol;- TC=Cs (t/20) Lr

120 =20 (1.5/2) L X 1.5

L= 120/22.5 = 4.33 cm

EX5:-

Determine the required length of the key and used to transmit the power from shaft to pulley .if the data are:- Ss=55 kg/cm^2

b=5 cm from shaft

d= 4 cm from key

TS= 180 kg .cm

Ts=Ss . b . L. r

180 = 55 x 5 4/2 XL L=180/550=1.13 cm