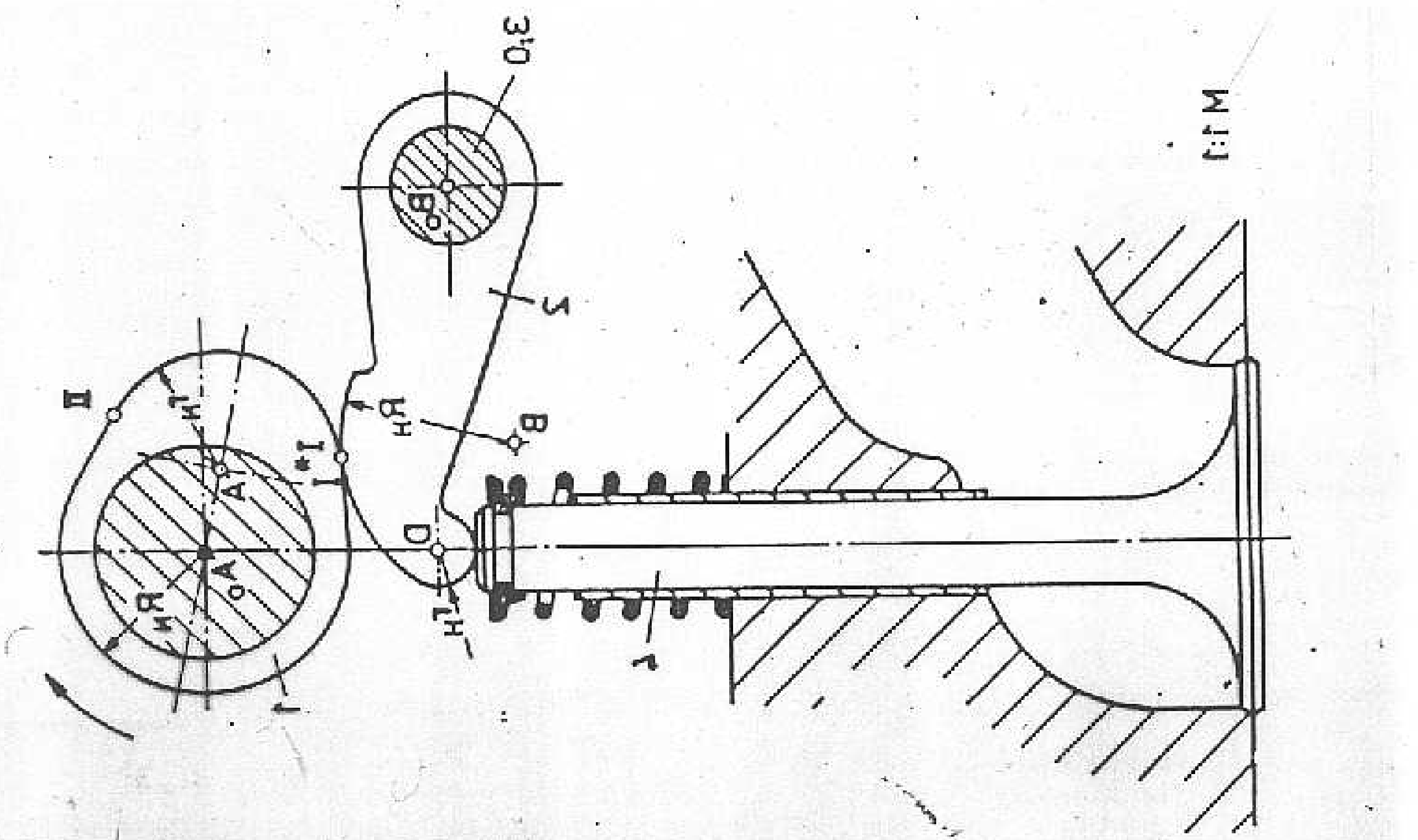

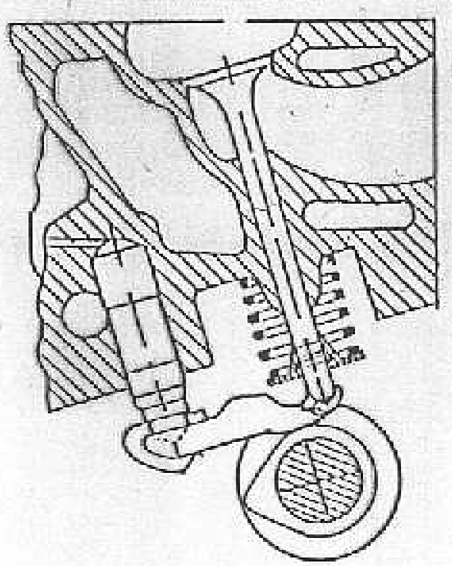

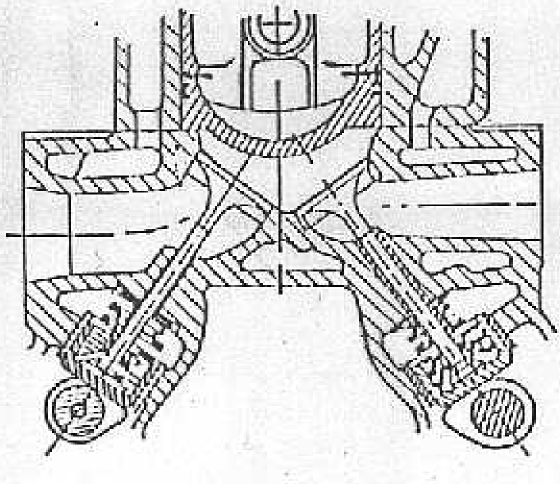

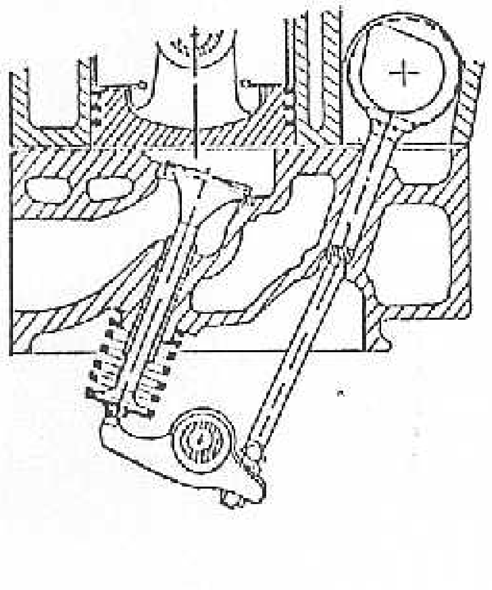

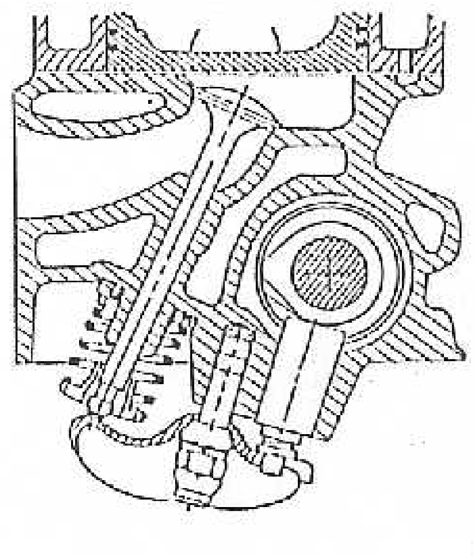

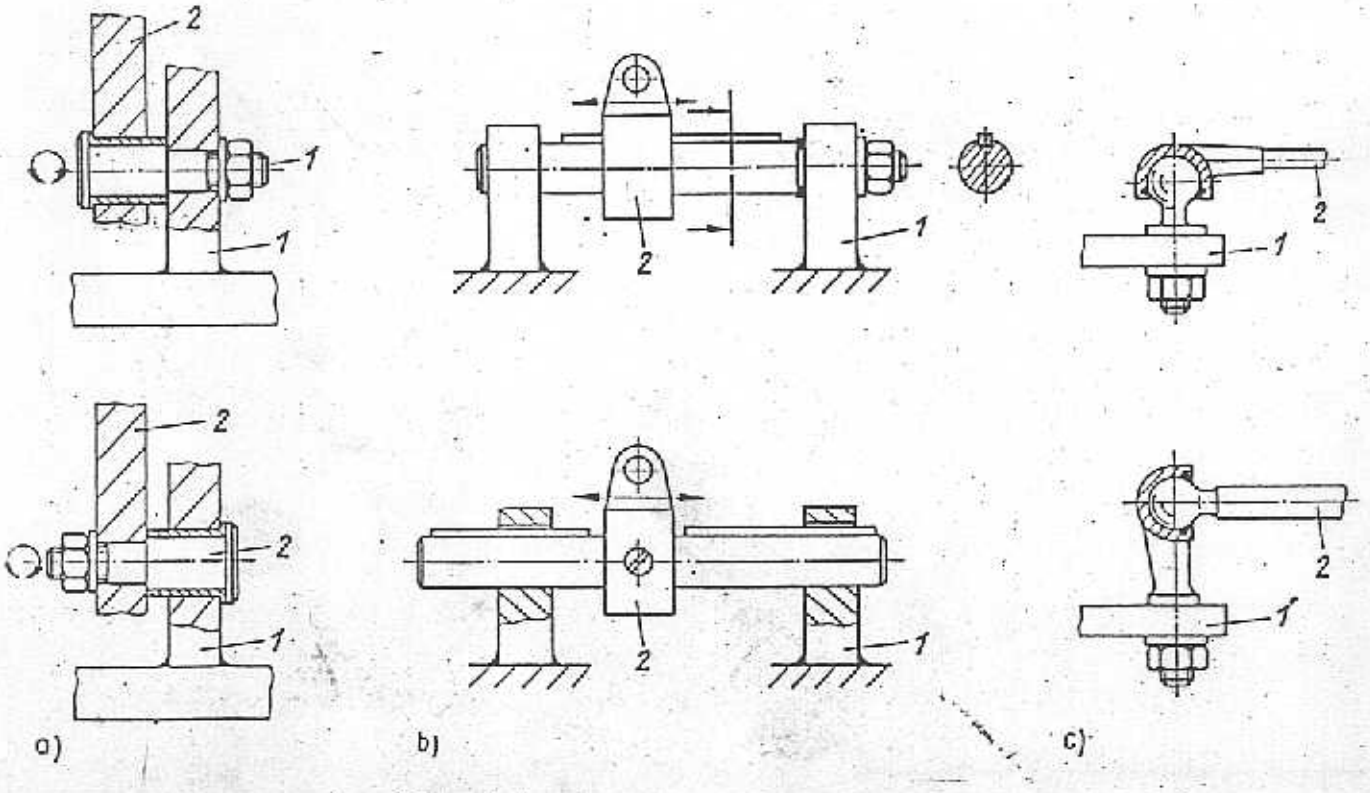
2
1
1
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2
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2
2
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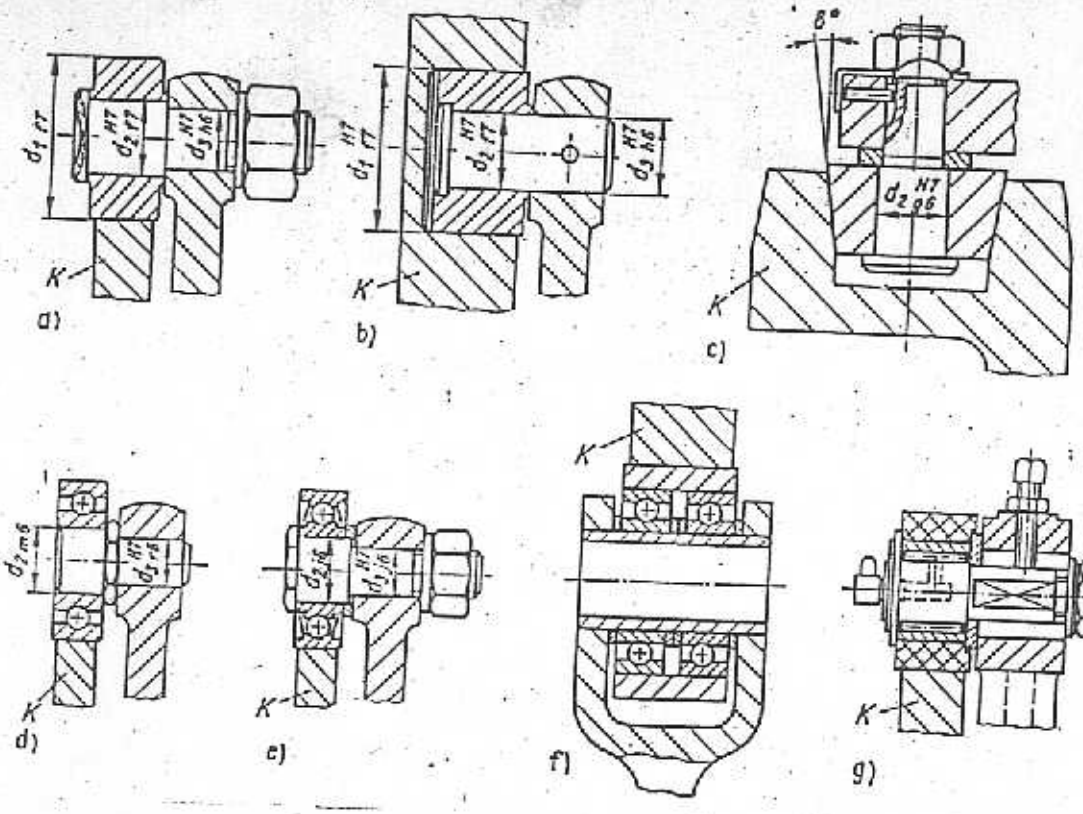
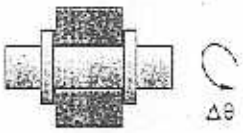
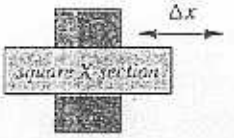
2
1
a)
b)
c)

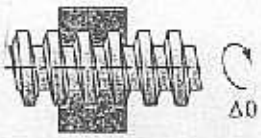

K
a)
b)
c)
d)
e)
f)
g)



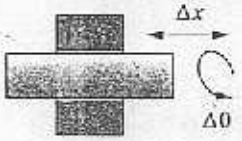
Revolute (R) joint—1 *DOF*



Prismatic (P) joint—1 *DOF*

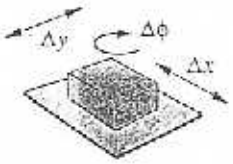


Helical (H) joint—1 *DOF*



Cylindric (C) joint—2 *DOF*

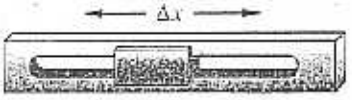
Spherical (S) joint—3 *DOF*



Planar (F) joint—3 *DOF*

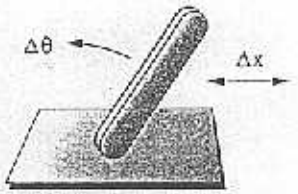
(c) The six lower pairs

Rotating full pin (R) joint (form closed)

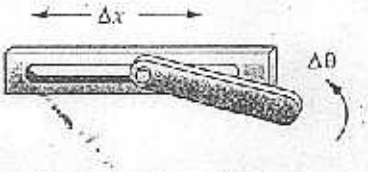


Translating full slider (P) joint (form closed)

(b) Full joints - 1 *DOF* (lower pairs)

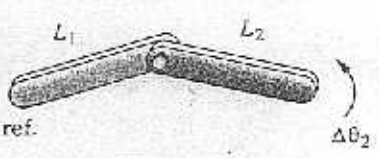


Link against plane (force closed)

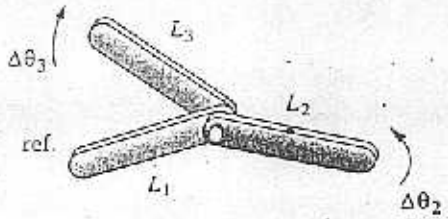


Pin in slot (form closed)

(c) Roll-slide (half or RP) joints - 2 *DOF* (higher pairs)

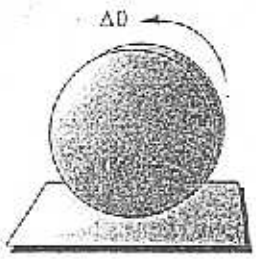


First order pin joint - one *DOF*
(two links joined)



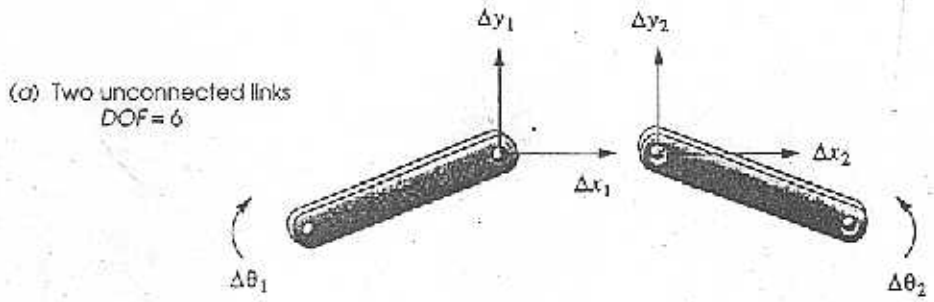
Second order pin joint - two *DOF*
(three links joined)

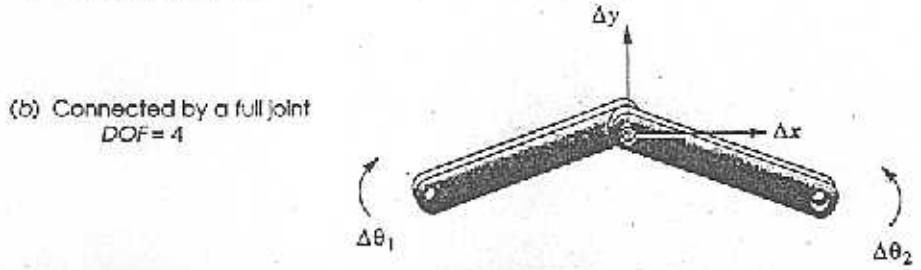
(d) The order of a joint is one less than the number of links joined

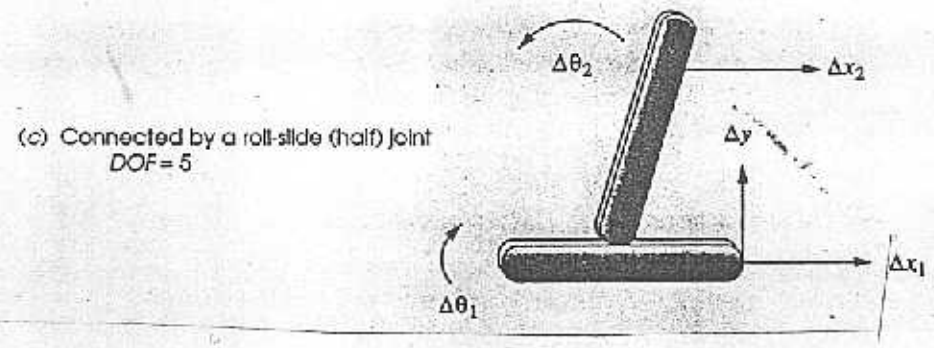


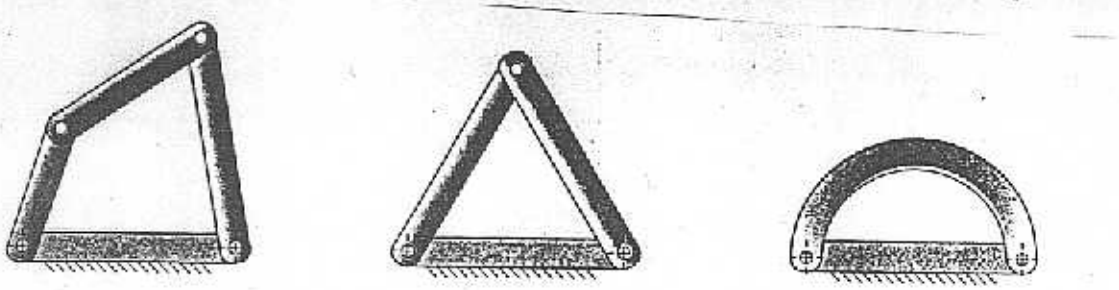
May roll, slide, or roll-slide, depending on friction

(e) Planar pure-roll (R), pure-slide (P), or roll-slide (RP) joint - 1 or 2 *DOF* (higher pair)

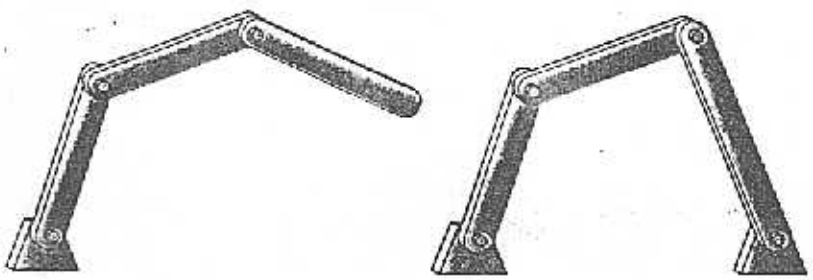






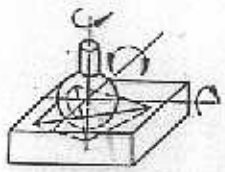
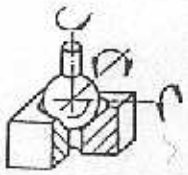
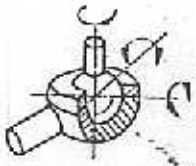
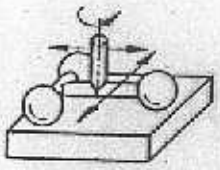
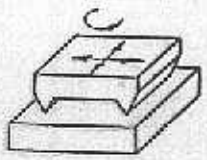
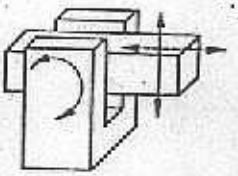
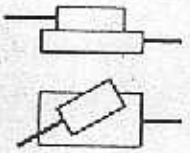
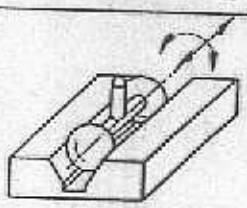
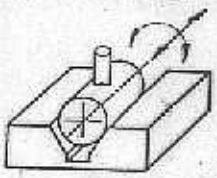
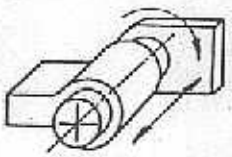
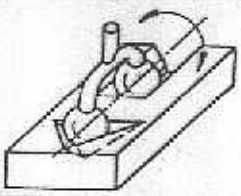
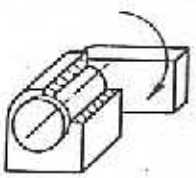
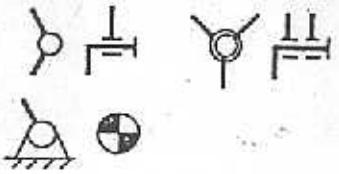
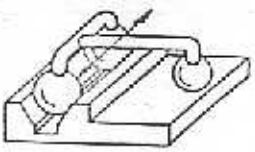
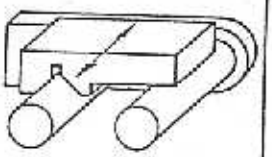
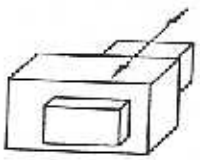
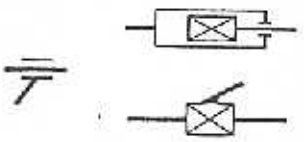
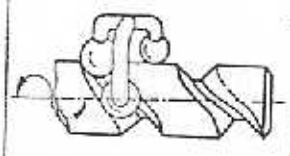
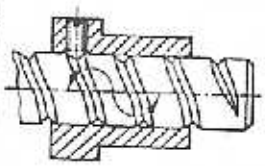
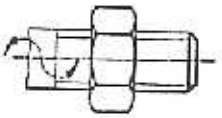
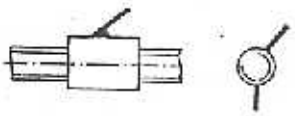


(a) Mechanism—*DOF* = + 1 (b) Structure—*DOF* = 0 (c) Preloaded structure—*DOF* = −1



(a) Open mechanism chain (b) Closed mechanism chain

Prostostne stopnje zgibov

	Točkovni dotik	Linijski dotik	Ploskovni dotik	Simbol
Krogelni zgib f=3 3R				
Ploskovni zgib f=3 1R 2T				
Rotacijsko-pomični zgib f=2 1R 1T				
Rotacijski zgib f=1 1R				
Pomični zgib f=1 1T				
Vijačni zgib f=1 W = 1R+1T				

Razdelitev mehanike

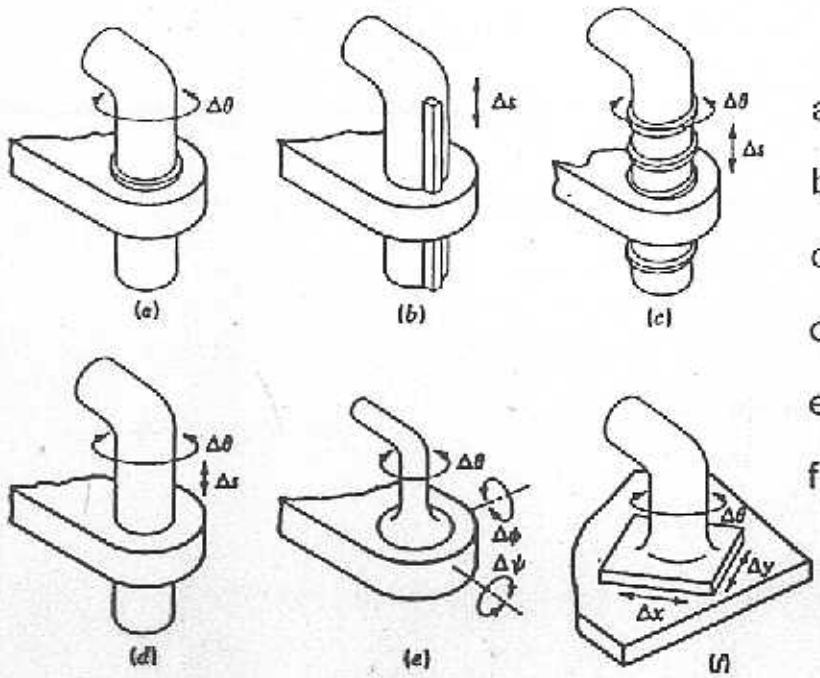
Konstrukcije, mehanizmi in stroji

KONSTRUKCIJA - skupina nepomično povezanih teles
(sile - statika)

MEHANIZEM - skupina nepomično in pomično povezanih teles za izvajanje željenega gibanja
(gibanje - kinematika)

STROJ - skupina nepomično in pomično povezanih teles za opravljanje določenega dela, naprava za prenos moči ali spremembo njene smeri pretoka
(sile, momenti, delo, moč - kinetika)

Osnovni kinematični pari (spoji - povezave)



a - vrtljivi par (R)

b - translacijski par (P)

c - navojni par (S_L)

d - valjasti par (C)

e - krogelni par (G)

f - ravninski par (F)

Nastanek mehanizma

Kinematična veriga - med seboj gibljivo povezana toga telesa.

Zaprta kinematična veriga - vsak element kinematične verige je povezan z vsaj še dvema drugima elementoma verige.

MEHANIZEM - zaprta kinematična veriga, pri kateri ima vsaj ena točka enega od elementov verige točno določeno pozicijo. Tak element (točka) je izhodiščni element (izhodišče) mehanizma, glede na katerega lahko opazujemo gibanje točk vseh ostalih elementov mehanizma.

Razdelitev mehanizmov

Ravninski mehanizmi - so mehanizmi pri katerih vse točke gibajočega mehanizma opisujejo ravninske krivulje v prostoru, pri čemer so ravnine večih krivulj gibanja paralelne.

Krogelni mehanizmi - so mehanizmi pri katerih se točke gibajočega mehanizma gibljejo po krogelni površini.

Prostorski mehanizmi - so mehanizmi pri katerih ni nobenih omejitev glede gibanja njihovih elementov.

Število prostih prostostnih stopenj ravninskih mehanizmov

ali Grueberjev kriterij mobilnosti ravninskih mehanizmov:

$$m = 3 \cdot (n-1) - 2 j_1 - j_2$$

m - število prostostnih stopenj mehanizma
n - število elementov mehanizma
j_1 - število povezav z eno prostostno stopnjo
j_2 - število povezav z dvema prostostnima stopnjama

$m = 0$ - gibanje ni mogoče, mehanizem je konstrukcija
$m > 0$ - mehanizem ima m prostostnih stopenj, torej je za enolično obratovanje mehanizma potrebnih m pogonov
$m < 0$ - mehanizem je statično nedoločena konstrukcija

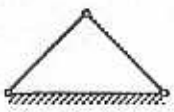
Število prostih prostostnih stopenj prostorskih mehanizmov

ali Grueberjev kriterij mobilnosti prostorskih mehanizmov:

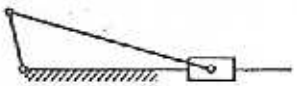
$$m = 6 \cdot (n-1) - 5j_1 - 4j_2 - 3j_3 - 2j_4 - j_5$$

m - število prostostnih stopenj mehanizma
n - število elementov mehanizma
j_1 - število povezav z eno prostostno stopnjo
j_2 - število povezav z dvema prostostnima stopnjama
j_3 - število povezav s tremi prostostnimi stopnjami
j_4 - število povezav s štirimi prostostnimi stopnjami
j_5 - število povezav s petimi prostostnimi stopnjami

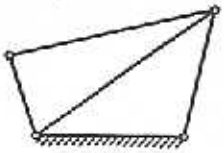
Primeri ugotavljanja prostih prostorskih stopenj mehanizmov



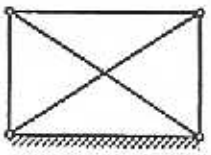
$n = 3, j_1 = 3$
$j_2 = 0, m = 0$



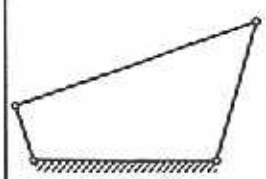
$n = 4, j_1 = 4,$
$j_2 = 0, m = 1$



$n = 5, j_1 = 6,$
$j_2 = 0, m = 0$

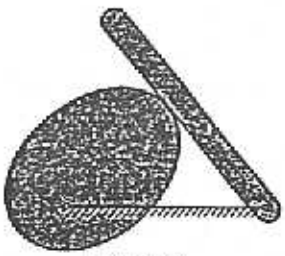


$n = 6, j_1 = 8,$
$j_2 = 0, m = -1$

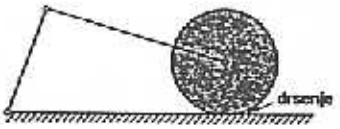


$n = 4, j_1 = 4,$
$j_2 = 0, m = 1$

$n = 5, j_1 = 5,$
$j_2 = 0, m = 2$

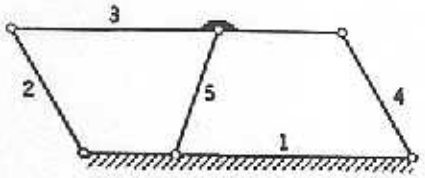


$n = 3, j_1 = 2,$
$j_2 = 1, m = 1$



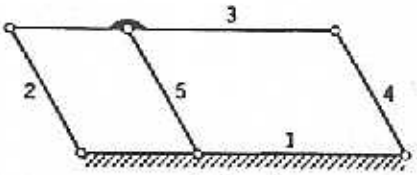
$n = 4, j_1 = 3$
$j_2 = 1, m = 2$

Primer neveljavnosti Grueberjevega kriterija



$n = 5, j_1 = 6,$
$j_2 = 0, m = 0$

konstrukcija

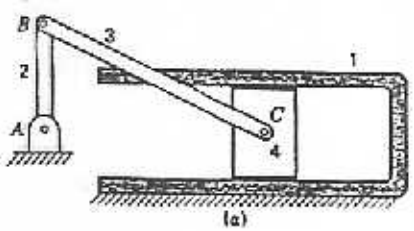


$n = 5, j_1 = 6,$
$j_2 = 0, m = 0$

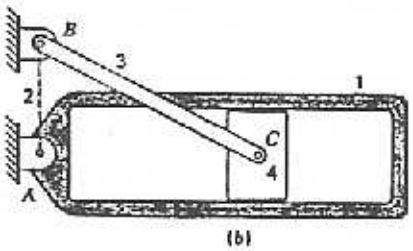
mehanizem z eno prostostno stopnjo

Kinematična inverzija

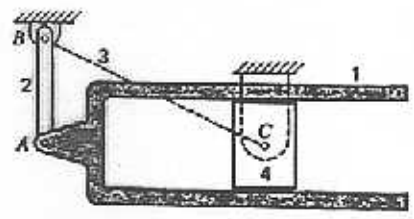
Izbira različnih izhodiščnih elementov kinematične verige povzroči spremembo absolutnih gibanj, pri čemer pa relativna gibanja med posameznimi elementi mehanizma ostanejo nespremenjena.



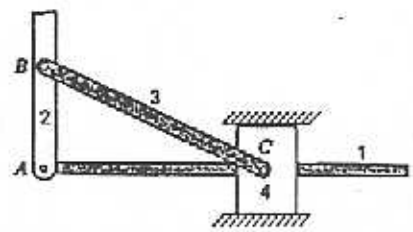
(a)



(b)



(c)



(d)