EXPANDED FOUR BAR LINKAGE WITH SPECIAL PARAMETERS AS THE FUNDAMENTALS AND MECHANISM OF THE MECHANICAL WALKER

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Reducing mechanism of the Mechanical walker to the Four Bar Linkage, further possibilities for sintheses of the new types of mechanisms with special kinematic characteristics are obtained.

This paper is a proof that simetrical Four Bar Linkage and crank sliding mechanism are between themselves equivalent. It is necessary to satisfy dimensionaly requirements so that:

a) memebers of the same length of a simetrical four bar linkage are infinite;

b) cranks of both mechanisms to be of the same lenght, so that

c) supports are equal.

Fulfilling of dimensional requirements for equivalence, previously mentioned, lenght of a link of simetrical four bar linkage becomes equal with the lenght of the link of crank sliding mechanism. Equivalent mechanism of different structure either in number of members or type of the kinematic pairs, realize partly or in full cyclus motion lows of leading points or members.

Equivalent mechanisms are important in machine syntheses because for the same motion low technologically regulated, the choice of possible solutions exists.(1)

On the other side , often, for kinematic also dynamical analyses of same mechanisms, mode of deriving analysed trough analyses of equivalent mechanism is simpler.(2)

However, in the theory of mechanisms and machines, the wide field of possibilities of application of equivalent mechanisms is not enough explored.

One field of application is in achieving of hybrids basic and equivalent mechanism in which equivalent mechanism takes on just in part of a cycle a function of ensuring continuous movement which is not suitable for conditions of dynamical sintheses of the basic one. Further, not enough analized field is connected with realization of new types of mechanisms (3) where new mechanisms are achieved trough compressing of structures of basic and equivalent one.

For possible achievement of new types of compressed crank sliding mechanism interesting for a number of applications, this paper proves that joint four bar mechanism of particular parametars is equivalent to the cranksliding mechanism.

Crank sliding mechanism (Fig.1) consists of a crank OA=r, link AC=b, rotary slider OE=d.

The trajectory of the point C of the link is sixth order curve simetrical to the x-axes (4).

By simetrical four bar linkage (Fig.2) where a,c, and R are equal, a=c=R, the curve of the link S_{CZ} is the sixth order curve simetrical to the x_Z-axes. The axes of simetry x_Z makes the angle $\beta/_2$ with the support d. In order that the curves C_Z of crank sliding mechanism and S_{CZ} of the joint four bar linkage, become equal and overlap, it is necessary that exes x and x_Z overlap. In this case the angle $\beta/_2=\pi$

$\beta = 2\pi$ and equal memebers are infinite, a=c=R=∞. Point B, in this case tends to infinity so the angle ACB becomes right angle, that is $\gamma = \pi/2$.

(Fig.3)

The analitical proof of this assumption is relatively simple. In general case analitical expression for crank of the link in the system yOx (fig.2) is

$$F(x,y) = (x^2 + y^2 + b^2 - r^2)^2\{(x - d)^2 + y^2\} +$$

$$+ (\frac{b}{a})^2(x^2 + y^2)\{(x - d)^2 + y^2 + a^2 - R^2\}^2 +$$

$$+ 2\frac{b}{a}(x^2 + y^2 + b^2 - r^2)\{(x - d)^2 + y^2 + a^2 - R^2\}\cdot$$

$$\cdot\{d(x\cdot\cos\gamma - y.\sin\gamma) - 4b^2\sin^2\gamma\{x(x - d) + y^2 -$$

$$- dy\cdot ctg\gamma\}^2 = 0 \qquad \ldots\ldots\ldots\ldots \qquad (1)$$

$\frac{b}{a} = 0$, $a = \infty$ $\sin\gamma = 1$ $ctg\gamma = 0$ $\gamma = \pi/2$

$$F(x,y) = (x^2+y^2+b^2-r^2)^2\{(x-d)^2+y^2\} - 4b^2\{(x-d)x-y^2\}^2 = 0 \quad \ldots(2)$$

Thus obtained expression (2)is is equassion of the trajectory of the curve sliding mechanism.
From the above mentioned, following theorem could be concluded.

Theoreme 1 Simetrical four bar linkage could be equivalent mechanism with c.rank sliding mechanism

Theoreme 2 Simetrical four bar linkage is equal with crank sliding mechanism if

a) members of the same lenght of simetrical four bar linkage are infinite.
b) cranks of both mechanisms of the same lenght and
c) support equal.

Theoreme 3 By interchanging of conditions a), b) and c) of the Theoreme 2. it is ensured that the supports, crank and coupler of both mechanisms are equal in length and overlapped.

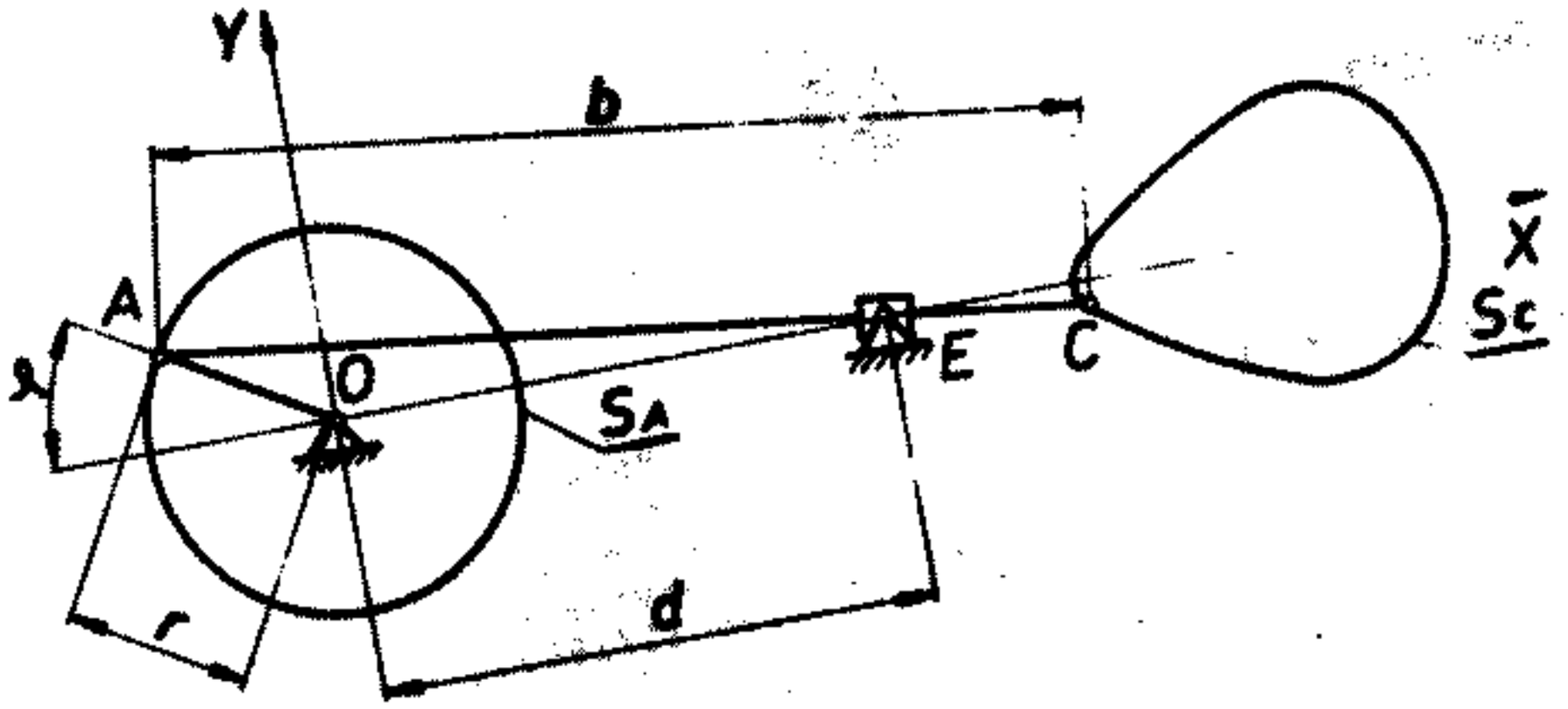
Y
b
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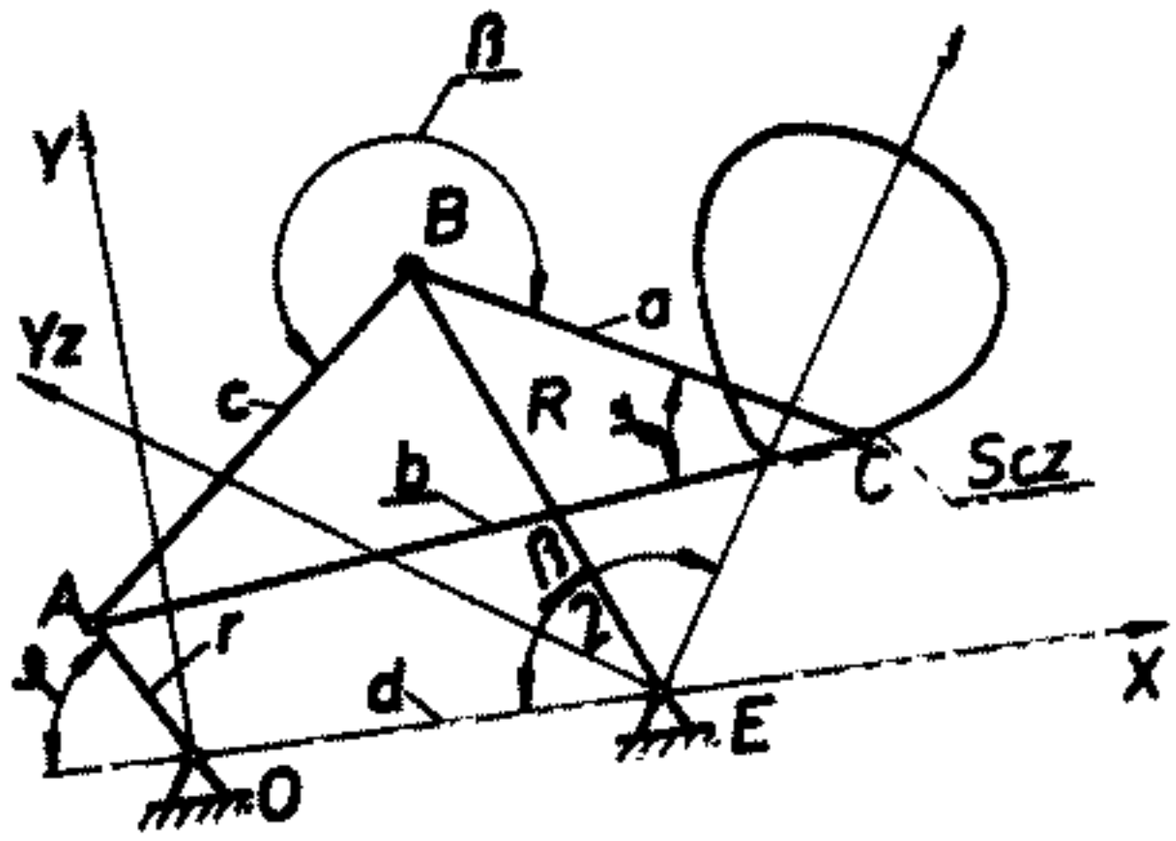
Fig


β
Y
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X
O

Fig.

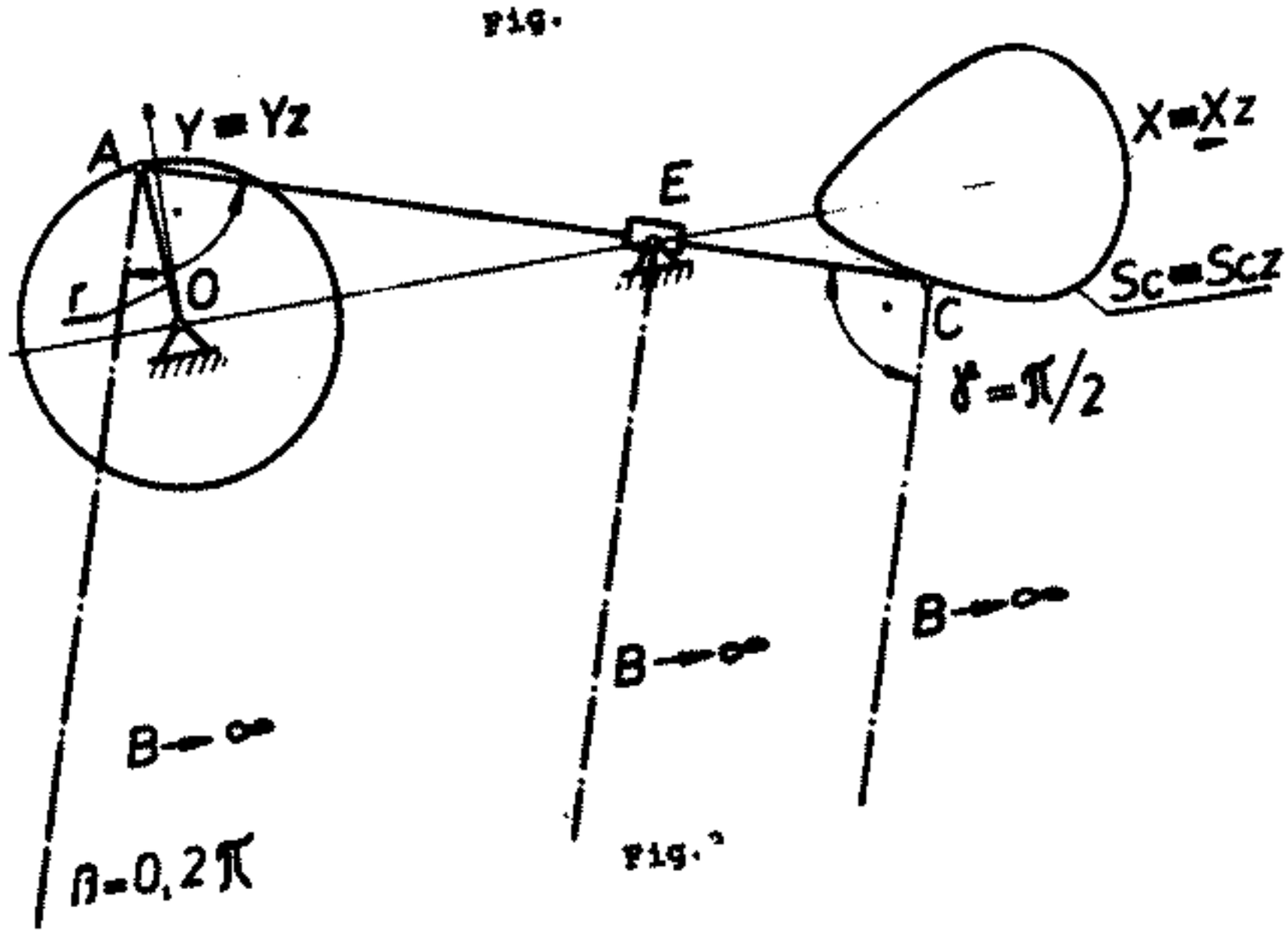
A
Y = Yz
X = Xz
E
r
O
C
Sc = Scz
γ = π/2
B
B
B
β = 0,2π

Fig.

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