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THE STUDY OF A MECHANISM WHICH GENERATES CURVES OF 3 AND 4 DEGREES

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Abstract: In the paper is presented a mechanism formed by a conducting element with rotation movement and an AAC dyad of type TRT. The mechanism is being studied with analytic methods, with especially created programs; in this way, different trajectories resulted. The studied mechanism generates algebraic curves of 3 and 4 degrees, depending on the relations between the initial dates. For other points of the mechanism, it has been established the obtaining of some similar curves and some other curves too. By modifying the dimensions of some segments from the connecting rod, they are being obtained other curves. The mechanism which is presented in the paper is very important in the context in which today are being looked after mechanisms which can generate as complicated curves as it can be.

1.INTRODUCTION

The discipline "Mechanisms" has developed through time, together with other disciplines which form the mechanic profile.

Through the coming up and developing of computers, the discipline "Mechanics" has gone further to analytic methods, with specific algorithms, which led to obtaining of more performing mechanism, more closed to the optimum solutions.

Geometry always had applicability at "Mechanisms". Many problems of geometric places led to creating new mechanisms. This is the reason why in literature are many usual curves with applicability in technique. The mechanisms which generate usual curves are very complicated. They have complex structure, with many elements, perpendicular links, with certain proportions between sides.

For a long time, these mechanisms had been studied with graphic methods, which means working at drawing board and sketching more positions of that mechanism.

2. THE STUDY OF THE MECHANISM WHICH GENERATES CURVES OF 3 AND 4 DEGREES

It is considered the mechanism of figure 1 (of Newberg), which is formed of one conducting element with rotation movement (3) and an AAC dyad of type TRT.

In [Artobolevskii] it is shown that if XC=a, then D point describes an algebraic curve of third degree and, for other dimensions, this point describes an algebraic curve of fourth degree.

They are written the relations:

$$\begin{aligned} X_C + S_2\cos\varphi + a\cos(\varphi+90) &= 0 \\ S_2\sin\varphi + a\sin(\varphi+90) &= S_1 \end{aligned} \qquad (1)$$

On the connecting rod number 2, they are taken several points: H, K, G, B, E, F, D, by following the trajectories which are generated by these points.

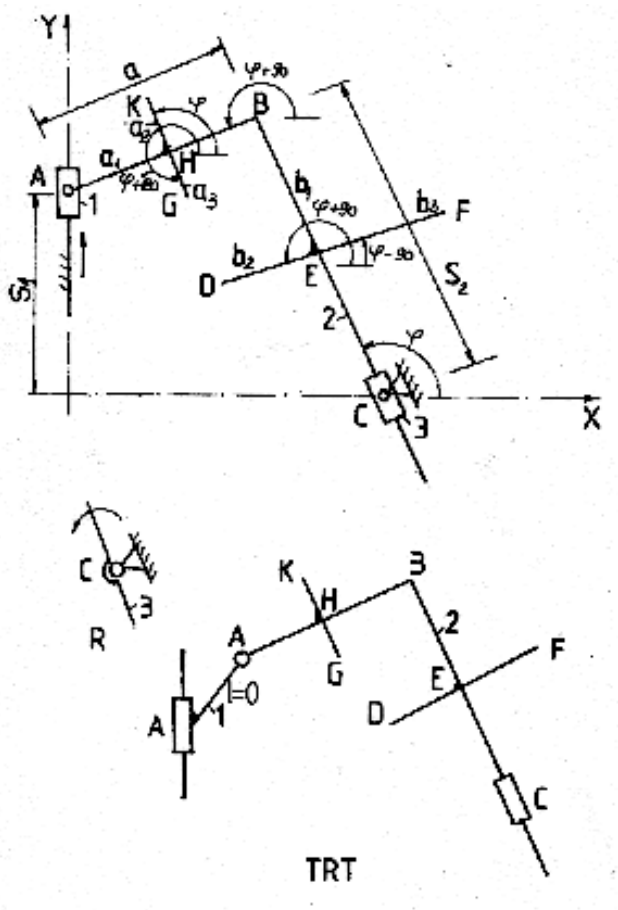

Fig.1. The kinematic scheme of the mechanism

Based on the plane movement relations, they are written the co-ordinates of these points, depending on the angles and the distances which are indicated in figure 1.

For knowing the trajectories of other points, they are established the points which are named above and they are successively modified some dimensions.

In this way, for a=30, XC=30, it is obtained the trajectory of B from figure 2. (type strophoyde or Pascal worm gear).

For a=30, XC=30, a1=a2=a3=a/2; b1=b2=b3=a, they are obtained the following trajectories: fig. 3-for H, fig.4-for E, fig.5-for F, fig.6-for D, fig.7-for K and fig.8-for G.

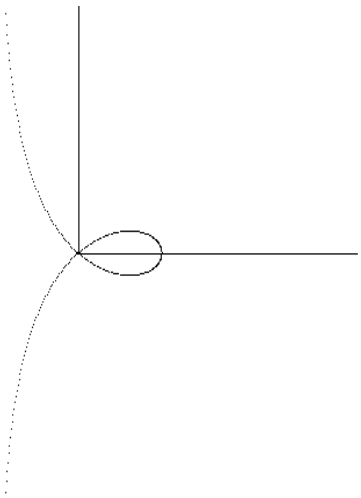

Fig.2. The trajectory of B

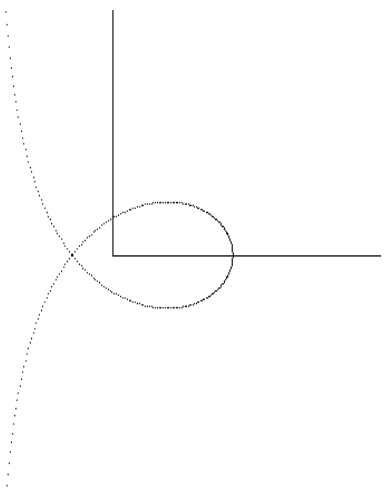

Fig.3. The trajectory of H

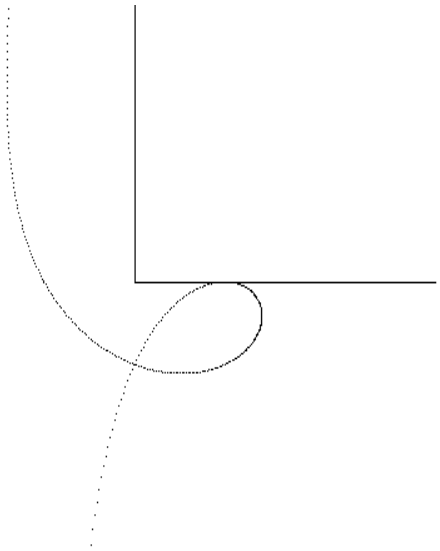

Fig.4. The trajectory of E

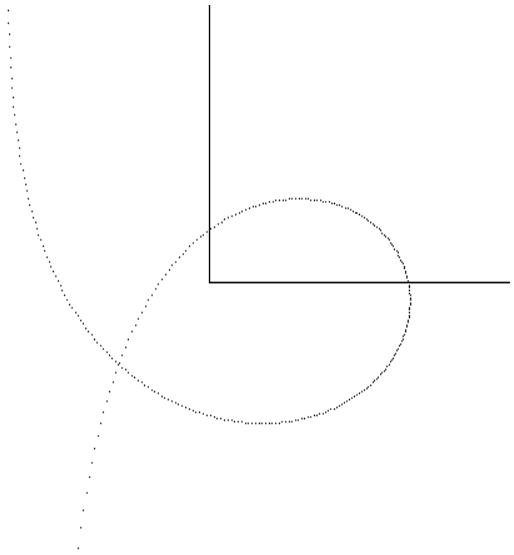

Fig.5. The trajectory of F

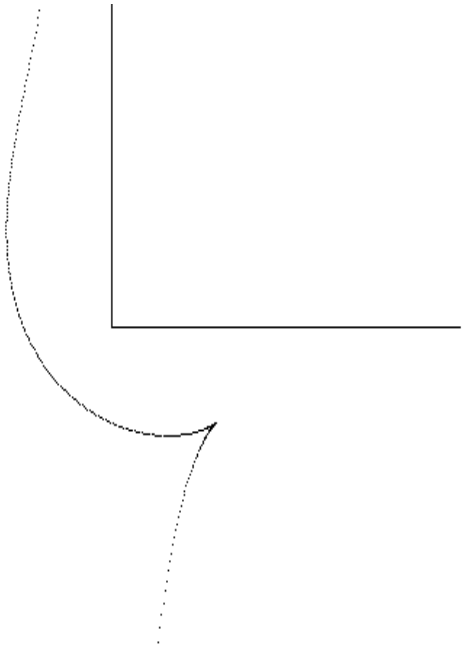

Fig.6. The trajectory of D

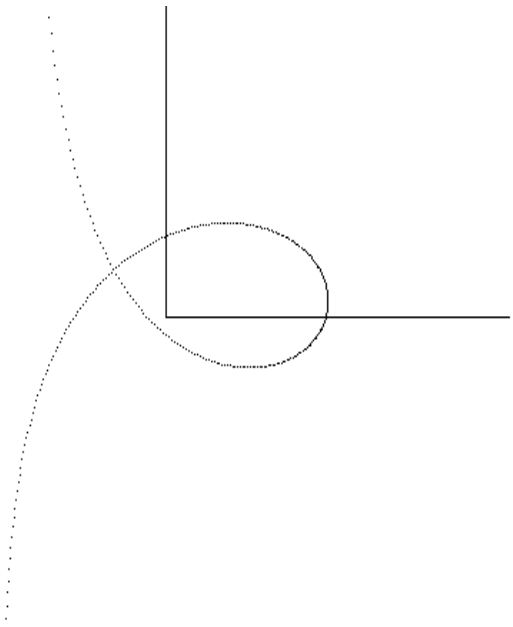

Fig.7. The trajectory of K

In fig. 9 are represented all these curves to track comparatively the resemblances and differences between them. It has been found that only the curve which is being traced by D is in essence different from the others.

By modifying the basic quotes at a=30, XC=60, they resulted the curves from fig.10. It has been ascertained that we had obtained other types of curves.

Further, they are being modified the quotes of the segments from the connecting rod at these values: a1=25; a2=36; a3=16; b1=54; b2=26; b3=44, having a=38, XC=60, so that they are obtained the curves from fig.11.

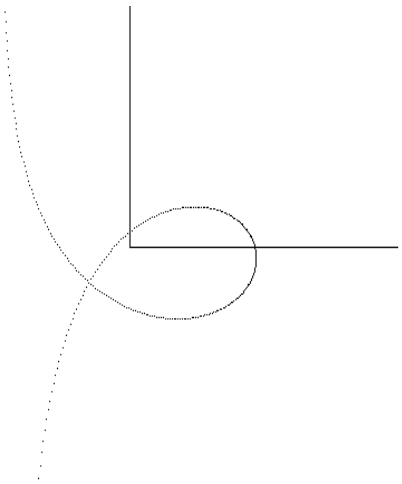

Fig.8. The trajectory of G

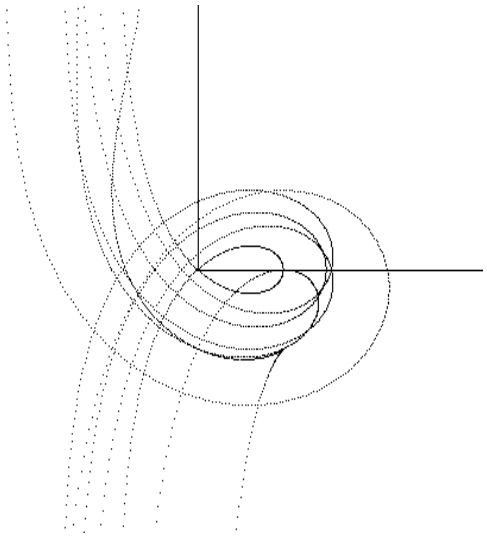

Fig.9. The trajectory of all points

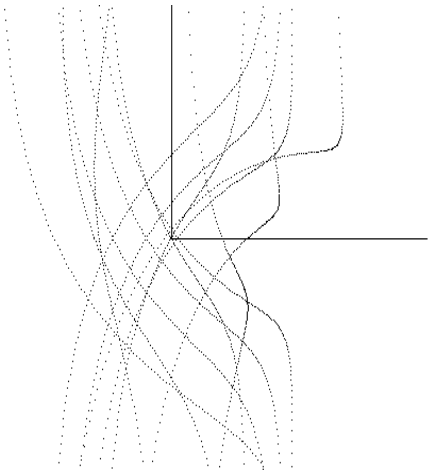

Fig.10. Curves for a=30, XC=60

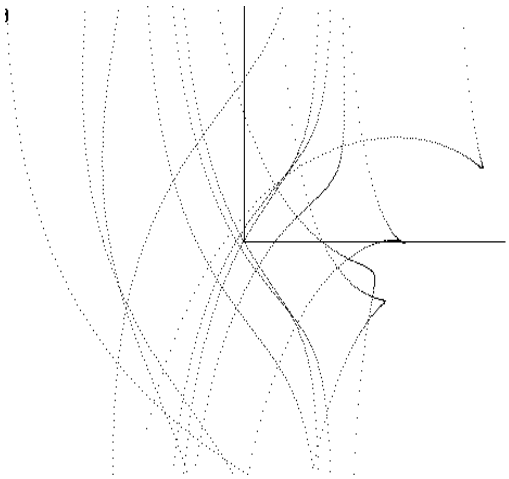

Fig.11. Curves for a=30, XC=60

3.CONCLUSIONS

The studied mechanism generates algebraic curves of 3 and 4 degrees, depending on the relations between the initial dates.

For other points of the mechanism, it has been established the obtaining of some similar curves and some other curves too.

By modifying the dimensions of some segments from the connecting rod, they are being obtained other curves.

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