ANNALS of the ORADEA UNIVERSITY.

Fascicle of Management and Technological Engineering, Volume VI (XVI), 2007

THE STRUCTURAL SYNTHESIS OF THE MECHANISMS WITH ONE OR TWO DYADS AND TWO CONDUCTING ELEMENTS

Liliana Luca*, Iulian Popescu, Liviu Cirtina***
***Universitatea Constantin Brancusi Tg-Jiu**
****Universitatea din Craiova**

Keywords: mechanisms, dyads, structural synthesis

Summary

It is being established a method, based on the rules of the inventiveness, throughout they are being generated all the plane mechanisms, which are formed by tho conducting elements and one or two dyads. It is shown the codification manner and they are given examples. These mechanisms can offer very complicated trajectories and laws of movement.

1. INTRODUCTION

In technics they are being used several mechanisms, which are formed by two conducting elements and two dyads. They have been empirically realised by planners.

In [2] they are presented 6 such mechanisms (fig.1, a-f), which are destinated to generating complicated trajectories.

In [1] it is shown the manner of generating mechanisms with one, two or three dyads, with only one conducting element, starting with a codification of all variants of dyads, which is given in fig.2, by using the method of the morphological analysis from inventiveness. Lower, it is used the same methode, but for mechanisms with two conducting elements.

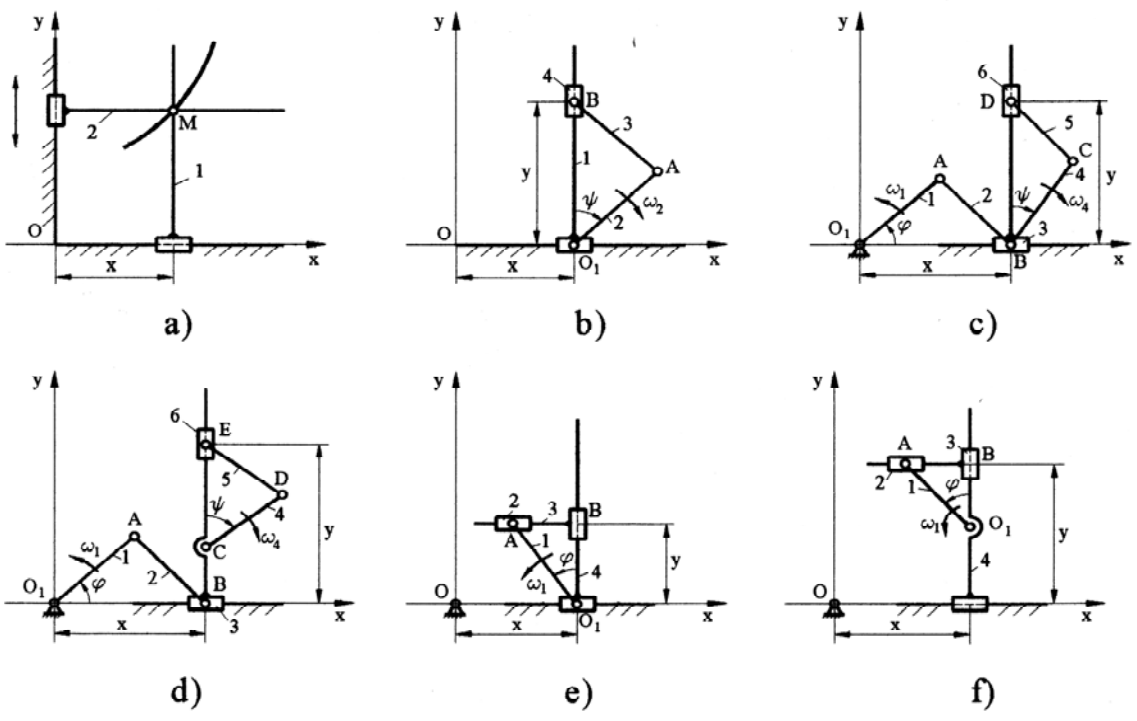


Fig.1.

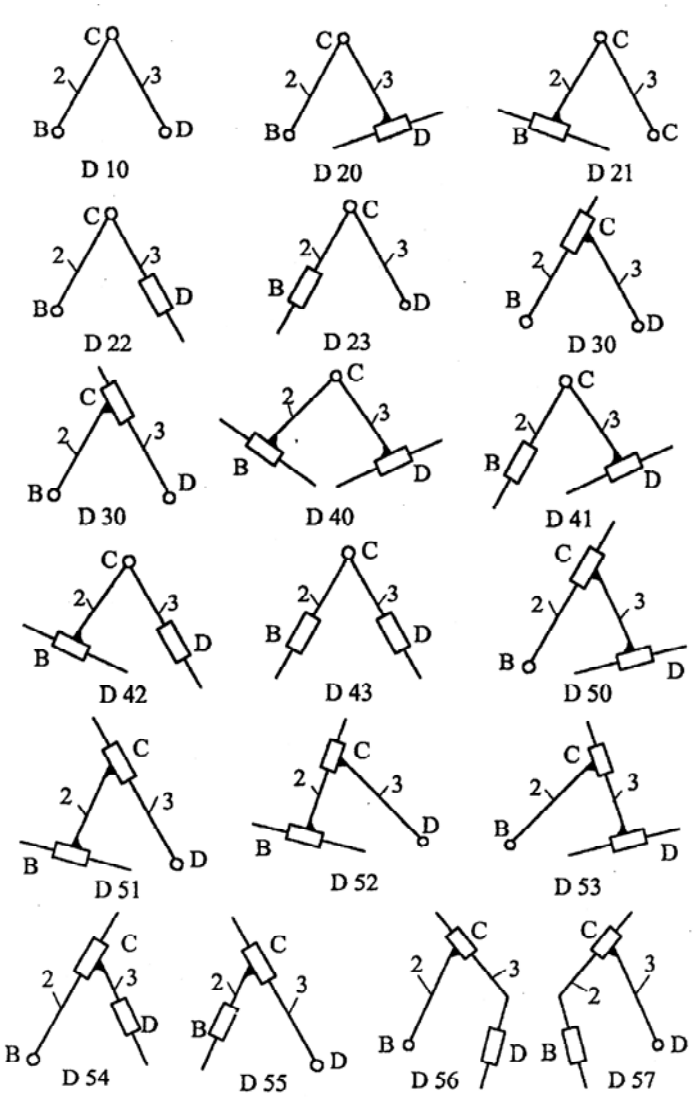


Fig.2.

2. MECHANISMS WITH ONE DYAD

In table 1, they are shown all variants of mechanisms with two conducting elements and one dyad. They are two types of conducting elements and 19 variants of dyads, and all the combinations between them offer 76 mechanisms. In figure 3 it is shown the mechanism in which the 1 and 4 elements/ conductors of R type, are tied with the dyad of RRR type (D10).

Here exists only one variant of tieing: 1+4, meaning the dyad is tied to the 1 and 4 elements, which are tied to the base.

Table 1

First conducting element	Second conducting element	The variant of the dyad
R	T	D10,D20,D21,D22,D23,D30,D31,D40,D41,D42,D43,D50,D51,D52, D53,D54,D55,D56,D57
T	T	
Total:2	2	19
Total	variants	2x2x19=76

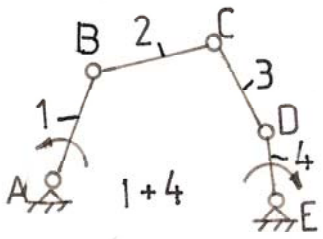


Fig.3

3. MECHANISMS WITH TWO DYADS, ONE CONDUCTING ELEMENTS TO THE BASE AND THE OTHER ELEMENT-MOBILE

The mechanisms of this type, which are possible, are given in table 2. It results a total of 2x19x2x19x9=12996 mechanisms.

The first dyad is always being tied to the first conducting element and to the base.

The second dyad can be tied in 9 ways, as it is shown in the last column of table2 and in figure 4 a, b.

It must be said that it would be possible another variants of tieng, for example 2+1, beside 1+2, but, in these cases, we would repeat some mechanisms;

This situation has been taken in consideration at the dyad's classification (figure 2).

For notations, they are used the following rules:

-the first conducting element is noted with 1 and AB;

-the first dyad is noted with 2, 3 and BCD;

-the second conducting element is noted with 1 and A'B'

- the second dyad is noted with 2', 3' and B'C'D';

- on each drawing it is indicated the tieing variant.

Table 2

First conducting element	First dyad	Second conducting element	Second dyad	The tieng variant
R T	D10,D20,D21, D22,D23,D30, D31,D40,D41, D42,D43,D50, D51,D52,D53, D54,D55,D56, D57	R T	D10,D20,D21, D22,D23,D30, D31,D40,D41, D42,D43,D50, D51,D52,D53, D54,D55,D56, D57	1+1 2+2 3+3 1+2 1+3 2+3 1+0 2+0 3+0
Total:2	19	2	19	9

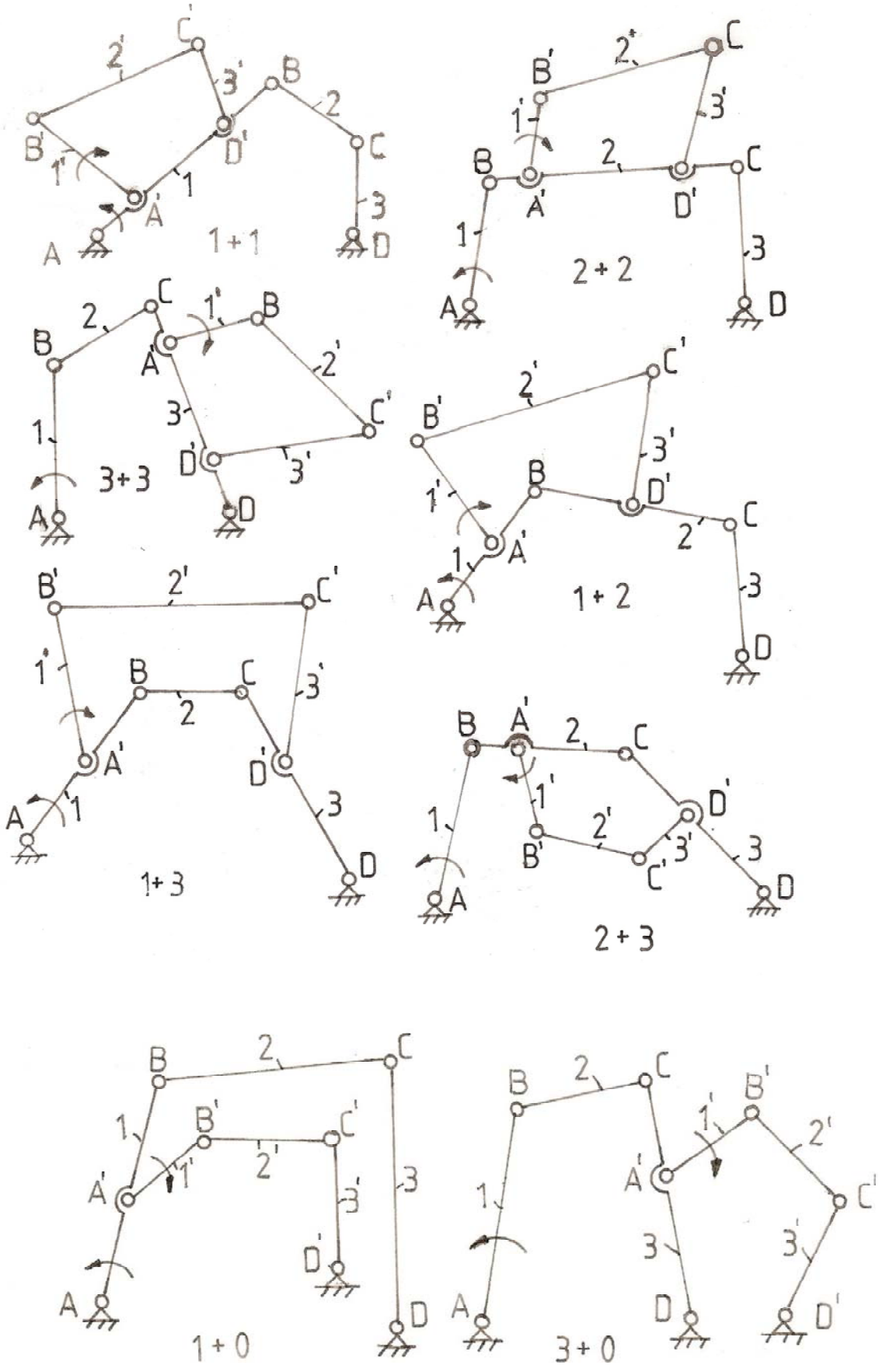


Fig.4.a.

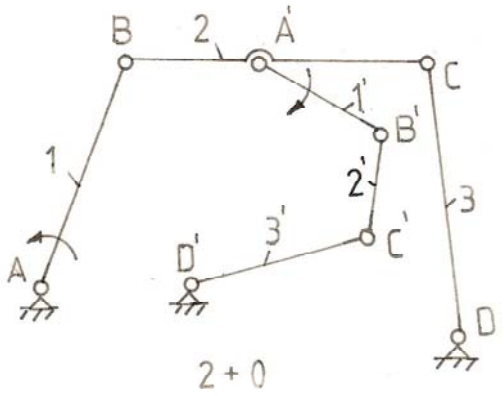
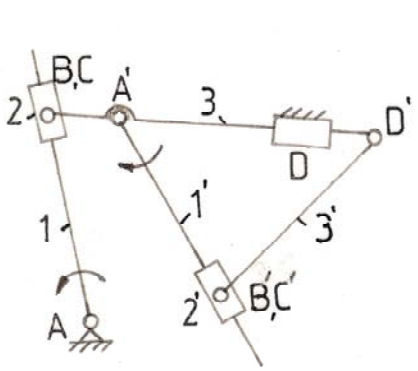


Fig.4.b.

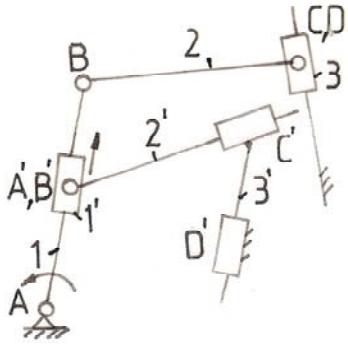
The realised mechanisms can have particular cases, for example when some couplings are superposed, or some elements have their lengths equals to zero.

From these mechanisms , those which do not have minimum two rotation couplings in each independent outline, degenerate into mechanisms with one or two outlines of fourth family, meaning with too simple movements(translation after X and Y).

In figure 5-9 they are shown some of the 12996 obtained mechanisms. The symbolism of the mechanisms is made in the following way: the first conducting element code, the code of the first dyad, the code of the second conducting element, the second dyad's code, the tieing variant code.

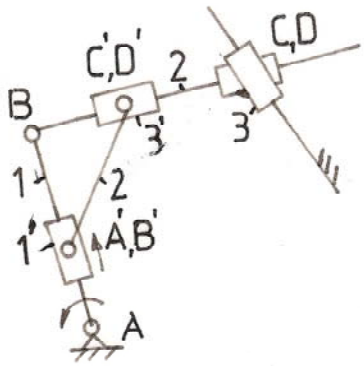


R-TRT-R-TRR-3+3

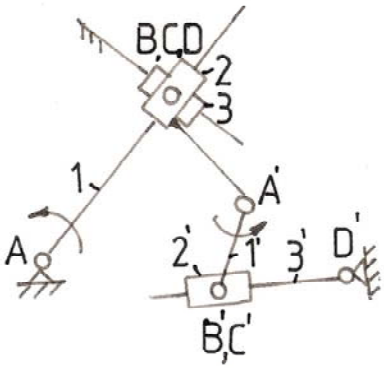


R-RRT-T-RTT-1+0

Fig.5

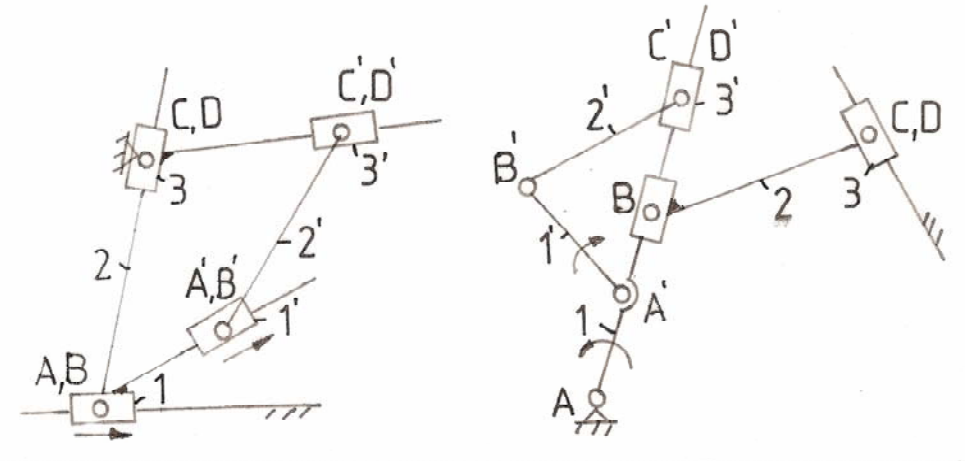


R-RTT-T-RRT-1+2



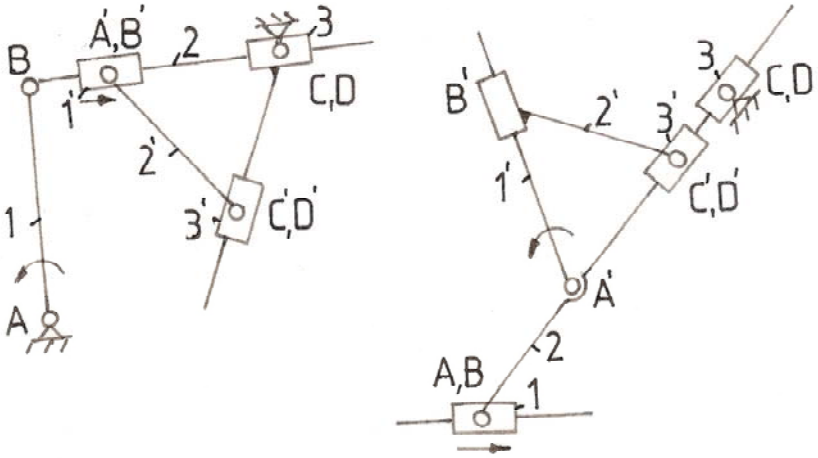
R-TRT-R-RTR-2+0

Fig.6.



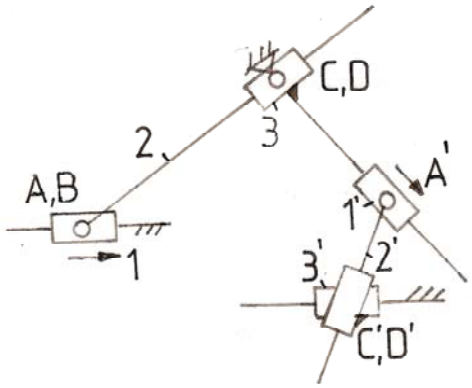
T-RTR-T-RRT-1+3 R-TRT-R-RRT-1+1

Fig.7.



R-RTR-T-RRT-2+3 T-RTR-R-TRT-2+2

Fig.8.



T-RTR-T-RTT-3+0

Fig.9.

4. MECHANISMS WITH TWO DYADS, WITH BOTH CONDUCTING ELEMENTS TIED TO THE BASE

We start from figure 3, where the conducting elements 1 and 4 are tied to the base, and the first dyad is being tied to those elements. The second dyad cannot be tied wich both extreme couplings at only one element, because that would become a rigid tied to that element. Therefore, it would be possible the following tieing variants for the second dyad: 1+2, 1+3, 1+4, 2+3, 2+4, 3+4. It results, based on table 3: 2x19x2x19x6=8664 mechanisms. Their construction is similar to the method wich is presented above.

In this way, they have been obtained all mechanisms which are formed by two conducting elements and two dyads, meaning 21660 mechanisms.

Table 3

First conducting element	First dyad	Second conducting element	Second dyad	The tieng variant
R T	D10,D20,D21, D22,D23,D30, D31,D40,D41, D42,D43,D50, D51,D52,D53, D54,D55,D56, D57	R T	D10,D20,D21, D22,D23,D30, D31,D40,D41, D42,D43,D50, D51,D52,D53, D54,D55,D56, D57	1+1 1+3 1+4 2+3 2+4 3+4
Total:2	19	2	19	6

5. CONCLUSIONS

They have been obtained 76 mechanisms with two conducting elements and one dyad and 21660 mechanisms with two conducting elements and two dyads.

From all these mechanisms, thase which don't have minimum two rotation coupling in each of the 2 independent outlines, degenerate.

With the analysis programmes of the dyads from [1], we can study the kinematic possibilities of these mechanisms.

Bibliography

1.Popescu,I.-Mecanisme.Noi algoritmi si programe.Tipografia Universitatii din Craiova, 1977.
2.Tempea, I.-Metoda pentru trasarea unor curbe plane prin compunere de miscari. Simpozion Syrom'73, pag.727-737.