EXPERIMENTAL EQUIPMENTS FOR RESEARCHES REGARDING THE KINEMATICS OF TRIPOD COUPLINGS

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Abstract: *The paper presents experimental researches regarding the kinematics of tripod couplings with exterior contacts. First, there are presented the tripod couplings solutions proposed for testing; also it is presented the testing stand and the measurement system.*
Keywords: *tripod coupling, test stand, error from homokinetics.*

1. INTRODUCTION

The tripod couplings have a wide practicability in caring away the driving and director wheels with independent suspension cars. The new class of tripod coupling (with exterior contacts) removes the sliding friction, simplify the construction and the technology. The structural pattern model, for a solution with cylinder-cylinder contacts is presented in figure 1 [2]; *1* is the input shaft and *2* the output shaft. To increase the torque capacity, there are proposed solutions with different types of elements in contact (parabolical, hyperbolical). The general problem for tripod couplings is to determine the error from homokinetics. The paper proposes a method of testing the tripod couplings and presents the results of the testing of this type of couplings.

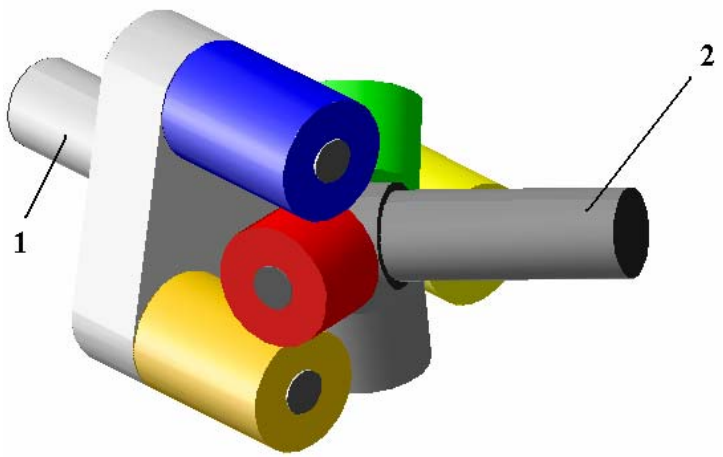
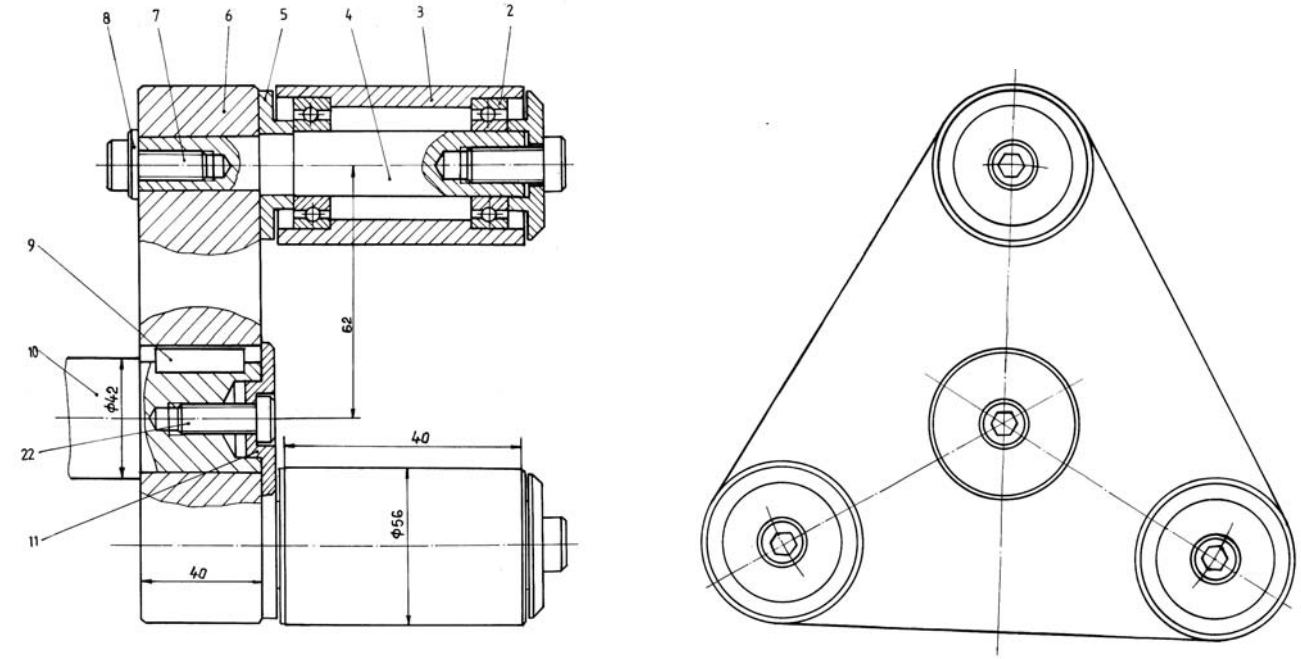


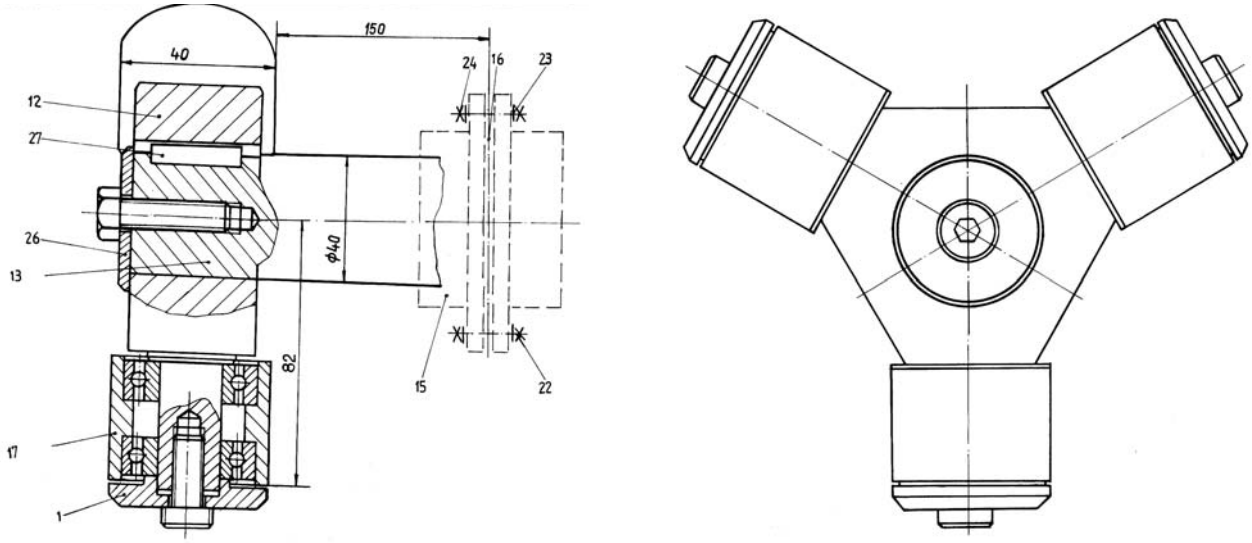
Fig. 1. Tripod coupling

2. TRIPOD COUPLING SOLUTIONS

For testing researches are proposed three variants of tripod couplings with exterior contacts; the practical solutions are based on the initial solution, presented in figure 2 [2].



a



b

Fig. 2. Practical solution

The input element (figure 2,a) and output element (figure 2,b) are in contact by using elements *3* and *17*; these elements have different geometrical exterior surfaces: cylindrical, parabolical, hyperbolical – *3* (*20*, *21*) and, respectively, *17* (*18*, *19*); the elements in contact are mounted on bolts *4* by using the ball bearings *2*. The ball bearings are fixed by using the bonnets *1* and respectively, *5*. The bolts from the input element are fixed in the plate *6* by using the screws *7* fixed by bonnets *8*. The input shaft *10* is fixed in the plate *6* by using the key *9*; the input shaft is axial fixed in the plate *11* by using the screw *22*. The output shaft *13* is fixed in the plate *12* by using the key *27*; this shaft is axial fixed with the element *26*. At the end part of the output shaft it is put a flexible coupling. The coupling has two half couplings *15* and elastic disks *16* are mounted by using the screws *23*, *24*.

The solution offers the whole assembly to be used for experimental researches. The experimental study is possible only if the output shaft has an element capable to eliminate the angular errors. There can be used two solutions:

a. using another tripod coupling;using a flexible coupling.

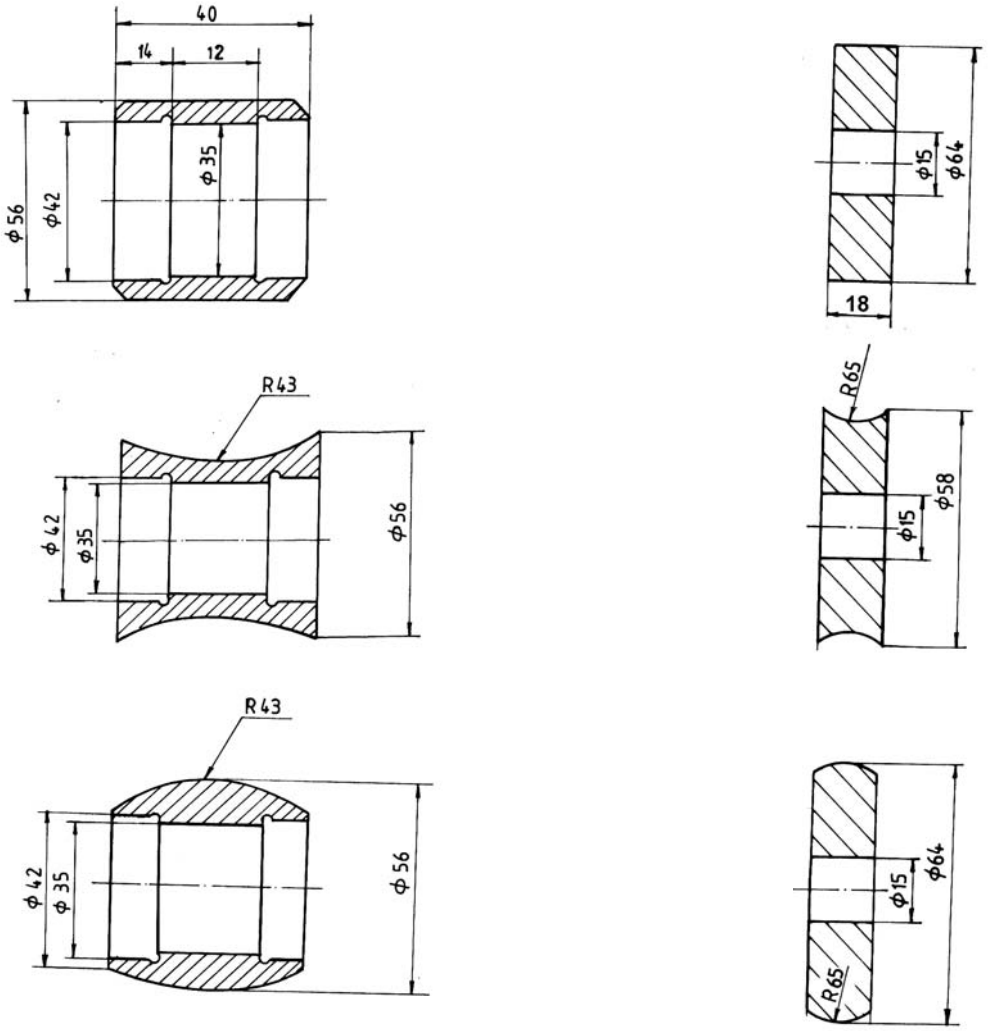


Fig.3. Types of contact elements

b. using a flexible coupling.

The flexible coupling is flexible for bending torques and elastic for torsion torques; while the construction symmetry, the flexible coupling is a homokinetical coupling. To reduce the local contact stresses, there can be used different types of elements who are in contact: cylinders, paraboloids, hyperboloids (see figure 3).

3. TESTING STAND

For experimental researches it is used an open power network testing stand [1] from Institutul National de Autovehicule Rutiere S. A. Brasov. The testing stand scheme is presented in figure 4. The actuator is an alternomotor *1* controlled by the controlboard *2*. The power is transmitted to the tripod coupling *3* through the couplings *6* and the cardano transmission *7*. At the end part of the output shaft there is a hydraulic break *4* controlled by the controlboard *5*. The break is transmitted to the tripod coupling through the coupling *6* and the flexible coupling *8*. The stand is equipped with the incremental transducers *9* by using this transducers can be measured the angular position, the angular velocity and the torque at the input and the output shaft of the tripod coupling. The transducers are connected to the electric energy by using the simple tension source *10* and the triple tension source *11*. The transducers are connected to the data acquisition board *12* from the personal computer *13*.

4. MEASUREMENT EQUIPMENT

The transducers are working at 4V and the measurement increment is 1250 readings/rotation. The measurement error is 0.2%. For angular position measurements, the signal from the transducer *5* and through the connector *2* and the interface *3* is transmitted to the personal computer1. For the torque measurement it is necessary to use a tensometer 4 (see figure 5).

5. CONCLUSIONS

The tripod couplings proposed for the experimental researches is characterized by simple construction and technology. The existent stand is adapted to experimental researches on the kinematics behavior of the tripod couplings with exterior contacts. The measurement

system offers the values for the angular position of the input and output shafts; by using this values, can be determined the variation of the error from homokinetics and can be compared to the theoretical values.

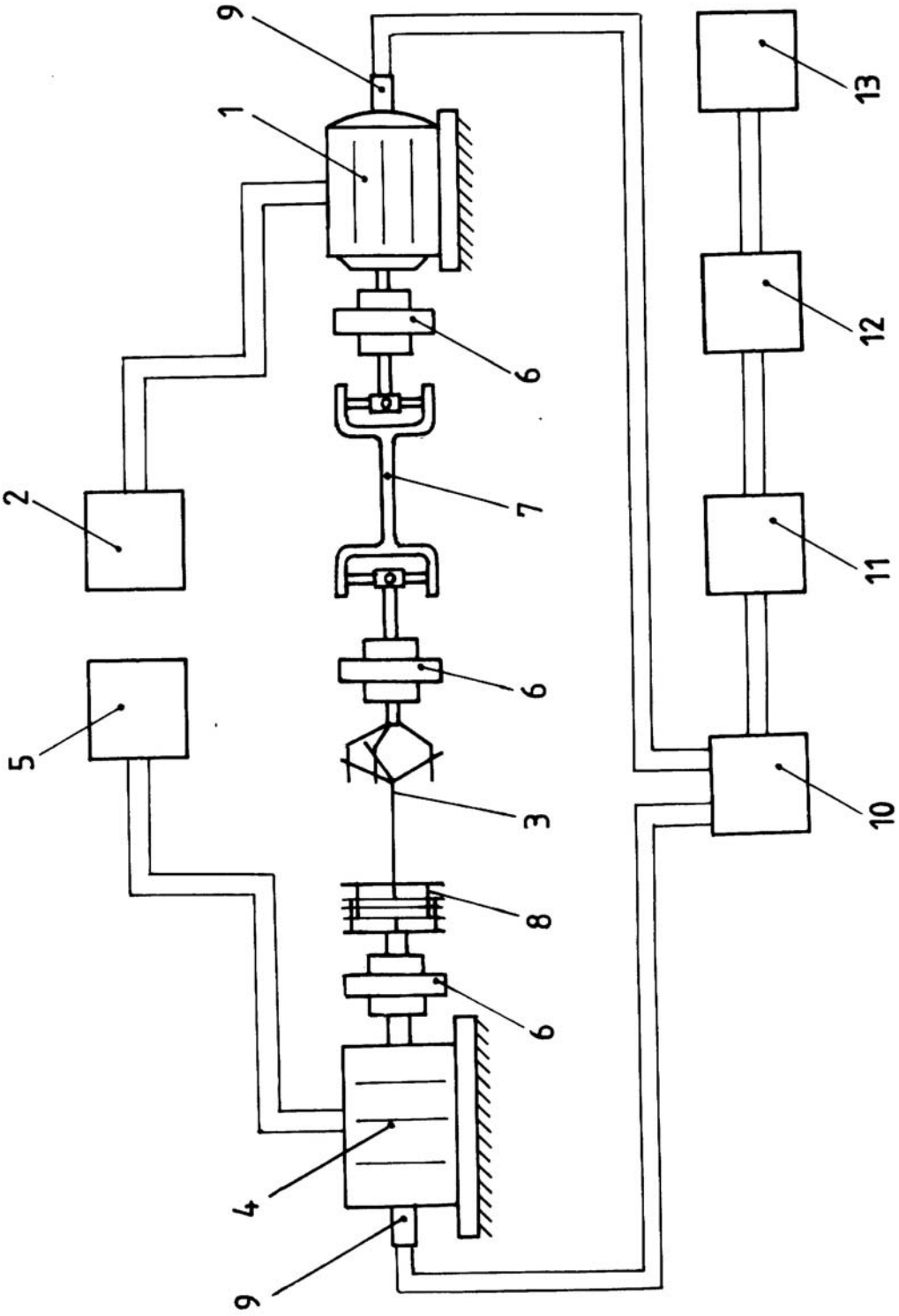


Fig.4. Testing stand

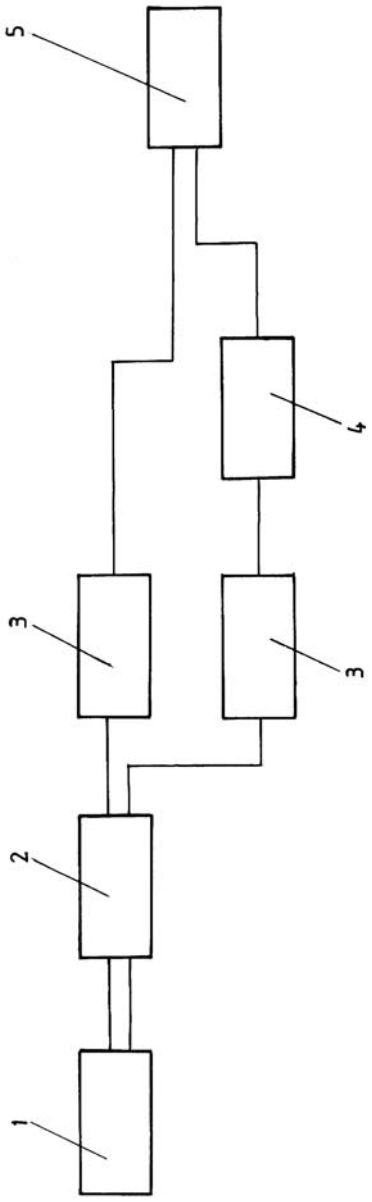


Fig.5. Measurement equipment

REFERENCES

1. Jula, A. ş.a. Organe de masini, vol.II. Universitatea din Brasov, 1989.
2. Lateş, M. T. Cuplaje cu contacte mobile. Teza de doctorat. Universitatea Transilvania din Braşov, 2003.