TABLE IV
CHANGES OF THE RADIAL PLAY, OF SLOTS, OF BALLS, OF CENTERING TYPE AND OF BALLS NUMBER

	Lot V Φ 12,25				
	51	52	53	54	55
D_2	59.8	59.8	59.8	59.8	59.8
D_2 D_c	59.7	59.7	59.8	59.7	59.8
	60	90	00	80	00
J_{RC}	0.4				
Radial play	21	22	20	23	25
VG	12	15	12	12	11

TABLE VI
CHANGES OF THE RADIAL PLAY, OF SLOTS, OF BALLS, OF CENTERING TYPE AND OF BALLS NUMBER

	Lot VI Φ 12,1				
	61	62	63	64	65
D_2	59.8	59.8	59.8	59.8	59.8
D_2 D_c	59.16	59.7	59.7	59.8	59.80
	0	90	76	03	0
	44.7	44.4	44.4	44.4	44.4
J_{RC}	0.4				
Radial play	18	18	22	23	20
VG	15	15	14	12	14

TABLE VII
CHANGES OF THE RADIAL PLAY, OF SLOTS, OF BALLS, OF CENTERING TYPE AND OF BALLS NUMBER

	Lot VIII Φ 12,1 8 balls						
	71	72	73	74	75	76	77
D_2	59.8	59.8	59.8	59.8	59.8	59.8	59.8
d_2	59.7	59.8	59.8	59.75	59.8	59.7	59.7
D_c		2					
J_{RC}							
Radial play	20		19	19	18	18	18
VG	14		12	15	15	15	14

4 Conclusions

This paper presents a set of theoretical and experimental results. Bearings exist in machines and tool components that are used in a wide range in all industry areas.

Using the initial principle of the capacitive method for experiments (Fig. 14), a sectioned angular contact ball bearing was used with the pressure being taken by a single ball while in the third phase a cylindrical roller bearing with many balls was used. The lubrication is essential to assure the bearings' friability and the durability is directly influenced by the parameter λ of the lubrication film.

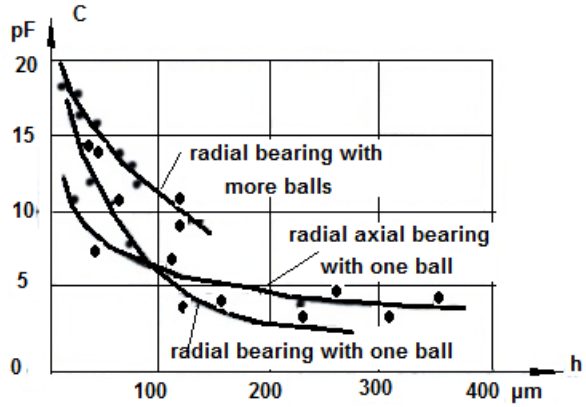

Fig.14.The variation of electrical capacity according to the thickness of the lubricant film

During the experiments, it is observed that there are substantial differences between the bearings working at normal speeds and those working at high speeds. The supplementary effects caused by the speed increase (centrifugal forces, gyroscopic movements, additional frictions) unfavorably influence the speed limits. The role of the lubricant in maintaining reliability at high speeds is decisive both by accomplishing the EHD film and by controlling thermic effects.

Following the analysis of the research results, the conclusion is that the model which provides a minimum moment of friction at the whole range of speeds and at high speeds corresponds to the type of bearing characterized by the presence of longitudinal lubrication channels in seats and of holes in the outer ring.

For high-speed bearings, an important factor is the discrepancy of the rolling motion from the epicycloidal theoretical movement discrepancy that is translated through a "cage slip". The stability of the

cage must also be viewed from a motional point of view. In the presence of the lubricant and under the thermal influence, a change of the cage's dimensions is produced.
Analyzing the obtained results concerning the friction of the bearings in the standard and modified classes, some conclusions can be identified:

1. By increasing the speed for the standard class, an increase of the friction moment generally occurs, in conformity with the theoretical model. There are areas of speeds, around the values of 20.000 and 30.000 (rpm), in which large reductions of the friction moment occur. These reductions are caused by changes in the bearing kinematics and were also evidenced by testing the cage gliding.
2.
3. By increasing the play between the cage and the outer race on which this is guiding from 0,3mm to 0,5mm, a reduction of the friction moment is obtained in comparison with the theoretical one up to 27.000 (rpm) speeds. In this case, a reduction of the power variation by 25% occurs compared with the standard version (control group).

4. The increase of the play between the ball and the cage leads to the reduction of the friction moment in the bearing only on the high speed domain, up to 25.000 (rpm). In the other classes the moments remain at high values.

5. The centering of the cage on both rings has an effect on the reduction of the friction moment that is more significant at high speeds. At the same time, it is observed that there is an absence of some of the main fluctuations of the moment as a result of the cages' improved alignment.

6. By increasing the number of balls from 7 to 8 the friction moment is reduced, especially in the domain of high speeds, as well as causing a leveling of the moment on the whole range of speeds.

7. Producing modified bearings with outlets in the seats and with outlets at the external ring level, results in reductions of the friction moment on the whole range of revolutions.

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