THE QUESTION OF IMPROVING THE MECHANICAL JOINT OF THE POWER TRANSMITTING SYSTEM

By

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Abstract:

This research work includes invistigation about the connection joint of the mechanical transmitting system. Two experimental stations have been construgted, each of them has some variation in its construction. This variation was carried out at the base of driven pulley when the electo-drive is fixed. The performance of each experimental station and the comparizon between them are presented. The invistigation shows that it is preferable to use these system within a certain limits to protect the belt, increase its life time and improve the working condition.

I. INTRODUCTION

There are two experimental stations have been constructed. The modification had been carried out at the construction of the movable base of driven pulley 1 .

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II. Construction of the experimental stations. Fig. 1. illustrats the picture of this case i.e. when the electro-drive is fixed and the driven pulley is mounted on a movable rectangular base 2 and 3 . It represents the construction of this station which consists of the following parts:

1. Electro-drive,
2. Vibration transducer,
3. Fixed base,
4. Driving, pulley,
5. V-belt,
6. Driven pulley,
7. Movable triangle base,
8. Driven shaft,
9. Torque transducer,
10. Bearing,
11. weights,
12. Pulley,
13. Belt of the braking system,
14. Bearing,
15. Main base,
16. Vibration meter,
17. Amplifier,
18. Recorder device.

Changing the loads at the driven shaft was carried out by using the breaking system. The load increase by increasing the weight W,Kg. at the brake as shown in Fig. 1.

III. Performance of the first experimental station.

This can be represented in the following relations

a. Speed of the driven pulley and loads during operation Fig. 2,
b. Slip coefficient and load Fig. 3,
c. Reduction ratio and slip coefficient Fig. 4,
d. Efficiency and slip coefficient Fig. 5,

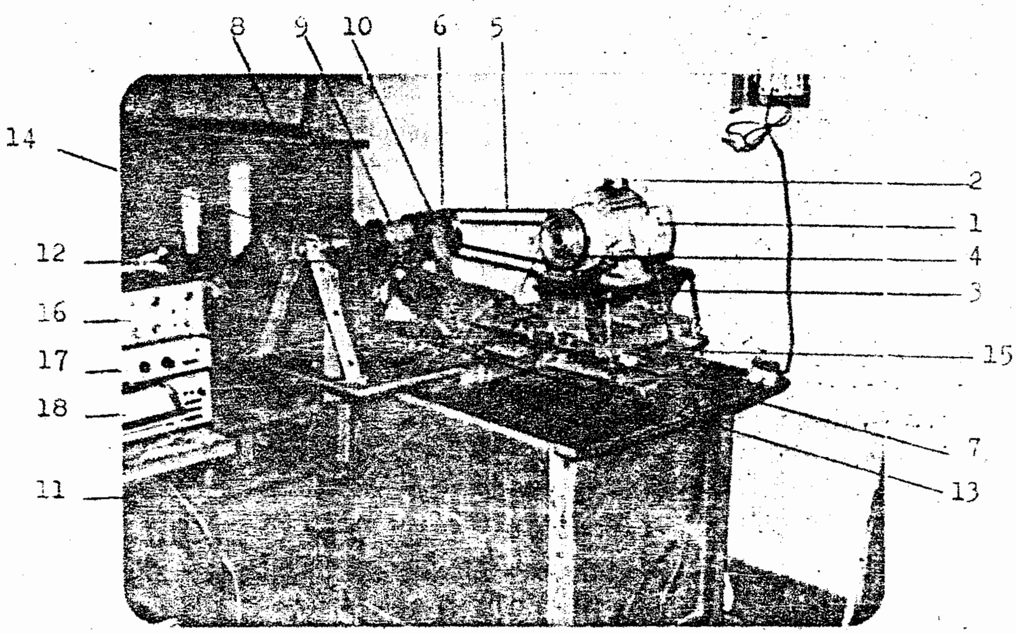

Fig.1. Picture of experimental station and the equipments used during the investigation

1. Electro-drive ;
2. Vibration transducer;
3. Fixed base;
4. driving, pulley;
5. V-belt;
6. Driven pulley;
7. Movable triangle base;
8. Driven shaft;
9. Torque transducer;
10. Bearing;
11. Weights;
12. Pulley;
13. Belt of the braking system;
14. Bearing;
15. Main base;
16. Vibration meter;
17. Amplifier;
18. Recorder device.

In addition for the previous relations the driving pulley speed against load characteristic was introduced which has a constant form.

IV. Construction of the Experimental Station After Modification.

The modification had been carried out by changing the construction of the movable base. Fig. 6 illustrates the shape of this base before modification it consists of four parts as a triangle base 1, horizontal base 2, a web 3 and a pin 4 to give the possibality of the triangle base to rotate arround it. (part 5 used as a packing from wood during pick up the picture only and not include in the construction of the proposed mechanizm). Fig. 7 illustrates the modified base which consists from a movable base 1, pin 2, web 3, base had the L shape and controlling spring 5.

Fig. 8. illustrates a picture for the modified experimental station which has the same component as in the first case. Only the base of the driven pulley was changed with new one as indicated in Fig. 7. The experimental work was repeated to introduce the performance of the modified system.

V. Performance of the modified experimental station

The same relations as before have been obtained. These relations are represented in Fig. 9, 10, 11 and 12. The main advantages of these relation are tends to linearity.

VI. Vibration measurment on the proposed system.

The induced vibration during the running condition was measured by the help of vibration transducer. This was fixed on the body of electro-drive as in Fig. 13a. This figure illustrates the equipments and measuring devices used during investigation the performance of the experimental station.

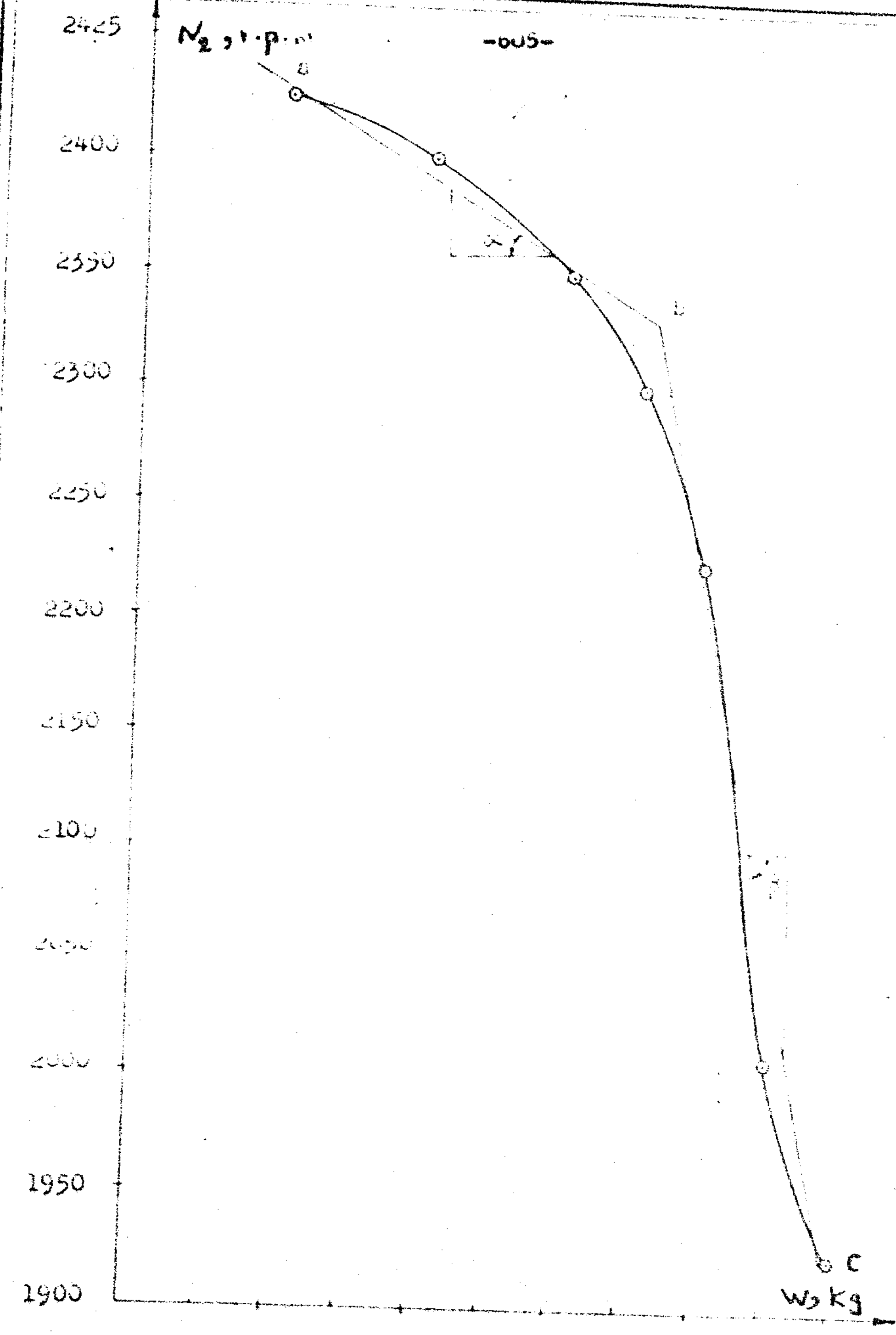

Fig.2 .. Relation between rotation of driven pully and loads.

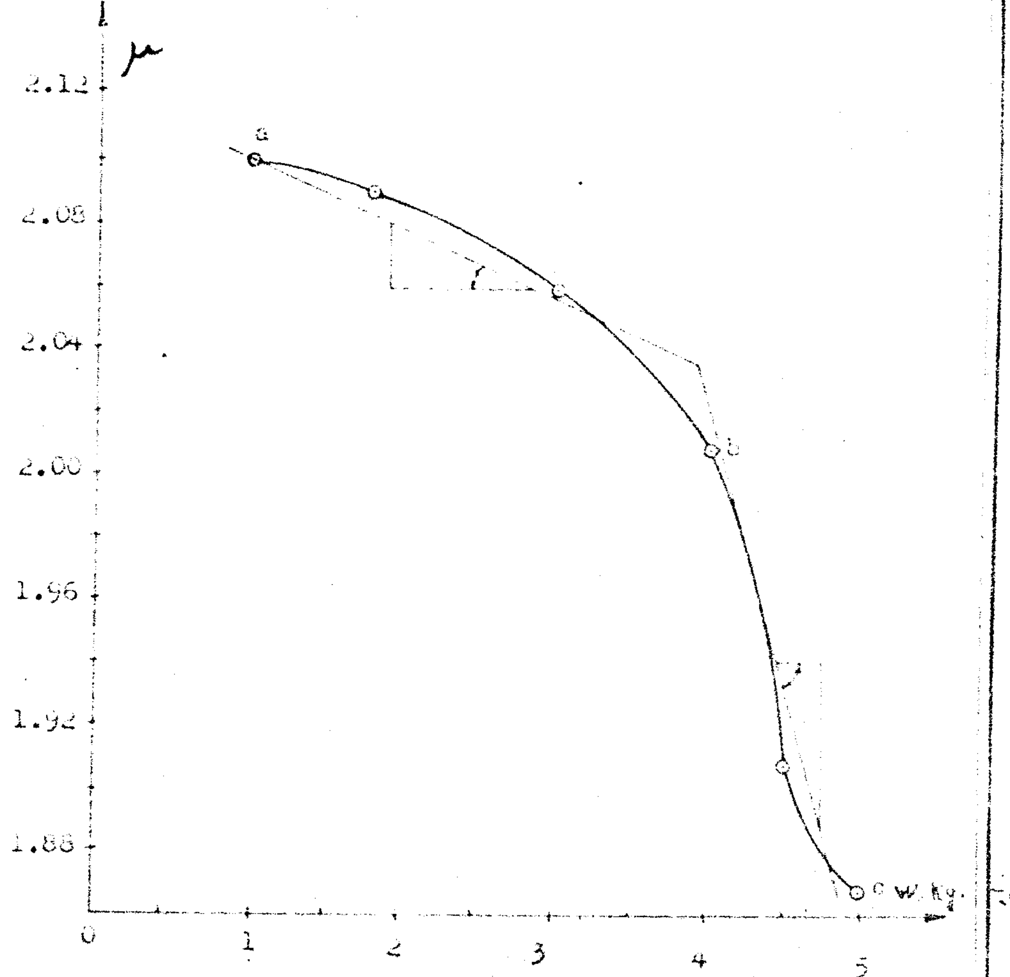

Fig.3 . Relation between slip and load

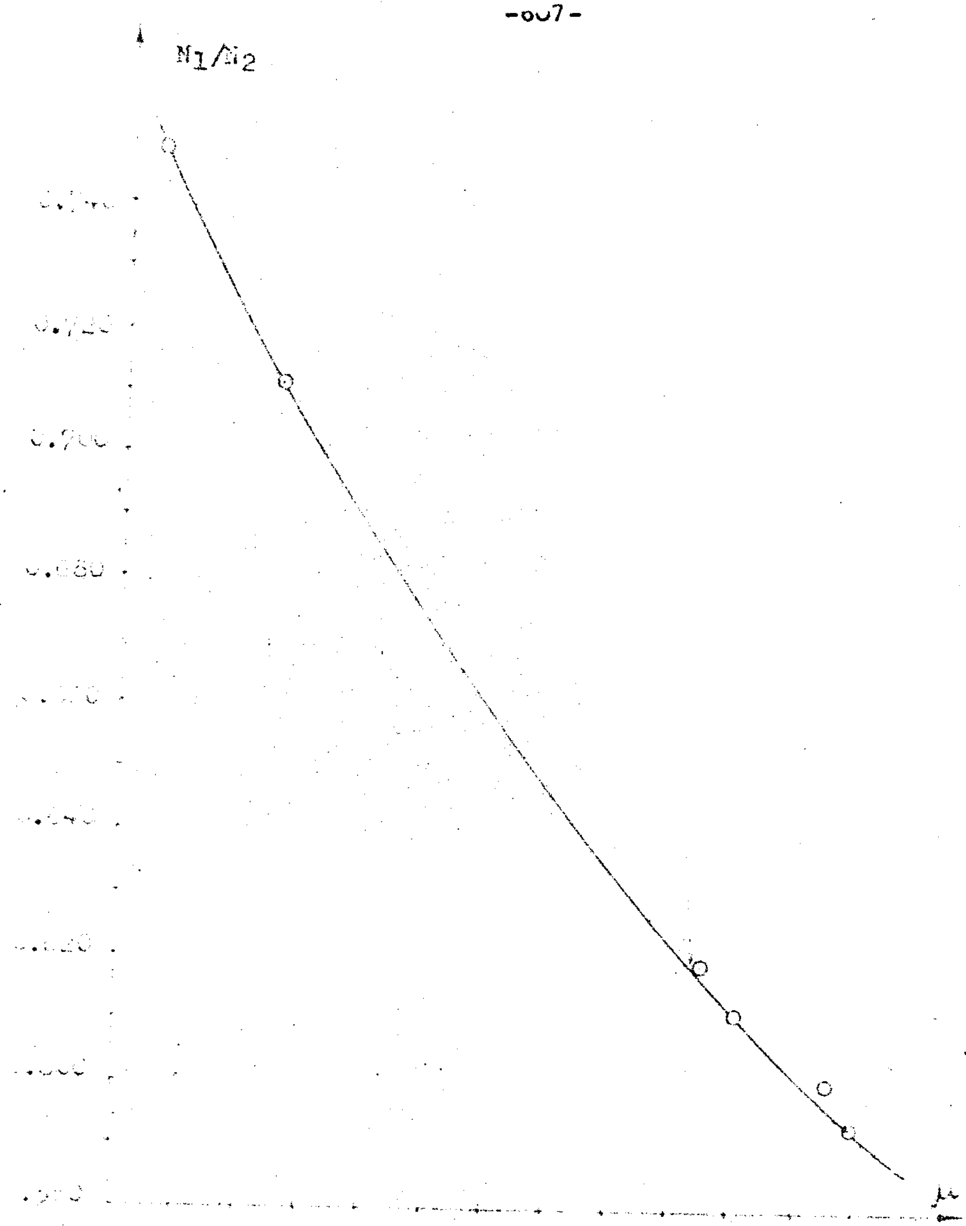

Fig.4. Relation between Reduction ratio and slip.

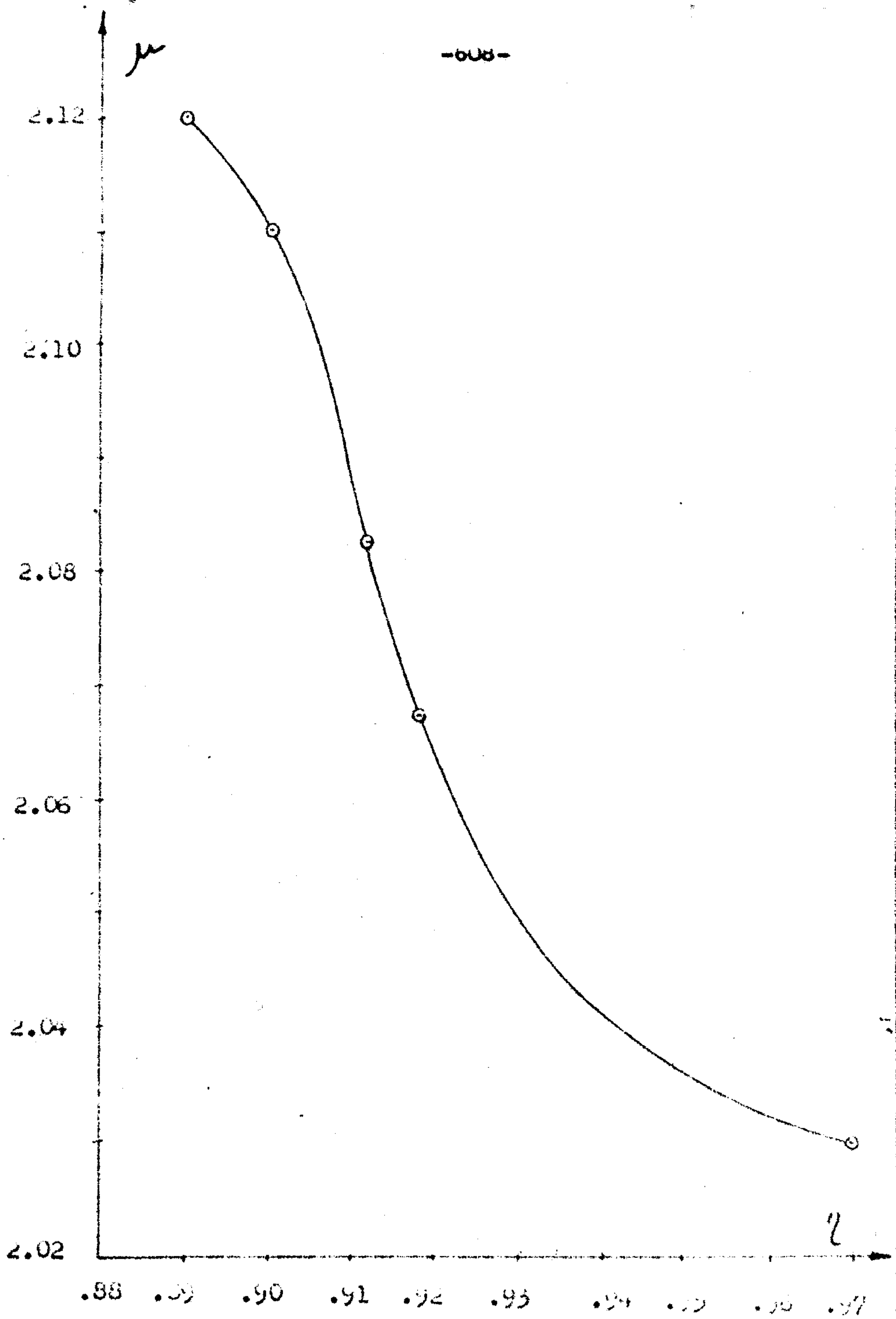

Fig. 5 Relation between slip Coefficient and efficiency of transmission

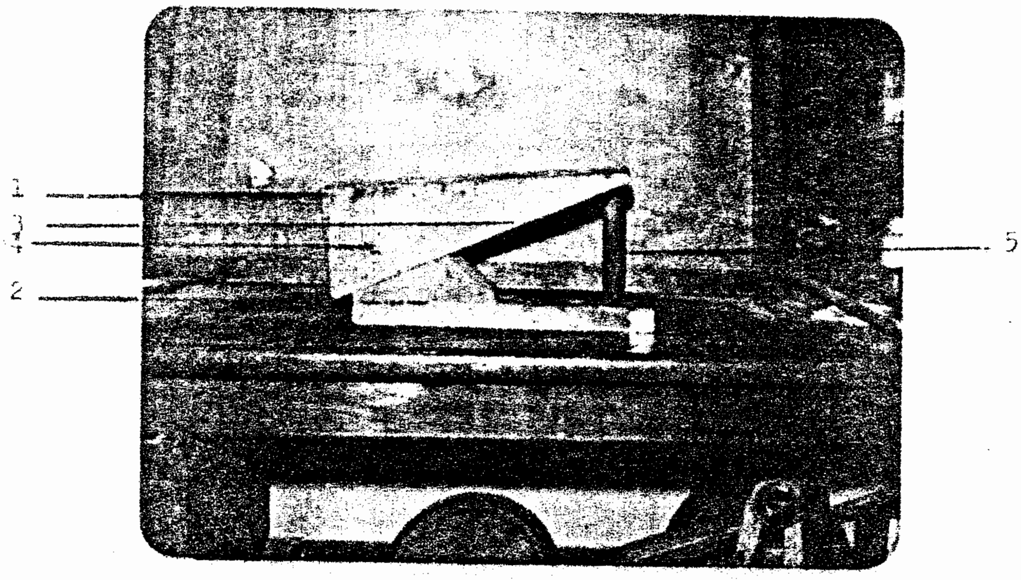

Fig.6 Construction of the driven pulley base before modification.

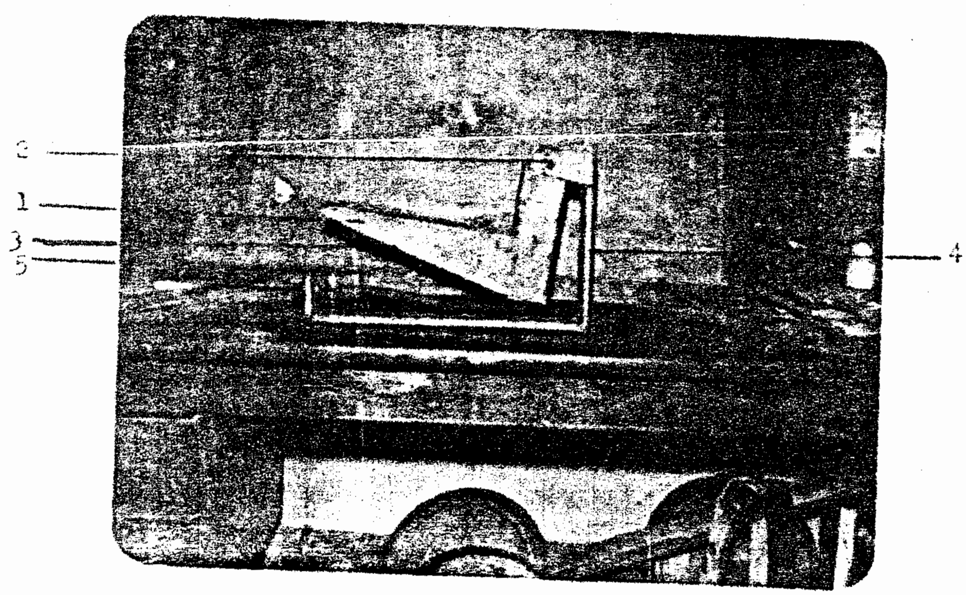

Fig.7. Construction of the driven pulley base after modification.

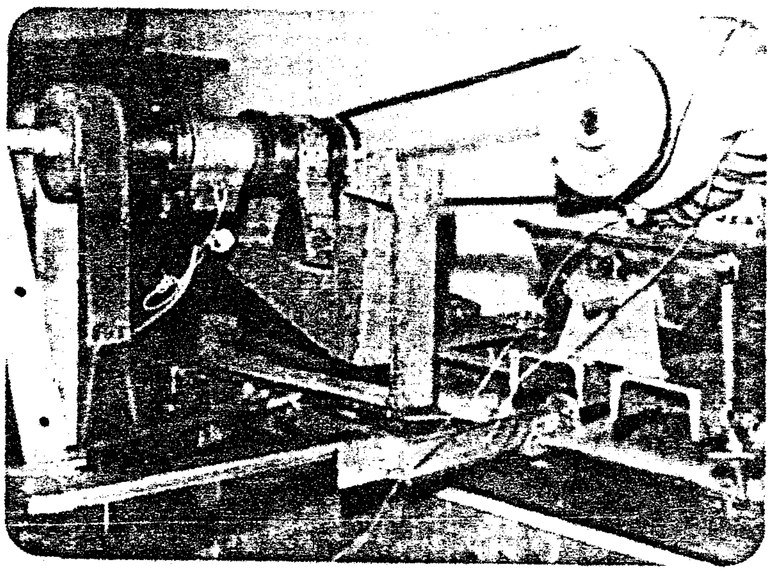

Fig.8. Construction of the experimental
Station after modification.

These devices are the following:

1. Vibration transducer 2,
2. Amplifier 3,
3. Off-set 4,
4. Recording device 5,

Fig. 13. b indicates the block diagram for measuring instruments used during vibration measurement.

The output vibration was recorded at variable loads in Fig. 14 for the first case, and Fig. 15 for the second one. The following table represents the relation between amplitude of vibration at different load.

Weight in Kg.	0	1	2	3	4
Amplitude (microns) Case I	15	30	30	31	45
Amplitude (microns) case II	30	45	110	90	91

Fig. 16 illustrates the relation between the amplitude of vibration at variable loads for the two cases. It is clear to notice that the vibration at the body of electro-drive in the first case is less than the second one.

VII. CONCLUSION

From the previous investigation the following results was obtained.

- It is possible to use the proposed system as a mechanical power transmitting system to protect the belt and to increase its life time.

- The first case is preferable than the second one.
- The vibration is less in the first case than the second one.
- By using this method the belt will be subjected to a self tension control.

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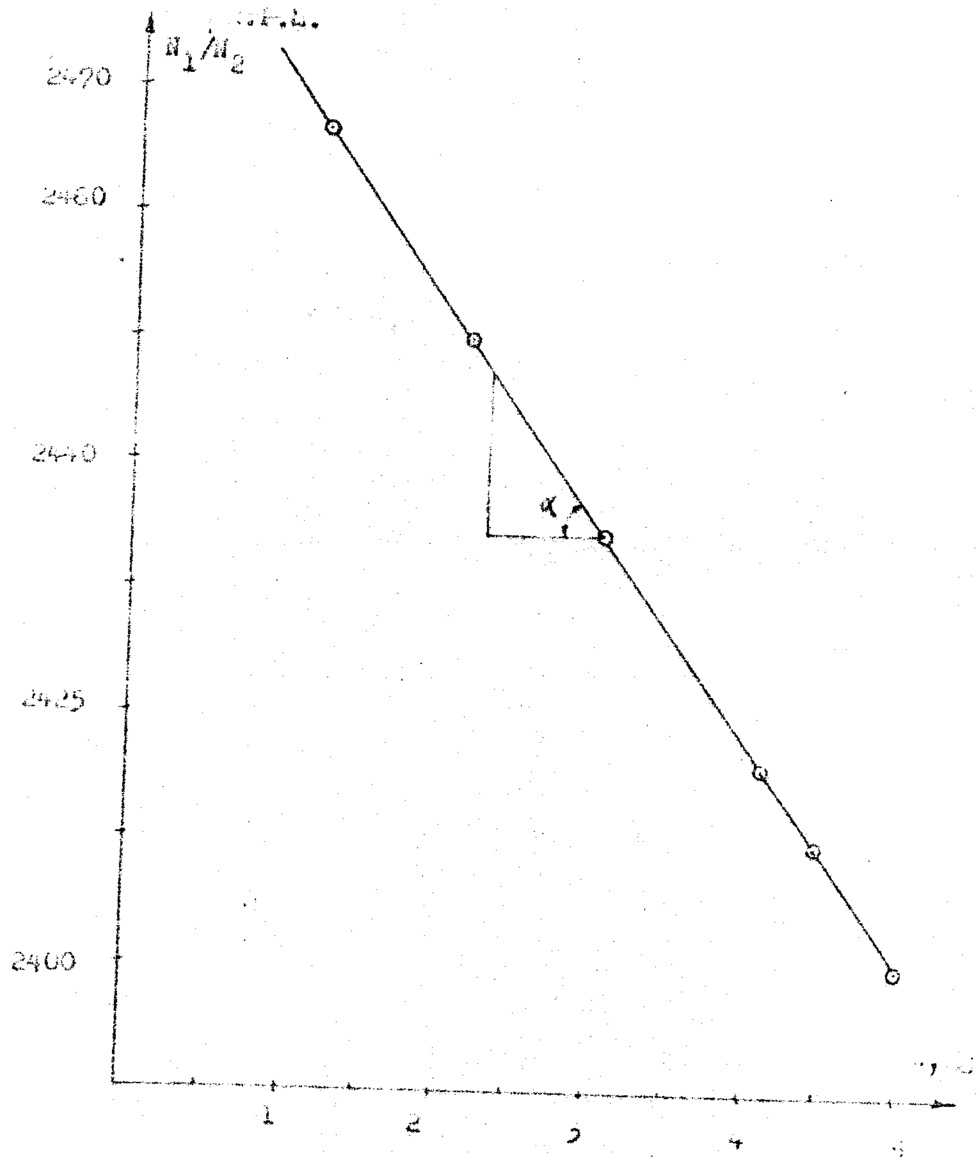


Fig. 9 Relation between speed of driven pulley and load.

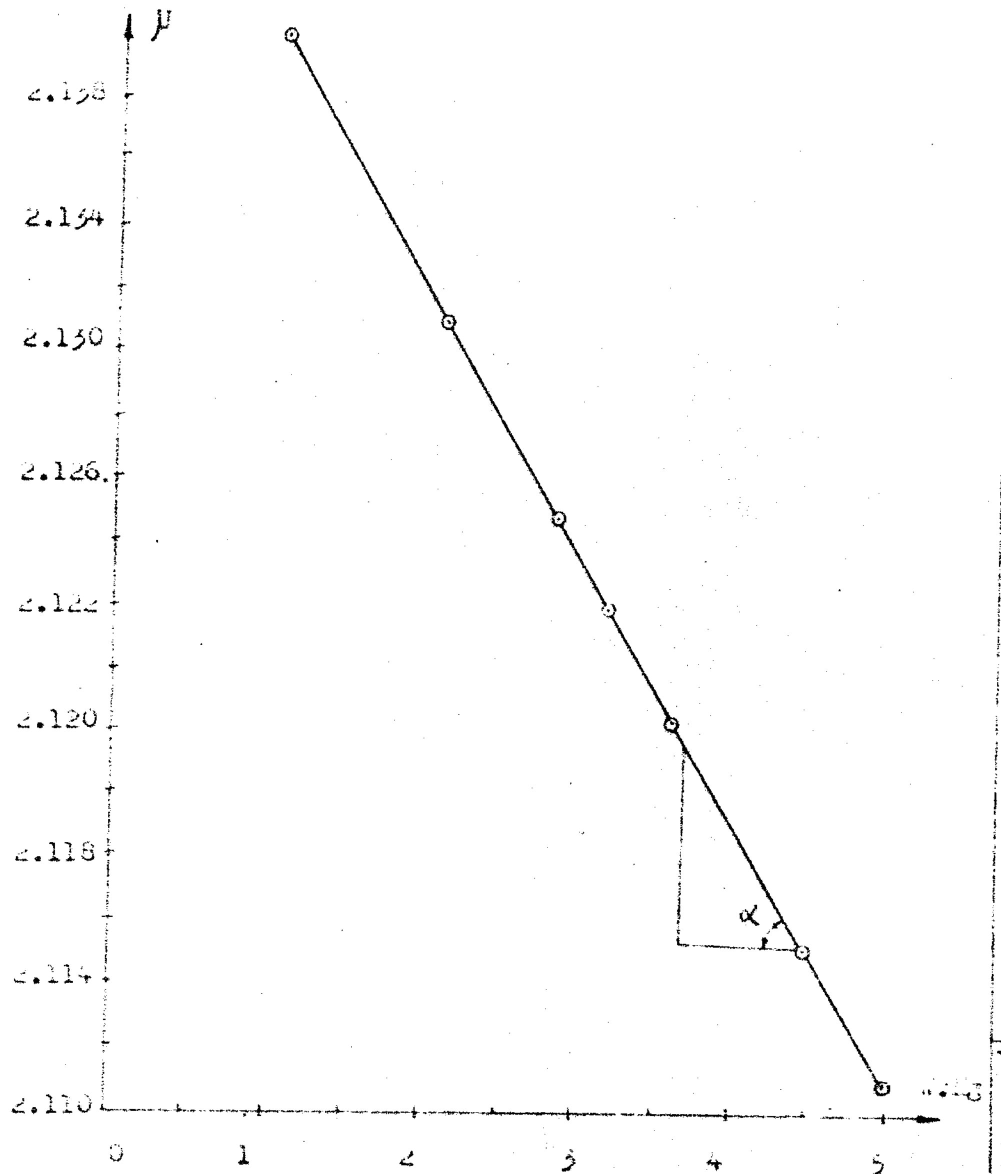


Fig. 10 Relation between slip and load at driven pulley.

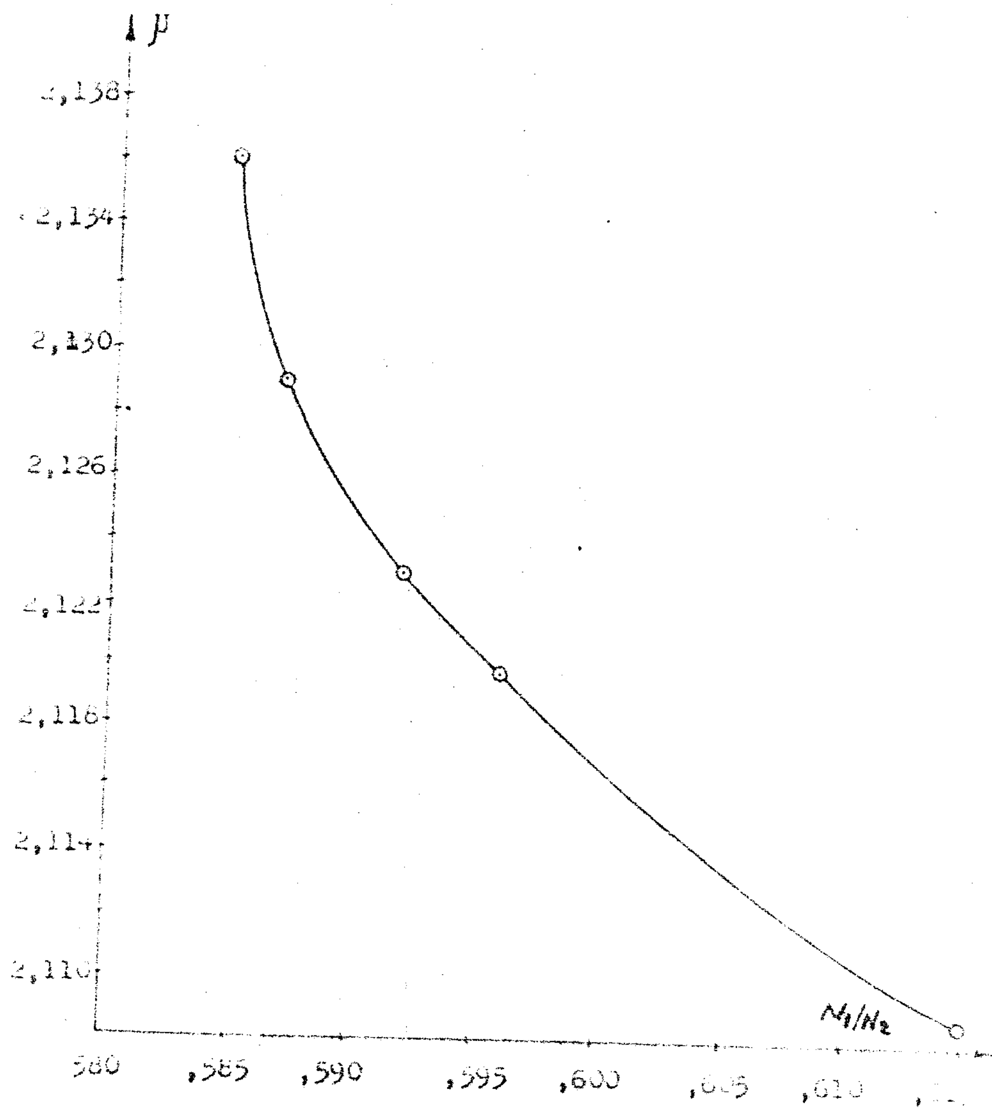


FIG. 11 . Relation between slip and reduction ratio

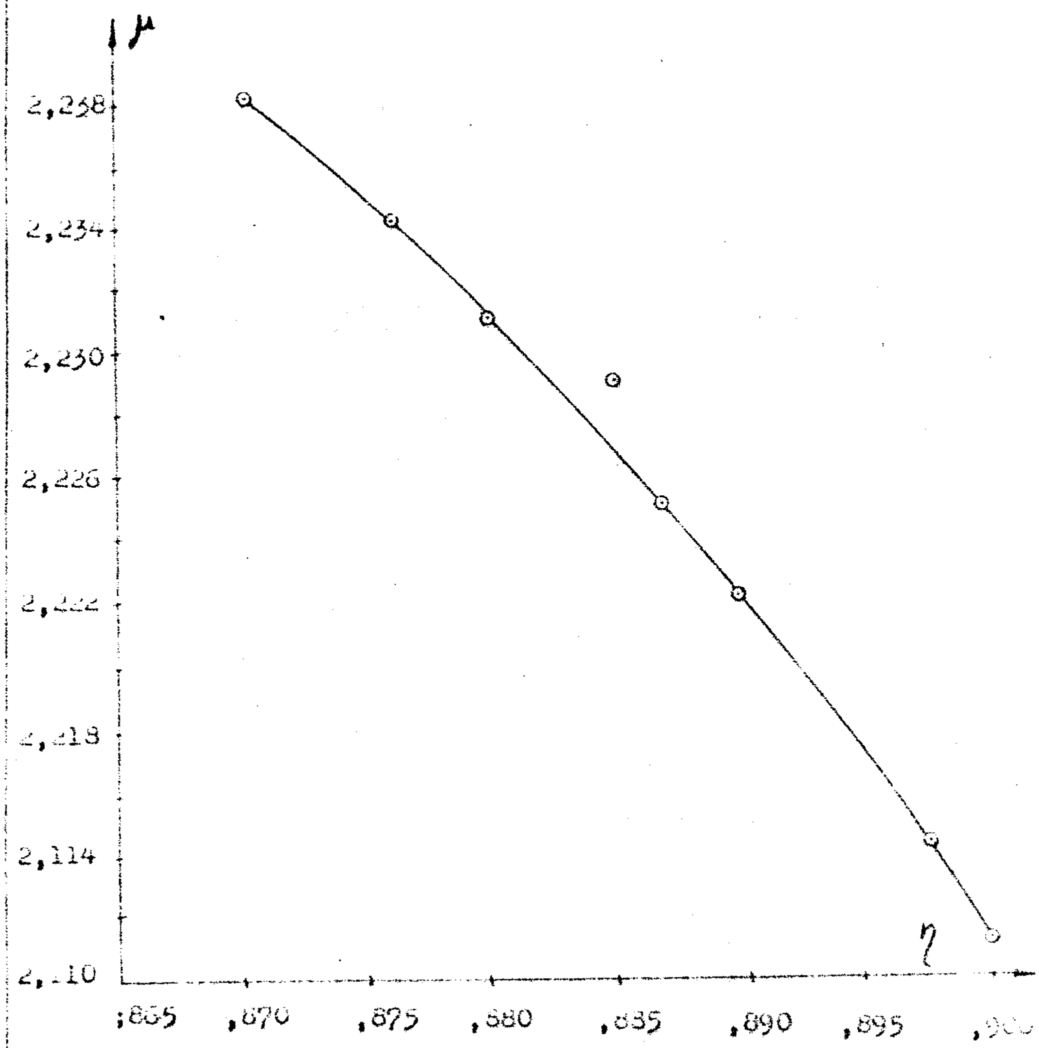


Fig. 12 . Relation between slip coefficient and efficiency of the system

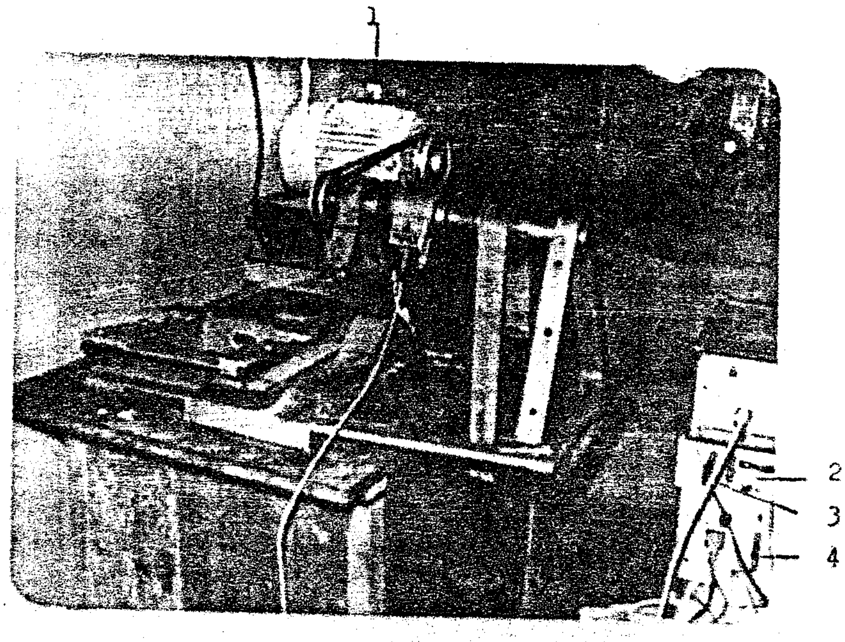


Fig.13.a. Equipments and measuring devices used for vibration measurements at electro-drive body.

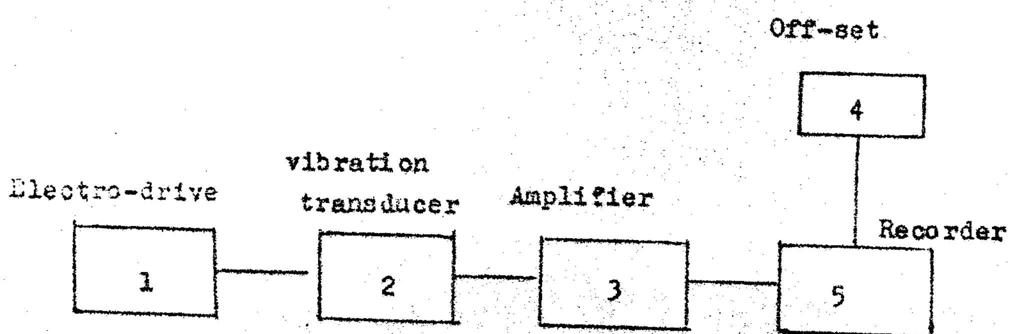
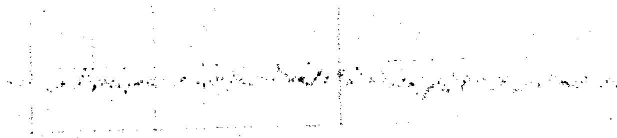


Fig.13.b. Block diagram for measuring the vibration

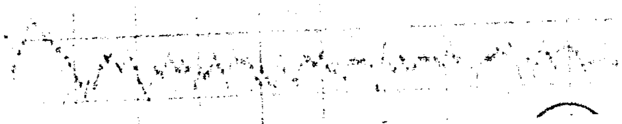
at noload

Fig.14 a



at 1Kg.

Fig.14 b



at 2 Kg.

Fig.14 c

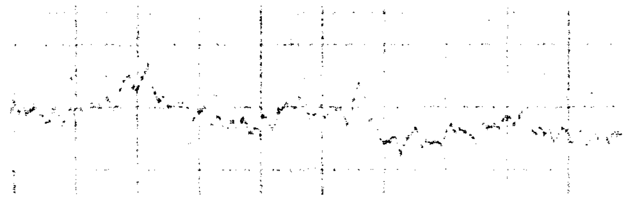
at 3Kg.

Fig.14 d

at 4Kg.

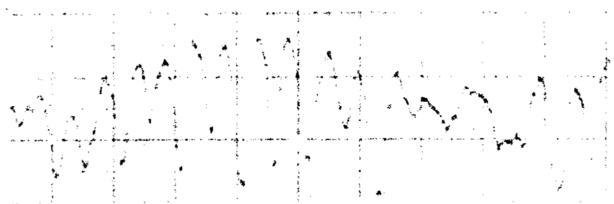
Fig.14 e

Fig.14. Vibration Characteristic Of Experimental Station at Variable Loads Before modification.



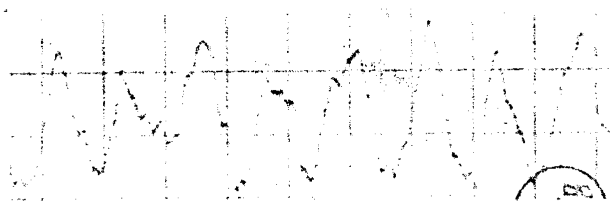
at noload

Fig. 15 a



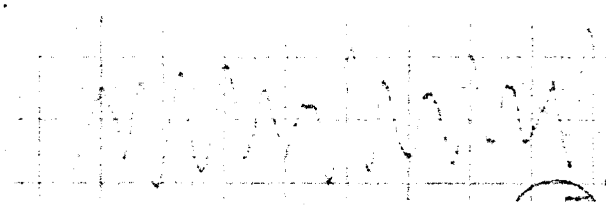
at 1Kg.

Fig. 15 b



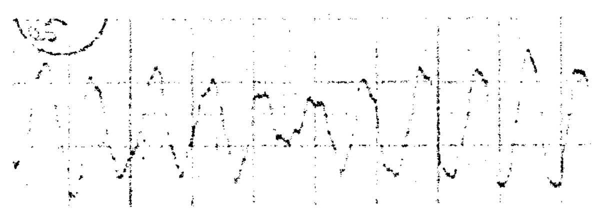
at 2Kg.

Fig. 15 c



at 3Kg.

Fig. 15 d.



at 4Kg.

Fig. 15 e

Fig. 15. Vibration Characteristic Of Experimental Station at Variable Loads After modification.

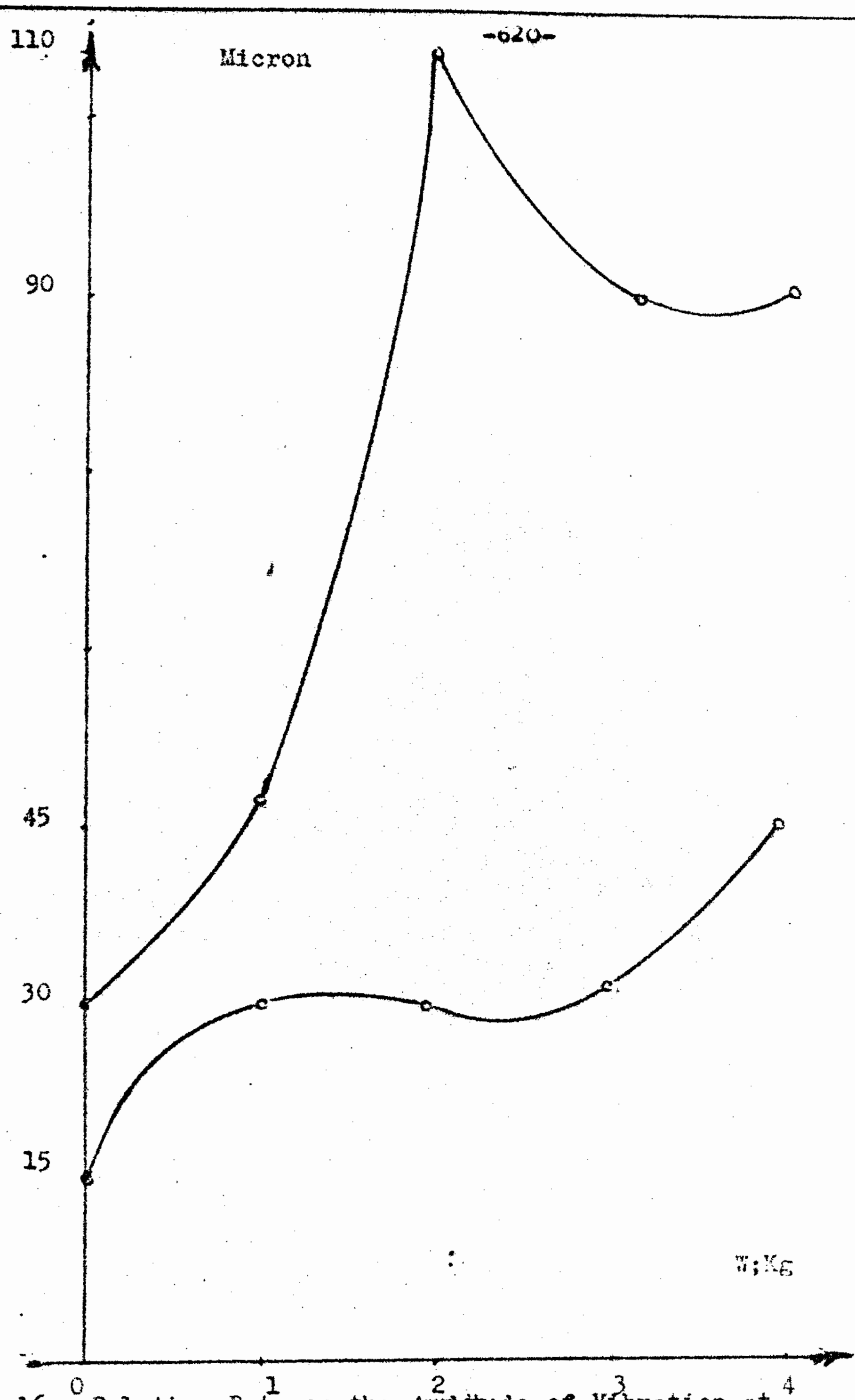


Fig.16. Relation Between the Amplitude of Vibration at Variable Loads Before and After Modification.

امكانية تحسين نقل القدرة فى الوصلات الميكانيكية

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ملخص البحث

نظرا للتأثير المباشر لطريقة نقل القدرة فى الوصلات الميكانيكية على كيفية الاداء و الاهتزازات الناتجة منها فقد تم وضع تركيبتين مختلفتين لطريقة نقل الحركة الأولى عندما تثبت الطارة المنقادة على قاعدة مفصلية وتتزن تحت تاثير شد السير والثانية مفصلية من طرف وبينما الاخر محكم الوضع بواسطة يساعد لدراسة تاثير نوع الوصلة على كفاءة نقل الحركة والاهتزازات العرضية الناتجة فى كل حالة ٠ وقد تم فى هذا البحث دراسة النوعين وقد أوضحت النتائج الاهتزازات العرضية على الموتور الكهربى فى الحالة الاولى أقل منها فى السعة فى الحالة الثانية وهذا يعطى مؤشرا على أن مثل هذه الطريقة يساعد على اطالة عمر السير المستخدم فى نقل القدرة كذلك فان مثل هذه الطريقة تجعل السير فى حالة شد ذاتى وذلك يضمن حماية مجموعة نقل الحركة من الاحمال الزائدة التى قد تحدث أثناء التشغيل ٠