

Nov. 21, 1939.

W. SCHEPPMANN

2,180,853

SHAFT ARRANGEMENT

Filed Oct. 10, 1936

2 Sheets-Sheet 1

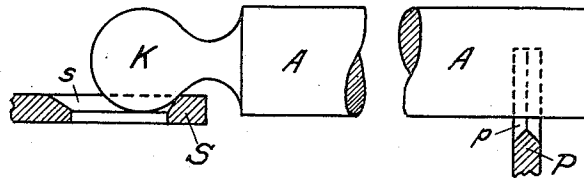


Fig. 1

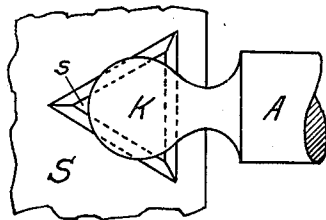


Fig. 2

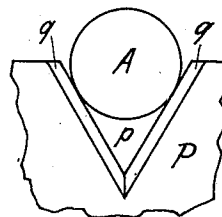


Fig. 3

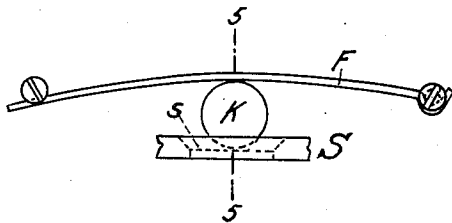


Fig. 4

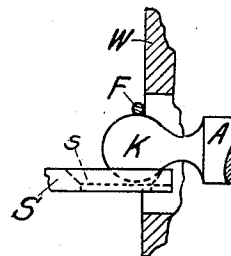


Fig. 5

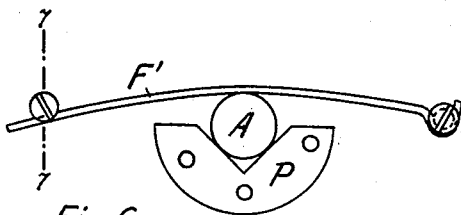


Fig. 6

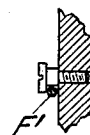


Fig. 7

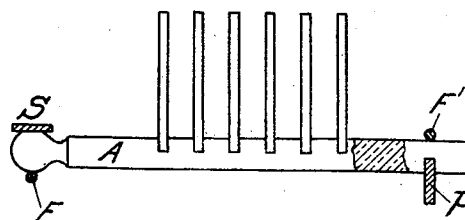


Fig. 8

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2 Sheets-Sheet 2

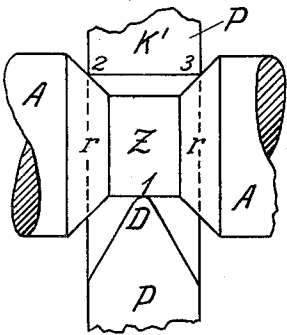


Fig. 12

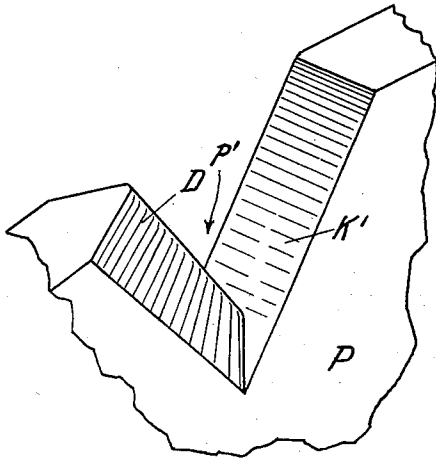


Fig. 13

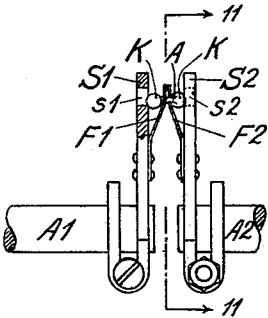


Fig. 9

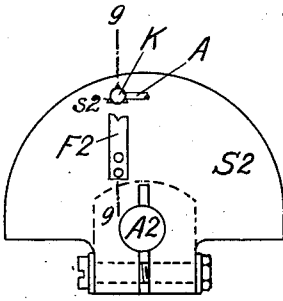


Fig. 11

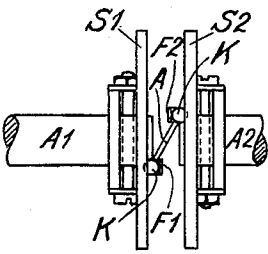


Fig. 10

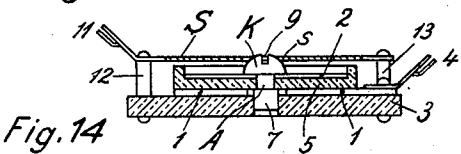


Fig. 14

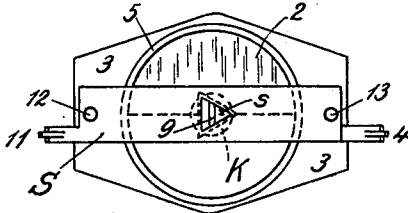


Fig. 15

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UNITED STATES PATENT OFFICE

2,180,853

SHAFT ARRANGEMENT

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Application October 10, 1936, Serial No. 104,977
In Germany October 11, 1935

10 Claims. (Cl. 308—2)

When mounting a shaft care should be taken that the shaft is unconstrained in its motion without having undue room for play in its bearings. The arrangement shall also be independent of stresses due to temperature or to the mode of mounting, or caused by impacts or similar influences. Furthermore, arrangements of this kind should be such that the manufacture thereof do not require too much accuracy in the construction of the parts, especially if production in mass is concerned, as is the case for instance with rotatable plate condensers.

With these objects in view the principal features of arrangements as provided by the invention are that one end of the shaft has a globular head and is mounted in a triangular aperture, and further that the other end, being cylindrical as usual, is mounted in a V-shaped aperture.

The invention will be understood from the following description and be particularly pointed out in the appended claims, reference being had to the accompanying drawings in which:

Fig. 1 is a partially sectioned elevation of one embodiment of the invention.

Fig. 2 is a plan view of that part of the arrangement shown on the left in Fig. 1.

Fig. 3 is an end view of the right hand part of Fig. 1.

Fig. 4 is an end view representing a means for improving or completing arrangements of the kind illustrated in Figs. 1 to 3.

Fig. 5 shows a section on line 5—5 of Fig. 4.

Figs. 6 and 7 are views similar to Figs. 4 and 5, but showing the other end of the device.

Fig. 7 representing a section on line 7—7 of Fig. 6.

Fig. 8 is an elevation of the movable part of a rotatable plate condenser whose shaft is mounted by the means afforded by the invention.

Fig. 9 is a view partially sectioned on line 9—9 of Fig. 11 and showing the invention as applied to a clutch device.

Fig. 10 is a top view to Fig. 9.

Fig. 11 represents a section on line 11—11 of Fig. 9.

Fig. 12 is a plan view illustrating a modification of the arrangement disclosed in Figs. 1 to 3.

Fig. 13 is a perspective representation of the bearing shown in Fig. 12.

Fig. 14 shows a section through an adjustable condenser whose rotary member is mounted with the aid of means provided by the invention.

Fig. 15 shows a top view of this condenser.

Reverting to Figs. 1 to 3, the shaft A is formed

in a turner's lathe or in any other suitable manner with a globular end or head K which is seated in a triangular aperture s of a bearing S.

The edges of the aperture s ensure that the shaft is correctly mounted on the bearing S without requiring the ball portion K to be of mathematical accuracy, whereby the manufacture is much facilitated. The other shaft end is cylindrical and is mounted in a V-shaped recess p of a bearing P. Recess p forms two crests q so that the shaft is supported here in two points. At the cylindrical end therefore the shaft is able to yield under the action of the before mentioned stresses.

If the force of gravity is not sufficient to secure the shaft A in its position on the bearings S, P, springs F, F' may be arranged as shown in Figs. 4 to 7. These springs may be wire-shaped. Spring F is arranged to act on the ball portion K while F' is to act upon the cylindrical end of the shaft. Spring F' is resting on ball portion K somewhat behind the vertical centre plane of the ball and bears against a wall or the like W so as to be confined on the ball portion K.

The axles of rotatable plate condensers, such as used in high frequency apparatus, are preferably of a ceramic material and thus liable to fracture under the action of impacts which may arise for instance during the transportation thereof. In such case the bearings S, P and springs F, F' are preferably arranged on opposite sides of the shaft A, as shown in Fig. 8, bearing S being disposed above the ball portion K while bearing P is arranged below the cylindrical end of the shaft. In this way the shaft is able to yield under the action of impacts so as not to be broken. Experiments have shown this to be true even if the apparatus was caused to fall down.

In the device represented in Figs. 9 to 11 a rod A whose ends K are globular is arranged to clutch two shafts A1, A2 to each other. This is well known per se in condensers of this type. The shafts A1, A2 are each fitted with a disc S1 or S2, respectively, as is likewise well known in itself. In accordance with the invention, however, the ball portions K are seated in triangular apertures s1, s2 of the discs S1, S2, whereas in the known arrangements these apertures are circular and thus entail an incorrect transmission of the driving force, in consequence of the fact that balls produced in a lathe are in general untrue. This drawback is overcome by the apertures s1, s2, being triangular, because in this way any slackness in the mutual engagement of the parts

K, S1, S2 is obviated. Springs F1, F2 serve to hold the ball portion K and thus also rod A in place.

In the arrangement according to Figs. 12 and 13 the shaft A has an angular groove Z with conical edge portions r and is seated by means of this groove in a V-shaped recess p' of a bearing P. Recess p' is formed by a crest D and a flat surface K', as is best seen in Fig. 13. Shaft A is thus supported in three points 1, 2, 3.

The device represented in Figs. 14 and 15 is a so called balancing condenser which owing to the means afforded by the invention is less subject to shocks than are the customary constructions. Also here the rotary member is supported by means of an axle which has a globular head seated in a triangular aperture. The rotary, cup-shaped member 5 is of ceramic material and contains a condenser coating 2. The lower coating 1 is fitted to an insulating plate 3 which by preference is likewise of a ceramic material of small losses. In such case the coating 1 may be burnt onto plate 3 in a well known manner. The two coatings in the example represented are semicircular. Member 5 and coating 1 are preferably ground onto each other. The axle A carrying the rotary member 5 is cylindrical at its end 7 and has a ball portion K forming the other shaft end. This portion K is provided with a slot 9 for adjusting the condenser by means of a screw driver and is seated in the triangular aperture s provided in a metal strip S fixed to plate 3 by bolts 12, 13. The arrangement is preferably such that the strip S shall bear yieldingly against the ball portion K so as to press the movable member 5 firmly against coating 1. Also here therefore an unconstrained mounting is obtained by the cooperation of a globular axle head and a triangular aperture. Coating 1 is fitted with a soldering tab 4 while strip S has a soldering tab 11.

What is claimed is:

1. A shaft and bearing arrangement comprising a bearing member to receive one end of the shaft to restrain movement of the shaft longitudinally in the direction of its axis while allowing it to rotate freely around said axis, said bearing member and said shaft end being arranged to provide a three-point support for the shaft, the opposite end of said shaft being cylindrical and provided with a V-shaped bearing whereby said cylindrical end is supported at only two points around its periphery.

2. A rotatable shaft having a globular-shaped bearing surface at one portion and a cylindrical-shaped bearing surface at another portion, the

first portion having a three-point support and the second portion having a two-point support.

3. An arrangement according to claim 1 in which the three-point bearing consists of a triangular aperture in the bearing member and a spring is provided engaging the first-mentioned end of the shaft to maintain it in point engagement with the edges of said aperture.

4. An arrangement according to claim 1 in which the said cylindrical end of the shaft is provided with a spring-pressed stop to maintain it in a two-point engagement with said V-shaped recess.

5. An arrangement according to claim 1 in which the first-mentioned shaft end is globular and is provided with a spring for pressing it against the associated bearing member, said spring being located between the globular end and a rigid stop and in off-center relation with respect to said globular end whereby said spring is locked in position.

6. An arrangement according to claim 1 in which said shaft is of ceramic material and the first-mentioned shaft end is spherical in shape and the associated bearing member is provided with a triangular bearing aperture with bevelled edges.

7. An arrangement according to claim 1 in which said bearing members engage opposite sides of the shaft.

8. An arrangement according to claim 1 in which said V-shaped bearing is provided with a crest where it engages the cylindrical shaft end.

9. A shaft having a composite cylindrical and conical bearing portion to provide a three-point support for one portion of the shaft, and a cylindrical bearing portion at another portion of the shaft.

10. A shaft and bearing arrangement comprising a shaft having a first bearing region of substantially cylindrical form and a second bearing region of substantially the form of two cone frustums and an intermediate cylinder, a first bearing member having a V-shaped aperture disposed to contact at two points with said first bearing region of said shaft, and a second bearing member having a V-shaped aperture whose bounding surfaces are respectively substantially planar and substantially knife-edged disposed with said planar surface contacting said cone frustums and said knife-edged surface contacting said intermediate cylinder whereby said shaft is supported by said members at five points of contact.

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