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R. MATTEUCCI
YIELDABLE COUPLINGS
Filed March 17, 1941

Serial No.
383,882
2 Sheets-Sheet 1

Fig. 1

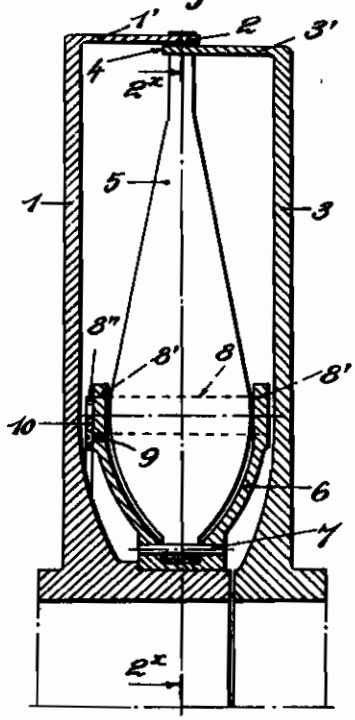

Fig. 2

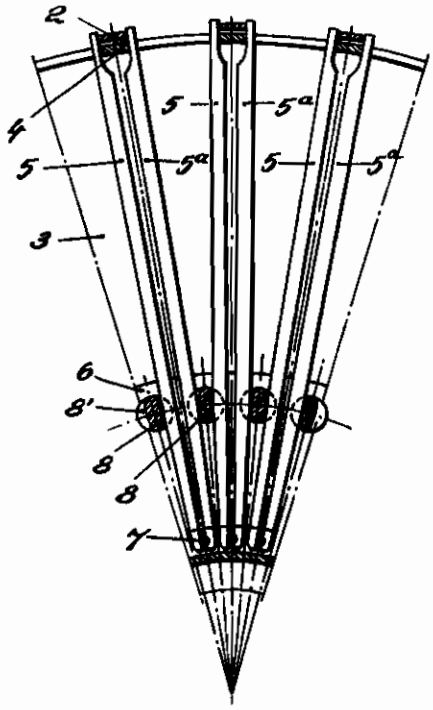

Fig. 3

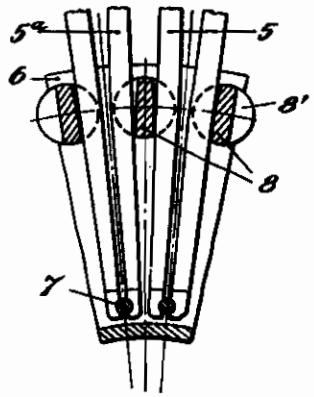

Fig. 4

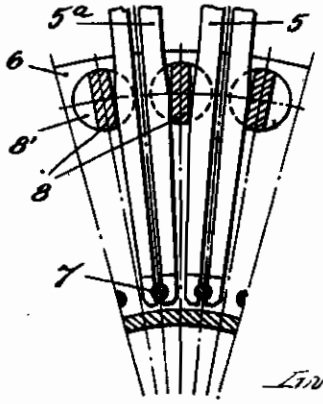

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Fig.5

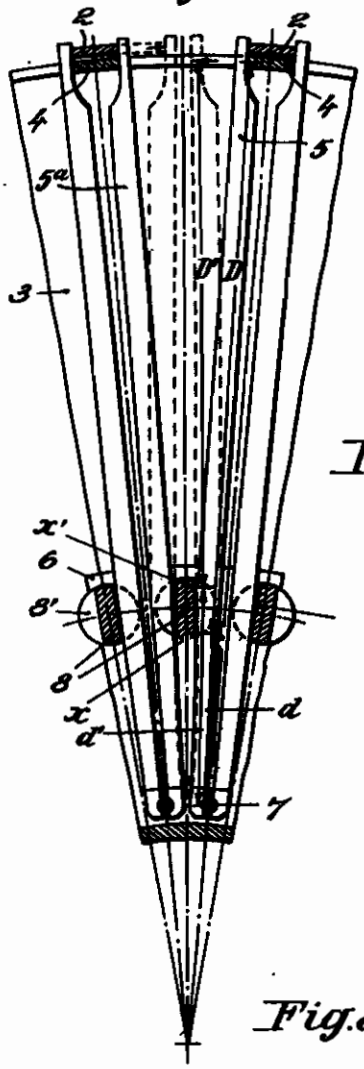


Fig.6

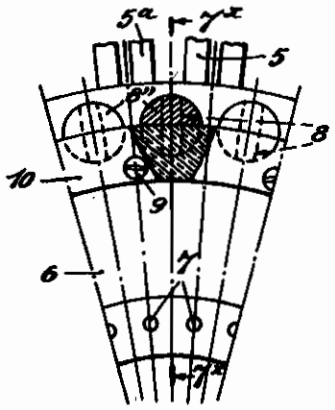


Fig.7

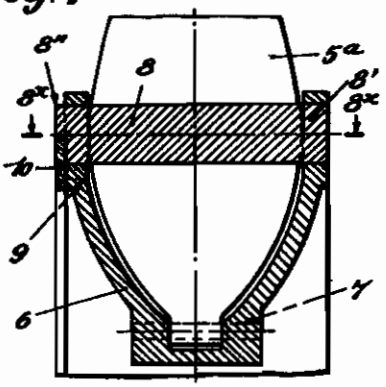
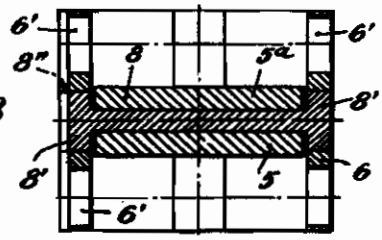


Fig.8



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ALIEN PROPERTY CUSTODIAN

SPRING COUPLINGS COMPRISING A PLURALITY OF COUPLES OF STAR-LIKE DISPOSED ELASTIC FOLIATED ELEMENTS

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Application filed March 17, 1941

The present invention relates to improvements in elastic couplings for shafts substantially in alignment in which the entrainment occurs by means of couples of elastic foliated elements radiating from a central sleeve coaxial with the driving and driven members and angularly independent therefrom, to which sleeve these elements are tied by their inside end, while by means of their outside end the elements of each couple respectively engage the one the driving member and the other the driven member. In these couplings the elastic elements of each couple while leaning on a common fulcrum-bar interposed placed on an intermediary point of their length and subjected the one to the action strain developed by the driving member and the other to the reaction strain developed by the driven member, are stressed to deflection on said fulcrum in conditions of a free elastic deformation on their whole length and elastically transmit the strain between said members. Furthermore in these known couplings the length of the two sections in which the total length of the single elastic elements is divided by the fulcrum remains constant during functioning.

Now the improvements according to the present invention mainly relate to a particular conformation of the conjugated surfaces of contact of the elastic elements of each couple and of the bar interposed, owing to which conformation the fulcrum constituted by the line of contact of the elements with the bar is remarkably displaced in the radial direction with the changing of the deflection of the elastic elements. Owing to such a disposition the length of the two sections in which the total length of the elastic element is divided by the fulcrum, is continually changing with the fluctuation of the moment transmitted by the coupling and consequently the flexibility of the elastic element and therefor of the whole coupling is continually changing. Furthermore also the fundamental oscillatory frequency possessed by the elastic complex is continually changing, thus a coupling being realised, elastic and anti harmonic as further down better mentioned.

Said improvements relate furthermore to a particular conformation of the fulcrum-bars and to their adjustment on the central sleeve in order that they may perform well the function of settling the substantially radial position of the couples of the elastic elements on said sleeve.

A form of realisation of an elastic coupling thus improved is shown by way of example in the accompanying drawing, in which:

Fig. 1 shows the coupling in an axial section and

Fig. 2 in cross section according to the line 2*x*—2*x* of Fig. 1;

Figures 3–4 show in cross section some changes in the conformation of the conjugated surfaces of contact between the elastic element and the fulcrum;

Fig. 5 is a cross section of the coupling illustrating its functioning;

Fig. 6 shows in side elevation, partially sectioned, a portion of the central sleeve with some elastic elements;

Fig. 7 is a cross section according to the line 7*x*—7*x* of Fig. 6 and

Fig. 8 is the horizontal section according to the line 8*x*—8*x* of Fig. 7.

With reference to Figures 1 and 2 of the drawing, 1 and 3 are the coaxial discs of the coupling, the one of them, whatever it may be, being the driving the other the driven member. Reference numbers 2 and 4 are teeth axially directed provided on the perimetrical band 1' and 3' of the discs to be engaged with the ends of the external portions of two elastic foliated elements 5, 5ª of two adjacent couples of elements. The elastic elements 5, 5ª are projected star-like from the central sleeve 6, independent from the driving and driven members, within which they are arranged with their internal portion and to which they are tied against the action of the centrifugal force by means of pins 7. These foliated elements preferably shaped as elements of uniform resistance to deflection have, for instance, a constant thickness in their portion outside the central sleeve 6 and linearly decreasing thickness in their internal portion, that is, while the one of their faces is flat the other comprises two surfaces, the one parallel to the first face and the other lightly inclined with respect to the same.

The elastic elements 5, 5ª of each couple with their face lightly inclined of their internal portion (Fig. 2) or with their flat opposed face (Fig. 3) are supported on opposite sides by a bar interposed 8 destined to function as a fulcrum having radially a sensible extension and a thickness limited. The bars 8 parallelly disposed to the axis of the coupling are situated within the central sleeve 6 at a distance from said axis conveniently chosen. Each bar ends at its both extremities with the cylindric flanges 8' by means of which each bar is inserted within as many holes 6' provided in the two sides of the central sleeve. Owing to this disposition when the ele-

ments 5, 5ª are adjusted in their place, the bars 8 cannot be drawn out from said engaging seats on the central sleeve as it clearly appears in Fig. 8. Furthermore said bars 8 are preferably blocked against the rotation by means of any expedient whatever. A practically very simple means consists in providing one of the flanges 8' with a semi-cylindric projection 8'' protruding from one of the sides of the central sleeve, against which there is fixed, by means of screws 9 a ring 10 on whose perimetric margin engage the projections 8'' of all the bars 8, these bars remaining thus blocked against rotation (Figs. 1–6–7). In Fig. 5 the flat faces of the elastic elements 5—5ª bear on the convex surface of the fulcrum-bar 8 the profile of which in right section is an arc of circle indicated in the Figure by an arrow or it is another convenient curve. When, as shown in full lines, the coupling does not transmit any load, the fulcrum is formed in x; but when there is a strain deforming the elastic elements as shown in dotted lines, the fulcrum is displaced in x', so that the length of the two sections d, d' respectively D—D' into which the fulcrum divides the length of the elastic element, results modified. It is then evident that the coefficient of flexibility of this coupling varies with the change of the load and consequently also the frequency of the oscillations properly of the elastic elements and consequently that of the whole coupling varies accordingly, while in the known couplings in which the fulcrum of each couple has a fixed radial distance the frequency of said oscillations is invariable. It is known that if the elastic coupling is placed on a point of the axis line where one of the occurring torsional vibrations presents a node, such a torsional vibration produces here an oscillatory fluctuation of the moment of torsion so that if the elastic coupling is of the known type, that is with fulcrums at a fixed radial distance and its invariable oscillatory frequency coincides with that of the oscillatory impulsions due to the torsional vibration a critical state is produced owing to resonance.

According to the new coupling with fulcrums at a fluctuating radial distance, the oscillatory frequency of the coupling changes automatically with the variation of the load and consequently such a resonance is efficiently precluded.

The fluctuating displacement of the fulcrum can be also obtained by making flat the surface of the fulcrum-bar 8 and curved the cooperating one of the elastic element as shown in the modification of Fig. 4 or also by providing these both surfaces with convenient curvatures.

It is clear after all, that the present invention is not limited to the exact dispositions specified and illustrated, but without departing from its principle it may be subjected to all the changes required by circumstances or to the exigencies which according to practice appear to be necessary or advantageous.

RAFFAELE MATTEUCCI.