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2,677,946

COUPLING

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Fig. 1.

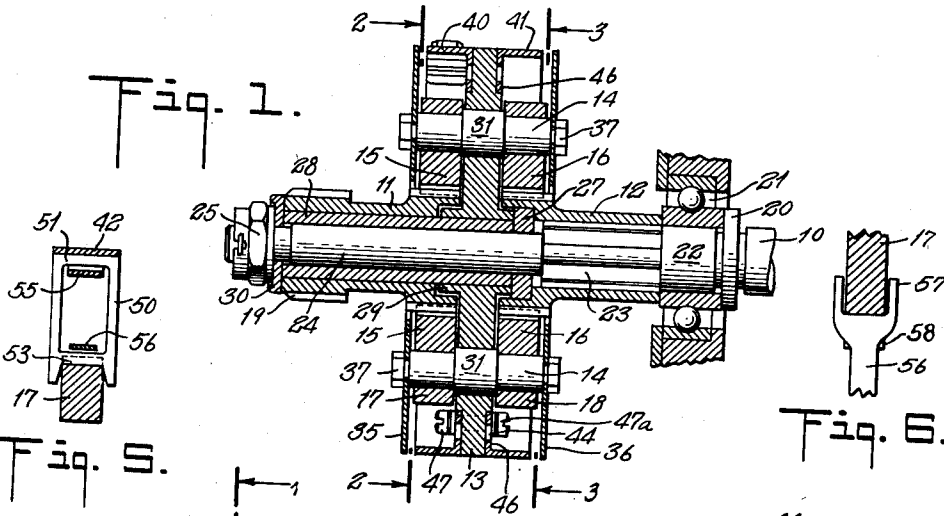


Fig. 5.

Fig. 6.

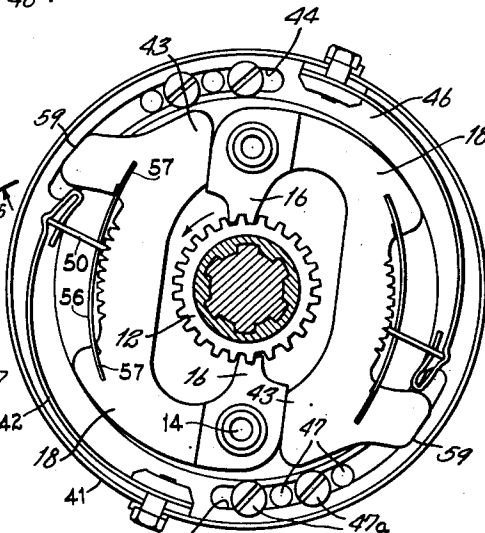
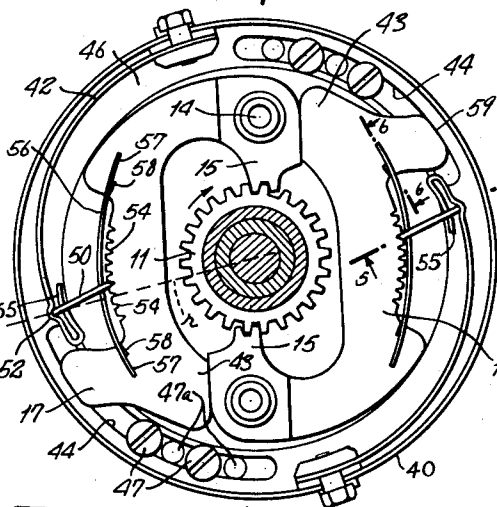


Fig. 2.

Fig. 3.

Fig. 4a.

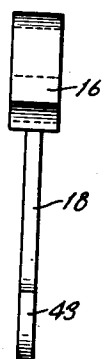
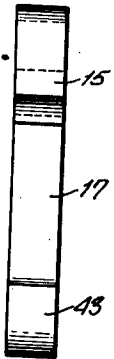
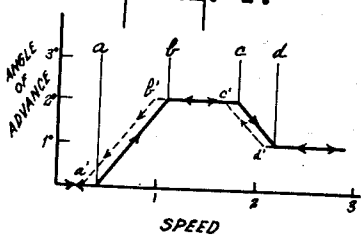


Fig. 4b.

Fig. 7.



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COUPLING

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This invention relates to couplings and more particularly to apparatus for drivably connecting rotatable parts while permitting and automatically controlling limited relative angular movement of said parts.

Among the many uses of this invention is its particular application to the timing of sparks produced by the ignition system of a combustion engine or the like, and the invention will be particularly described in connection with a mechanism suited to that use. It is to be understood however, that this particular description is for the purpose of illustration only and does not constitute a limitation upon the natural scope of the invention.

One of the objects of the present invention is to provide novel coupling means for connecting rotating parts, which means are adapted to effect relative angular movement of said parts in response to or in accordance with variations in the speed of rotation of said parts.

Another object of the invention is to provide a novelly constructed coupling device which is adapted, by way of example, to automatically advance or retard the sparks of an internal combustion engine when a particular speed of rotation is reached and to automatically further advance or retard the spark when a different increased speed of rotation is reached.

Still another object is to provide a coupling of the type which is actuated by centrifugal force to effect relative angular movement of driving and driven parts, said coupling being novelly constructed so as to reduce friction and the effects thereof to a minimum.

A further object of the invention is to couple driving and driven members by a novel coupling that automatically changes the angular relationship of said members at particular speeds of rotation or during particular ranges of increasing or decreasing speeds.

Still another object is to provide a speed sensitive coupling between rotating parts, the sensitivity of which can be varied in a novel manner to make it operate in accordance with predetermined requirements at different speeds.

Another object is to provide novel means to control the movement of a centrifugal weight, and a further object is to obtain such control by novel means for changing the leverage or mode of operation of a controlling device with respect to the weight.

A still further object is to provide means for simultaneously and equally adjusting the control means for a plurality of centrifugal weights

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in novel combination with novel means for adjusting the control means for each weight to vary the operation thereof in response to variations in speed.

The above and further objects and novel features of the invention will more fully appear from the following detail description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

Fig. 1 is a vertical section of one form of device exemplifying the invention, the section being taken substantially on line 1—1 of Fig. 2;

Fig. 2 is a vertical section on the line 2—2 of Fig. 1, looking in the direction of the arrows, the cover plate having been removed to expose the centrifugal flyweights;

Fig. 3 is a vertical section on the line 3—3 of Fig. 1, looking in the direction of the arrows, the cover plate having been removed to expose the flyweights;

Fig. 4a is an end view of a heavy flyweight, and Fig. 4b is an end view of a light flyweight, the weights being arranged to show a size relation that may sometimes be employed;

Fig. 5 is a detail view, partly in section, taken on line 5—5 of Fig. 2;

Fig. 6 is a detail view, partly in section and with parts broken away, taken substantially on line 6—6 of Fig. 2; and,

Fig. 7 is a diagram graphically illustrating one typical mode of operation of a device of the type shown in Fig. 1.

In some environments internal combustion engines are desirably operated at certain speeds with an advanced spark and at other speeds with a retarded spark. In the case of automobile engines, the advance and retardation of the spark were originally accomplished by manual means, but more recently by automatic means. In aircraft engines, it is also desirable during different phases of operation, such as in starting, taking off, idling, cruising, full power, etc., to operate with an advanced or a retarded spark, as the circumstances demand.

The invention provides the ignition systems of such engines with novel speed sensitive mechanism that automatically advances or retards the spark when selected engine speeds have been reached and contemplates for this purpose novel

means for altering the angular relation of driving and driven rotating members. The invention also provides control of the rate at which this angular adjustment takes place between predetermined speeds. In the drawings, a rotatable member, such as the shaft of a magneto, timer, distributor or the like of an ignition system, is indicated by the numeral 10. Upon this shaft is a driving gear 11, a driven gear 12 and a rotary support 13 between them. Double ended bearing pins 14 are mounted in the support and carry gear segments 15 that are in mesh with the gear 11 and gear segments 16 that are in mesh with the gear 12. The gear segments 15 extend beyond the points of pivotal attachment to the pins 14 and form centrifugal flyweights 17 (Fig. 4a) that are of a relatively heavy construction. Gear segments 16 extend beyond the pins on which they are pivoted as centrifugal weights 18, which in the mechanism illustrated, are of relatively light construction, as illustrated in Fig. 4b. Annular cover plates 35 and 36 are mounted on hollow pins 14 by means of bolts 37 threaded into said pins and serving to retain the flyweights on the pins.

The engine drive (not shown) meshes with the splines or gear teeth 19 of gear member 11 and rotates the latter clockwise rotation as viewed in Fig. 2 being assumed for purposes of this description. The rotative effort of the gear member 11 against the gear segments 15 urges flyweights 17 centripetally and forms in effect a positive driving connection that rotates the pins 14, support 13, gear segments 16, gear member 12, and the shaft 10 as a unit, the latter and gear member 10 being drivably connected by splines 23. However, when the speed of rotation has increased sufficiently the flyweights 17 move centrifugally under the impulse of centrifugal force, the gear segments 15 walk about the gear 11, angularly advancing the support 13 and all the mechanical connections that follow it, and imparting an angular advance in the direction of rotation to the driven gear 12 and to the circuit breaker cam or other mechanical device operated thereby. It may be here pointed out that the invention may be incorporated in a device embodying a single flyweight or a single set of flyweights, such as flyweights 17, in which case the support 13 may be considered as the driven member.

After flyweights 17 have functioned as described above to vary the angular relationship of the driving and driven parts, upon a further increase in the speed of rotation the flyweights 18 are actuated by centrifugal force to apply through gear segments 16 and gear member 12 a retrograde relative angular motion whereby a reverse adjustment of gear 12 and shaft 10 with respect to gear 11 will take place and the spark will be retarded. It will be understood that this relative angular adjustment can be availed of in either direction with this coupling, depending upon which is the driving and which is the driven gear or upon the direction of rotation.

Referring now to the novel construction of the embodiment of the invention that is illustrated in the drawings, 10 indicates, generally, a shaft of an instrument, such as a magneto or ignition timer, having an abutment 20 formed on the shaft as a thrust collar or bearing for the inner race of a roller bearing 21 that carries the bearing area 22 of the shaft 10. To the left of said abutment and the bearing area as viewed in Fig. 1, the shaft 10 is provided with splined portion

23 and a reduced smooth portion 24 that is screw threaded at its end for the reception of a nut 25.

The gear member 12 is mounted on shaft 10 by interfitting internal splines that mesh with the splines 23 and is provided with external gear teeth adapted to mesh with gear segments 16. A washer or spacer 27 fits over the reduced portion 24 of shaft 10 and is brought up against a shoulder formed inside gear member 12. A bearing and spacing sleeve 28 is placed over the end 24 of the shaft and brought up against the washer 27. The hub 29 of the annular support 13 is freely mounted upon the inner end of the sleeve 28 so that a portion of the hub fits within the gear 12 and bears against washer 27. The gear 11 is freely mounted on the sleeve 28 with an inner annular flange circumscribing the hub 29. The parts of the mechanism above described are held in assembled relation by means of a thrust washer 30, a lock washer and the nut 25.

The central portions 31 of pins 14 are larger than the bearing portions at the ends thereof and are preferably mounted fixedly on a single diameter of the support 13 in order that the parts of the apparatus may be in dynamic balance. The enlarged central portions 31 of pins 14 project slightly beyond the faces of the support and constitute abutments that, together with the sleeve 28, provide clearance for the parts of the assembly. The gear segments 15, 16 and the flyweights are spaced from support 13 by the projecting parts of the enlarged portions 31 of the pins. Because of their interfitting splines the gear 12 must rotate with the shaft 10 and because of the connection of the gears 11 and 12 with the support 13 through the medium of gear segments 15 and 16 and pins 14, the parts of the mechanism will rotate as a unit despite the revoluble mounting of gear 11 and support 13 on sleeve 28.

The invention contemplates novel means for controlling the movements of the centrifugal flyweights whereby the coupling may be readily and easily adjusted to function at different speeds and during selected speed ranges to effect desired relative angular movements of the driving and driven members of the coupling. Said means are such as to permit adjustment of the coupling to vary the speed or speeds at which such relative movements are initiated as well as to vary the rate at which such relative angular movements occur, said rate being shown by the slope of the curve representing the angular relationship of the rotatable parts plotted against speed of rotation (Fig. 7). The novel control means provided is such that the effects of friction are reduced to a minimum so that the above-mentioned curve of operation for increasing speeds will be retraced as nearly as possible when the speed of rotation decreases. In the form shown, the control means for each flyweight is of the same construction so that a description of one will suffice.

Mounted at the circumference of and piloted for angular adjustment on the support 13 are abutment rings 40 and 41 on which leaf springs 42 are riveted, bolted or otherwise suitably fixedly or adjustably secured. Operatively interposed between the free end of spring 42 and a centrifugal weight 17 or 18 is a link 50, which as shown is in the form of a rectangular-like frame (Fig. 5). The outer or upper cross bar 51 of said link makes a fulcrum or pivotal engagement with a notch or recess 52 in the spring

75 and the inner or lower cross bar 53 engages a

selected one of a plurality of notches 54 in the outer edge of weight 17, thereby effecting a fulcrum or pivotal engagement therewith. From the point of view of eliminating friction, it is desirable that link 50 make knife-edge, line or point contact with spring 42 and weight 17, but in practice this advantage must be compromised with the disadvantage of the more rapid wearing to which a point or knife-edge on the link is subjected. Rounded engaging edges on the link have been found very satisfactory from the points of view of substantial elimination of friction and satisfactory wearing qualities. To prevent displacement of link 50 during operation spring 42 may be extended and reversely bent to provide a retaining tongue 55 which extends through the center of the link out of contact therewith but sufficiently close to bar 51 to prevent accidental disengagement of the link from the spring recess 52. A leaf spring retainer 56 passes through link 50 in proximity to cross bar 53, but out of normal contact therewith and has bifurcated ends 57 which engage notches 58 in oppositely facing shoulders on weight 17. The retaining strip 56 prevents link 50 from being accidentally disengaged from a selected notch 54 but yieldably permits an operator to move the link from one notch to another for effecting an adjustment, the purpose and effect of which will appear hereinafter.

The spring 42 thus exerts a continuing pressure through link 50 against the flyweights so as to load them centripetally and yieldably hold them in limiting, innermost position with the abutments 43 of each pair of flyweights making contact with flat areas on the gear segments 15 and 16. The outer surfaces of the flyweights have portions 59 that are preferably concentric with and engage the abutment rings when the weights are in centrifugally energized or outermost position to limit the outward movement thereof.

Another form of adjustability is obtained in this preferred structure by a change in leverage secured by moving the abutment ring 40, for example, with respect to the flyweight 17 so that the spring 42 interposed between the ring and the weight is shifted bodily relative to the weight. The leverage of the spring or weight will be equal in each position to the distance between the point at which the link 50 engages the flyweight surface and the center of the supporting pin 14 on which the weight is pivoted. Each ring 40, 41 is made adjustable by a pair of arcuate mounting slots 44 in the mounting flange 46 thereof, said rings being piloted for angular adjustment by annular shoulders on the support 13. The adjustability of each ring is determined by the length of its mounting slots. Mounting bolts 47, 47a pass through the slots into threaded openings in support 13 and may be screwed down against lock washers and the mounting flange 46 to frictionally hold the ring in adjusted position. A similar and separate mounting is provided for each ring. It will be understood therefore, that the speeds at which the angular variation of the driving and driven members takes place is governed in part by the weight of the flyweights and in part by the leverage and strength of the springs and the spring rates thereof. By means of the two modes of adjustment mentioned above, i. e. adjustment of links 50 and bodily adjustment of springs 42, the very widest selection of modes of operation can be secured.

As a practical matter, devices embodying the present invention are usually designed for particular uses, such as for use on a given type of engine, for accomplishing a certain predetermined mode of operation. In such instances the parts are designed and assembled to provide as nearly as possible the desired mode of operation when the center of gravity of the flyweight and the points of engagement of link 50 with the flyweight and control spring are on or near the same radial line passing through the axis of rotation to thereby substantially balance the weight on pivot 50, 54 and thus minimize friction at pivot 14. This ideal is, of course, substantially impossible from a mechanical point of view because of manufacturing tolerances and because of the substantial impossibility of manufacturing large quantities of identical springs having the same spring rates, i. e., springs which stiffen or increase in tension an equal amount for equal increments of flexion. Likewise, it is difficult to maintain this ideal or even ideal adjustment during long periods of operation because of the effects of wear and the like. Accordingly, the adjustments provided by the present invention may be utilized primarily to correct for manufacturing tolerances, theoretical inaccuracies and errors introduced by usage of the device. However, substantial adjustments can be effected for attaining a wide range and variety of modes of operation, thereby rendering any particular device adaptable for a wide variety of applications.

Assuming now that power is being applied to or by the driving member 11, a simultaneous and equal rotation of all parts will occur at speeds below a predetermined speed at which outward movement of the heavy flyweights 17 is initiated by centrifugal force. This movement of the weights is yieldably resisted by the force exerted by springs 42 and by inevitable friction so that the centrifugal force must attain a value slightly greater than the sum of these forces before the weight begins to move. By way of example, let us say that this centrifugal force is attained at speed a (Fig. 7) which may be almost any selected speed determined by the design of the weights and springs in a manner well understood in the art. As pointed out above, the friction present in the connection between the spring 42 and weight 17 is reduced to a minimum by the fulcrum contacts thereof with link 50 and friction at pivots 14 is minimized by locating the center of gravity of the weight on or near the radial line connecting the axis of rotation and the point of contact of link 50 with weight 17. Thus, when the weight is thrown by centrifugal force, it will be in theoretical balance with respect to link 50 against which the pressure thereof is applied so that the pressure of the weight against pivot 14 and hence friction at that point will be materially reduced.

As the speed increases from a to b (Fig. 7) the driven member or shaft 10 is angularly advanced relative to driving member 11 at a rate and in a manner represented by the inclined portion of the full line curve of Fig. 7. The slope of this curve, i. e., the rate at which the relative angular movement takes place in relation to increases in speed of rotation is determined by the relationship of the spring rate of spring 42 and the rate at which the centrifugal force exerted by the flyweight increases as a result of outward movement thereof, i. e., as a result of the center of gravity of the weight moving away from the axis of rotation. If, for a given movement of

the weight and corresponding flexion of the spring, the increase in centrifugal force exerted by the weight is greater than the increased tension or force of the spring, the weight will move to its outer limit very quickly without any further increase in speed and the curve will approach the vertical. If the reverse is true, i. e., if the spring pressure increases faster than the centrifugal force for corresponding movements of the parts, the curve will approach the horizontal, increased speed being necessary to create sufficient centrifugal force to overcome the increased spring pressure.

In prior known devices utilizing simple leaf springs for controlling the movement of centrifugal weights, the slope of the operational curve has been varied in a haphazard, hit-or-miss manner, such as by bending the spring beyond its elastic limit to effect a permanent deformation thereof. In the present device the same effect is obtained and accurate adjustments are made possible without tampering in any way with the inherent characteristics of the spring. By setting the link 50 at different angles to the axis of the spring, i. e., by engaging it in different notches 54 in the flyweight with a given setting of ring 40, a given outward movement of the weight may be made to cause either a greater or lesser movement of the spring and hence a larger or smaller increase in spring pressure for a given increase in centrifugal force exerted by the weight without increase in speed. When the spring pressure increases at a relatively high rate, the curve between speeds *a* and *b* will be relatively flat or horizontal whereas when it increases at a relatively low rate, i. e., at a rate only slightly greater than the rate at which the centrifugal force increases during a comparable movement of the flyweight, the curve will be relatively steep or vertical.

Referring, for example, to the link 50 shown at the left side of Fig. 2, it will be seen that as weight 17 swings away from the axis of rotation of the coupling, the right hand or inner end of the link engaging the weight will move to the left and upwardly (as viewed in the drawings) in an arcuate path whereas the outer end of the link engaging the spring will move in a path which does not parallel the path of the inner ring. When the link is initially tilted in a direction extending below a radial line *r* (Fig. 2) a given outward pivotal movement of weight 17 will tilt the link closer to line *r* and thereby impart a somewhat greater movement to the end of spring 42 so that the effective force exerted by the spring will increase at a greater rate than the centrifugal force exerted by the weight. If the link is set or is moved to a position such that it is above the radial line *r*, i. e., a radial line connecting the axis of rotation and notch 52, outward movement of weight 17 will cause the link to tilt further away from said radial line and hence a given movement of the weight will impart a somewhat lesser movement to the spring so that the increase in spring pressure will be correspondingly less than the increase in centrifugal force resulting from each increment of outward movement of the weight. It will thus be seen that varying the initial angular setting of link 50 has the same effect as varying the spring rate of the spring. It will be understood that when the spring force increases faster than the increase of centrifugal force resulting from movement of the centrifugal weight, continued outward movement of the weight will be effected

only by increasing the speed to thus gain increased centrifugal force without at the same time increasing the spring pressure.

When speed *b* has been attained weights 17 will have moved into engagement with ring 40 so that further relative movement or advancement of member 12 thereby is prevented as the speed is further increased. When a predetermined higher speed *c* is attained, the weights 18 will start to swing outwardly and effect relative angular movement of the driving and driven parts, opposite in direction to that effected by the outward movement of weights 17, to cause a retardation of the spark. The speed at which retardation of member 12 is initiated is determined primarily by the size of weights 18, the strength of the springs 42 resisting movement thereof, and the adjusted position of the parts. This relative movement is represented by the declining portion of the curve (Fig. 7) between speeds *c* and *d*. As explained above, the slope of this curve may be varied by changing the angle or tilt of links 50 which engage weights 18, and the speed at which this relative movement begins to take place may be varied by varying the length of the leverage arm, i. e., the distance between pivot 14 and the point at which link 50 engages weight 18. When speed *d* has been attained, the weights 18 will have engaged ring 41 so that further increase in speed will not effect further relative angular movement of the driving and driven shafts. It will be understood that by reversing the mounting of weights 13 driven member 12 may be further advanced rather than retarded relative to driving member 11 between speeds *c* and *d*. By the same token the relative movement between speeds *a* and *b* may also be reversed if desired by changing the mounting of weights 17 or by reversing the direction of rotation.

When the speed of the unit is decreased from a speed greater than speed *d* the weights 18 will not be swung inwardly by springs 42 until the pressure exerted thereon by the springs exceeds the sum of the centrifugal force exerted by the weights and the frictional and other inherent forces tending to resist such inward movement of the weights. Accordingly, initial reverse or inward movement of the weights 18 will not occur until a speed *d'* somewhat lower than speed *d*, has been reached, i. e., a speed at which the centrifugal force of the weights has been sufficiently reduced to compensate for the forces of friction and the like. The same applies to the inward movement of weights 17 which indicated as beginning when speed *b'* has been reached. Therefore, as the speed decreases the curve *d', c', b', a'* will be followed. In some installations it is desirable to effect operation as nearly as possible along the same curve for both increasing and decreasing speeds. The present invention approaches this ideal by materially reducing the undesirable frictional forces.

There is thus provided a simple and effective coupling for rotating parts which will permit and control limited relative angular adjustment of said parts during operation and automatically in response to the varying speed of the parts. Additionally, the coupling contemplated is so constructed as to make it possible by easy adjustments to effect numerous different modes of operation and to accurately compensate for minor manufacturing and theoretical inaccuracies in the construction and design. Although the means of adjustment are relatively rugged, the

several such means provided are so related that when used in conjunction with each other extremely fine and accurate adjustments may be made to effect almost any desired operation at or between selected speeds. The construction is such as to permit easy variation of the rate at which angular adjustment of the parts takes place in response to speed changes and also permit variation of the speed at which such adjustment is initiated. The structure in its simplest form comprises only a small number of rugged parts which may be readily and inexpensively manufactured and assembled.

Although only a limited number of embodiments or modifications of the invention are illustrated in the drawing and described in the foregoing specification, it is to be expressly understood that the invention is not limited thereto. For example, suitable known means other than gear teeth may be employed for operatively connecting the flyweights and members 11 and 12. Although each set of weights 17 and 18 comprises only two weights, it will be clear that the number in each set may be more or less than two. Also, only one or one set of weights may be required in some installations, while in others the number of sets of weights may be increased. As illustrated, spring 42 has only one notch 52 for engagement by link 50 but the invention contemplates possible adjustment of the contact point between parts 50 and 42 such as by providing a plurality of such notches. Other known types of low friction connections may be used in operatively connecting link 50 to the spring and weight. Various other changes may also be made particularly in the design and arrangement of the parts illustrated without departing from the spirit and scope of the invention as it will now be understood by those skilled in the art.

What is claimed is:

1. In apparatus of the class described, rotatable means, centrifugally actuatable means and resilient means mounted on said rotatable means, and link means interposed between said resilient means and said centrifugally actuatable means for transmitting the force of the resilient means to said centrifugally actuatable means to resist movement of the latter in response to centrifugal force, said centrifugally actuatable means being selectively operatively engageable by said link means at any of a plurality of notches in and at different distances from the pivotal axis of said centrifugally actuatable means to vary the leverage thereof with respect to said resilient means.

2. In apparatus of the class described, rotatable means, weight means rotatable therewith and pivotally mounted thereon for centrifugal movement about an axis eccentric and parallel to the axis of rotation of said rotatable means, resilient means mounted on said rotatable means, and pivoted pressure-transmitting means interposed between and wholly supported by said resilient means and said weight means independently of said rotatable means whereby said resilient means is effective to yieldably resist centrifugal movement of and impart centripetal movement to said weight means.

3. Apparatus as defined in claim 2 wherein said resilient means is constituted by a leaf-type spring.

4. Apparatus as defined in claim 2 wherein said pressure-transmitting means comprises a thin plate-like member having edgewise engagement

with at least one of said weight means and said resilient means.

5. Apparatus as defined in claim 4 wherein said member is selectively operatively engageable with notches in at least one of said weight means and said resilient means at spaced points thereon at different distances from the mounting point of said one means to vary the effective force of said resilient means for any given position of said weight means.

6. A coupling for drivably connecting rotatable members comprising centrifugally actuatable weight means for imparting relative angular movement to said members; said weight means being pivotally mounted on an axis parallel to the axis of rotation of said members, resilient means for resisting centrifugal movement of said weight means, and one-piece substantially rigid motion-transmitting means interposed between, wholly supported by and having direct pivotal contact with said weight means and said resilient means.

7. In apparatus of the type comprising a rotatable driving member, a rotatable driven member and means connecting said members to impart rotation from said driving member to said driven member, said means including centrifugally actuated weight means pivotally mounted on one of said members and operatively engaging the other member to move said members angularly relative to each other in response to pivotal movement of said weight means, the combination therewith of means for controlling the pivotal movement of said weight means comprising a leaf-type spring for yieldably resisting centrifugal movement of said weight means, and link means pivotally engaged with said weight means and said spring for transmitting the force of the spring to the weight means, said link means comprising a plate-like member having edgewise engagement with said weight means and said spring.

8. In apparatus of the class described, a rotatable driving member, a rotatable driven member, means for drivably connecting said members including a plurality of centrifugally actuatable weights pivotally mounted on one of said members and comprising portions which mesh with gear teeth on the other of said members whereby said members are adapted to rotate together and are movable angularly relative to each other in response to pivotal movement of said weights, a spring mounted on said one member for yieldably resisting the pivotal movement of each of said weights, and link means interposed between each of said springs and the weight controlled thereby for transmitting the force of the spring to the weight.

9. Apparatus as defined in claim 8 comprising means for supporting said springs on said one member to permit simultaneously adjusting said springs relative to said weights, said supporting means including a supporting member mounted on and for angular adjustment about the axis of rotation of said one member.

10. In apparatus of the type comprising a rotatable driving member, a rotatable driven member and means for drivably connecting said members including centrifugally actuated weight means pivotally mounted on one of said members and operatively engaging the other member whereby said members are adapted to rotate together and are movable angularly relative to each other in response to pivotal movement of said weight member, the combination therewith of means for controlling the pivotal movement of

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said weight means comprising resilient means for yieldably resisting centrifugal movement of said weight means, and link means pivotally engaged with said weight means and said resilient means for transmitting the force of the resilient means to the weight means, said weight means having spaced notches thereon selectively engageable by said link means.

11. In apparatus of the class described, rotatable means, centrifugally actuatable means and resilient means mounted on said rotatable means, and link means interposed between said resilient means and said centrifugally actuatable means for transmitting the force of the resilient means to said centrifugally actuatable means to resist movement of the latter in response to centrifugal force, said link means being adjustable

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to selectively engage any of a plurality of spaced notches in and at different distances from the mounting point of at least one of said centrifugally actuatable means and said resilient means for varying the leverage of said centrifugally actuatable means with respect to said resilient means.

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