May 26, 1942. R. M. ROOF 2,284,070

ANGULAR ADJUSTMENT MECHANISM FOR ALIGNED SHAFTS

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FIG. 1

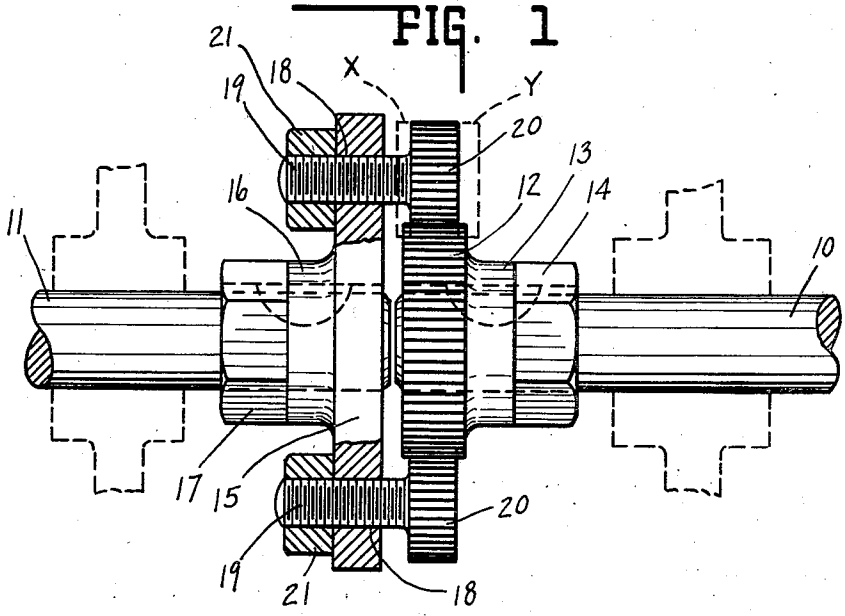


FIG. 2

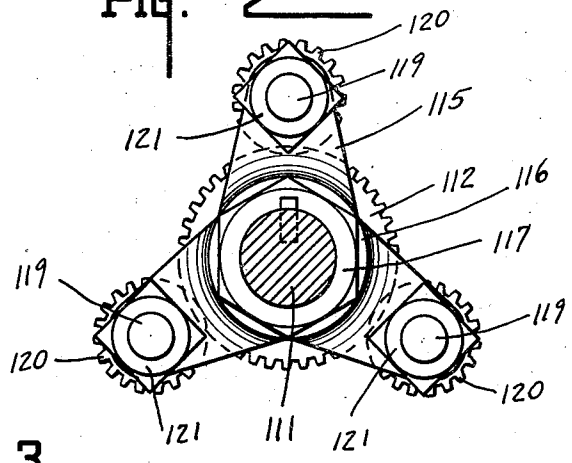
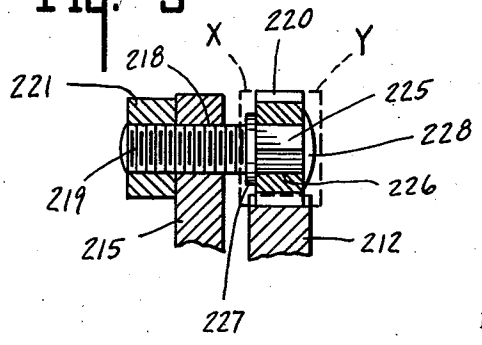


FIG. 3



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ANGULAR ADJUSTMENT MECHANISM FOR ALIGNED SHAFTS

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7 Claims. (Cl. 287—1)

This invention relates to a universal adjustable drive.

The chief object of this invention is to provide a relatively simple structure and one which is easily adjusted whereby two shafts in axial alignment may be angularly adjusted for specific timing purposes.

In certain arts and industries it is essential that a certain timing relationship exists between a source of power and the structure utilizing that power. In certain applications in the aforesaid arts and industries, conditions vary so that the so-called timing requires adjustment. In some particular instances, such timing variation is extremely critical to ultimate operation or peak performance. Consequently a slight angular adjustment between a driving shaft and a driven shaft may result in a performance all out of proportion to the minor character of the adjustment actually effected in the angular relation between the two shafts.

The chief feature of the invention consists in accomplishing the foregoing result by relatively simple means which are very readily adjusted.

The primary characteristic of the invention is the inclusion between two axially aligned shafts of two toothed surfaces, one of which is of appreciable length and one of which (and not necessarily the other one) is longitudinally slidable and rollable relative to the other toothed surface in mesh therewith.

Other objects and features of the invention will be set forth more fully hereinafter.

The full nature of the invention will be understood from the accompanying drawing, the following description and claims:

Fig. 1 of the drawing is a simple embodiment of the invention utilizing a central gear and a pair of meshing pinions, the pinion support and specific anchorage being shown in section.

Fig. 2 is an end elevation of a triple pinion modification of the invention showing the same including a spider type support for the pinion.

Fig. 3 illustrates in central section a slightly modified form of pinion support, the associated portion of the central gear being illustrated in section.

In Fig. 1 of the drawing, 10 indicates one shaft and 11 an axially aligned shaft. Herein the two shafts are shown terminating immediately adjacent each other but the same may have abutting contact or one may be recessed and telescopically receive and rotatably support a reduced extension upon the end of the other shaft. Numeral 12 indicates the central gear having a hub portion 13 which, preferably, is provided with a tool engageable portion 14. Such portion may be hexagonal so that the same can readily mount a monkey wrench, hand vise or the like.

Confronting the gear 12 and carried by the other shaft is a plate-like member 15. This plate-like member may have a cylindrical periphery or may be of spider form as illustrated in Fig. 2. It also includes a hub portion 16 which has a peripheral tool engageable portion 17 that may be similar to the portion 14 or the hub 13.

In offset relation to the common axis of the aligned shaft and, preferably, equidistant insofar as arcuate and radial spacing is concerned, there are provided threaded sockets in the support member 15. Herein, such sockets are illustrated as the threaded apertures 18 extending through the plate-like member 15. Threadedly mounted therein is a bolt-like portion or extension 19 rigid with a pinion 20. This pinion meshes with the adjacent toothed portion of the gear 12. As shown by the two sets of dotted lines X and Y, whenever the pinion is rotated relative to the gear 12 the bolt portion 19 or extension threads into or out of the threaded opening or aperture 18 of the support member 15. In so doing, it will be quite apparent that the pinion has longitudinal movement along its axis and hence has sliding movement relative to the teeth of the gear 12 and rolls upon said teeth. In so doing, the shaft 11 therefore is angularly adjusted relative to the shaft 10. When the proper angular adjustment for timing purposes is obtained, a lock nut 21 may be applied to the projecting end of the bolt extension 19 and lock the bolt to the support member 15 and prevent further movement of the pinion relative to said support member 15. When all the pinions are so adjusted and similarly locked to the support member 15, the shaft 11 is locked in adjusted relation to the shaft 10.

An easy means of adjustment is as follows: All the lock nuts 21 are released. Then a hand vise or monkey wrench is applied to the collar 14 and a hand vise or monkey wrench is applied to the collar 17, it being understood that these members are rigidly secured to their respective support shafts. The one hand vise may be turned relative to the other to effect the desired angular adjustment. In that relative movement the bolt-like extensions 19 either thread into or thread out of the threaded apertures 18 simultaneously.

It will be apparent, therefore, that angular adjustment between the two shafts can be in extremely minor amounts and be less than the angular advance of one of the teeth of the gear 12 or may be greater or lesser than a full tooth or same even may be adjusted the advance of one or more full teeth of said gear. The number of teeth in the pinion 20 and the character of the threaded connection of the bolt and plate or support member 15 will determine the amount of pinion rolling relative to the gear that is effected and the axial movement of the pinion and, hence, the sliding movement of the pinion relative to the gear.

From the foregoing, therefore, it is obvious that the construction can be designed for any desired capacity of power transmission from one shaft to the other and the invention is of such character that the shafts have unlimited variable adjustment possibilities. Such adjustment is not restricted to full tooth adjustment for reasons hereinbefore set forth.

For any major angular adjustment between shafts, greater than permitted by the axial accommodation of bolts 19, the pinions, etc. can be entirely disassociated, or gear 13 unlocked from shaft 10 and relocated and then reassociated with the pinions and the final adjustment effected by means of the bolts 19. It is this possibility of accurate minor adjustment that constitutes the major value and utility of the invention.

In Fig. 2 of the drawing, numerals of the 100 series indicate parts similar, identical or comparable to the primary numerals which designate, similar, identical or comparable parts illustrated in Fig. 1.

This form of the invention shows the support member 15 as of spider-like character. It is in a sense one of balanced type but it is not as balanced as when such support is a circular plate, the periphery of which is concentric with the supporting shaft axis.

In Fig. 1, it will be noted that the bolt-like extension 19 is integral with the pinion 20. In Fig. 3, numerals of the 200 series indicate like or similar parts to those illustrated in Fig. 1 and designated by the primary numerals.

This embodiment of the invention differs from that shown in Fig. 1 in that the bolt-like extension 219 is not integral with the pinion 220 but is provided with a non-circular pinion supporting portion 225 that is seated in the corresponding complementary, non-circular aperture 226 of the pinion gear. A flange 227 on the extension 219 in conjunction with the headed portion 228 serves to rigidly secure the pinion 220 to the bolt-like mounting member 219.

The dotted lines in this figure indicated by X and Y again indicate the extreme positions of longitudinal or axial movement of the pinion.

The form of the invention illustrated in Fig. 2 is such that the pinion 120 and the bolt 119 may be of the character illustrated in Fig. 1 or of the character illustrated in Fig. 3.

While the invention has been illustrated and described in great detail in the foregoing description, the same is to be considered as illustrative and not restrictive in character.

The several modifications described herein, as well as others which will readily suggest themselves to persons skilled in this art, are all considered to be within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. In combination with two axially aligned shafts one being driven by the other, an angular adjustable connection therebetween including a central gear secured to one shaft and having a tooth face of appreciable length, a plate secured to the other shaft in confronting relation to the gear, a plurality of arcuately equally spaced pinions meshing with the gear, an axial extension from each pinion and externally threaded, said plate having threaded sockets for threaded extension reception, the pinions being arcuately movable about the gear upon pinion threading and unthreading movement upon the plate and movable longitudinally of said gear parallel to the axis thereof in such movement, and means locking said extensions in adjusted position in the plate sockets.

2. In combination with two axially aligned shafts one being driven by the other, an angular adjustable connection therebetween including a central gear secured to one shaft and having a tooth face of appreciable length, a plate secured to the other shaft in confronting relation to the gear, a plurality of arcuately equally spaced pinions meshing with the gear, an axial extension from each pinion and externally threaded, said plate having threaded sockets for threaded extension reception, the extensions having threaded ends exposed by the plate, the pinions being arcuately movable about the gear upon pinion threading and unthreading movement upon the plate and movable longitudinally of said gear parallel to the axis thereof in such movement, and means locking said extensions in adjusted position in the plate sockets, said sockets constituting apertures extending through the plate, and the ends of the extensions being exposed by the plate opposite from the pinion side thereof, said locking means constituting a locknut upon the plate exposed end of the extension.

3. In combination with two axially aligned shafts one being driven by the other, an angular adjustable connection therebetween including a central gear secured to one shaft and having a tooth face of appreciable length, a plate secured to the other shaft in confronting relation to the gear, a plurality of arcuately equally spaced pinions meshing with the gear, an axial extension from each pinion and externally threaded, said plate having threaded sockets for threaded extension reception, the extensions having threaded ends exposed by the plate, the pinions being arcuately movable about the gear upon pinion threading and unthreading movement upon the plate and movable longitudinally of said gear parallel to the axis thereof in such movement, and means locking said extensions in adjusted position in the plate sockets, said sockets constituting apertures extending through the plate, and the ends of the extensions being exposed by the plate opposite from the pinion side thereof, said locking means constituting a locknut upon the plate exposed end of the extension, the plate and gear each including a hub portion, said hubs being oppositely directed and formed for tool engagement.

4. A pair of hub provided confronting members, one having a toothed periphery and the other constituting a gear support, a gear meshing with the periphery and slidable and rollable relative thereto and carried by said other member, and means locking the gear in the adjusted position for locking the confronting members together in angularly adjusted relation.

5. A pair of axially aligned shafts, a gear rigid with one shaft, a pinion meshing with the gear and rollable and slidable relative thereto, and means locking said pinion to said other shaft for locking said shafts together in angularly adjusted relation.

6. A pair of axially aligned shafts, a plurality of rotatively adjustable toothed members, rotatable upon parallel axes appreciably offset from and parallel to the axis of the shafts and movable longitudinally of their respectives axes, means securing said toothed members in adjusted position upon one of the shafts, and means rigid with the other shaft and having adjacent each first-mentioned toothed member an appreciable number of arcuately arranged teeth having meshing engagement with the toothed members whereby said shafts may be locked together in angularly adjusted relation.

7. A pair of axially aligned shafts, a plurality of rotatively adjustable toothed members, rotatable upon parallel axes appreciably offset from and parallel to the axis of the shafts and movable longitudinally of their respective axes, means securing said toothed members in adjusted position upon one of the shafts, and means rigid with the other shaft and having adjacent each first-mentioned toothed member an appreciable number of arcuately arranged teeth having meshing engagement with the toothed members whereby said shafts may be locked together in angularly adjusted relation, certain of the teeth being of appreciable width to insure meshing engagement for any axial adjustment of the toothed members.

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