April 19, 1932. W. V. ORR 1,854,622

VARIABLE SPEED GEARING

Filed May 12, 1930 2 Sheets-Sheet 1

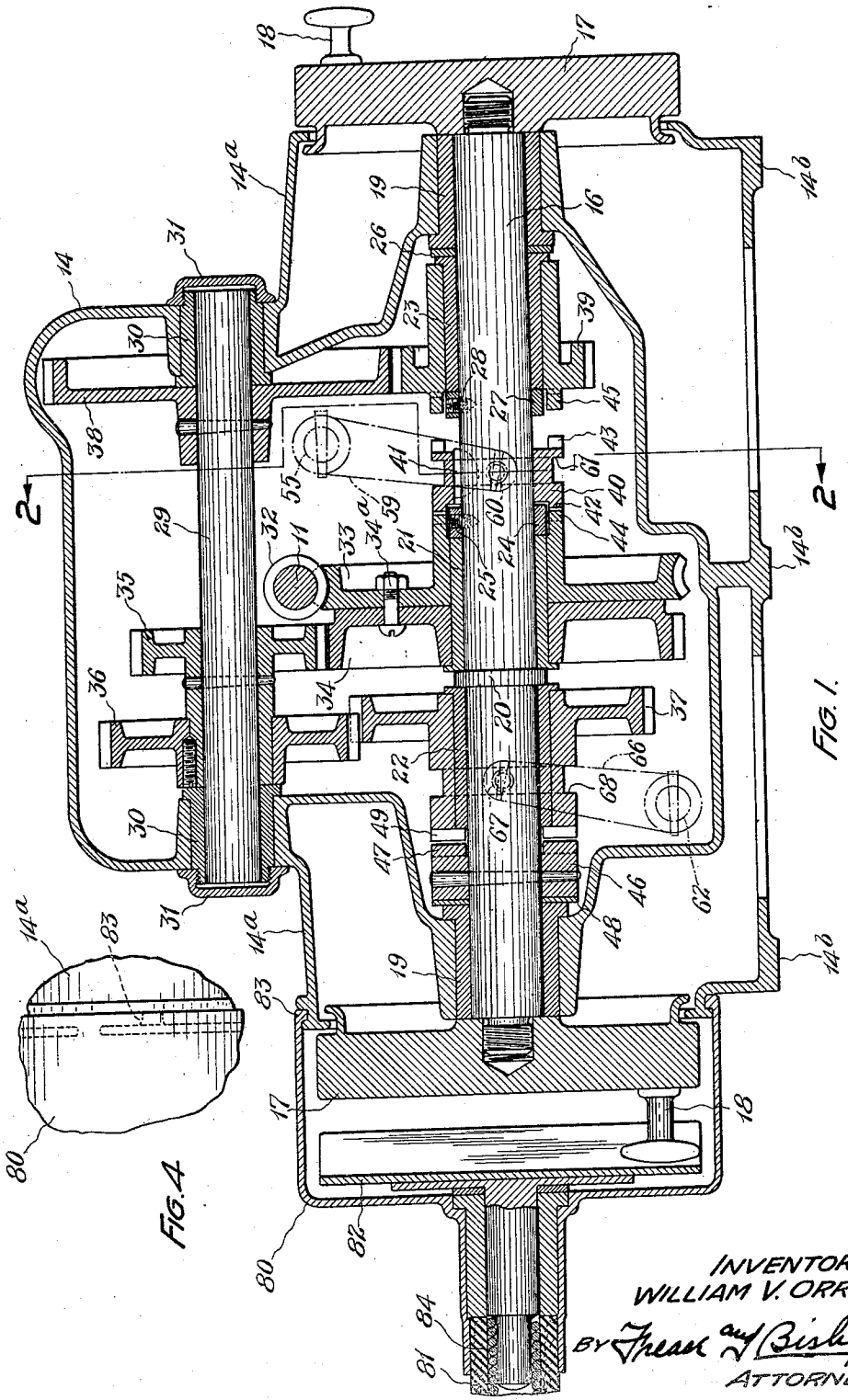

FIG. 1.

FIG. 4

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VARIABLE SPEED GEARING

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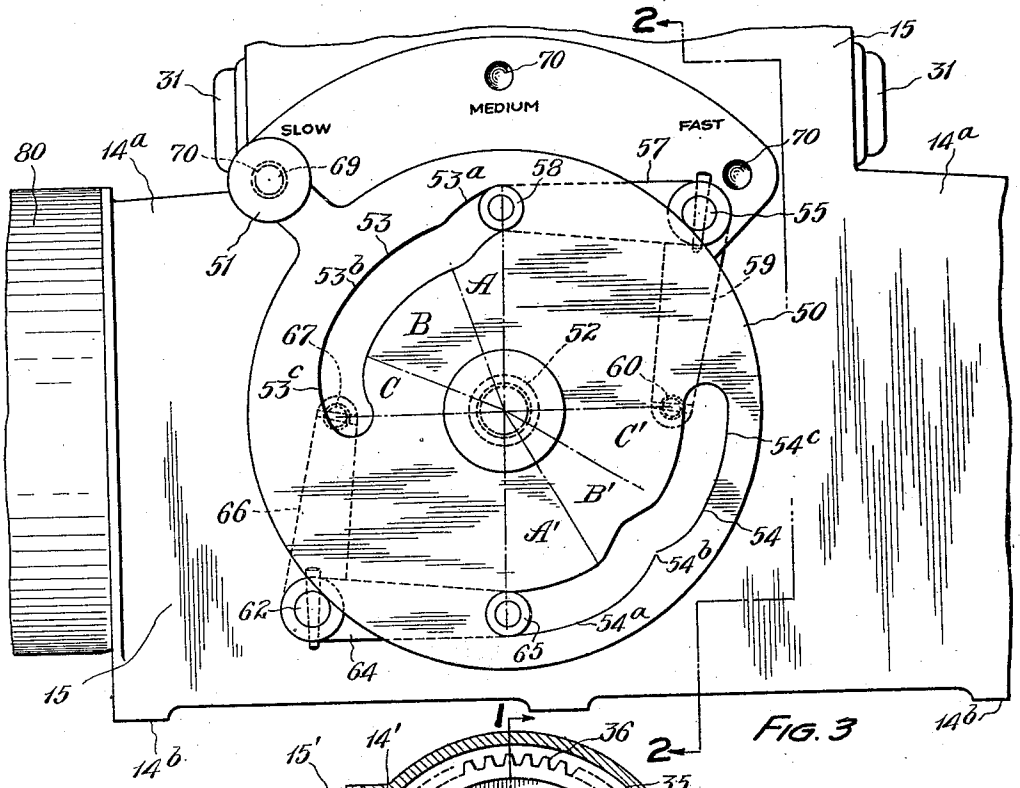

FIG. 3

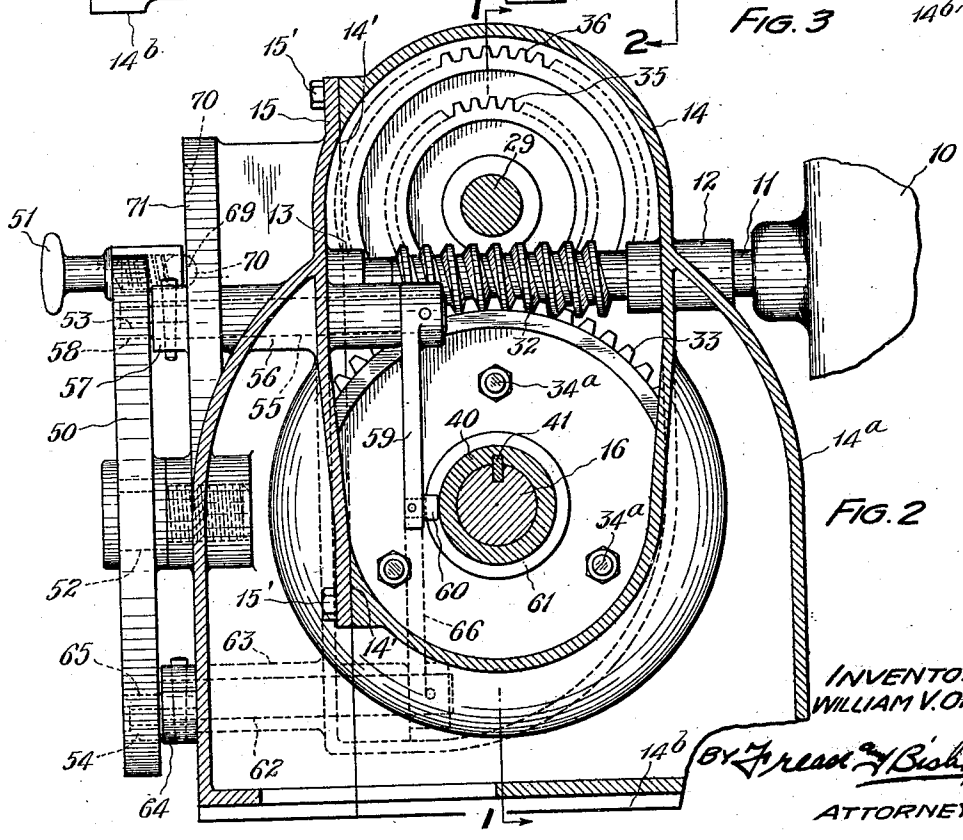

FIG. 2

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UNITED STATES PATENT OFFICE

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VARIABLE SPEED GEARING

Application filed May 12, 1930. Serial No. 451,808.

The invention relates to variable speed gearing, and more particularly to speed changing mechanism forming an integral part of an exercising and massaging machine.

Exercising and massaging machines in common use include a strap applicator, or other form of massaging appliance, for massaging and exercising body parts by imparting a massaging or rubbing movement to the strap through the medium of pins eccentrically mounted on a rotating shaft, the ends of the strap applicator being connected with the pins.

In use, the strap applicator engages the portion of the body desired to be massaged, and the eccentric pin shaft is rotated, thereby imparting a massaging movement to the body part.

In order to meet the tastes and requirements of different persons, to comply with physical characteristics of the body parts being massaged, and to prevent physical damage to particular persons utilizing the exerciser, it is desirable if not necessary to rotate the eccentric pin shaft at different speeds of from 200 to 700 R. P. M., for varying the rate of massage movement of the strap applicator.

Prior devices are known in which the speed of the eccentric pin shaft may be retarded or advanced by utilizing cone pulleys operatively connected by a belt. However, difficulties are encountered in changing the belt when such a construction is used in the home of ordinary persons who know little of the manner in which belts should be changed. Consequently, such belts are never changed by the users when they should be changed; and physical injury has often resulted, due to the use of improper speeds when massaging certain body parts.

Moreover, an unenclosed running belt presents a serious hazard, and in order that safe operation of such massaging machines can be had, the belts and cone pulleys must be enclosed, thus increasing the difficulty with which the belt may be changed to change the speed of operation of the machine.

Moreover, enclosed cone pulleys and belt variable speed exercisers are so expensive to manufacture that it is commercially impractical to produce the same for common use by the ordinary person.

Accordingly, it is an object of the present invention to provide a variable speed exercising machine with which the speed of rotation may be changed by the most unskilled operator or user, according to the requirement of that person, by merely moving a lever.

A further object of the invention is to provide a variable speed exercising machine which is safe in operation, no mechanical hazards being presented by the speed changing operating mechanism.

A further object of the invention is to provide a variable speed gearing speed changing device having a very simplified and inexpensive construction and having a centralized visible control readily operable by the average person.

Moreover, an object of the present invention is to provide a speed changing mechanism in connection wth an exercising machine, which has a relatively few number of constituents parts, each of which have a very simplified and standard design which may accordingly be manufactured at a very low cost so that a variable speed exerciser will be available for use by the average person.

It is often desirable to use massaging appliances which can only be attached to the massaging machine through the medium of a flexible drive shaft.

It is therefore a further object of the present invention to provide means for connecting a flexible drive shaft with the eccentric crank pin of the exercising machine for transferring rotary motion from the exercising machine rotatable shaft to the flexible shaft.

These and other objects may be obtained by utilizing a construction which may be stated in general terms as including in connection with a motor, a drive shaft, a driven shaft carrying eccentric pins, means interposed between the drive shaft and the driven shaft including clutches and gearing for driving the driven shaft at different speeds, and centralized operating means for the clutches including bell crank levers cooper-

ating with the clutches and a rotatable internal cam disk operating the levers for changing the speed of rotation of the eccentric pin shaft.

The preferred embodiment of the improved device is illustrated in the accompanying drawings forming part hereof, in which

Figure 1 is a longitudinal section through the gear box of the improved massaging machine variable speed gearing, on the line 1—1, Fig. 2;

Fig. 2 is a cross section through the gear box, taken on the line 2—2, Fig. 1 and showing a fragmentary portion of the massaging machine drive motor in elevation;

Fig. 3 is a front elevation of the gear box looking toward the centralized internal cam control disk; and

Fig. 4 is a fragmentary elevation view showing the manner in which a flexible shaft may be operatively connected with the gear box.

Similar numerals refer to corresponding parts throughout the various figures of the drawings.

The massaging machine includes the motor, shown in broken lines at 10, having a rotatable motor shaft 11 journaled in bearings 12 and 13 carried respectively by the gearing casing sections 14 and 15.

The main eccentric pin shaft 16 is provided at either end with disks 17, which have eccentric pins 18 thereon, and the shaft 16 is journaled adjacent its end portions in bearings 19 carried by the casing section 14.

The shaft 16 is provided with a peripheral flange portion 20 intermediate its ends and a master gear bearing 21, a second bearing 22, and a third bearing 23 are mounted on the shaft 16. The master bearing 21 is held in seated relation with the flanged peripheral portion 20, by the collar 24 and set screw 25. A washer 26 is interposed between the third bearing 23 and the end bearing 19; and the collar 27 with its set screw 28 holds the third bearing 23 in seated relation against the washer 26.

A counter shaft 29 is mounted in bearings 30 in the upper portion of the casing 14, and the bearings 30 and counter shaft 29 are held in position by the bearing caps 31.

The motor shaft 11 is provided preferably with an integral worm 32 which meshes with a worm gear 33 rotatably mounted on the master bearing 21.

A master gear 34 is preferably bolted at 34*a* to the worm gear 33, and is accordingly similarly rotatably mounted on the master bearing 21. The master pinion 35 is pinned to the counter shaft 29 and arranged to mesh with the master gear 34; and the master pinion 35 has mounted thereon the second idler gear 36 which meshes with the second idler pinion 37 fixedly mounted on the second bearing 22 which is rotatably mounted on the eccentric shaft 16.

The counter shaft 29 also has a third idler gear 38 pinned thereon which meshes with the third idler pinion 39 fixedly mounted on the third bearing 23 which is rotatably mounted on the eccentric shaft 16.

A main clutch 40 is slidably keyed at 41 to the shaft 16 and is provided with a master clutch jaw 42 and a third clutch jaw 43 for selective engagement with the worm gear clutch jaw 44 and the third pinion clutch jaw 45 respectively.

A collar 46 having clutch jaws 47 is pinned to the shaft 16 and spaced from the left hand bearing 19 by the washer 48; and the jaws 47 are adapted for engagement with the clutch jaws 49 provided on the second idler pinion 37.

A disk plate 50 provided with an operating handle 51 is rotatably journaled at 52 on the front of the casing member 15, and the disk 50 is provided with the internal "slow-fast" cam slot indicated generally at 53 and the "medium" cam slot generally indicated at 54.

A "slow-fast" bell crank lever shaft 55 is rotatably journaled in the bearing 56 carried by the casing section 15, and its outer lever arm 57 carries a roller 58 which rides in the cam slot 53, while its clutch lever arm 59 carries a clutch operating pin 60 which rides in the peripheral groove 61 of the main clutch 40.

A "medium" bell crank lever shaft 62 is rotatably journaled in the bearing 63 carried in the casing section 15, and its outer lever arm 64 carries a roller 65 which rides in the cam slot 54, while its clutch lever arm 66 carries a clutch operating pin 67 which rides in the peripheral groove 68 of the combined second gear and clutch 37—49.

Although the sectional plane of Fig. 1 is taken beyond the clutch operating levers 59 and 66, for convenience in explanation, the location of the levers 59 and 66, is shown in dot-dash lines in Fig. 1 of the drawings.

The operating disk 60 is adapted to be shifted to three different positions, shown in Fig. 3 as slow, medium, and fast, at which times the spring pressed ball 69 is seated in one of the recesses 70 provided in the face plate 71 of the casing section 15.

The operation of the device is as follows:—

When the motor 10 is operating to drive the shaft 16 at slow speed, which may preferably be some 200 R. P. M., the various parts are in the positions shown in full lines in the various figures of the drawings, and the worm 32 on the motor shaft 11, drives the worm gear 33, and clutch 40 through the medium of the clutch jaws 42 and 44, and rotary motion is transmitted from the clutch 40 to the shaft 16 through the key 41.

If it is desired to drive the shaft 16 at medium or second speed, which is preferably at

or about 350 R. P. M., the operating disk 50 is rotated clockwise so that the spring pressed ball 69 moves toward the "medium" recess 70. During rotation of the disk 50, the roller 58 rides along the cam slot portion 53*a*, through the zone marked A of the cam slot 53, rotating the shaft 55 in a counter-clockwise direction to disengage the clutch 40 from engagement with the clutch jaws 44 of the worm gear 33.

Meanwhile, the roller 65 rides along the cam slot portion 54*a*, through the zone A of the cam slot 54, as shown in Fig. 3. Upon further rotation of the operating disk 50 toward medium position, the roller 65 rides into the depressed portion 54*b* of the cam slot 54 within the zone B′, and the roller 58 rides along the portion 53*b* of the cam slot 53 within the zone B.

Thus the shaft 62 is rotated in a counter-clockwise direction to shift the second pinion 37 axially of the shaft 16, so that its clutch jaws 49 engage the clutch jaws 47 of the collar 46; and the clutch 40 is held in neutral position.

With the parts in the positions last described, the spring pressed ball 69 moves into engagement with the "medium" recess 70 and the device will operate at medium or second speed, the drive being transmitted as follows:

The rotating motor shaft 11 through its worm 32 drives the worm gear 33, and the drive continues through the bolts 34*a*, to the master gear 34, master pinion 35, second idler gear 36, second idler pinion 37, clutch jaws 49—47, and to the shaft 16 through its keyed collar 46.

If it is desired to drive the shaft 16 at fast or third speed, which is preferably at or about 700 R. P. M. the operating disk 50 is rotated clockwise from medium position so that the spring pressed ball 69 moves toward the "fast" recess 70. During rotation of the disk, the roller 58 rides along the cam slot portion 53*b* and into the cam slot portion 53*c*, through the zones marked B and C of the cam slot 53, rotating the shaft 55 in a counter-clockwise direction to move the clutch 40 from neutral position into engagement with the clutch jaws 45 of the third idler pinion 39.

Meanwhile, the rollers 65 ride out of the cam slot portion 54*b* into the cam slot portion 54*c* through the zones marked B′ and C′ of the cam slot 54, as shown in Fig. 3, so that the shaft 62 is rotated in a clockwise direction to shift the second pinion 37 axially of the shaft 16 to disengage its clutch jaws 49 from engagement with the clutch jaws 47 of the collar 46.

With the parts in the last described position, the spring pressed ball 69 moves into engagement with the "fast" recess 70 and the drive from the motor 10 is as follows:

The rotating motor shaft 11, through the worm 32, drives the worm gear 33, and the drive continues through the bolts 34*a* to the master gear 34, master pinion 35, third idler gear 38, third idler pinion 39, clutch pins 45—43, and to the shaft 16 through the clutch 40 and its key 41.

Accordingly, the shaft 16 may operate at slow, medium, or fast speeds of from some 200 to 700 R. P. M., to drive the disks 17 and eccentric pins 18 carried thereby. Any desirable strap applicator, or other massaging appliance may be connected with the pins 18 for massaging body parts in the usual manner.

In assembling the device, the shaft 16 and counter shaft 29 may be inserted lengthwise into the end bearing openings of the casing section 14, while the various gears, clutches, bearings, etc., may be strung along the shaft by inserting the same through the front opening 14′ of the casing section 14.

The casing section 15 with its operating disk assembly thereon may then be placed in assembled relation with the casing section 14 and so held by bolts 15′.

It is pointed out that the casing section 14 has an auxiliary member 14*a* arranged to cover up all parts of the mechanism excepting the rotating disks 17. The auxiliary casing portion 14′ may be provided with feet 14*b*.

The casing 14 is preferably partially filled with grease for insuring a smooth and quiet operation and complete lubrication of the various moving parts.

Accordingly, an exercising or massaging machine is provided which may be run at any one of several desired predetermined speeds, and the speed change device may be readily operated by the most inexperienced user by merely moving a lever.

Moreover, the machine is very quiet in operation, and all moving parts are completely covered excepting only the disks carrying the eccentric pins.

And finally, all of the parts are of an extremely simple design and construction and can be manufactured at a very low cost.

When it may be desired to transmit rotary motion to a flexible shaft, a coupling member 80 provided on the end of a flexible shaft casing 81 journalling a flanged plate 82 may be connected by means of a bayonet joint indicated at 83, with the auxiliary casing 14*a*. In so connecting the coupling member 80, the flanged plate 82 engages one of the eccentric pins 18 for transferring rotary motion from the shaft 16 to the flexible drive shaft 84.

I claim:

1. In a massaging appliance, a variable speed mechanism including a casing, a drive shaft journaled in the casing, means for rotating the drive shaft, a driven shaft jour-

naled in the casing having eccentric pins mounted thereon, a worm on the drive shaft, a worm gear meshing with the worm rotatably mounted on the driven shaft, a master gear associated with the worm gear rotatably mounted on the driven shaft, a countershaft journaled in the casing, a master pinion meshing with the master gear keyed to the countershaft, a second gear keyed to the counter-shaft, a third gear keyed to the countershaft, a second pinion meshing with the second gear slidably and rotatably mounted on the driven shaft, a third pinion meshing with the third gear rotatably mounted on the driven shaft, the worm gear, second pinion and third pinion being provided with clutch jaws, a main clutch slidably keyed to the driven shaft having clutch jaws for selective engagement with either the worm gear or the third pinion clutch jaws, a collar keyed to the driven shaft having clutch jaws for alternate engagement with the second pinion clutch jaws, centralized operating means for slidably shifting the main clutch and second pinion on the driven shaft including bell crank levers journaled on the casing engaging the main clutch and second pinion, and an internal cam mounted for rotary movement exteriorly of the casing engaging the levers, and means for rotating the cam disk to different positions for simultaneously shifting the levers to selectively engage certain of the clutch jaws for changing the speed of rotation of the driven shaft.

2. In a massaging appliance, a variable speed mechanism including a casing, a drive shaft journaled in the casing, means for rotating the drive shaft, a driven shaft journaled in the casing having eccentric pins mounted thereon, a worm on the drive shaft, a worm gear meshing with the worm rotatably mounted on the driven shaft, a master gear associated with the worm gear rotatably mounted on the driven shaft, a countershaft journaled in the casing, a master pinion meshing with the master gear keyed to the countershaft, a second gear keyed to the countershaft, a third gear keyed to the countershaft, a second pinion meshing with the second gear slidably and rotatably mounted on the driven shaft, a third pinion meshing with the third gear rotatably mounted on the driven shaft, the worm gear, second pinion and third pinion being provided with clutch jaws, a main clutch slidably keyed to the driven shaft having clutch jaws for selective engagement with either the worm gear or the third pinion clutch jaws, a collar keyed to the driven shaft having clutch jaws for alternate engagement with the second pinion clutch jaws, centralized operating means for slidably shifting the main clutch and second pinion on the driven shaft including a slow-fast bell crank lever journaled on the casing engaging the main clutch, a medium bell crank lever journaled on the casing engaging the second pinion, and a cam disk mounted for rotary movement exteriorly of the casing engaging the levers, and means for rotating the cam disk to different positions for simultaneously shifting the levers for engaging the main clutch jaws and worm gear clutch jaws at one position, the second pinion clutch jaws and collar clutch jaws at another position, or the main clutch jaws and third pinion clutch jaws at another position for changing the speed of rotation of the driven shaft.

In testimony that I claim the above, I have hereunto subscribed my name.

WILLIAM V. ORR.