June 17, 1952 G. L. OLSON 2,600,912

SPEED REDUCING MECHANISM

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Fig. 1.

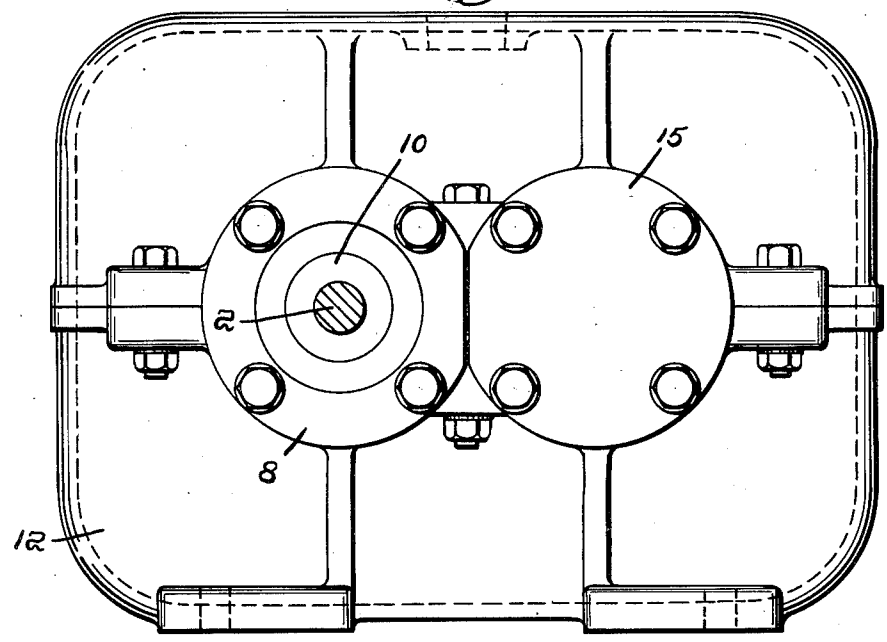
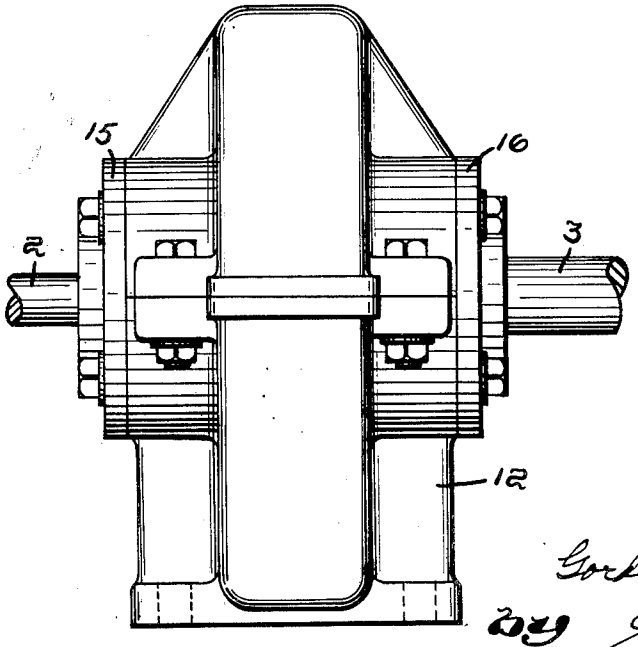


Fig. 2.



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Fig. 3.

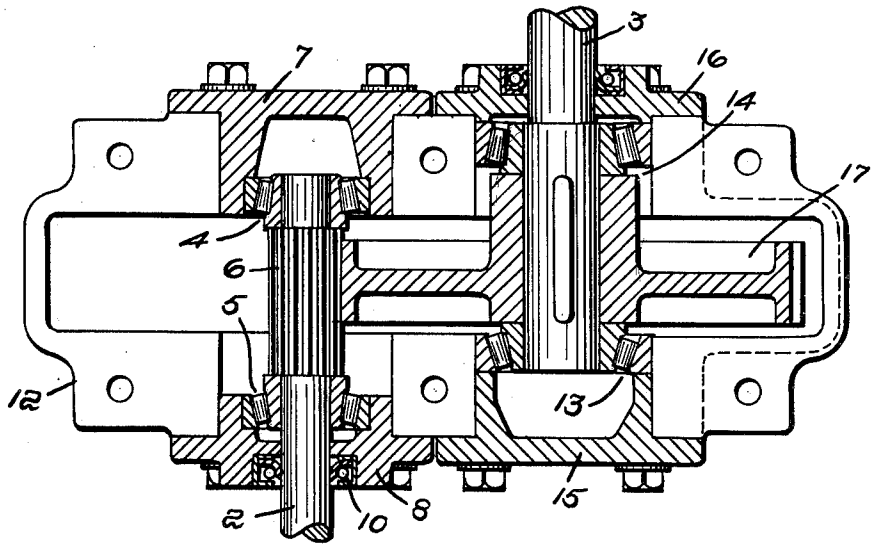
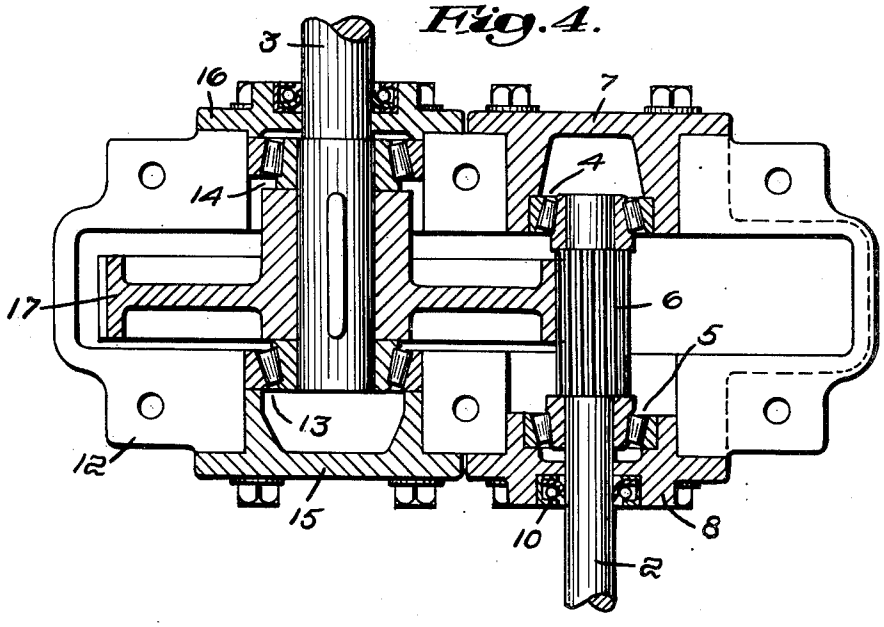


Fig. 4.



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Fig. 5.

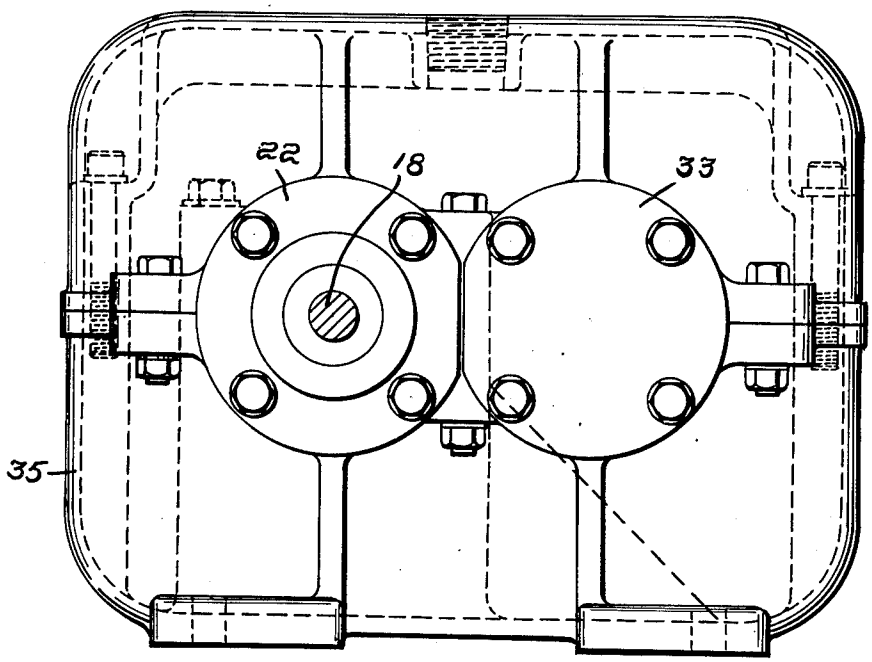
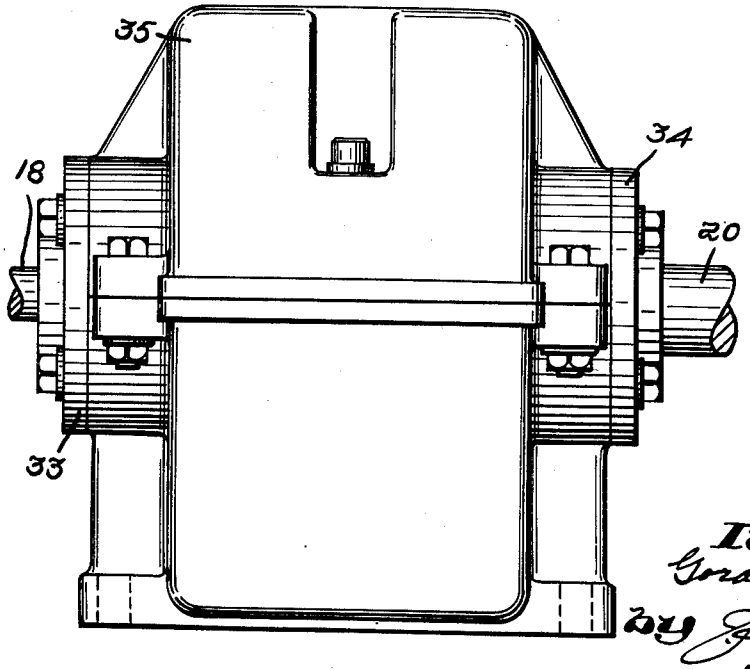


Fig. 6.



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Fig. 7.

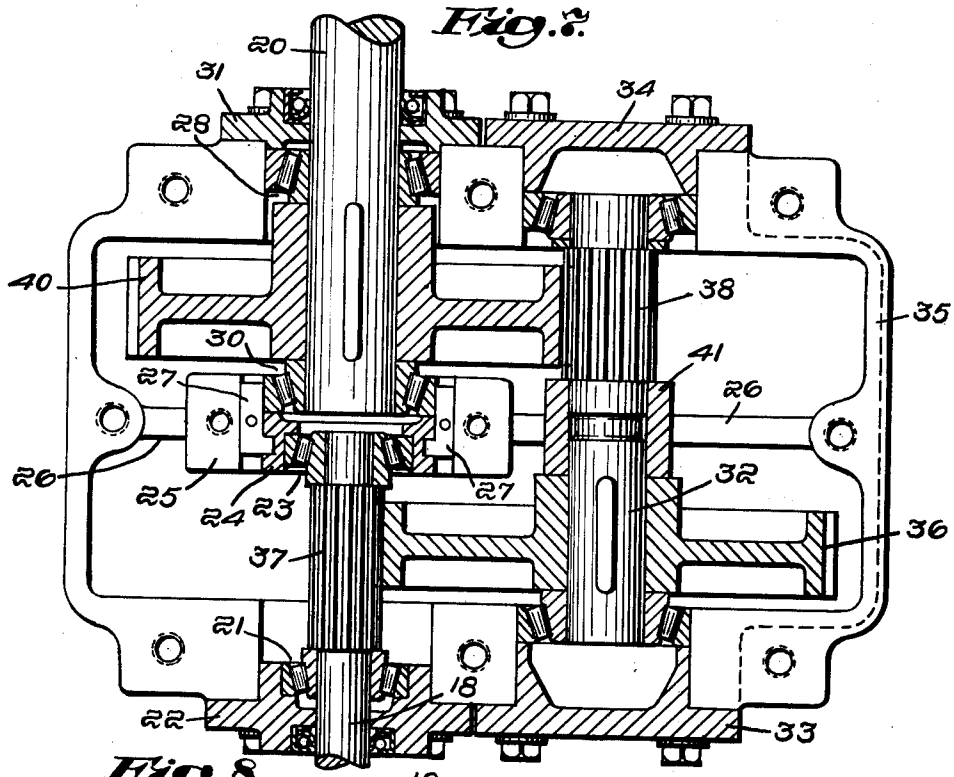
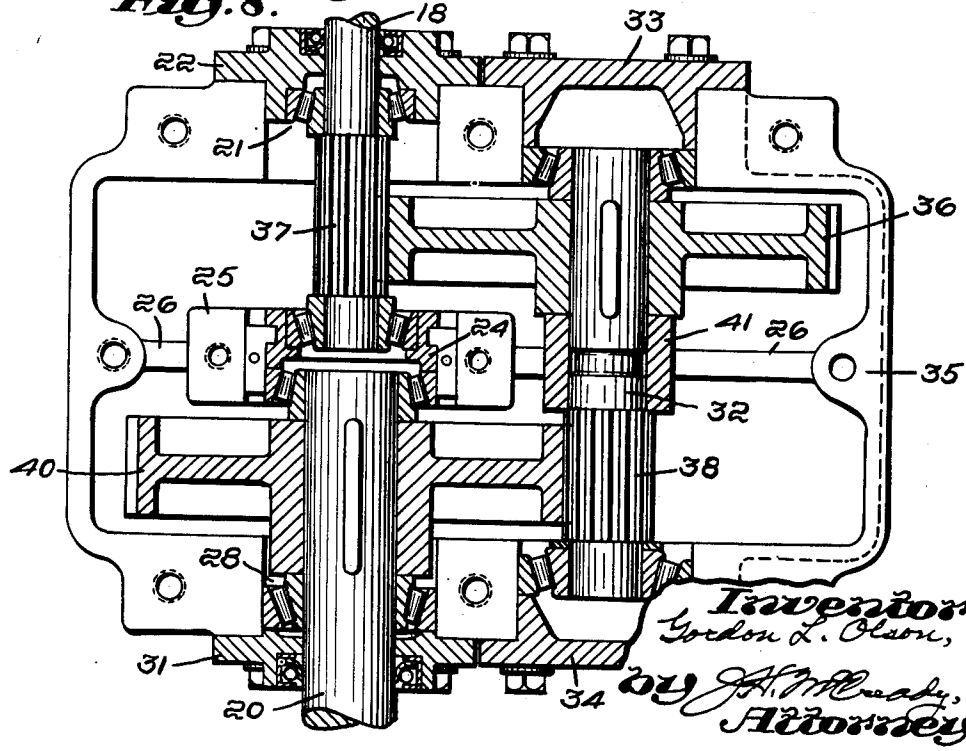


Fig. 8.



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Fig. 9.

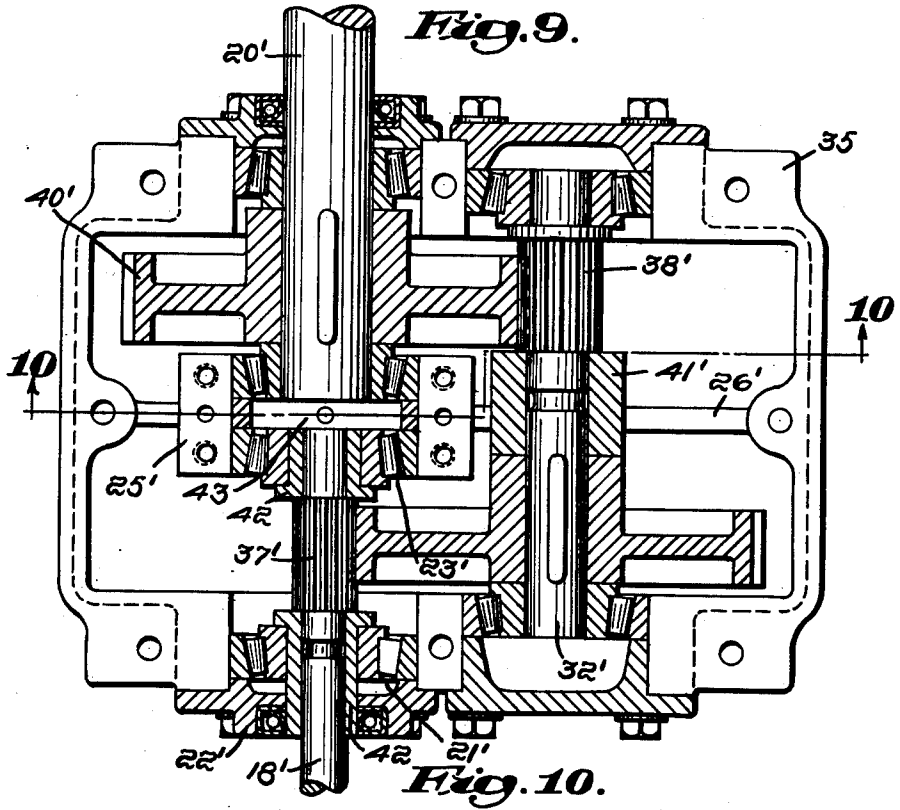
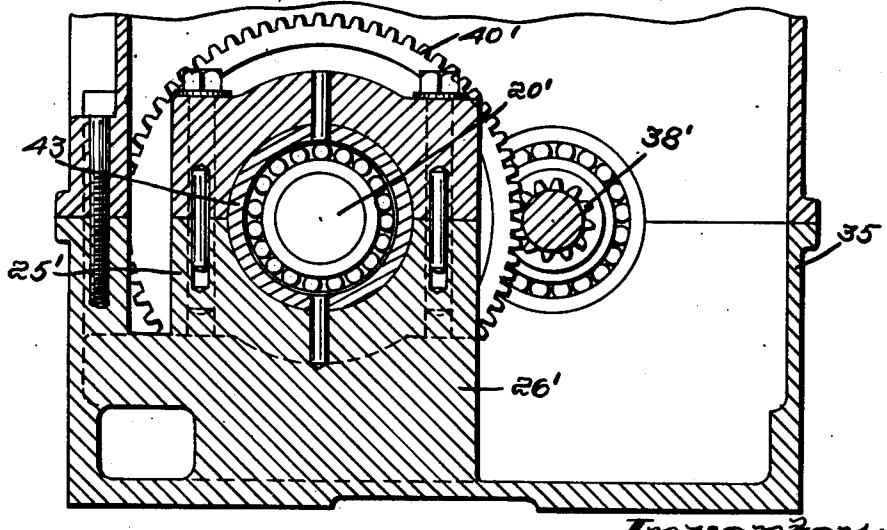


Fig. 10.



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UNITED STATES PATENT OFFICE

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SPEED REDUCING MECHANISM

Gordon L. Olson, Arlington, Mass.

Application February 19, 1947, Serial No. 729,451

4 Claims. (Cl. 74—421)

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This invention relates to mechanisms of the type much used in industry to reduce the speed of a motor, or other prime mover, to that desired for the particular machine to be driven. The invention aims to devise a mechanism of this character which can be manufactured very economically; will be exceptionally sturdy in construction; capable of giving long, trouble-free service; and which can be quickly changed over to reverse the shafts for either a right or left-hand drive, as may be desired.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Figs. 1 and 2 are side and end views, respectively, of a single speed-reduction drive embodying this invention;

Fig. 3 is a horizontal, sectional view taken through the plane on which the casing is divided and illustrating the lower half of the mechanism shown in Fig. 2;

Fig. 4 is a view, similar to Fig. 3, showing the shafts and bearings reversed;

Figs. 5 and 6 are side and end views, respectively, of a speed reducing mechanism in which a double reduction is accomplished;

Fig. 7 is a view, similar to Fig. 3, but showing the double reducing mechanism;

Fig. 8 is a view similar to Fig. 7, but showing the parts laterally reversed;

Fig. 9 is a view, similar to Fig. 7, but showing a somewhat modified construction; and

Fig. 10 is a vertical, sectional view on the line 10—10, Fig. 9.

Referring first to Figs. 1 to 4, inclusive, the mechanism there shown comprises an input shaft 2 and an output shaft 3. Supporting the input shaft are two sets of antifriction bearings 4 and 5 mounted on the shaft at opposite ends of the driving pinion 6. The bearings 4 are mounted in a socket formed to receive them in the inner end of a bearing cap 7, while the other bearing 5 is similarly mounted in a cap 8 through which the shaft 2 extends. It is encircled by an oil seal 10 which is pressed into the cap. Both of these caps are secured to the outer surface of the casing 12 by bolts.

The output shaft 3 is similarly supported, except that its bearings 13 and 14 are mounted directly in bores formed in alignment with each other in the opposite walls of the casing, but caps 15 and 16 similar to those shown at 7 and 8, respectively, are associated with this shaft to hold the bearings in their operative positions in the casing. Power is transmitted from the input to the output shaft by the pinion 6 and the gear 17 keyed to, or pressed on, the respective shafts, these two gears meshing with each other.

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It should be observed that the bores for the bearing structures supporting the input shaft, namely, the bearings and the caps in which they are mounted, are of the same diameter so that both can be drilled simultaneously by the same tool. This also is true of the bores in which the bearing structures for the output shaft 3 are mounted. In addition, the bores for both shafts are of the same diameter. This is an advantage from a manufacturing standpoint for the reason that when the casing 12 is set up in a jig or fixture which supports it for boring or drilling, the tool which performs this operation can be run completely through both bores so that they can be formed without changing the position of the casing in the machine. If the machine is of a multiple type the bores for both shafts can be drilled at the same time. If reaming is necessary, that operation also is facilitated by this arrangement, and the manufacturing expense is correspondingly reduced.

In addition to this advantage, the construction so provided permits the interchange of the two shafts, if that should be necessary or desirable in order to suit the space requirements of some particular location in which the mechanism is to be used. This is illustrated in Fig. 4 in which the bearings for the two shafts 2 and 3 have been interchanged in the casing 12 so that each shaft and its bearings occupy the space in the casing formerly occupied by the other shaft.

Similarly, because the outside diameters of all four bearing structures are equal, the shafts 2 and 3 can be reversed, end for end, so that if the unit was originally assembled for a right-hand drive it can be changed over to a left-hand drive. Or, if circumstances later require, it can be changed back again.

This flexibility of the unit is an exceedingly important practical advantage. It has been customary to make these drives either right-hand or left-hand. If a concern ordered one type and later discovered that it should have ordered the other, and the conditions under which it must be used are such that it cannot be turned around, the matter of securing the desired drive and the service which it is to perform, must be delayed until a unit of the desired "hand" is obtained. This often involves much annoyance, delay and

expense, all of which can be obviated with applicant's construction.

As best shown in Figs. 1 and 2, the casing is divided horizontally on a plane passing through the axes of the two shafts and the sections normally are secured together by bolts. This casing is made oil-tight so that the gears and the bearings run continuously in a bath of oil.

The construction above described provides only a single reduction in speed, but the invention is equally applicable to a construction in which a double reduction is accomplished, and such an arrangment is illustrated in Figs. 5 to 7. Referring more particularly to Fig. 7, the input shaft is illustrated at 18, and the output shaft at 20. These two shafts are positioned in axial alignment with each other and are mounted in much the same manner as in the construction above described, except that the adjacent inner ends of the two shafts are supported by a center bearing structure. As shown, the outer bearing for the input shaft is illustrated at 21 and is supported in a cap 22 in essentially the same manner that the input shaft 2 is supported by the cap 8 and its cooperating bearing. The opposite end of this shaft is supported by another antifriction bearing 23 mounted in a bearing holder 24 which fits into a socket formed in the bearing block 25 that is cast integral with the bottom section of the casing 35. It is rigid with the latter and the entire center section of the casing is strengthened and stiffened by the rib 26. Two keys 27—27 lock the holder 24 in its operative position. They can be lifted out but are supported against lateral movement by pins (not shown) which extend upwardly from the bottom of the casing into small holes shown in the keys.

The output shaft is supported in an outer bearing 28 and an inner bearing 30, the former being associated with a cap 31 in the same manner that the output shaft 3 is supported by the bearing 14 and cap 16 in Fig. 3, but the outer cone of the inner bearing 30 fits into the socket formed in the bearing block 25 and is locked in place by the same keys which hold the bearing 24. The latter bears against the outer race of the inner bearing 30.

In assembling this input and output shaft combination, the inner bearings are properly placed in the socket in the block 25; the outer bearings are brought into proper position; and as the lower bolts of the caps 22 and 31 are tightened up, one or both caps are shimmed more or less, as may be found necessary in order to adjust the antifriction bearings properly.

This double reduction mechanism also includes a countershaft 32, the ends of which are supported in antifriction bearings backed up by the caps 33 and 34, both of which are bolted to the outer surfaces of the casing 35. This shaft carries a gear 36 driven by the pinion 37 on the input shaft, and its pinion 38 drives a gear 40 on the output shaft, speed reductions being produced by each pair of intermeshing gears.

Preferably a ring 41 is shrunk on the countershaft 32 where it cooperates with the hubs of the gearing members 36 and 38 at opposite ends of it to stiffen this countershaft.

It will be observed that in this construction, as in that above described, the bores in which the bearing structures are mounted can be produced in the same manner as above explained in connection with Figs. 2 and 4. It should also be noted that the outside diameters of all the bearing members are the same. Consequently, the positions of the countershaft and the input and output shafts can be interchanged in the same manner that the shafts 2 and 3 can each be made to take the place of the other. Likewise, the bearings and shafts can be laterally reversed to produce either a right or left-hand drive and to change from one to the other, as desired.

Such a reversal is illustrated in Fig. 8. In making this reversal, the center bearings for the input and output shafts 18 and 20, respectively, must be reversed, as well as the outside bearings, but this can readily be done by lifting out the keys 27—27 after the shafts and their bearings have been removed, and then replacing the holder 24 in a laterally reversed relation to that shown in Fig. 7. The shafts and their bearings can then be replaced in a laterally opposite relationship to that illustrated in said figure.

Figs. 9 and 10 show a construction essentially like that illustrated in Fig. 7 and the parts, corresponding to those shown in the latter figure, are indicated by the same, but primed, numerals. This construction differs from that of Fig. 7 in two particulars:

First: The bearings 21′ and 23′ for the input shaft 18′ are mounted directly in the bores formed for them in the wall of the casing and in the center bearing block 25′, instead of being mounted, one in the cap 22 and the other in the holder 24, as in Fig. 7, and the inner races of these bearings are mounted on bushings 42—42 which are pressed or shrunk on the shaft 18′.

Second: The change just described does away with the holder 24 and with the keys 27—27 so that both of the inner bearings for the coaxial shafts 18′ and 20′ rest directly in sockets formed in the block 25′. Also a spacing ring 43 is inserted between these inner bearings to hold them apart. This ring has a hole to receive a centering pin fixed in the bottom of the casing and another in the cap. The ring can be lifted out, if that should be desired.

The changes above mentioned make it possible to use antifriction bearings of the same size throughout the entire mechanism and this simplifies manufacturing and assembling operations, as well as changing from one hand to the other, or making any of the other changes above described. In this connection, however, it may be pointed out that most of the antifriction bearings used in the construction shown in Fig. 7 are of the same dimensions, the exception being the two bearings 21 and 23 which support the input shaft 18. These are smaller than the other antifriction bearings.

As will be evident from the foregoing, this invention provides an exceptionally simple, sturdy and reliable form of speed-reducing mechanism which, because of the interchangeability of the parts, can readily be adapted to suit a variety of conditions which it has never been possible to meet in a single speed reduction mechanism heretofore, so far as applicant has been able to learn. In addition, the expense of manufacture has been substantially reduced for the reasons above described.

While I have herein shown and described preferred embodiments of my invention, it is contemplated that the invention may be embodied in other forms without departing from the spirit or scope thereof.

Having thus described my invention, what I desire to claim as new is:

1. A speed reducing mechanism comprising a casing, input and output shafts, said shafts being

in axial alignment with each other, a countershaft in said casing parallel with and spaced laterally from said input and output shafts, cooperating gears of different diameters supported on said shafts for transmitting motion from said input to said output shaft through said countershaft and bearings in the walls of said casing supporting said shaft, all of said bearings having the same outside dimensions whereby they, together with their respective shafts and gears, may be interchanged, and said casing at points included between the bearings having extended body portions to provide spaces in which gears of relatively larger diameter are free to rotate when in an interchanged position, in which the gears are located on the shafts in positions of fixed abutment with their respective bearings and may, together with said bearings and shafts, be shifted end for end from a right-hand to a left-hand drive, and vice versa, including antifriction bearings supporting the adjacent inner ends of said input and output shafts, a bearing block rigid with said casing and having a socket in which the latter bearings are removably supported, and a removable spacer in said socket separating the bearings supported in it.

2. In a gearing assembly including a housing, said housing being formed with a plurality of aligned bores of uniform diameter for the arrangement of parallel interchangeable and reversible shafts supporting gearing, bearings for the ends of said shafts, the gears on said shafts being so positioned that lateral relative positioning of the shafts is required to permit proper intermeshing of the gears and the positioning of the gears from the inner sidewalls of the housing when said shafts are interchanged or reversed, interchangeable plugs for the aligned bores, said plugs including flanges abutting the outer faces of the housing and inwardly projecting annular abutments of different length, said abutments being of varied length and

adapted to extend into said bores for supporting and positioning the inner face of the shaft bearings, whereby said shaft bearings may with their shafts be fixed in variable positions laterally with respect to the sidewalls of the housing by an interchange of the plugs with projecting annular abutments of predetermined lengths, and means for securing the plugs in fixed position.

3. The structure of claim 2 characterized in that certain of the inwardly projecting annular abutments carried by the plugs are recessed at their inner extremities to receive portions of a bearing assembly.

4. The structure of claim 2 characterized in that central bearings are provided for at least one of the shafts, the central bearings being laterally shiftable.

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