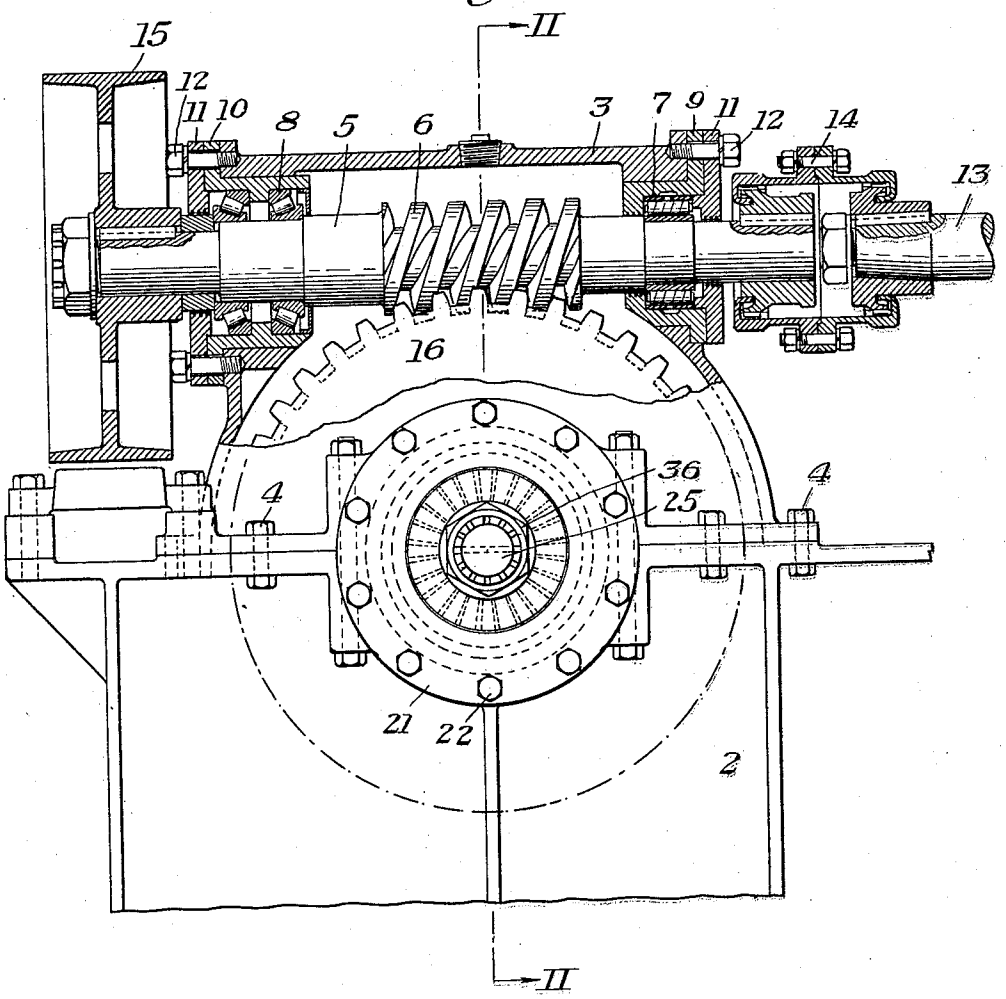
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WORM DRIVE

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Fig. 1.



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Fig. 2.

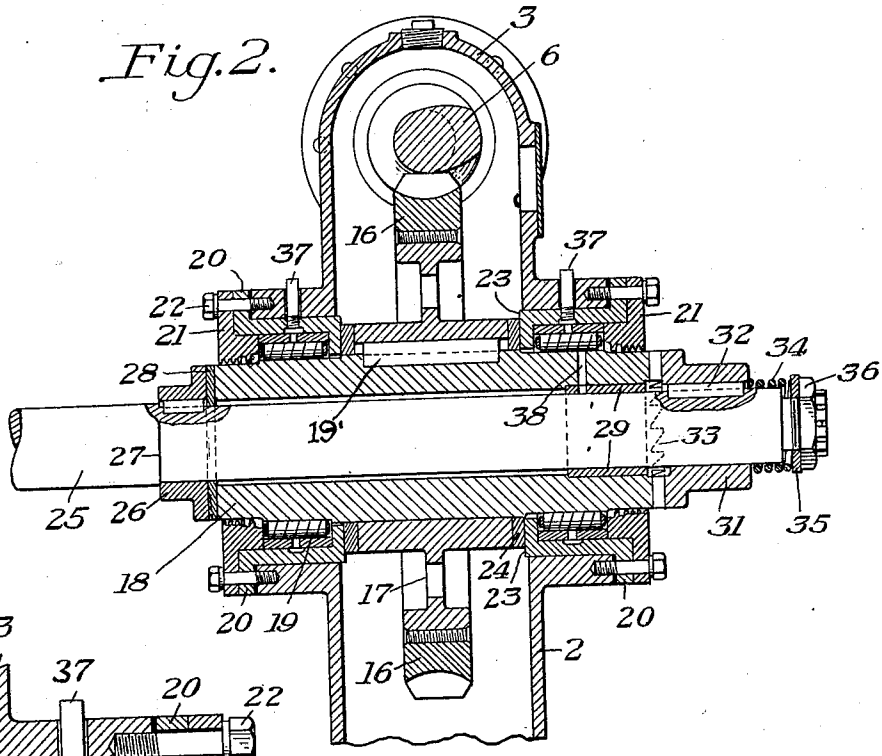


Fig. 3.

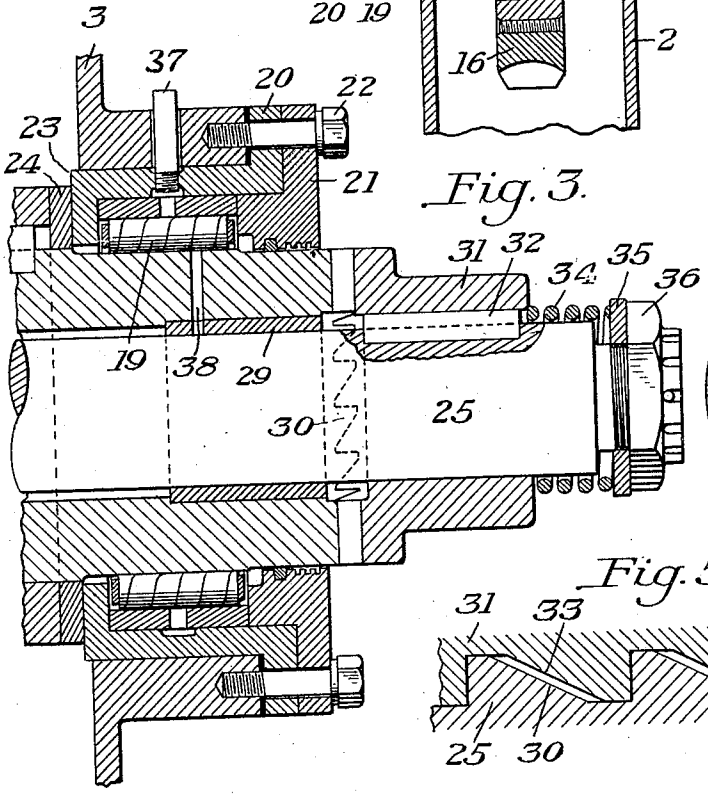


Fig. 4.

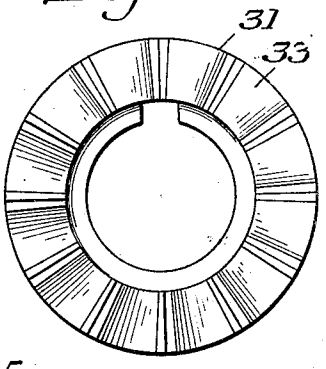
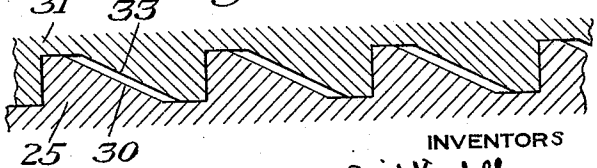


Fig. 5.



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UNITED STATES PATENT OFFICE

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WORM DRIVE

Application filed December 3, 1928. Serial No. 323,296.

This invention relates to worm drives and is particularly useful in connection with a ratchet mechanism, such as is employed in certain types of cranes, although it has numerous other applications.

Certain cranes, as for example soaking pit cranes, must be provided with a ratchet to prevent over-travel. The stiff leg of a soaking pit crane, for example, may actually lift the crane trolley from its rails after the stiff leg comes in contact with the top of the ingot in case no slip mechanism in the raising and lowering drive of the stiff leg is provided. In various other drives on cranes and like machinery a worm gear has numerous advantages over spur gear drives. In spur gear drives as heretofore employed on crane work two types of over-travel mechanisms have been employed. In one type a large master gear is made in two parts, one driving and one driven; one part being a ratchet member and the other part a pawl member. In the other type one member consists of a brake wheel, and a differential brake band is anchored to the other member. Both types of mechanism are cumbersome and inaccessible for inspection and repair. The first mentioned type is disadvantageous in that the pawl action depends on the action of non-adjustable springs and is noisy in operation. The second type mechanism is difficult to properly adjust and constantly requires readjustment. Furthermore, there is not provided a true positive drive in either direction.

It has heretofore been impractical to use a ratchet mechanism in connection with worm drives because of the necessity of maintaining accurate alignment for the worm wheel and worm. The ratchet mechanisms heretofore available could not be used with worms or worm wheels because the substitution of a worm wheel for the spur gear would necessarily result in an imperfect mechanism, the worm wheel being always likely to get out of alignment.

We provide a worm drive wherein the worm wheel is mounted on a sleeve and is restrained against axial movement. A shaft is extended through this sleeve and a ratchet connection is provided between the sleeve and the shaft. This construction is very compact and the worm wheel is always held in alignment. The mechanism is quiet in operation, provides a positive drive in one direction, is readily adjusted so that the load at which slipping in the opposite direction will occur may be nicely controlled, and may be readily incorporated in crane design as it requires a minimum of space.

In the accompanying drawings illustrating the present preferred embodiment of the invention,

Figure 1 is a side elevation partly broken away of a worm drive embodying our invention,

Figure 2 is a transverse section taken on the line II—II of Figure 1,

Figure 3 is a view to enlarged scale of a portion of Figure 2,

Figure 4 is an end view of the sleeve showing the ratchet teeth, and

Figure 5 is a developed view showing the ratchet teeth of the sleeve and of the cooperating ratchet member in engagement.

Figure 1 shows a frame member 2 forming part of a trolley structure, and serving as the lower half of a housing and bearing for the worm drive. It is surmounted by a housing 3 held in place by bolts 4. A worm shaft 5 having an integral worm 6 lies in the top of the housing 3. It is carried in bearings 7 and 8, which bearings are mounted in shells 9 and 10. The bearing 8 is a combined radial and thrust bearing.

Covers 11 lie over the shells 9 and 10 and the covers and shells are held in place by cap screws 12. One end of the worm shaft 5 is connected to the shaft 13 of a driving motor (not shown) by a coupling 14 of the Fast type. A brake drum 15 is mounted on the other end of the shaft.

The worm 6 meshes with a worm wheel 16, the teeth of which are formed on a rim carried by a central spider 17. The spider fits over a sleeve 18 and is connected thereto by a key 19′ so that the worm wheel and the sleeve must rotate together.

The sleeve 18 is journaled in roller bearings 19 carried by shells 20 lying in openings

formed in opposite sides of the housings 2 and 3. Covers 21 are provided for the shells and the covers and shells are held in place by cap screws 22.

The inner faces 23 of the shells 20 cooperate with thrust rings 24 to prevent axial movement of the worm wheel. The end faces of the hub of the spider 17 bear against the thrust rings 24.

The shaft to be driven is indicated at 25. Its end portion is reduced in diameter and extends through the sleeve 18. A flanged collar 26 lies against a shoulder 27 on the shaft and is keyed to the shaft. A thrust ring 28 lies between the collar and the left hand end face of the sleeve 18 as viewed in Figure 2.

Adjacent the right hand end of the sleeve 18, as viewed in Figure 2, there is provided a bearing 29 for the end portion of the shaft 25. The right hand end face of the sleeve 18 has ratchet teeth 30 formed thereon. The projecting end portion of the shaft is provided with a second sleeve 31 which is slidable on the shaft, but is splined thereto by a key 32. The sleeve 31 has ratchet teeth 33 thereon cooperating with the ratchet teeth 30. The sleeve 31 is backed by a compression spring 34, one end of which engages the rear face of the sleeve 31 and the other end of which engages a washer 35 backed by a castillated nut 36 on the end of the shaft 25.

The ratchet mechanism provides a positive drive in one direction and a frictional drive in the reverse direction. When a given resistance to rotation of the shaft 25 in the reverse direction is set up the sleeve 31 slides outwardly on the shaft 25 and the ratchet teeth 33 click over the ratchet teeth 30. Any chattering or vibration is confined to the ratchet parts and no misalignment of the worm wheel occurs, as its radial and thrust bearings are not subjected to any load by reason of the ratchet action.

Oil tubes 37 are provided for the bearings 19. The sleeve 18 and the bearing 29 are drilled as indicated at 38 so that lubrication of the bearing 19 will also serve to lubricate the shaft 25 at the bearing 29.

We have illustrated and described the present preferred form of our invention, but it is not limited to this form as it may be otherwise embodied within the scope of the following claim:—

We claim:

A worm drive, comprising a hollow casing with openings in opposite walls thereof, a shell lying in each opening, a sleeve extending through the shells and journaled therein, a worm wheel mounted on the sleeve, the shells having inner faces forming thrust bearings for preventing axial displacement of the worm wheel, a shaft extending through the sleeve, a ratchet connection between the sleeve and the shaft, and a thrust bearing between the sleeve and the shaft for resisting endwise forces set up by the ratchet connection.

In testimony whereof we have hereunto set our hands.

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