May 30, 1944. A. C. NOWLIN 2,350,248

DEVICE FOR OBTAINING DIRECTIONAL FORCE FROM ROTARY MOTION

Filed Nov. 30, 1942 2 Sheets-Sheet 1

Fig. 1

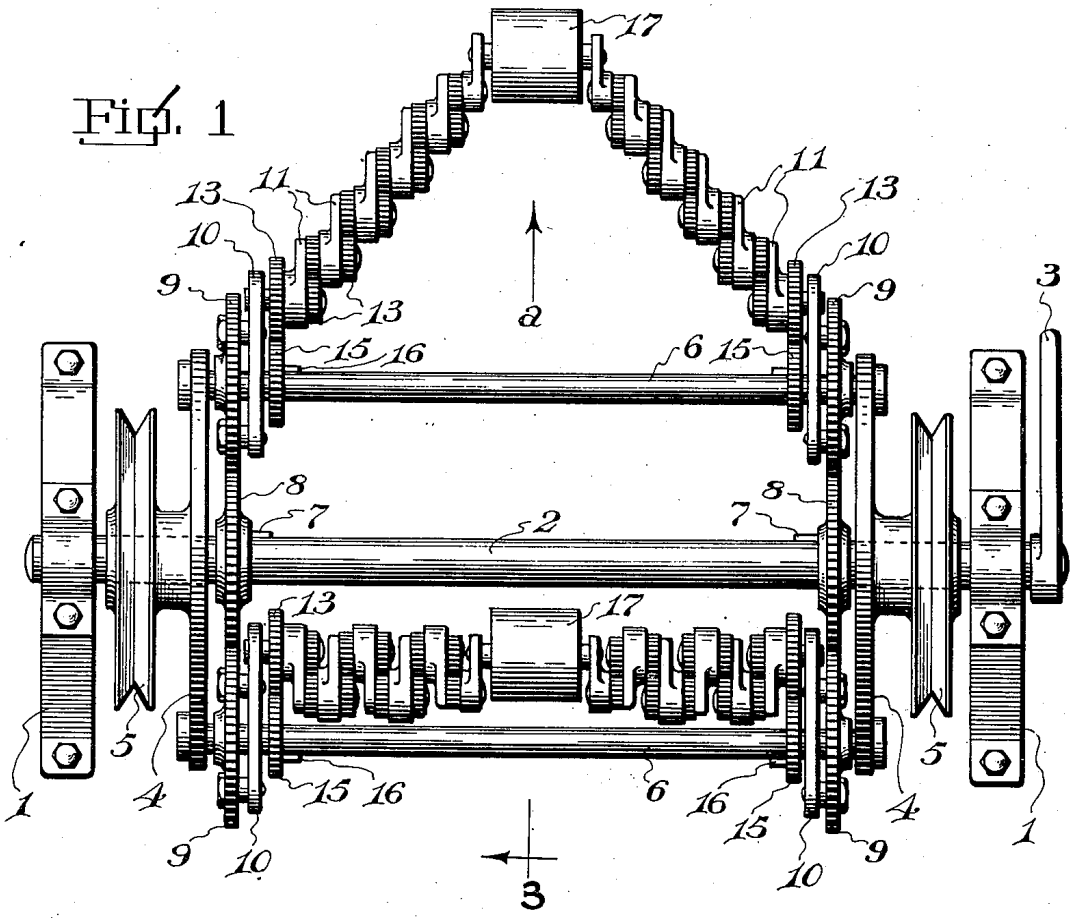

Fig. 2

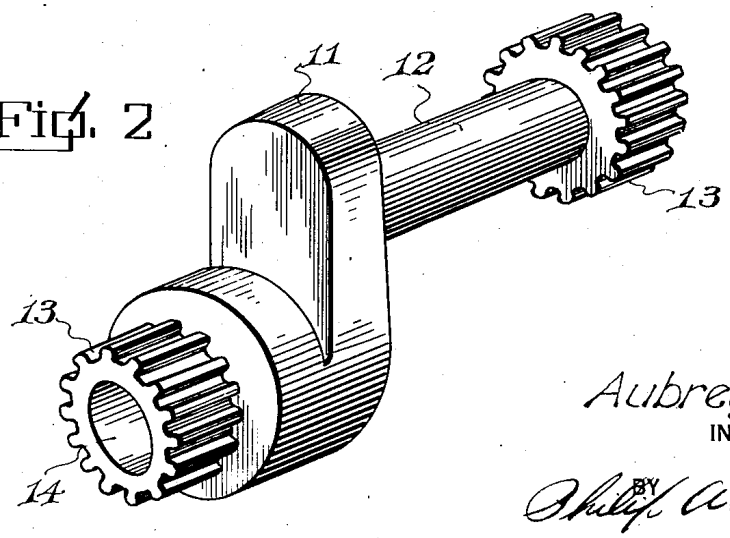

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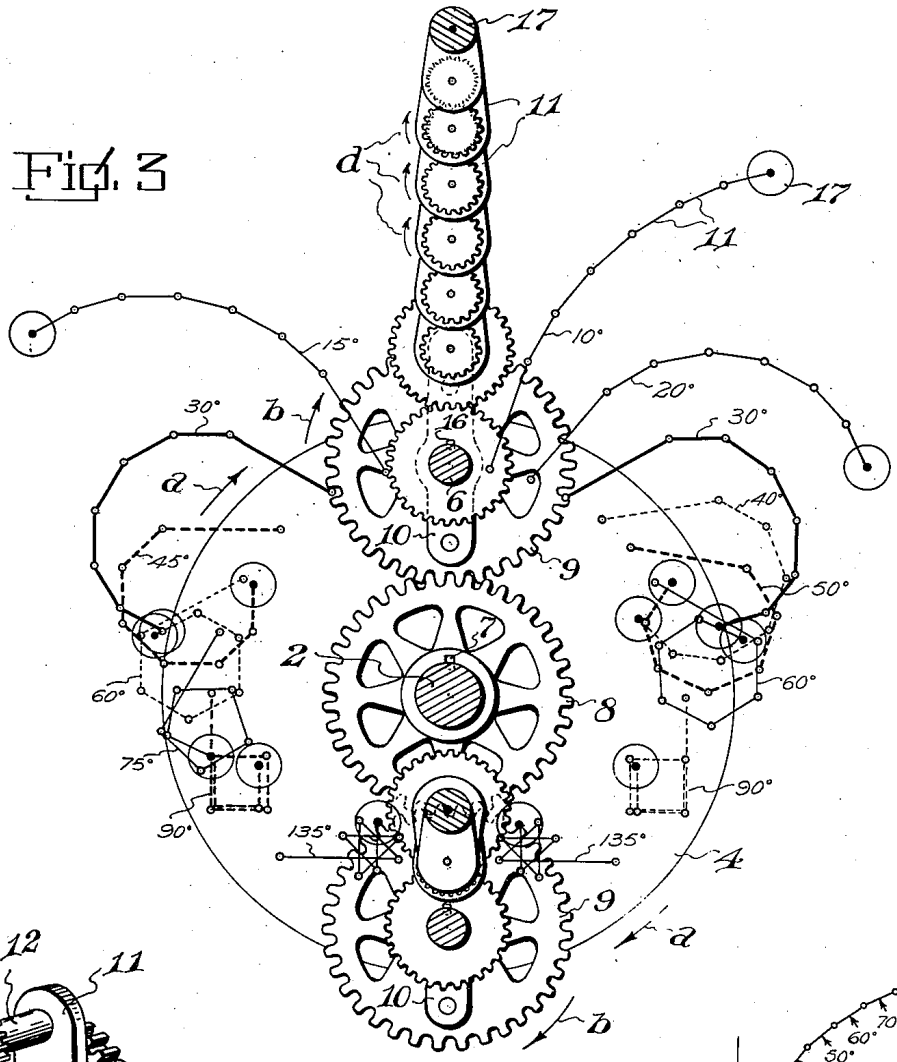
Fig. 3



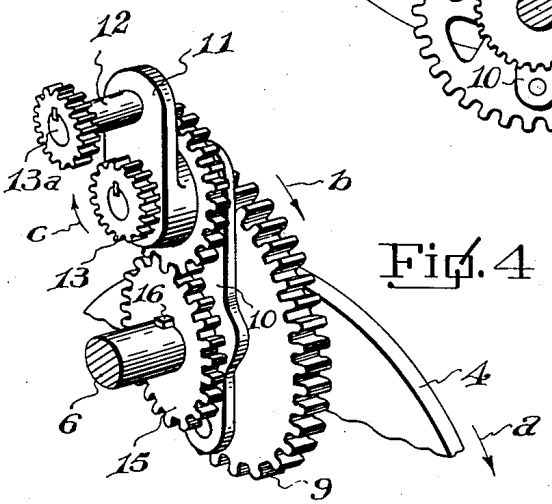


Fig. 4

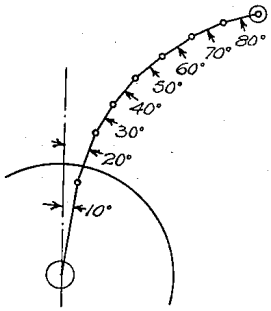


Fig. 5

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DEVICE FOR OBTAINING DIRECTIONAL FORCE FROM ROTARY MOTION

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Application November 30, 1942, Serial No. 467,356

6 Claims. (Cl. 74—61)

The invention relates to a power driven rotary device provided with means whereby the centrifugal force of the rotary device is utilized for imparting directional movement to the device as a whole and is particularly adapted for use in connection with vehicles or in any position where it is desired to use the same.

A further object is to provide the device with extensible and foldable members, extended and folded through a planetary gear system whereby the members will be extended to their full limit for imparting a directional throw in the direction desired, preferably at the top of the device and incident to the planetary gear system will gradually fold on the downward right rotation side of the device until the device is completely folded at the lower side of the device, thereby allowing maximum forward throw of the extended members at the upper side of the device. The members slowly unfold as they approach the upper extended position.

A further object is to provide the outer ends of the extensible members with weights for increasing the throw and power in the direction of bodily movement of the device.

A further object is to so proportion gear ratio of the planetary gearing whereby each foldable extensible arm will be fully extended at one side of the device and will be completely folded inwardly towards the center of the device gradually when it has moved 180 degrees, and will slowly unfold and extend progressively to full extension when it is moved the other 180 degrees. The full folding at the first mentioned 180 degrees bringing the folded arm to a point adjacent the axis of the device.

A further object is to provide a stationary non-rotatable shaft having operating discs rotatable thereon and also stationary gearing thereon and to form the arms from crank and gear members having a planetary movement in relation to each other for extending and folding the arms and planetary gears rotatable on the discs to opposite sides of the center shaft and meshing with the stationary gears on the center shaft for planetary movement in relation thereto and means for rotating the disc on the central shaft.

A further object is to provide means whereby the central shaft can be rotatably adjusted for extending the arms at any degree so that the direction of the straight movement may be varied according to the application of the device to various uses.

A further object is to so arrange the link and planetary gearing of the extensible and folding arms, for instance V-shaped, so that as the arms are folded and opened as the discs are rotated, the outer ends of the arms, with their weights, will at the point of complete folding be in axial alinement or transverse side by side position as they start the unfolding operation.

A further object is to provide a one to one gear ratio so that the arms, when in the folded position, would be in transverse registry with each other for insuring the proper balance.

With the above and other objects in view the invention resides in the combination and arrangement of parts as hereinafter set forth, shown in the drawings, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings:

Figure 1 is a view in elevation of the device showing the extended position of one of the arms and the folded position of the other arm.

Figure 2 is a detail perspective view of one of the cranks and their gears.

Figure 3 is a vertical transverse sectional view through the machine.

Figure 4 is a detail perspective view of a portion of one of the rotatable discs and part of the gear train mounted thereon.

Fig. 5 is a diagrammatic view of one of the arms in a partly extended position.

Referring to the drawings, the numeral 1 designates supporting brackets which may be secured to any structure it is desired to move in a straight line, for instance a vehicle or airplane. The brackets 1 are connected together by a central stationary shaft 2, which may be adjustably rotated, according to the direction of power desired, by a conventional lever 3.

Rotatably mounted on the stationary shaft 2 adjacent the ends of the shaft are operating discs 4, which are driven through the medium of pulleys 5. The pulleys 5 are belted to any suitable source of power for rotating the device as a whole.

Discs 4 are connected together by concentrically arranged shafts 6, which may be any number desired. Two shafts are shown for purposes of illustration and 2 foldable arms. Keyed at 7 on the stationary shaft 2 are stationary gears 8, which mesh with the gears 9, which gears 9 are rotatably mounted on the shafts 6, and are provided with brackets 10 on the inner sides of the gears 9 for supporting the foldable arms. It will be seen that as the discs 4 are rotated the gears 9 will have a planetary movement in relation to the gears 8, and at the same time the brackets 10 will rotate with the gears 9.

Each foldable extensible arm is formed from a plurality of crank members 11, similar to that shown in Figure 2, and each crank member at the outer ends of its arms 12 are provided with gears 13 which mesh with similar gears carried by adjacent crank members as clearly shown in Figure 1. One arm of each crank member extends through the integral gear 13 at one end of the crank and the bearing 14 through the main body of the crank arm to a position where all of the gears 13 mesh. The gear 13 on the small shaft of the crank is preferably placed in position after the assembling operation. It will be noted with all of the gears of the various cranks in mesh and the V-shaped arrangement of each foldable and extensible arm, that there is a planetary movement of the gears in relation to each other as the discs 4 are rotated, and at the same time there is a folding operation, according to the setting of the shaft 2. The outer gears 13 of the diverging sides of the extensible arms mesh with stationary gears 15, keyed at 16 to the shafts 6, therefore it will be seen that there is a planetary gear train from the center of the device outwardly, thence through the various cranks to the weights 17 of the extensible arms. The weights are utilized to impart momentum directionally from the device incident to the centrifugal action of the rotating device.

Referring to Figure 3, it will be seen that when the disc 4 is rotated in the direction of the arrow *a*, the stationary disc 8 will cause the gear 9, which is rotatably mounted on one of the shafts 6, to rotate in the direction of the arrow *b*, and as the bracket 10 is fixed and rotatable with the gear 9, the gear 13 carried by the stub shaft 13*a* will rotate in the direction of the arrow *c*, incident to the planetary movement of the crank gear 13, which meshes with the stationary gear 15 carried by the non-rotatable shaft 6, hence all of the crank gears 13 of the extensible V-shaped arms will be rotated in the direction of the arrows *d*, as shown in said figure. The gear ratio is preferably one to one, hence during a complete rotation of each extensible arm, the arm is folded inwardly during the first 180 degrees of movement until the various cranks are in substantially a side by side alinement as shown at the lower side of Figure 1 and the weight adjacent the axis of the device so that the directional throw of the fully extended arms at the top of the device will directionally move the device as a whole. During the next 180 degrees of movement, the arms will slowly unfold and be fully unfolded as they reach the top of the device. This folding and unfolding operation is shown diagrammatically in Figure 3, and two arms are shown in detail, and for purposes of illustration only, as it is obvious any number of arms may be used, and the diagrammatic showing shows the link arrangement and curvature of each arm at various degree positions entirely around the discs. It will be noted that as each arm approaches the upper side of the device and the straightening out position, the weighted ends of the arms will impart a directional throw to the right, and as the arms pass the center there is a whipping action which increases the directional movement. This directional movement, according to the showing in Figure 3, is to the right, however by adjusting rotatably the stationary shaft 2 the directional movement may be adjusted to a vertical or any other position, according to the use of the device.

It is obvious that when the device is applied to a motor vehicle a forward or rearward movement is necessary. By arranging the various gears and cranks, and proportioning the same as shown, it will be seen that the V-shape arrangement will allow a folding of the arms inwardly to a position where all of these parts are in registry with each other and with the outer crank members, thereby rapidly bringing the weight of the arms towards the center of the device after the momentum has been utilized for imparting directional movement to the device, and the folding action starts immediately after the maximum throwing power is obtained from each arm.

Referring to the diagrammatic position showings in Figure 3, each showing has degree position markings thereon for the position of the various links and shape of the arms when the axis of gears 15 reaches each degree position. These degree markings are figured outwardly and downwardly to the right and left of the top center, and the various links correspond to the cranks 11. The arrangement and gearing of arms provides for eccentricity at one constant point of direction, which is accomplished by folding certain parts of the unit, that is the arms, to the center on one side, and causing them to extend to the opposite side. This is clearly illustrated in Figure 3. The folding action, as well as the unfolding is gradual and constant and each joint on each arm is not only carried a given degree by the joint closest the center but develops a light degree in addition which is transmitted to the next joint, and so on to the outer end of each arm. In other words the further the joint is from the inner end of the arm the quicker its movement.

From the above it will be seen that a device is provided whereby rotary movement may be converted into directional by the slow folding and unfolding or whipping of power arms carried by the device. Also means provided whereby directional movement may be varied.

The invention having been set forth what is claimed as new and useful is:

1. A machine for obtaining directional movement from rotary, said machine comprising a stationary shaft, discs rotatably mounted on said shaft, auxiliary shafts spaced outwardly from the stationary shaft, extensible foldable inertia arms carried by the auxiliary shafts and adapted to be extended at predetermined points as the discs are rotated, and to be gradually folded toward the axis of the stationary shaft after passing the directional point, said extensible members being formed from a plurality of cranks pivotally connected, gear connections between said cranks, gears rotatably mounted on the auxiliary shafts, gears fixed against rotation on the stationary shaft and meshing with the gears on the auxiliary shafts, members carried by the rotatable gears on the auxiliary shafts and to which cranks of the arms are pivoted, the inner cranks of the arms having their gears in mesh with stationary gears on the auxiliary shafts, all of said gearing having a planetary movement whereby the arms are folded and then extended to full length during a complete revolution of the discs.

2. A device as set forth in claim 1 wherein the gear ratio is one to one.

3. A device as set forth in claim 1 including means for rotatably adjusting the stationary shaft for varying the degree at which the arms

are extended, thereby allowing selective directional movement.

4. A device as set forth in claim 1 wherein the meshing gears and cranks forming the extensible foldable arms are arranged whereby the arms are V-shaped in elevation.

5. A device as set forth in claim 1 wherein the arms are V-shaped in elevation when extended and terminate in weight members.

6. A device as set forth in claim 1 wherein the meshing gears and cranks forming the arms when extended are in inward and outward step relation in different transverse planes, said gearing of the arms being so proportioned whereby said cranks and gears will be in longitudinal alined arrangement inwardly when the arms are fully folded after the travel of the arms a predetermined distance.

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