April 3, 1956 J. A. WAKEFIELD 2,740,307

ALTERNATELY DRIVEN SHAFTS

Filed Oct. 3, 1951 4 Sheets-Sheet 1

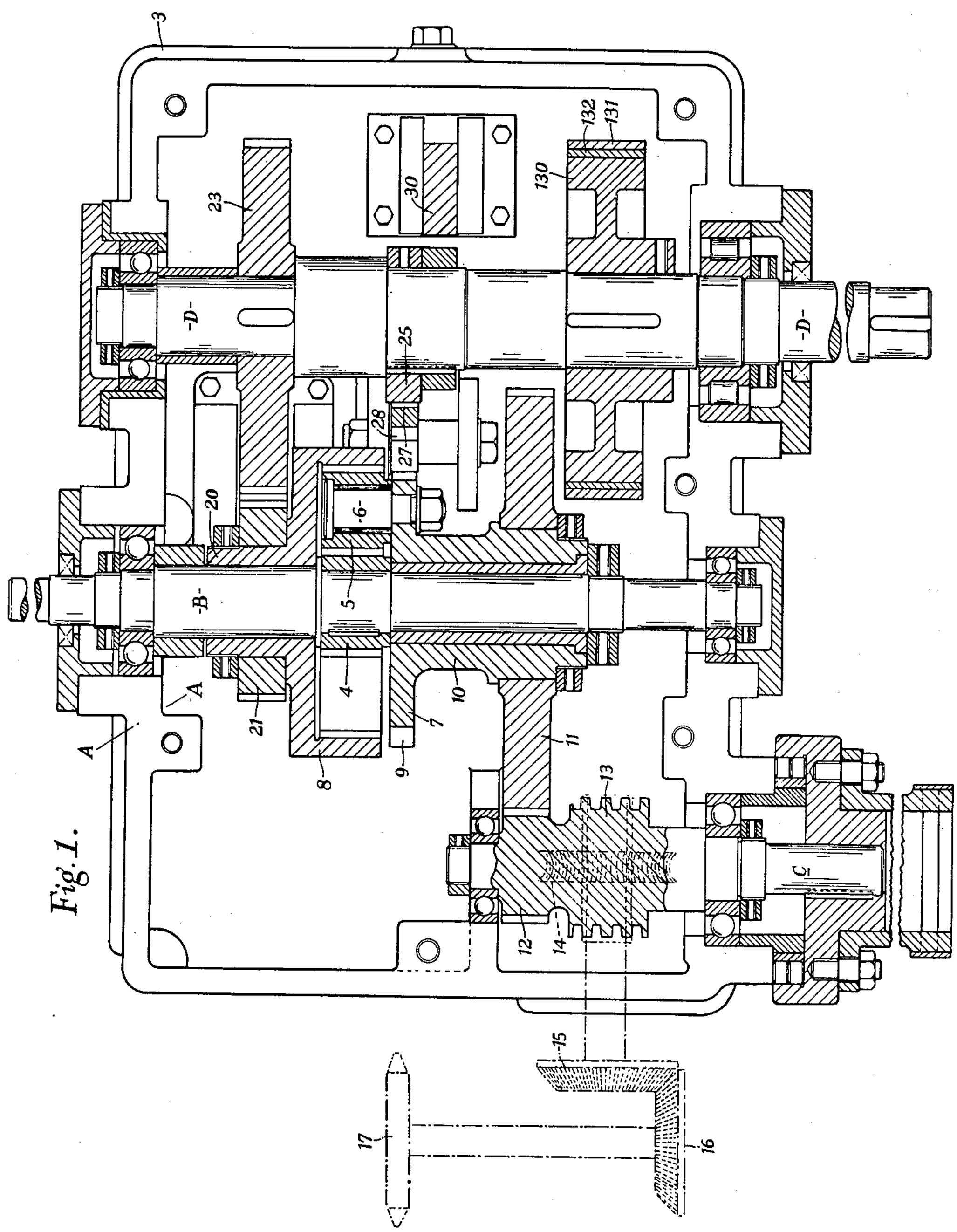

Fig. 1.

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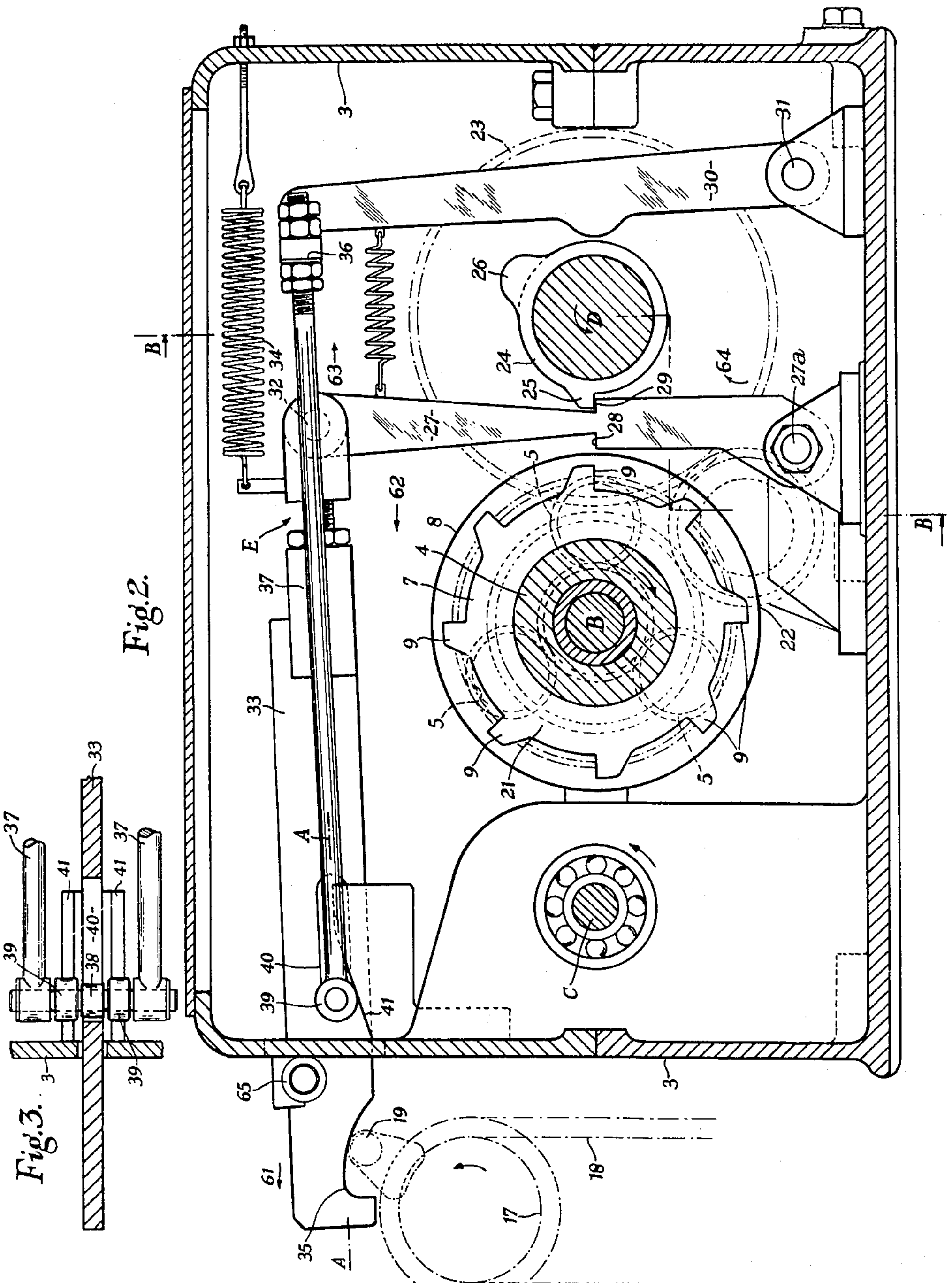

Fig.2.

Fig.3.

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Fig. 4.

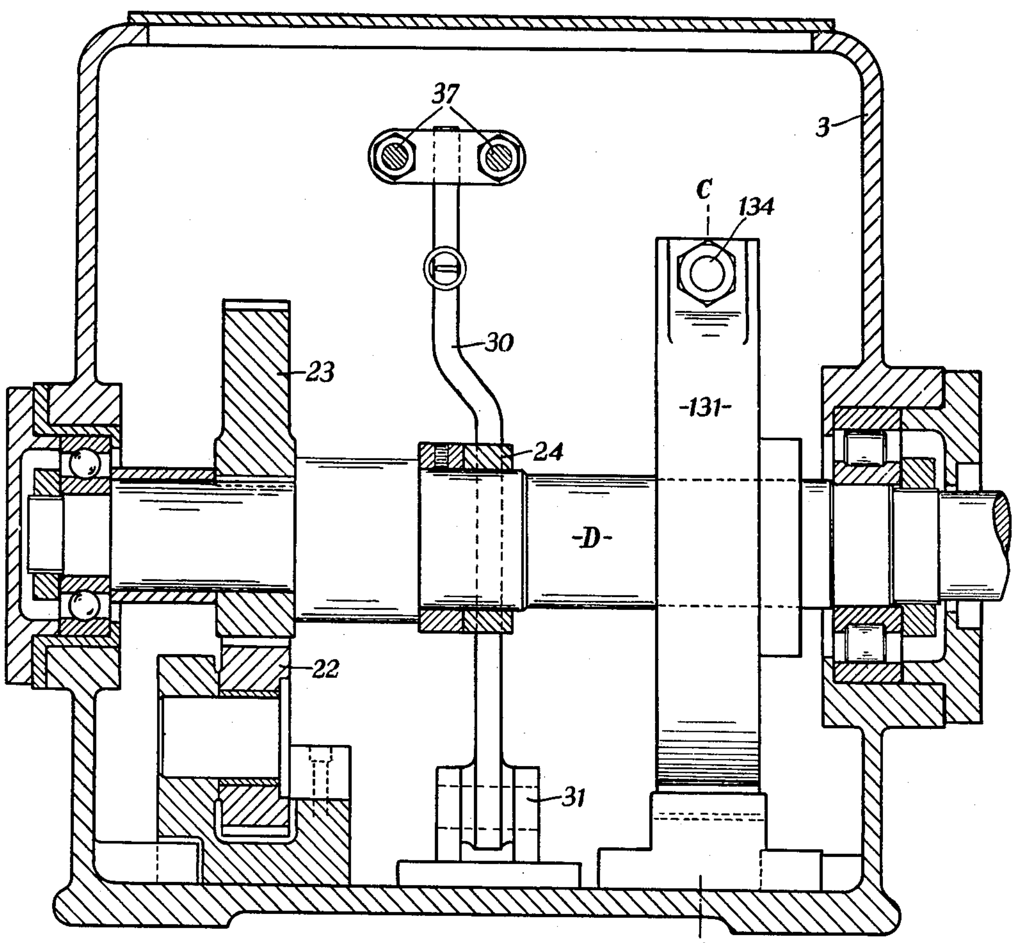

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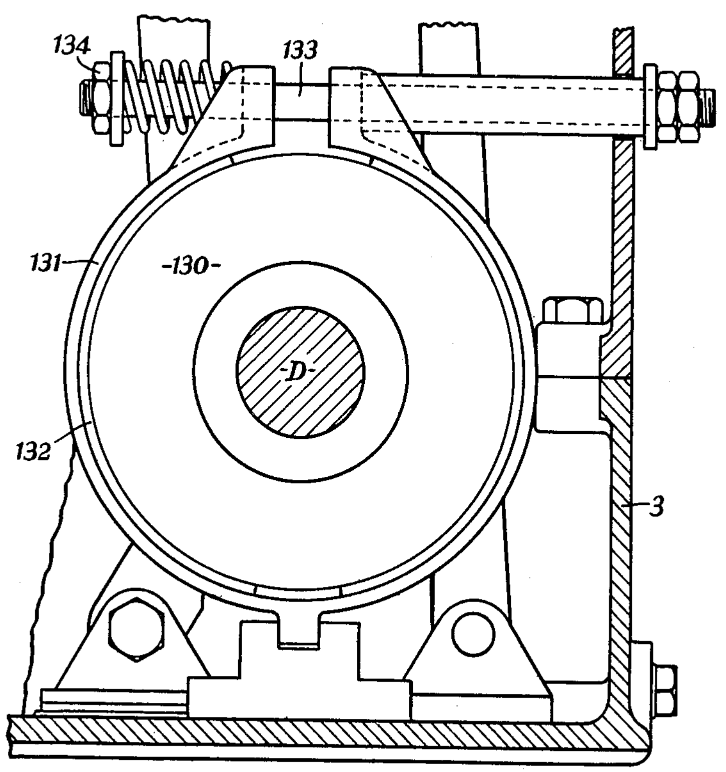
Fig.5.



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ALTERNATELY DRIVEN SHAFTS

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Application October 3, 1951, Serial No. 249,586

10 Claims. (Cl. 74—674)

This invention has reference to a machine for manufacturing wire fabric or so called "chain link fabric" of quadrangular or square mesh and which is particularly, although not exclusively, used for fencing.

The invention concerns a machine of the kind in which a length of wire, or two lengths of wire fed from two sources are wound into zig-zag form on a flat forming bar or blade rotating in a stantionary worming coil or so called "giraffe" and the wound wire is interlinked or interlaced with the last row of the chain link fabric being made. In this machine, provision is made to stop rotary motion of said forming bar after interlacing is effected and a single revolution shaft is then brought into operation and drives mechanism adapted to sever the interlaced wire from the coiled supply and also to knuckle or turn over the sharp barbed wire ends formed by the severing operation and which are located at the side edges of the fabric. The wire fabric is advanced in a step-by-step motion and the operations of coiling and interlacing and then severing and turning over of the barbs take place in automatically controlled cycles.

A known driving mechanism for performing these operations automatically comprises a driving shaft, a former blade shaft which is separate from the driving shaft and a single revolution shaft driven from the main shaft for actuating the other parts of the machine operating to produce the fabric, the operation of the former blade and the single revolution shaft being under the control of a clutch on the main shaft which permits the former blade shaft and the single revolution shaft to come into operation alternately, the operation of the clutch being itself under control of a trip mechanism driven from the main shaft.

One of the objects of the present invention is to provide an improved driving mechanism for controlling the cycles of the machine.

According to the present invention, a machine of the kind hereinbefore specified is provided with an epicyclic gear train for driving the weaving spindle and the single revolution shaft and a control mechanism combined with the epicyclic gear train is adapted to co-operate therewith in such a manner as to cause automatically the drive to be transmitted alternately to the weaving spindle and the single revolution shaft and to hold one of them static while the other is in motion.

In carrying the invention into effect, the epicyclic gear train comprises a sun pinion on a driving shaft, planet pinions on an externally toothed planet carrier and an internally toothed annulus engaged by the planet pinions, the planet carrier and the toothed annulus being rotatably mounted on the driving shaft and being adapted to drive respectively the weaving spindle and the single revolution shaft.

The control mechanism comprises a system of levers including a spring loaded control lever provided with abutments adapted alternately to positively engage the toothed planet carrier, and a toothed dog on the single revolution shaft, said control lever being disconnected

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from the dog and connected to the planet carrier by a moving abutment driven from the weaving spindle drive and said lever being disconnected from the planet carrier and connected to the dog by a tripping mechanism. The tripping mechanism incorporates a trip lever moved by a cam on the dog, said lever being connected to a transverse lever of the system in such a manner that the transverse lever is lifted out of engagement with the abutment. The transverse lever is raised by a ramp and roller co-operation which transmits the movement through a slot in the said lever engaged by means of a pin and slot connection between the transverse lever and the connection. The moving abutment is on a chain driven through gearing from the weaving spindle.

A satisfactory embodiment of the invention disclosing a driving mechanism in a machine, for manufacturing such wire fabric is illustrated by way of example on the accompanying drawings:

Fig. 1 is a longitudinal section of the power transmission.

Fig. 2 is a transverse section of Fig. 1.

Fig. 3 is a scrap section of Fig. 2 taken on dotted line A—A.

Fig. 4 is a diagrammatic section taken on the dotted line B—B, Fig. 2, and

Fig. 5 is a sectional detail of Fig. 6 taken on the dotted line C—C.

The machine is designed to manufacture wire fabric or so called "chain link fabric" of square or quadrangular mesh. This fabric consists of interlaced or interlinked zig-zag wires (52, 53) and is of indeterminate length, whereas the width is determined by the manufacturer in relation to trade requirements; a common and satisfactory width of such fabric for use as field fencing is of approximately six feet.

The driving mechanism includes a gear box 3 supporting in suitable bearings the driving shaft B, the weaving spindle C and the single revolution shaft D, all arranged in parallel order and longitudinally of the machine. The shaft B drives epicyclic gearing comprising a sun pinion 4 fast on the shaft B, planet pinions 5 mounted on radial stub shafts 6 fast on a circular planet carrier 7 and an internally toothed annulus 8. The planet carrier 7 is provided with peripheral teeth 9 and is mounted on the shaft B by means of a loose sleeve 10. The sleeve 10 drives through spur gearing 11, 12, the weaving spindle C and a worm-wheel drive 13, 14 from the spindle C, via bevel gearing 15, 16, transmits motion to a sprocket 17 driving a chain 18 carrying an abutment 19 and passing over another sprocket (not shown).

The toothed annulus 8 is carried by a sleeve 20 loosely mounted on the shaft B, and a pinion 21 fast on the sleeve 20 transmits through an intermediate wheel 22 motion to a pinion 23 fast on the single revolution shaft D.

Fast on the single revolution shaft D is a dog 24 having a tooth 25 and a cam form 26, the dog 24 together with the toothed planet carrier 7 lying close to a control lever 27 of the mechanism E. The control lever 27 is rockable in a vertical plane about an axis 27*a* and is provided with two shoulders 28, 29; a trip lever 30 rockably mounted in a vertical plane about an axis 31, lies in the path of the dog 24. The upper end of the control lever 27 is pivoted at 32 to one end of a transverse lever 33 of the control mechanism E, this lever 33 being loaded by a tension spring 34 which urges the lever 33 towards the right of the gear box 3 (Fig. 2). The other end of the lever 33 has a hook 35 projecting outside the box 3 and in the path of the abutment 19. The upper end of the trip lever 30 is connected at 36 to ends of a pair of links 37 whose other ends carry co-axial rollers 38, 39. The roller 38 engages a longitudinal slot 40 in the lever 33 and the rollers 39 ride on a fixed ramp 41 on the inside of the box 3.

In the position occupied by the parts of the transmission mechanism A shown in Figs. 1 and 2, the control mechanism E is holding the single revolution shaft D stationary by the co-acting engagement of the shoulder 29 with the tooth 25. Therefore, the transmission from the shaft B is through the sun pinion 4, planet pinions 5, planet carrier 7, sleeve 10 and gearing 11, 12 to the weaving spindle C and the sprocket 17. It will be appreciated that during this cycle of operations, the toothed annulus 8 and its gearing 21, 22, 23 is static and the planet pinions 5 idle around the then stationary toothed annulus 8.

It will be seen from Fig. 2 that the moving abutment 19 is about to engage the hook 35 of the lever 33 and when engagement takes place the abutment 19 transmits movement to the lever 33 in the direction of the arrow 61. This operation causes the lever 33 to impart pivotal movement to the control lever 27 in the direction of the arrow 62 and simultaneously disengages the shoulder 29 from the tooth 25 on the dog 24 and engages the shoulder 28 with a tooth 9 on the planet carrier 7. This operation takes place quickly and with precision and as the planet carrier 7 is now rendered static, the drive to the weaving spindle C and the sprocket 17 stops and the single revolution shaft D is driven from the shaft B from the epicyclic gearing by the sun pinion 4 transmitting motion to the planet pinions 5 and thence to the toothed annulus 8, its sleeve 20, pinion 21 and wheels 22, 23.

The turning of the single revolution shaft D is employed to carry out automatically several important operations in the machine, and these operations will be specifically referred to in the further description of the machine and in its operation.

The revolution of the single revolution shaft D is controlled initially by the cam 26 on the dog 24 in the following manner: as the cam 26 is turned in the direction indicated (Fig. 2), it co-acts with the trip lever 30 moving it clockwise. The rods 37 connecting the trip lever 30 with the rollers 38, 39 are simultaneously moved in the direction of the arrow 63 and the rollers 39 ride up the ram 41. As the co-axial roller 38 is engaging the slot 40 in the lever 33, the latter is lifted by the roller ramp cooperation 38, 41 about the pivotal connection 32, thus raising and releasing the hooked end 35 of the lever 33 from engagement with the abutment 19, whereupon the energy of the tension spring 34 acting on the lever 33 pulls the lever 33 to the right and simultaneously tilts the control lever 27 in the direction of the arrow 64 so as to cause the shoulder 29 to engage the tooth 25, as shown in Fig. 2 and arrest the single revolution shaft D. Thus, the planet carrier 7 can be driven by the epicyclic train as before described and the weaving spindle C will be driven. Under this arrangement, the weaving spindle C and the single revolution shaft D are alternately driven from the continuously rotating shaft B.

Associated with the single revolution shaft D is a co-axial friction loading device (Figs. 4, 5) consisting of a brake drum 130 fast on the shaft D and running in a split band 131 having a friction lining 132. The tension on the band 131 can be adjusted by means of a spring loaded screw and bolt 133, 134.

The function of the friction device is to equalise the load on the single revolution shaft D with that of the wire load on the weaving spindle C.

A rubber buffer 65 is provided on the lever 33 and adapted to engage the gear box 3 so as to avoid or minimise the possibility of the control lever vibrating or chattering.

What I claim is:

1. In a machine the combination of a rotatable member; a single revolution shaft, a tooth and a trip member on said shaft; an epicyclic driving gear having a peripherally toothed planet carrier for driving alternately said rotatable member and said single revolution shaft; and automatically operating control means for said planet carrier and said single revolution shaft for effecting said alternate driving and comprising a spring loaded control lever having a pair of shoulders adapted to engage alternately with said toothed planet carrier and said tooth, an operating lever connected to said control lever, said operating lever being adapted to be shifted by a moving abutment of the machine in its cycle for engaging one shoulder with said toothed planet carrier and disengaging the other shoulder from said tooth, a trip lever adjoining said trip member, and an interconnecting mechanism between said trip lever and said operating lever for restoring said control lever into engagement with said tooth.

2. In a machine the combination of a rotatable member; a single revolution shaft; a driving shaft; an epicyclic gear train comprising a sun pinion rigidly secured to said driving shaft; a toothed annulus rotatably mounted on said driving shaft; a planet carrier rotatably mounted on said driving shaft; a plurality of planet pinions rotatably mounted on said planet carrier, said planet pinions meshing with said sun pinion and said toothed annulus, means connecting said planet carrier to said rotatable member to cause said rotatable member to rotate when said planet carrier rotates with said driving shaft; means connecting said toothed annulus to said single revolution shaft to cause said single revolution shaft to rotate when said toothed annulus rotates with said driving shaft; and control means engageable with said planet carrier and said second revolution shaft for holding said planet carrier and said single revolution shaft alternately stationary.

3. In a machine the combination of a rotatable member; a single revolution shaft; a driving shaft; an epicyclic gear train comprising a sun pinion rigidly secured to said driving shaft; a toothed annulus rotatably mounted on said driving shaft; a planet carrier rotatably mounted on said driving shaft; a plurality of planet pinions rotatably mounted on said planet carrier, said planet pinions meshing with said sun pinion and said toothed annulus; means connecting said planet carrier to said rotatable member to cause said rotatable member to rotate when said planet carrier rotates with said driving shaft; means connecting said toothed annulus to said single revolution shaft to cause said single revolution shaft to rotate when said toothed annulus rotates with said driving shaft; and control means engageable with said planet carrier and said single revolution shaft for holding said planet carrier and said single revolution shaft alternately stationary, said control means comprising a pivoted control lever having a pair of shoulders, one of said shoulders being adapted to engage one tooth of a plurality of teeth provided on said planet carrier to hold said planet carrier stationary, the other of said shoulders being adapted to engage a tooth provided on said single revolution shaft to hold said single revolution shaft stationary, and means for moving said control lever alternately in opposite directions to engage said shoulders alternately with said teeth to hold said planet carrier and said single revolution shaft alternately stationary.

4. In a machine the combination of a rotatable member; a single revolution shaft; a driving shaft; an epicyclic gear train comprising a sun pinion rigidly secured to said driving shaft; a toothed annulus rotatably mounted on said driving shaft; a planet carrier rotatably mounted on said driving shaft; a plurality of planet pinions rotatably mounted on said planet carrier, said planet pinions meshing with said sun pinion and said toothed annulus; means connecting said planet carrier to said rotatable member to cause said rotatable member to rotate when said planet carrier rotates with said driving shaft; means connecting said toothed annulus to said single revolution shaft to cause said single revolution shaft to rotate when said toothed annulus rotates with said driving shaft; and control means engageable with said planet carrier and said second revolution shaft for holding said planet carrier and said single revolution shaft alternately stationary, said control means com-

prising a pivoted control lever having a pair of shoulders, one of said shoulders being adapted to engage one tooth of a plurality of teeth provided on said planet carrier to hold said planet carrier stationary, the other of said shoulders being adapted to engage a tooth provided on said single revolution shaft to hold said single revolution shaft stationary, and means for moving said control lever alternately in opposite directions to engage said shoulders alternately with said teeth to hold said planet carrier and said single revolution shaft alternately stationary, said means for moving said control lever comprising an operating lever connected to said control lever and being movable periodically by a moving abutment of the machine to engage one shoulder with a tooth of said planet carrier and simultaneously disengage the other shoulder from the tooth of said single revolution shaft, a trip lever movable by a cam mounted on said single revolution shaft, and means connecting said trip lever to said operating lever for periodically moving said control lever to engage said other shoulder with the tooth of said single revolution shaft and simultaneously disengage said one shoulder from a tooth of said planet carrier.

5. The device of claim 1, and an adjustable brake means for said single revolution shaft to equalize the loads on said single revolution shaft and said rotatable member.

6. The device of claim 2, and an adjustable brake means for said single revolution shaft to equalize the loads on said single revolution shaft and said rotatable member.

7. The device of claim 3, and an adjustable brake means for said single revolution shaft to equalize the loads on said single revolution shaft and said rotatable member.

8. The device of claim 4, and an adjustable brake means for said single revolution shaft to equalize the loads on said single revolution shaft and said rotatable member.

9. In a machine having a rotatable member; a single revolution shaft; a tooth and a trip member on said shaft; an epicyclic driving gear having a peripherally toothed planet carrier for driving alternately said rotatable member and said single revolution shaft; and automatically operating control means for said planet carrier and said single revolution shaft for affecting said alternate driving and comprising a spring loaded control lever having a pair of shoulders adapted to engage alternately with said toothed planet carrier and said tooth, an operating lever connected to said control lever, said operating lever being adapted to be shifted by a moving abutment of the machine in its cycle for engaging one shoulder with said toothed planet carrier and disengaging the other shoulder from said tooth, a trip lever adjoining said trip member, and an interconnecting mechanism between said trip lever and said operating lever for restoring said control lever into engagement with said tooth.

10. In a machine the combination of a rotatable member; a single revolution shaft; a tooth and trip member on said shaft; an epicyclic driving gear having a peripherally toothed planet carrier for driving alternately said rotatable member and said single revolution shaft, automatically operating control means for said planet carrier and said single revolution shaft for affecting said alternate driving comprising a spring loaded control lever having a pair of shoulders adapted to engage alternately with said toothed planet carrier and said tooth, an operating lever connected to said control lever, said operating lever being adapted to be shifted by a moving abutment of the machine in its cycle for engaging one shoulder with said toothed planet carrier and disengaging the other shoulder from said tooth, a trip lever adjoining said trip member, and an interconnecting mechanism between said trip lever and said operating lever for restoring said control lever into engagement with said tooth; and an adjustable brake on said second revolution shaft for equalizing the loads on said single revolution shaft and said rotatable member.

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