Feb. 2, 1926.

1,571,653

K. O. B. TEXTORIUS

MACHINE OPERATING MECHANISM

Filed Sept. 27, 1921

7 Sheets-Sheet 1

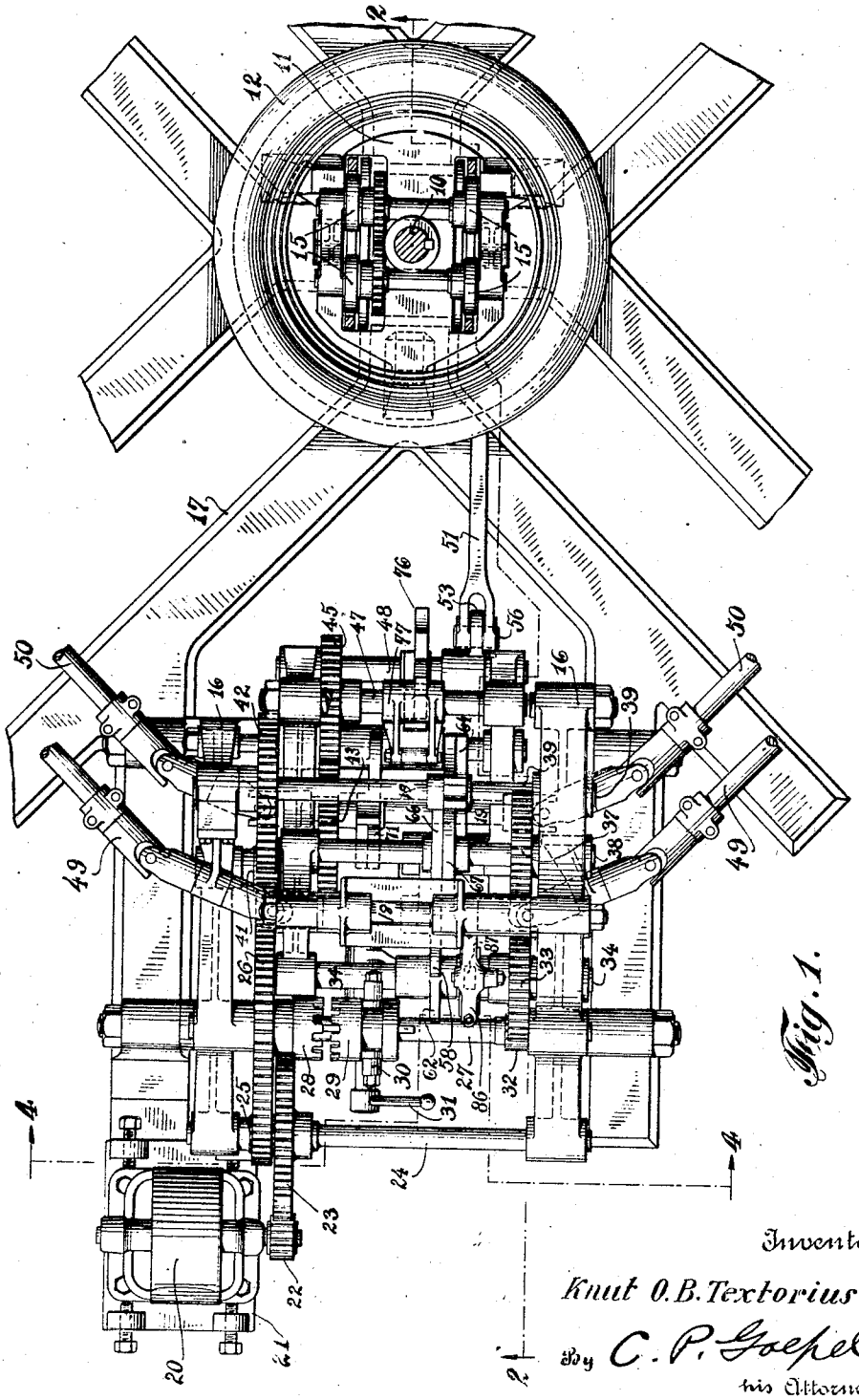


Fig. 1.

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his Attorney

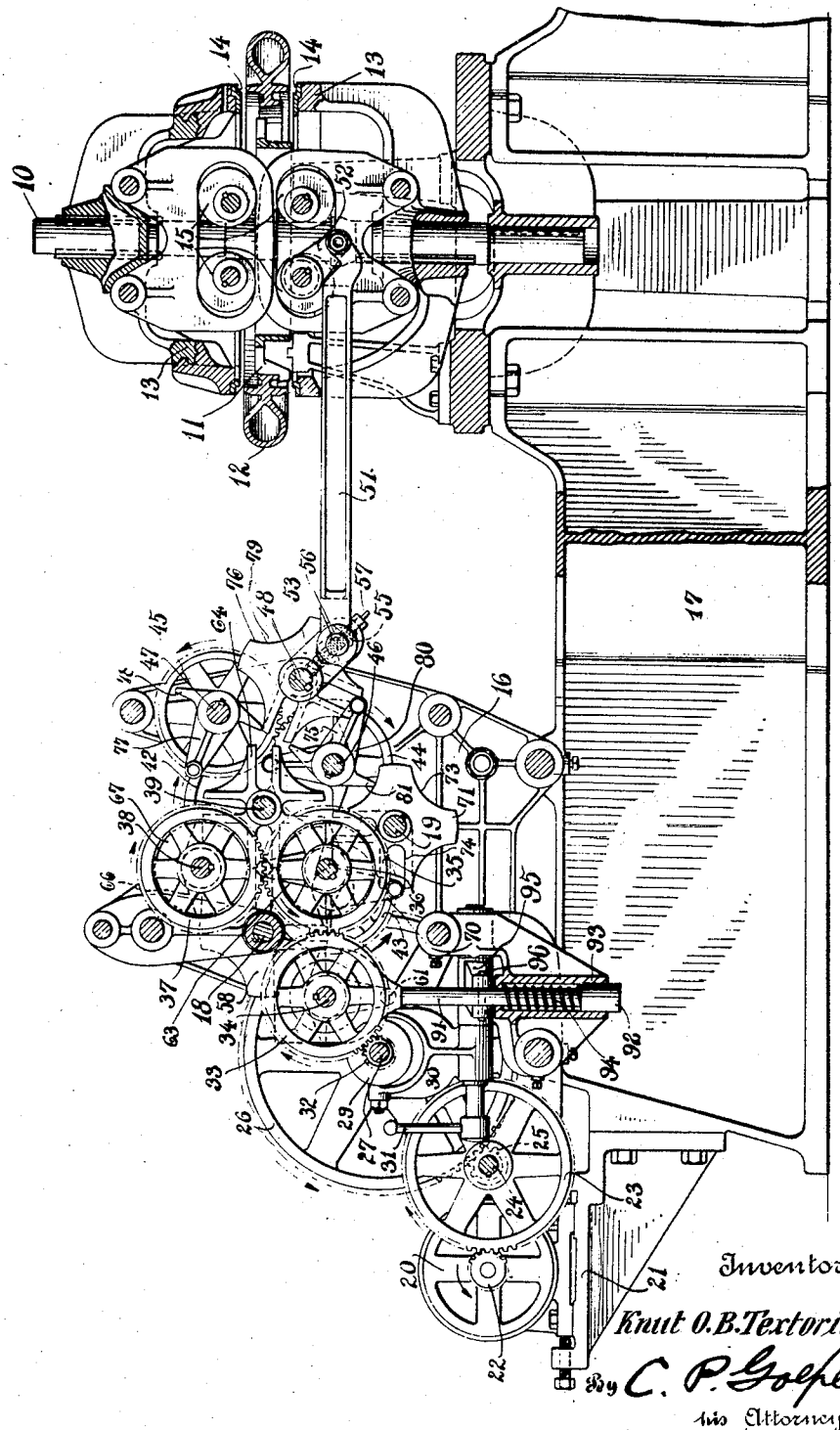
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MACHINE OPERATING MECHANISM

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Fig. 2.



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MACHINE OPERATING MECHANISM

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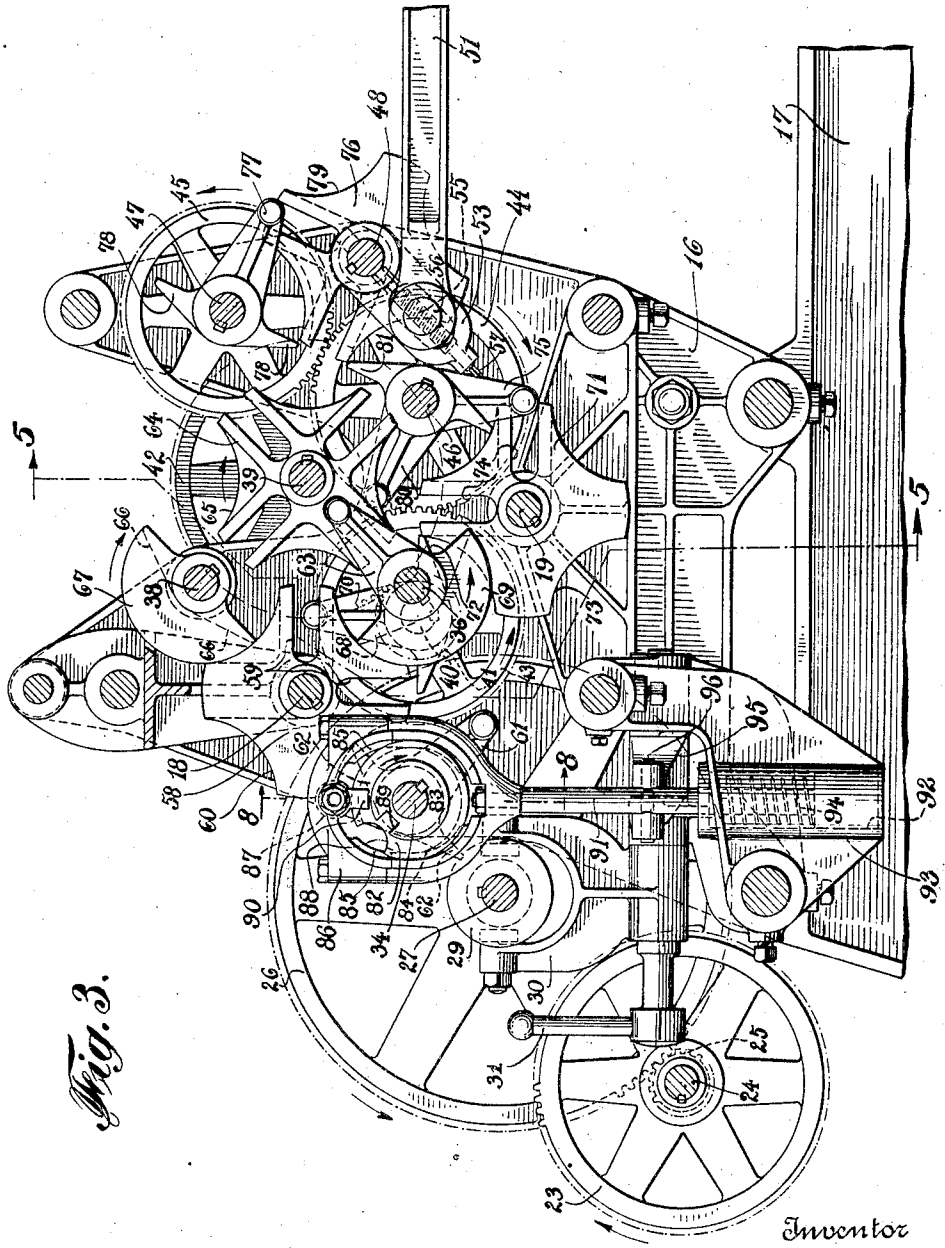


Fig. 3.

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MACHINE OPERATING MECHANISM

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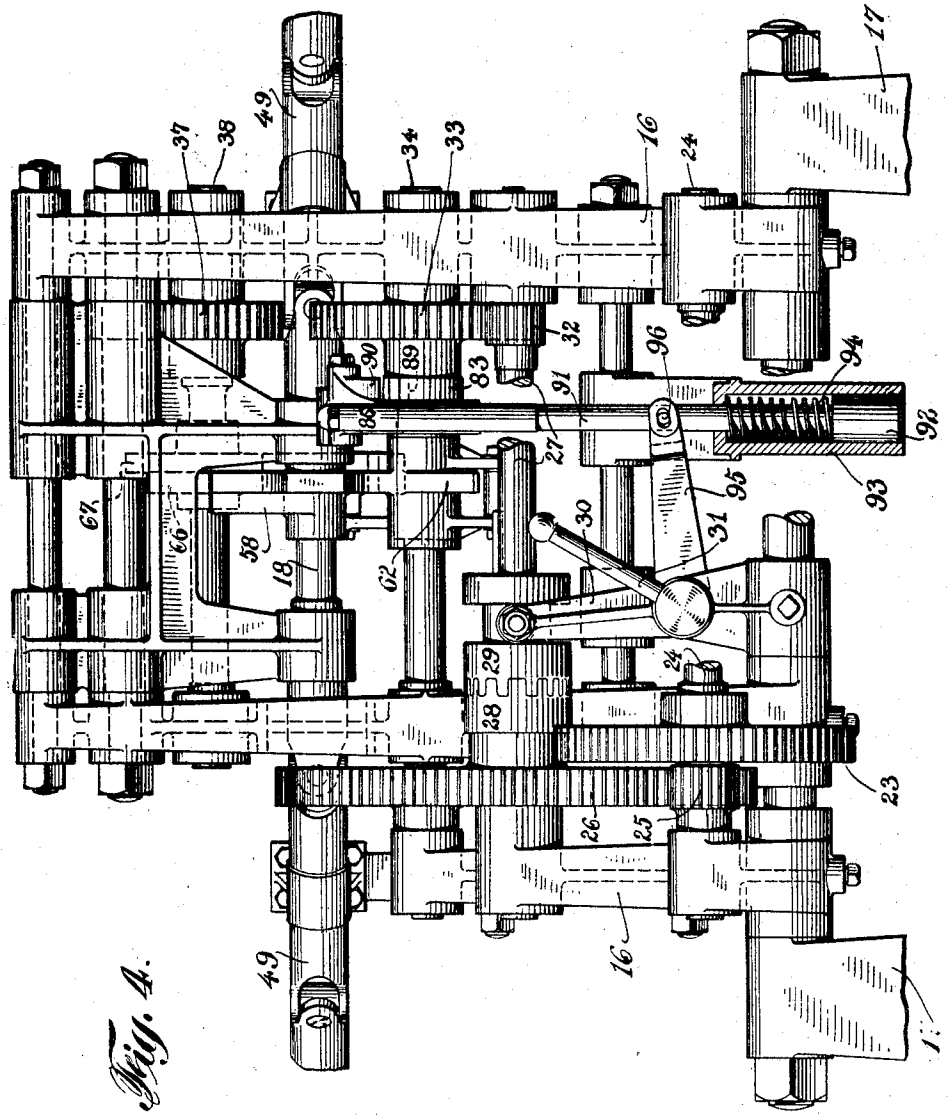


Fig. 4.

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MACHINE OPERATING MECHANISM

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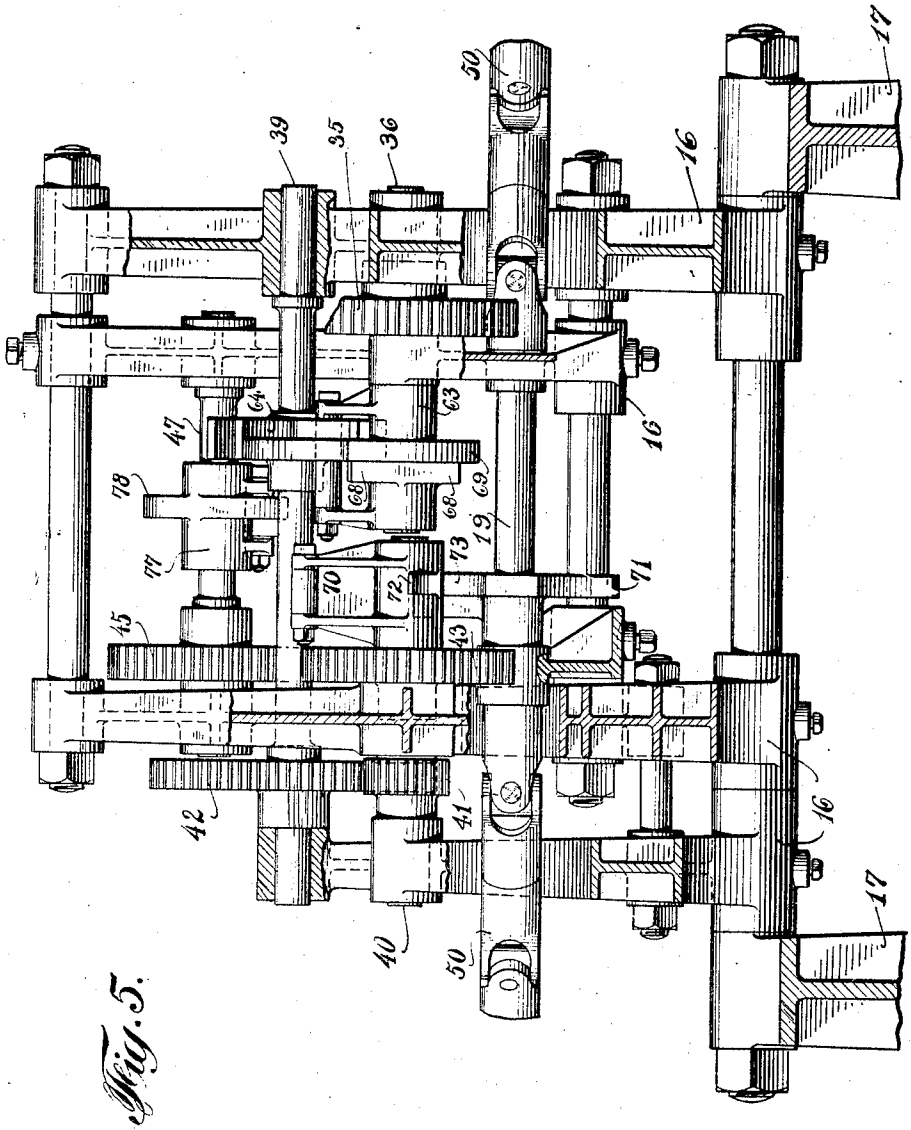


Fig. 5.

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MACHINE OPERATING MECHANISM

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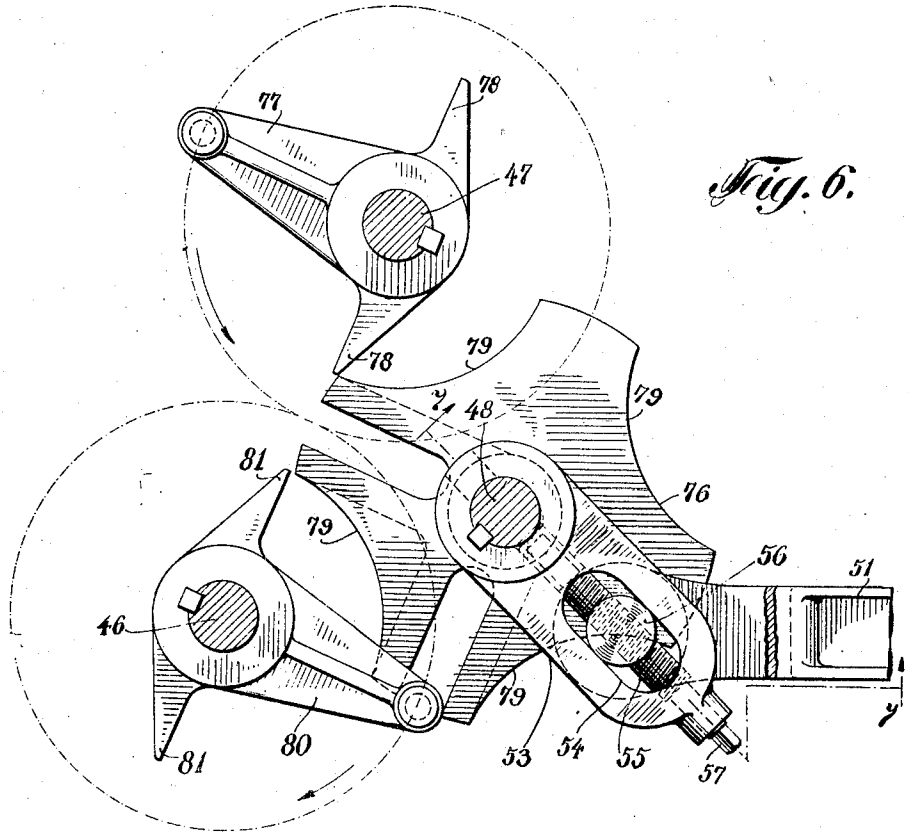


Fig. 6.

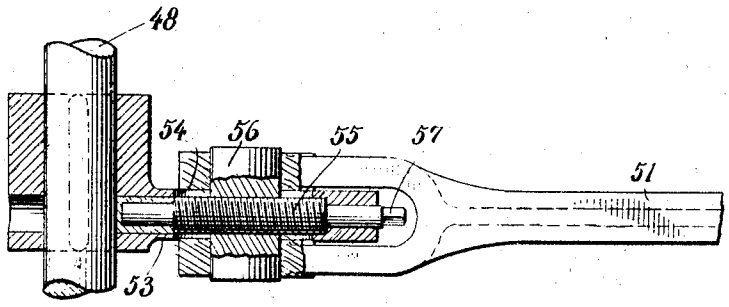


Fig. 7.

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MACHINE OPERATING MECHANISM

Filed Sept. 27, 1921 7 Sheets-Sheet 7

Fig. 10.

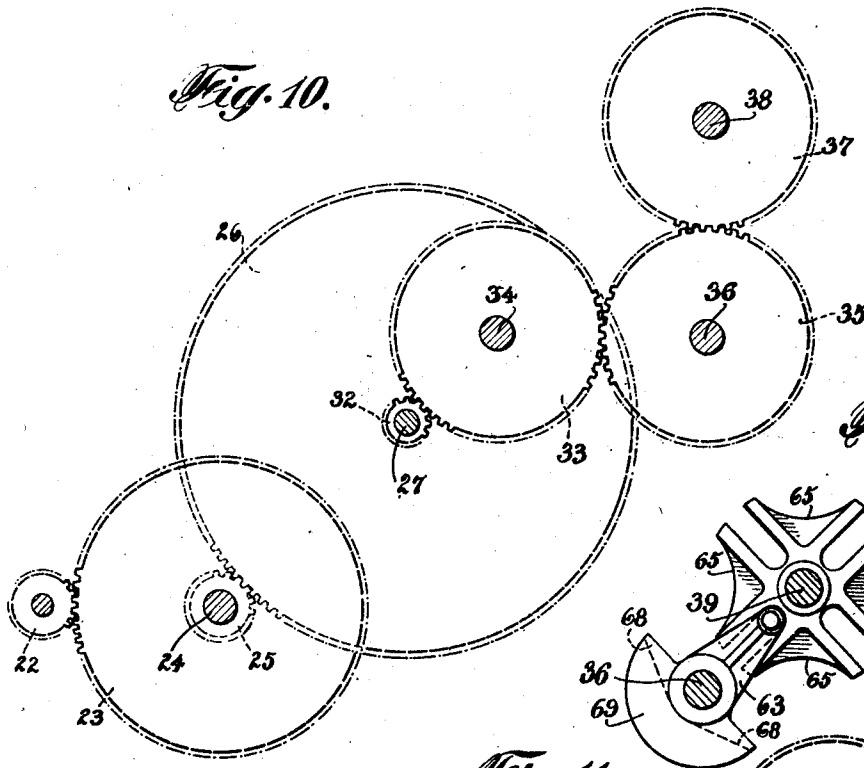
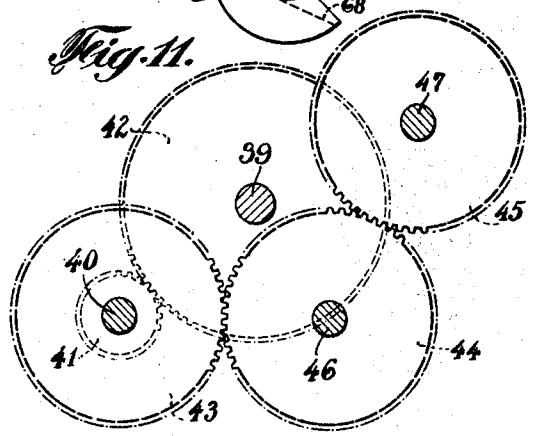


Fig. 12.

Fig. 11.



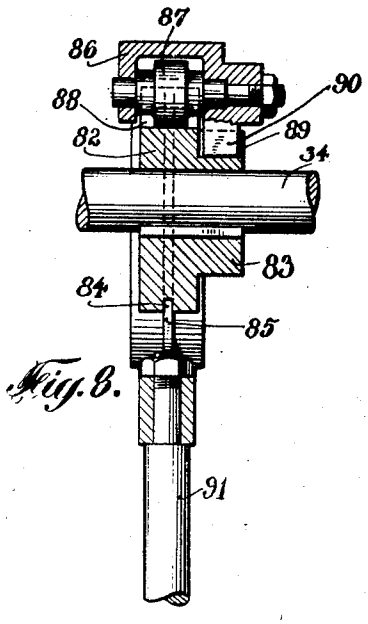


Fig. 8.

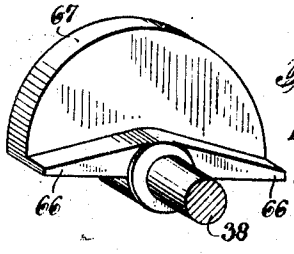


Fig. 9.

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Patented Feb. 2, 1926. 1,571,653

UNITED STATES PATENT OFFICE.

KNUT O. B. TEXTORIUS, OF NEW YORK, N. Y., ASSIGNOR TO TEX ENGINEERING CORPORATION, OF NEW YORK, N. Y.

MACHINE-OPERATING MECHANISM.

Application filed September 27, 1921. Serial No. 503,677.

To all whom it may concern:

Be it known that I, KNUT O. B. TEXTORIUS, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Machine-Operating Mechanism, of which the following is a specification.

This invention relates to operating mechanism for cord tire building machines and is more particularly applicable to a machine of the character disclosed in my pending application for patent, Serial No. 373,087, filed May 27th, 1921.

In the machine disclosed in the application above referred to a complete layer of cords is applied to and secured upon the circumference of a tire forming core in each operation of the machine which involves a series of sub-operations sequentially performed in properly timed relation to each other.

It is the primary object and purpose of my present invention to provide an operating mechanism whereby these sub-operations are sequentially executed with rapidity and in an absolutely positive manner.

It is also an important object of the invention to provide an automatically operating stop device for instantaneously stopping the operation of the mechanism upon the completion of each cycle thereof so that the several co-operating instrumentalities are locked and held against movement in their proper relative positions whereby they will properly coact when the machine is again operated.

In attaining the desired ends of the present invention I have designed a relatively simple and very compact arrangement of the several elements of the operating mechanism, entirely eliminating the use of all cams, interrupted or segmental gears, or other like elements which are subject to rapid wear and the action of which is more or less uncertain. On the contrary, my present invention is primarily characterized by the fact that all toothed gear elements are continuous and remain constantly in coacting engagement notwithstanding the fact that the parts of the machine to be operated thereby are intermittently actuated in timed relation to each other.

It is likewise the general object and purpose of the present improvements to materially simplify the operating mechanism for the machine above referred to over that which is for instance disclosed in Patent No. 1,359,632 granted to me November 23rd, 1920 and to eliminate to the greatest possible degree lost motion incident to wear and to thus provide a mechanism which is not liable to get out of order, or require frequent inspections and repair.

With the above and other objects in view, the invention consists in the improved operating mechanism and in the form, construction and relative arrangement of its several co-operating parts as will be hereinafter more fully described, illustrated in the accompanying drawings and subsequently incorporated in the subjoined claims.

In the drawings wherein I have illustrated one practical and satisfactory embodiment of the invention and in which similar reference characters designate corresponding parts throughout the several views:

Figure 1 is a top plan view of the operating mechanism illustrating the same arranged for use in connection with a cord tire building machine, the tire forming core being shown together with the mechanism which actuates the cord clamping heads;

Figure 2 is a longitudinal sectional view taken on the line 2—2 of Figure 1;

Figure 3 is an enlarged view of the operating mechanism similar to that seen in Figure 2 but showing a different relative position of the several co-operating elements;

Figure 4 is a section taken on the line 4—4 of Figure 1;

Figure 5 is a section taken on the line 5—5 of Figure 3, certain of the parts being broken away;

Figure 6 is an enlarged detail elevation of those parts of the mechanism which control the operation of the means for actuating the cord clamping heads;

Figure 7 is a detail section taken on the line 7—7 of Figure 6, illustrating the means for adjusting the operating connection to regulate the throw of the eccentrics;

Figure 8 is a detail vertical section of the positive stop device in normal position taken on the line 8—8 of Figure 3;

Figure 9 is a detail perspective view of one of the duplex locking elements for certain of the parts of the mechanism;

Figure 10 is a diagrammatic view showing one train of gearing which controls the operation of certain parts.

Figure 11 is a similar view of another independent gear train through which other parts of the mechanism are actuated; and

Figure 12 is a detail view of the means for imparting operative movement to the gear train shown in Figure 11.

As observed in the foregoing statement of my invention, the mechanism constituting the subject matter of this application is primarily designed for the purpose of effecting the proper operation of the several sub-mechanisms comprised in a cord tire building machine of the character disclosed in my co-pending application. However, it is quite possible that this mechanism might be additionally utilized for various other purposes, or on the other hand, certain of its novel features employed in combination with mechanisms designed for the operation of other machines. Accordingly, while in the following description I shall make frequent reference to the cord tire building machine, this is not to be construed as a limitation upon the utility of the operating mechanism itself. Briefly stated, the machine which is illustrated in a general way in the accompanying drawings and more fully disclosed in my co-pending application embodies a series of identic mechanisms which are grouped around a tire forming core. Each of these mechanisms includes a cord applying segment which is mounted for swinging movement upon a carriage arranged to travel radially with relation to the core. The swinging segments and the carriages upon which they are mounted are actuated by flexible shafts, which will be later referred to, so that the cord applying segments of the several mechanisms and the carriages respectively, will be simultaneously actuated, though at relatively different times. In addition, cord clamping heads are mounted for vertical movement axially of the tire forming core on opposite sides thereof. These heads are actuated to clamp the cord ends to the core. In the drawings I have illustrated so much of this machine as is believed to be essential to a clear understanding of the present invention. Therefore, the cord applying segments and the traveling carriages are not illustrated, but the flexible shafts for operating the same and their connection with the operating mechanism are clearly shown. The illustrated parts of the machine include the fixed post or standard 10 upon which the core supporting table 11 is rigidly secured. The tire forming core 12 is removably seated upon this table. The cord clamping heads 13 are keyed upon the standard 10 for vertical movement, said heads being substantially of the construction shown in my co-pending application and carrying the cord end clamping rings 14. These heads are actuated by eccentrics 15 which impart vertical movement to the heads simultaneously in relatively opposite directions, the shafts of said eccentrics being operatively geared to each other.

In the operation of this machine, the cord laying segments are normally disposed in a horizontal plane in radial relation to the core 12 and the first sub-operation is the movement of these segments from such normal position to vertical positions to receive the individual cords. The segments are then returned to their horizontal positions and in the next sub-operation they are simultaneously moved inwardly into embracing relation to the core. The cord laying segments remain in this position while the clamping heads are actuated to clamp the ends of the cords to the core. The cord laying segments are then withdrawn or retracted to their normal positions and finally the clamping heads are disengaged from the core, leaving the rings 14 in retaining engagement with the cord ends. These several operations constitute one complete cycle of operation of the machine and are consecutively performed in properly timed relation to each other by means of the mechanism which I shall now proceed to describe in detail.

The operating mechanism for the machine is mounted or supported in a suitable frame structure generally indicated at 16 which is secured upon the bed frame 17 of the machine. In this frame structure the primary operating shaft 18 for the cord laying segments is suitably journaled at its ends. In properly spaced relation to this shaft 18, the primary operating shaft 19 for the traveling carriages upon which the cord laying segments are mounted is likewise journaled in said frame.

The operating power for the mechanism may be obtained from any suitable source, as for instance, the motor 20 which is mounted upon a suitable supporting bracket 21. Upon the motor shaft a drive gear 22 is fixed and has continuous meshing engagement with a relatively large gear 23 fixed upon the shaft 24 which is rotatably mounted at its ends in the frame 16. A similar gear 25 is also fixed upon this shaft or may be integrally formed with the gear 23 and meshes with a relatively large gear wheel 26 which is loosely mounted upon the shaft 27 journaled in the supporting frame. The hub of this gear 26 is provided with one part 28 of a clutch. The complementary part 29 of said clutch is keyed upon the shaft 27 for sliding movement. This clutch part is actuated through the medium of a suitable yoke 30 pivotally supported in the frame and is moved in one direction to engage the clutch parts by means of an operating handle 31. The disengagement of said clutch parts whereby the operation

of the mechanism is stopped is automatically performed by means which will be later referred to in detail.

On one end of the shaft 27 a pinion 32 is fixed which has constant meshing engagement with a relatively large gear 33 fixed upon the shaft 34 journaled in the frame 16. This gear 33 meshes constantly with gear 35 of the same diameter which is fixed upon another shaft 36 and the gear 35 in turn meshes with a third gear 37 of the same diameter secured upon the shaft 38. It will be noted from reference to Figures 2 and 10 of the drawings that the shafts 36 and 38 are in vertical alignment and the primary operating shaft 18 for the cord laying segments is located intermediate of these shafts and laterally spaced from the vertical plane thereof. All of the shafts above referred to, with the exception of shafts 18 and 19, are continuously rotated in one direction during the operation of the mechanism, the directions of rotation being indicated by the arrows in Figures 2 and 3 of the drawings. At the opposite side of the vertical plane of the shafts 36 and 38 and in the horizontal plane of the shaft 18 an intermittently operating shaft 39 is journaled in the supporting frame.

The shaft 36 does not extend entirely across the supporting frame structure but terminates approximately on the central line thereof. A similar shaft 40 located out of axial alignment with the shaft 36 is journaled in the opposite side of the frame structure and is intermittently rotated independently of the gearing above described by means which will be subsequently referred to. Upon the shaft 40 a pinion 41 is secured and has constant meshing engagement with a relatively large gear 42 which is fixed upon the shaft 39. A second gear 43 is secured upon the shaft 40 and through the medium of gears 44 and 45 of the same diameter as the gear 43, rotates the shafts 46 and 47 respectively at the same speed as the shaft 40.

The primary operating shaft 48 for the vertically movable clamping heads 13 is intermittently actuated through the medium of coacting instrumentalities fixed upon said shaft and the shafts 46 and 47 to which more specific reference will later be made.

Referring now to Figure 1 of the drawings, the flexible actuating shafts 49 for the cord laying segments as shown in my issued patent above referred to are connected to the opposite ends of the intermittently operated shaft 18 while the flexible actuating shafts 50 for the traveling carriages upon which said segments are mounted are similarly connected to the opposite ends of the intermittently operated shaft 19. The eccentrics 15 for actuating the vertically movable heads 13 whereby the layer of cords is clamped to the core are operatively connected to the intermittently operated shaft 48 through the medium of a rod 51 which is pivotally connected at one of its ends to an arm 52 fixed to one of the eccentric shafts. The other end of this rod is pivotally and adjustably connected to an arm 53 which is fixed upon the shaft 48. The adjustable connection referred to is shown in detail in Figure 7 of the drawings. As will be observed from reference thereto, the arm 53 is provided with a longitudinal slot 54 and a screw 55 extends longitudinally of this slot and has suitable bearings at its opposite ends in the arm. A pin 56 extends transversely through the slot beyond the opposite sides of the arm and the screw 55 is engaged in a central threaded opening in said pin. The end of the connecting rod 51 is bifurcated, the arms thereof extending upon opposite sides of the arm 53 and being pivotally engaged upon the ends of the pin 56. The shank of the screw 55 projecting beyond the end of the arm 53 is squared as at 57 to receive a suitable wrench. It will be apparent that by rotating the screw 55, the pivot pin 56 and the connecting rod 51 will be shifted longitudinally in the arm 53 towards or from the shaft 48. In this manner the throw of the eccentrics 15 may be regulated to compensate for lost motion and insure a proper movement of the clamping heads 13.

Intermittent rotation is imparted to the three primary operating shafts 18, 19 and 48 for the several parts of the machine whereby the cord layer is applied to the core and clamped thereon in properly timed relation to each other, by means of the several coacting instrumentalities to which I shall now refer.

Upon the shaft 18 there is fixed a half Geneva gear 58 having two radially disposed slots 59 extending at angles of 90° with relation to each other. At diametrically opposite points this gear element is provided with concave peripheral faces 60 which are all of the same radius. Upon the shaft 34 a fork 61 is fixed, an antifriction roller being mounted between the arms of the fork for engagement in one of the slots of the gear element 58. At its inner end this fork is provided with flukes 62 projecting from opposite sides of the shaft 34. One of these flukes, when the fork is not operatively engaged with the gear element 58, coacts with one of the concave peripheral faces 60 of said element to lock the same and consequently the shaft 18 against casual oscillation.

On the shaft 36 there is fixed a similar fork 63, which, however, is relatively wide as it cooperates with two motion transmitting gear elements which are not in align-

ment with each other. One of these elements is in the form of a full Geneva gear 64 and is fixed upon the shaft 39, said element having four radially disposed slots at 90° angles with relation to each other. Between these slots this gear element also has concave peripheral faces 65. This fork likewise coacts with the half Geneva gear 58 to rotate the shaft 18 in one direction.

Upon the shaft 38 a duplex locking member is fixed, said member having oppositely extending flukes 66 and at one side of said flukes being provided with a flange 67 the peripheral face of which is concentric to the axis of the shaft 38. This locking member is shown in detail in Figure 9 of the drawings. One of the flukes 66 coacts with one of the concave faces 60 of the element 58 as an additional locking means therefor while the flange 67 is adapted to coact with one of the peripheral faces 65 of the Geneva gear 64. The fork 63 at its fixed end is formed in a similar manner to the locking member just referred to and is provided with oppositely extending flukes 68 to coact with the element 58 and with a flange 69 the peripheral face of which is adapted to coact with one of the concave faces of the Geneva gear 64. It will thus be apparent that when the elements 58 and 64 are not being positively actuated by the forks 61 or 63 they are absolutely locked against any possibility of casual movement due to vibration or other causes.

On the shaft 40 there is fixed a fork 70 which is adapted to coact with a half Geneva gear 71 fixed on the shaft 19 to rotate said gear element and the shaft in one direction. This fork also is provided with oppositely projecting flukes 72 adapted to coact with the concave peripheral faces 73 of the element 71 when the latter is not in operation. With this gear element which is provided with two radial slots 74 at 90° angles, a fork 75 fixed upon the shaft 46 coacts to rotate said element and the shaft 19 in an opposite direction.

On the shaft 48 a half Geneva gear 76 similar to the elements 58 and 71 is secured. With one of the slotted arms of this gear element a fork 77 fixed upon the shaft 47 coacts, said fork at its fixed end having the flukes 78 to engage the concave faces 79 of said gear element. The element 76 and the shaft 48 are rotated in an opposite direction by means of a second fork 80 which is fixed upon the shaft 46, said latter fork also having flukes 81 to coact with the concave faces 79 of the element 76.

Having now described the several parts of the operating mechanism, one complete cycle of sub-operations whereby the cord layer is applied to and secured upon the tire forming core occurs as follows:

At the start, when the cord laying segments are in their outer positions in radial relation to the core as shown in my copending application, the several parts of the mechanism are in the relative position seen in Figure 2 of the drawings. The clutch parts 28 and 29 being engaged and the motor started, rotation is transmitted through the gearing to the shaft 27. Through the medium of gears 32 and 33 the shaft 34 is operated. This shaft drives the shaft 36 through the gearing 33 and 35, and the fork 63 fixed upon said shaft 36 is thus moved in the direction indicated by the arrow from the position seen in Figure 2 so that it enters one of the slots of the gear element 58 and thus imparts a rotation to said gear element and consequently the operating shaft 18 for a period of 90° until the slot is disposed in a vertical position below the shaft while the other slot of said gear element will be horizontally positioned at the left hand side of the shaft. In this 90° rotation of the operating shaft 18, the cord layers are swung downwardly from their horizontal positions to a vertical position to receive the individual cords. During this operation the fork 61 fixed on shaft 34 has also moved a quarter revolution so that it is disposed at right angles to the position seen in Figure 2. During the next quarter revolution of the shafts 34 and 36, the cords are positioned in the cord laying segments and the fork 61 then enters the horizontal slot of the element 58 and reverses the rotation of said element and the shaft 18, moving the same in the reverse direction through 90° to return the several cord laying segments to their normal positions in radial relation to the core. Each of the shafts 34 and 36 has now made three-quarters of a revolution and the roller of the fork 63 is at the entrance to the lower slot of the Geneva gear 64. During these operations, the shaft 40 has remained stationary with the fork 70 disposed in the position seen in Figure 2 of the drawings. In the continued rotation of shaft 36, the fork 63 coacts with the gear element 64 to rotate the same in the direction shown by the arrow in Figure 3. Through the intermeshing gears 41 and 42 rotation is thus transmitted to shaft 40 so that the roller of the fork 70 enters one of the slots in the gear element 71 and rotates said element and consequently the shaft 19 in one direction through 90°. In this movement of the shaft the several carriages upon which the cord laying segments are mounted are moved inwardly so that the cords carried by said segments are laid in embracing relation around the core. The ratio of the gears 41 and 42 is such that the speed of movement of the shaft 40 and consequently of the fork 70 is relatively great. As herein shown, this ratio is four to one, and it will be noted from reference to Figure 3 of

the drawings that in one-eighth of a revolution of the fork 63, the fork 70 has made a half revolution, having operated the shaft 19 and then continued its movement to a vertical position above the shaft 40 (compare Figures 2 and 3).

The cord laying segments having been moved inwardly upon the core, the next operation is the movement of the heads 13 to clamp the ends of the cord layer upon the tire forming core. In the relative position of the parts seen in Figure 3, this operation has just taken place. In other words, during the actuating movement of the fork 70 while it is engaged with gear element 71, the fork 77 on shaft 47 moves from the position seen in Figure 2 to the entrance to one of the slotted arms of the gear element 76. In the continued movement of said fork 70 to its upper vertical position, the fork 77 actuates element 76 and moves the same from the position seen in Figure 2 to the position of Figure 3, in which actuation of said element and the shaft 48 the rod 51 is moved to the left and the several eccentries 15 are actuated to move the heads into engagement with the cord ends and clamp the latter upon the flanges of the core 12. This position of the parts is shown in Figure 3. In the last eighth of a revolution of the fork 63 from the position shown in Figure 3 to the position of Figure 2, the fork 75 on shaft 46 first enters one of the slotted arms of the element 71 and reverses the rotation of shaft 19 again moving the same through 90° and retracting the carriages upon which the cord applying segments are mounted. At the end of this movemment the fork 80 is about to enter one of the slotted arms of gear element 76, and in the final portion of the movement of fork 63 to its normal position shown in Figure 2, the fork 80 actuates the shaft 48, reversing its rotation and through the medium of the connecting rod 51 reversing the movement of the eccentrics 15 to disengage the clamping heads from the core as seen in Figure 2 of the drawings.

As above stated, in this final operation the clamping rings 14 by frictional engagement with the core remain seated upon the cord ends. Thus a complete operating cycle is performed by the mechanism above described. With the gear ratios as herein indicated, one such complete operation of the cord tire building machine occurs every six seconds. Of course, it is manifest that by changing the gear ratios and the relative proportion and arrangement of the elements, this operating period might be increased, or possibly, further decreased.

It is quite important to the successful operation of a machine of this character that the mechanism shall operate in an absolutely positive and reliable manner. To this end I have devised an automatically acting stop device so that upon the completion of each cycle of operation the movement of every element of the mechanism is instantaneously stopped. This automatic stop device I have clearly illustrated in Figures 3 and 8 of the drawings. Referring to said figures, upon the shaft 34 a collar 82 is rigidly fixed. This collar has a diametrically reduced portion 83 projecting from one side thereof, and the main portion of the collar of larger diameter is provided with a continuous peripheral groove 84. This groove receives ribs 85 provided upon the inner sides of a yoke 86 which embraces said collar. This yoke is preferably constructed in two separable sections and in the upper section thereof a roller 87 is journaled to ride upon the periphery of the larger section of the collar. This larger section is provided in its periphery with a concave notch or recess 88 adapted to receive the rolier 87. At a corresponding point in the periphery of the reduced portion 83 of the collar a square or rectangular recess 89 is provided. This recess is adapted to receive a rigid lug 90 also of rectangular form which is fixed to or integral with the yoke 86.

The upper end of a rod 91 is connected to the yoke 86, the lower end of said rod having a piston 92 reciprocating in a cylinder 93 which is suitably mounted upon the frame structure. A coil spring 94 is interposed between the upper end of the piston and the closed upper end of the cylinder. An arm 95 is fixed at one of its ends to the pivotal axis of the clutch shifting yoke 30 and the other end of said arm has a slot and pin connection 96 with the rod 91.

Upon reference to Figure 3 of the drawings the operation of this device will be readily understood. At the start of the operation, the clutch 29 is thrown into engagement by means of the handle or lever 30 with the loose clutch element 28 and in such operation the rod 91 is moved upwardly thereby compressing the spring 94 and positioning the roller 87 upon the periphery of the collar 82. The yoke is sustained in this position during the operation of the mechanism. As the yoke is locked to the collar against relative movement axially of the shaft 34, there is no possibility of the accidental release of the clutch. During the operation of the mechanism the lower end of the lug 90 is spaced slightly from the periphery of the reduced portion 83 of the collar so that there is no frictional retarding influence to the free rotation of said collar. However, as the collar continues to rotate in the direction shown by the arrow in Figure 3 and as the cycle of operations is completed, when the roller 87 starts to move into the recess 88 the lug 90 contacts upon the periphery of the reduced portion of the

collar and sustains the yoke against a gradual downward movement, holding the yoke in its raised position until the lug is in direct alignment with the rectangular recess 89 and the axis of the roller is centrally positioned over the recess 88. The spring 94 then immediately expands, forcing the rod 91 downwardly and actuating the yoke 30 to disengage the clutch member 29 from the member 28. The spring 94 is of sufficient strength together with the weight of the parts to instantaneously effect such disengagement of the clutch members so that as the gear 26 continues to rotate, no movement whatever will be transmitted to the actuating parts of the mechanism after they have arrived at their starting positions shown in Figure 2 of the drawings.

From the foregoing description considered in connection with the accompanying drawings, the construction, relative arrangement and manner of operation of the several parts of the improved operating mechanism will be fully understood. In view of the fact that the use of cams, interrupted gears and similar mechanical elements whose action is more or less uncertain and which are subjected to considerable wear, is wholly avoided; that all toothed gears are continuous and remain constantly in intermeshing engagement; and finally that the mechanical elements which directly transmit movement to the several operating shafts are positively locked against casual movement when they are not being actuated, my improved mechanism will be absolutely positive and reliable in its operation. Owing to such positive coaction between the several co-operating parts, the cord tire building machine may be actuated with maximum rapidity and production correspondingly increased. As frictional wear between the elements of the mechanism is almost wholly eliminated, replacement of the parts at more or less frequent intervals as is ordinarily required in mechanisms of this character, is obviated. It will also be noted from an inspection of the accompanying drawings that this improved operating mechanism, considering the manifold functions thereof consists of comparatively few parts the arrangement of which is very compact so that the space occupied by such mechanism is reduced to a minimum.

It has been found in practice that the new operating mechanism is far superior to that disclosed in my issued patent hereinbefore identified and while primarily intended and designed for the operation of a cord tire building machine, it will be readily recognized from the foregoing description that many of the novel features are susceptible of arrangement in other and different mechanical combinations which might be advantageously employed for a variety of different purposes. It is accordingly to be understood that while I have referred to one adaptation or use of my present invention, the component parts thereof might be embodied in other alternative combinations of an analogous character. The privilege is therefore reserved of resorting to all such legitimate changes in the form, construction and relative arrangement of the several parts of the mechanism as may be fairly embodied within the spirit and scope of the invention as claimed.

I claim:

1. Mechanism for sequentially operating a plurality of machine parts in timed relation to each other including a plurality of motion transmitting shafts, other shafts constantly geared to each other, a common drive means for said shafts, means on each of the latter shafts, a common means on one of the first named shafts with which said means on the latter shafts coacts at different times to rotate the latter in opposite directions, a third series of shafts constantly geared to each other, and means actuated by the means on one of said second named shafts through the medium of said third series of shafts for rotating each of the remainder of said motion transmitting shafts in timed relation to said first named shaft.

2. Mechanism for sequentially operating a plurality of machine parts in timed relation to each other including a plurality of motion transmitting shafts, two additional series of shafts, the shafts in each of the latter series being constantly geared to each other, means for intermittently transmitting rotation from one series of shafts to the other series, means on said motion transmitting shafts, and means on certain of the shafts in each series coacting with the means on said motion transmitting shafts to intermittently operate the latter shafts and actuate the machine parts in proper sequence.

3. Mechanism for sequentially operating a plurality of machine parts in timed relation to each other including a plurality of motion transmitting shafts, two additional series of shafts, the shafts in the latter series being constantly geared to each other, means on certain of the shafts in one of said series, means on one of the motion transmitting shafts with which said last named means coacts to rotate the motion transmitting shafts in opposite directions, and means actuated by the first named means on one of said shafts through the medium of the other series of shafts for rotating each of the remainder of said motion transmitting shafts at a relatively higher speed than said first named shaft and in timed relation to the latter.

4. Mechanism for sequentially operating a plurality of machine parts in timed relation to each other including a plurality of motion transmitting shafts, two additional series of

shafts, the shafts in each of the latter series being constantly geared to each other, power means having a constant driving connection with one of said series of shafts, a part on one shaft in the other series, means for transmitting rotation from the first series of shafts to one of said motion transmitting shafts in relatively opposite directions, said means including a part coacting with the part on the shaft in the other series of shafts to intermittently rotate the latter shafts at a relatively high speed, means on the other motion transmitting shafts, and means on the remaining shafts in the latter series coacting with said means on the other motion transmitting shafts for operating the latter in timed relation to the first named motion transmitting shaft and thereby actuate the machine parts in proper sequence.

5. Mechanism for sequentially operating a plurality of machine parts in timed relation to each other including a plurality of motion transmitting shafts, means for imparting a partial rotation to each of said shafts in properly timed relation to actuate the machine parts in sequential order, and an automatically acting positive stop device to instantaneously lock the mechanism against further operation upon the completion of each operating cycle of the machine.

6. Mechanism for sequentially operating a plurality of machine parts in timed relation to each other including a plurality of motion transmitting shafts, means for imparting a partial rotation to each of said shafts in reverse directions and in properly timed relation to the rotative movements of the other shafts to thereby actuate the machine parts in sequential order, said means including actuating elements each moving in a circular path, a complementary element on one of the motion transmitting shafts with which said actuating elements coact, and a positive stop device automatically actuated to instantaneously lock the mechanism against further operation upon the completion of each operating cycle of the machine.

In testimony that I claim the foregoing as my invention, and I have signed my name hereunder.

KNUT O. B. TEXTORIUS.