Feb. 15, 1949. G. O. YOUNG 2,461,583

KNITTING MACHINE

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8 Sheets-Sheet 1

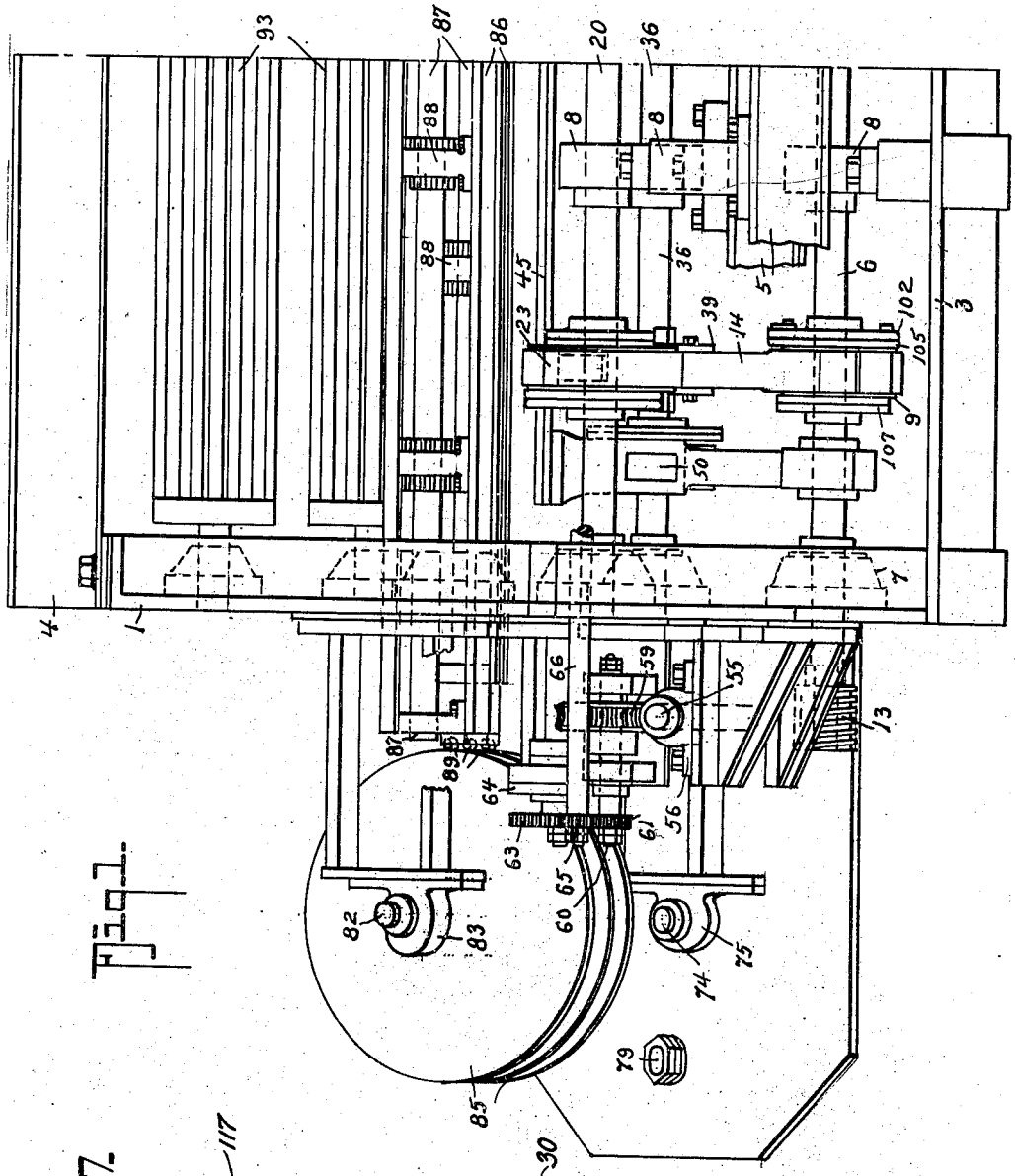

Fig. 1.

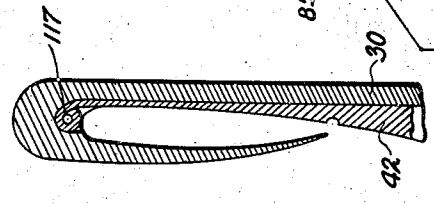

Fig. 17.

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KNITTING MACHINE

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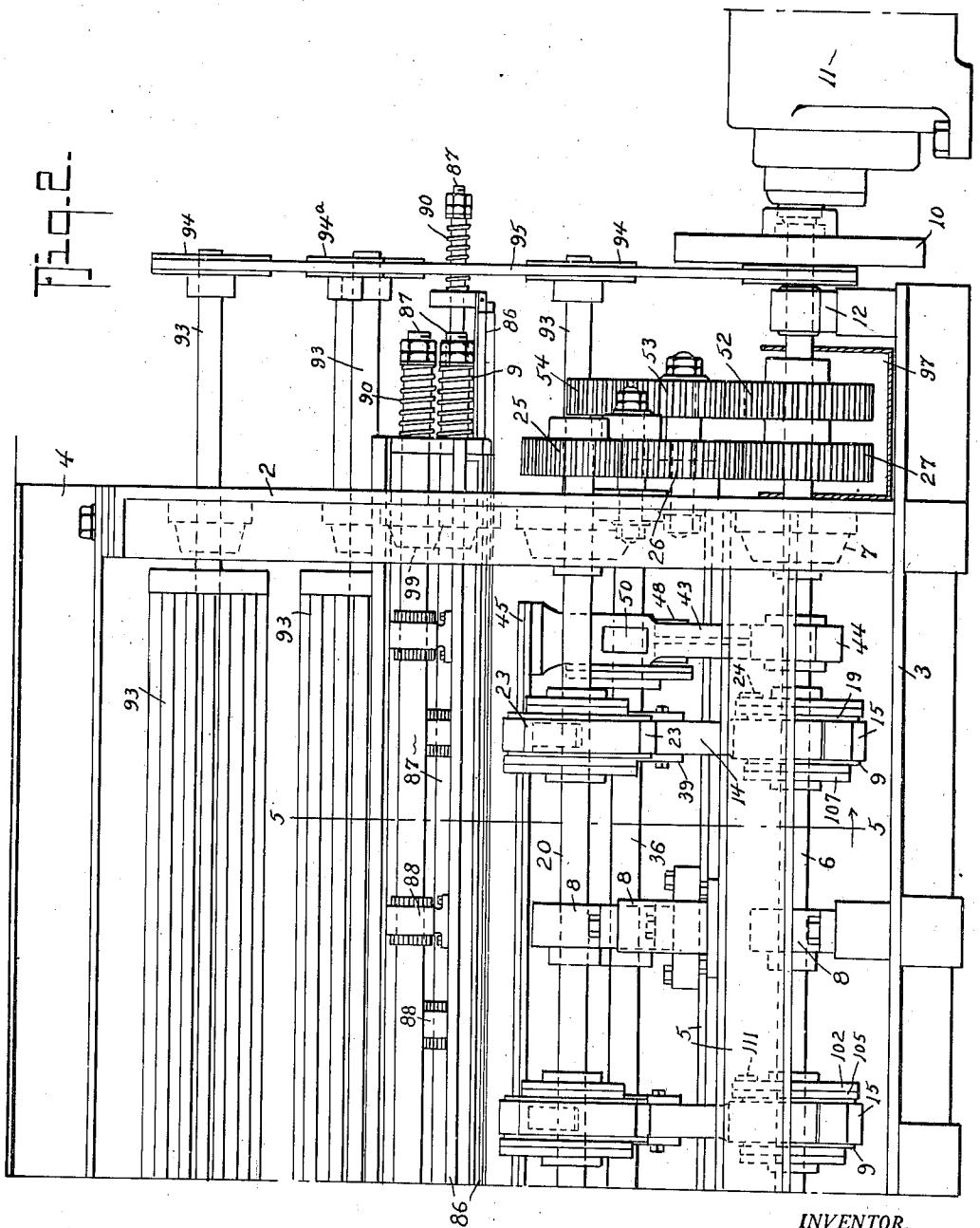
Fig. 2.



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KNITTING MACHINE

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8 Sheets-Sheet 3

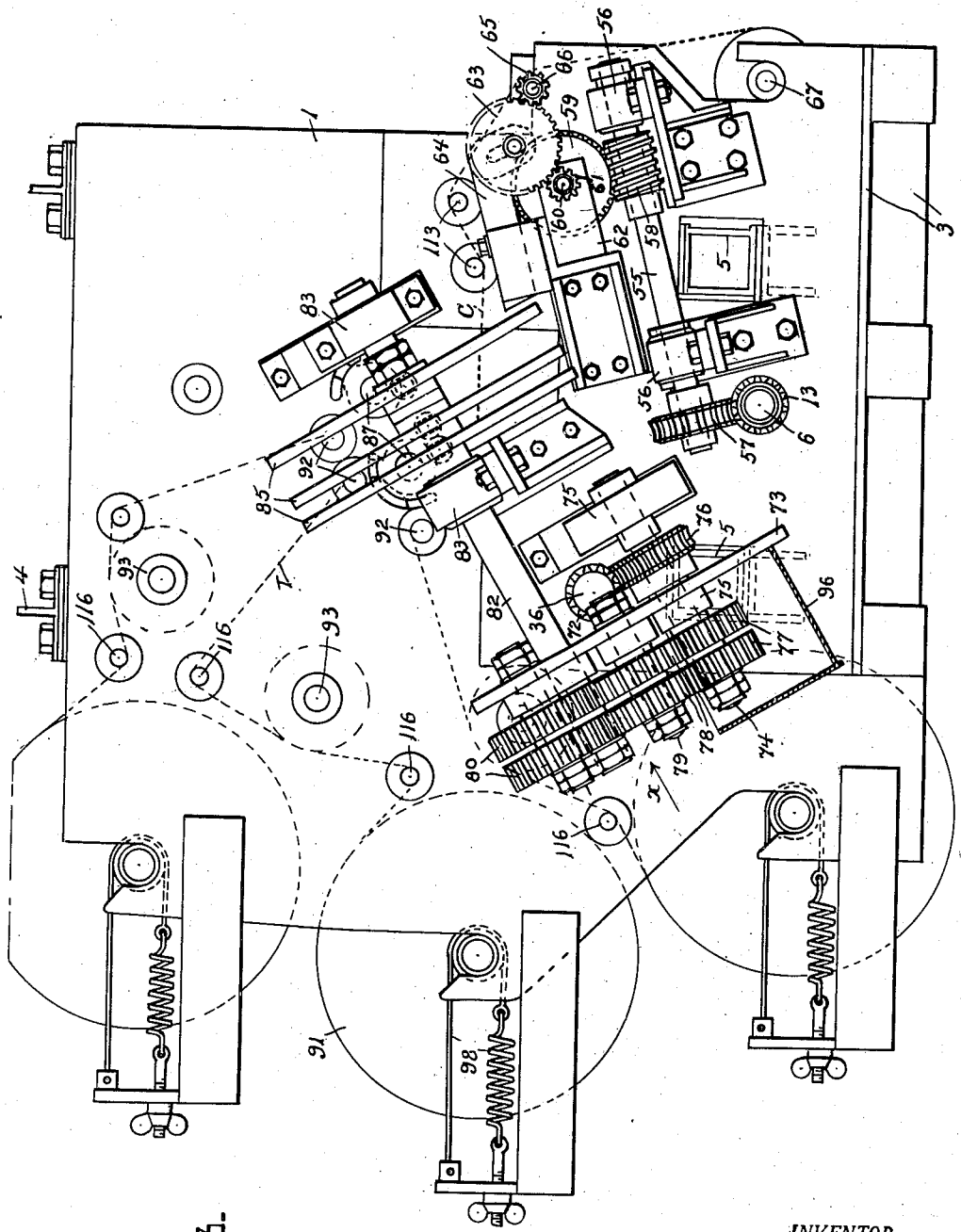

Fig. 3.

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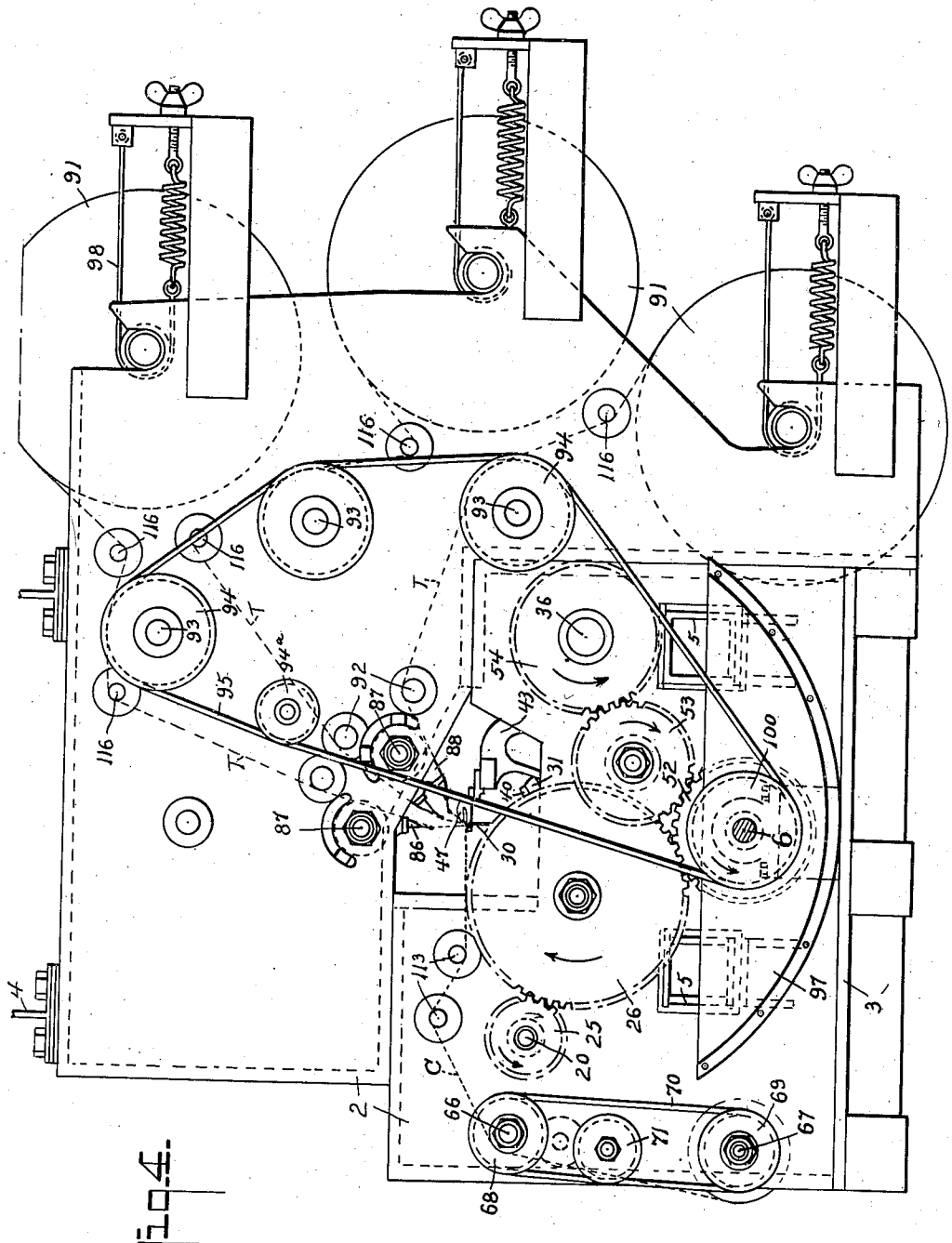

FIG. 4.

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Fig. 5.

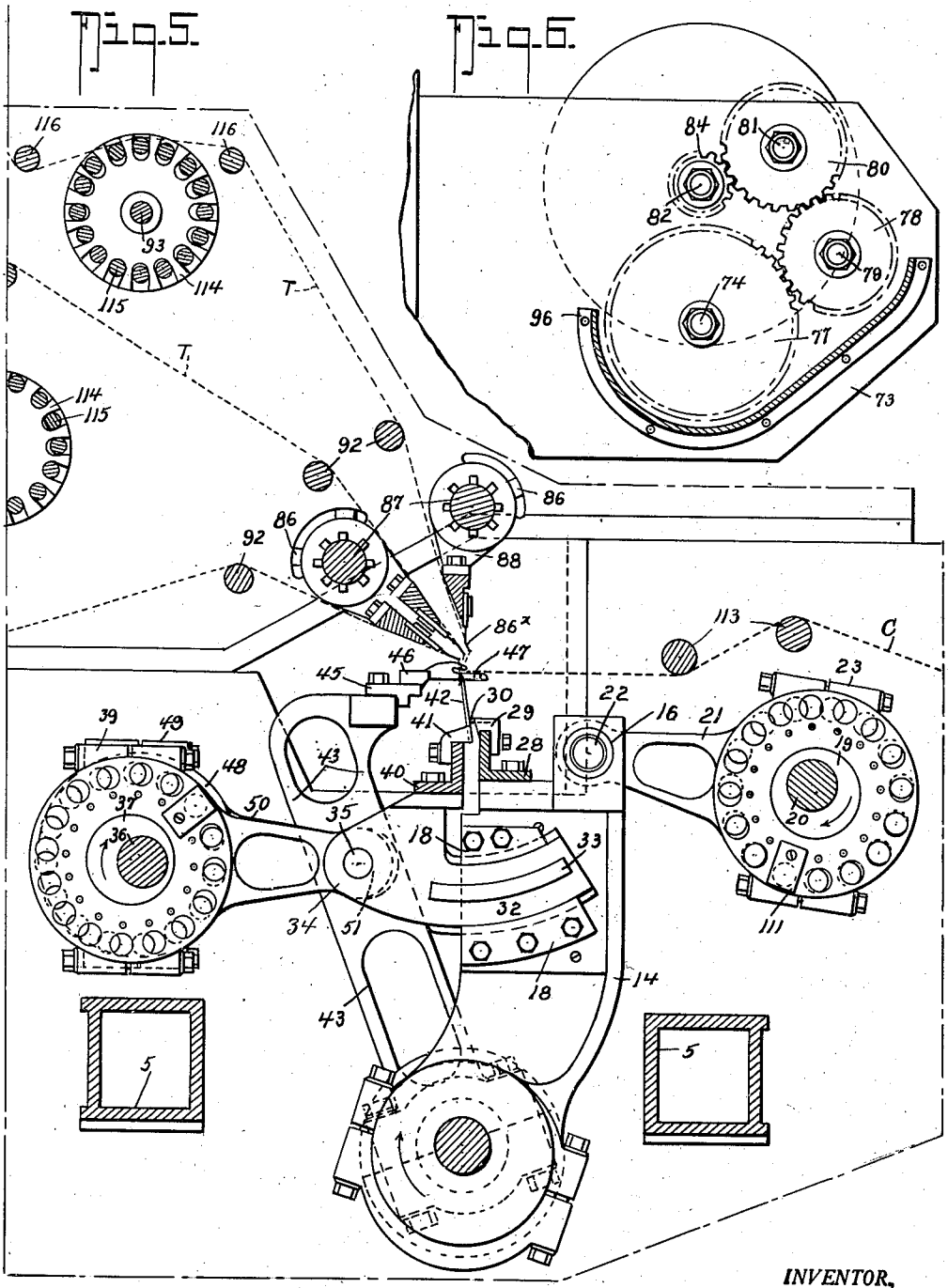

Fig. 6.

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Fig. 7.

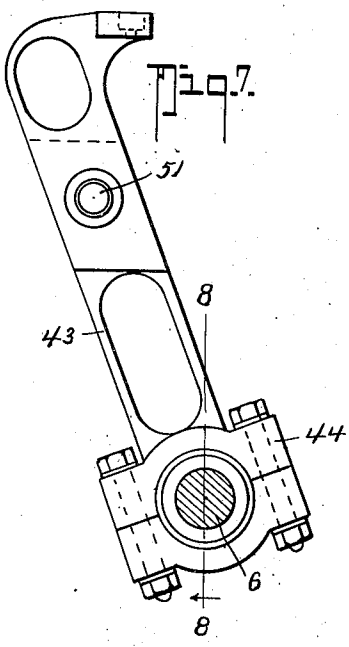


Fig. 8.

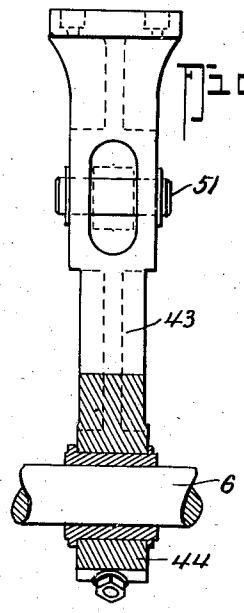


Fig. 9.

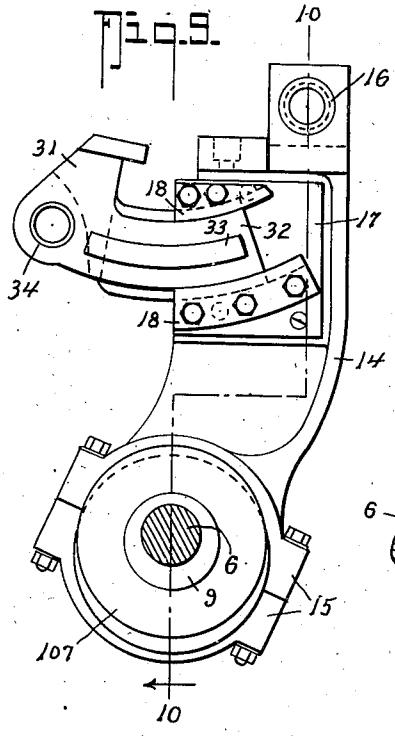


Fig. 10.

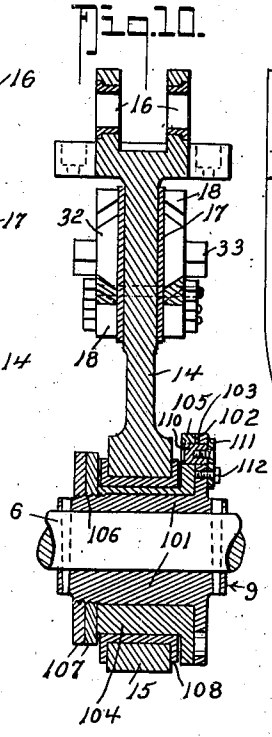
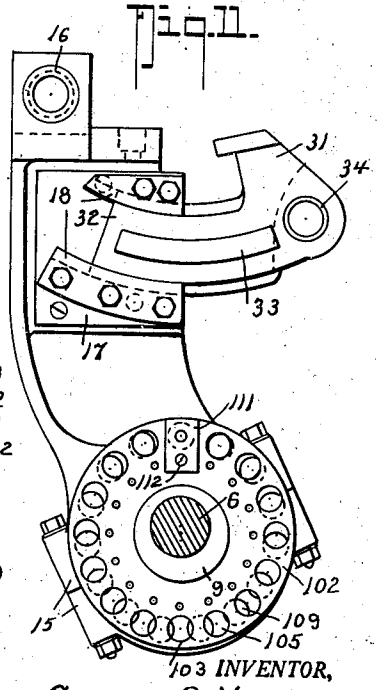


Fig. 11.



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KNITTING MACHINE

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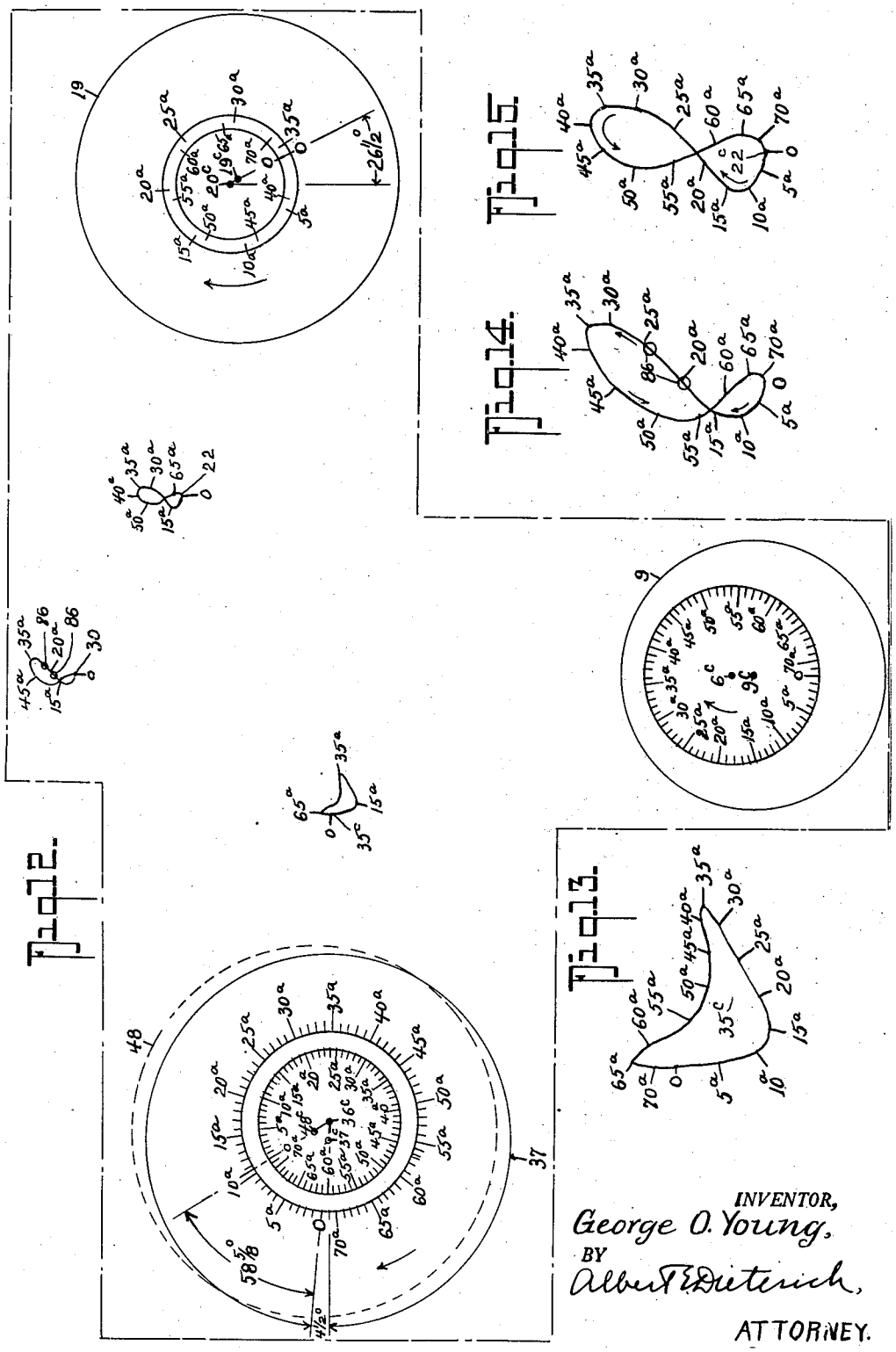

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KNITTING MACHINE

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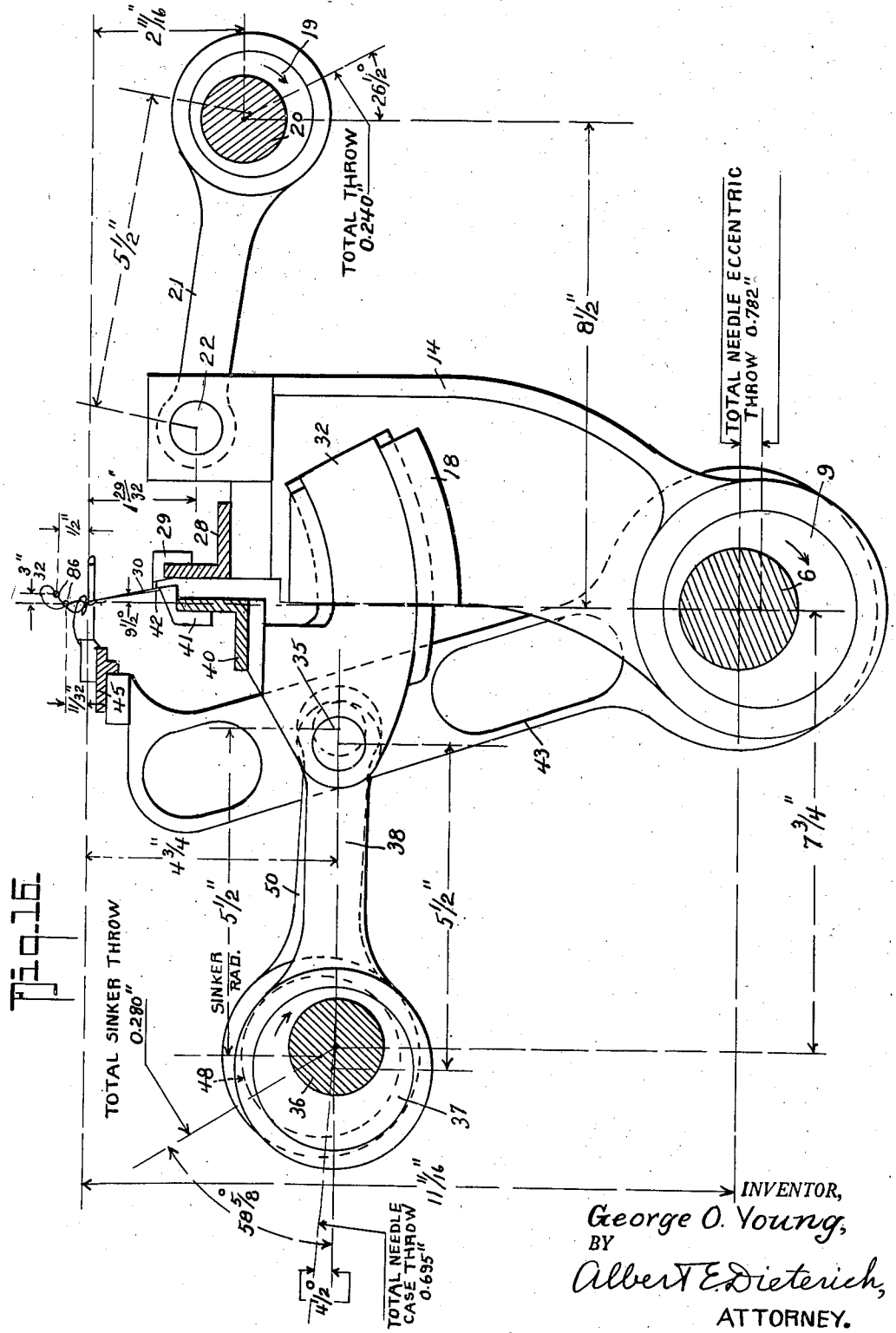

Fig. 16

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Patented Feb. 15, 1949

2,461,583

UNITED STATES PATENT OFFICE

2,461,583

KNITTING MACHINE

George O. Young, Robesonia, Pa., assignor to Vanity Fair Mills, Inc., Reading, Pa., a corporation of Pennsylvania

Application December 30, 1946, Serial No. 719,229

15 Claims. (Cl. 66—86)

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My invention relates to knitting machines of the flat or tricot type.

Among the objects of my present invention are the following:

1. To improve generally the machine disclosed in my application filed October 15, 1945, Serial No. 622,321.

2. To provide a machine in which the use of the rock shaft of the machine of the above application, which has bearings for the needle-bar and the tongue-bar carrying shafts, is eliminated.

3. To provide a machine in which the weight of the needle bar, tongue bar and sinker bars is carried entirely by the main eccentric shaft of the machine.

4. To provide a machine in which no reciprocating rods or shafts are employed for supporting the needle bar, the tongue bar and the sinker bar.

5. To provide a machine in which the sinker bar has an oscillating movement instead of a rectilinear or reciprocating movement as in the machine of my application aforesaid.

6. To provide a machine in which adequate provision is made to support the main eccentric shaft so that it can carry the weight imposed upon it without vibration or bending.

7. To provide improved means for adjusting the eccentrics so as to give the proper movements to the needles, tongues and sinkers.

To the attainment of the aforesaid objects and ends invention further resides in those novel details of construction, combination and arrangement of parts which will hereinafter be first described in detail and then be specifically pointed out in the appended claims, reference being had to the accompanying drawings in which:

Fig. 1 is a front elevation of the left-hand portion of the machine, the cloth take-up mechanism being omitted and parts broken away.

Fig. 2 is a view similar to Fig. 1, showing the right-hand portion of the machine.

Fig. 3 is an end elevation of the left-hand end of the machine.

Fig 4. is an end elevation of the right-hand end of the machine.

Fig. 5 is a detail cross section on the line 5—5 of Fig. 2 on a somewhat larger scale.

Fig. 6 is a detail elevation looking in the direction of the arrow *x* in Fig. 3.

Fig. 7 is a detail side elevation of the sinker-bar carrying arm.

Fig. 8 is a section on the line 8—8 of Fig. 7.

Fig. 9 is a detail side elevation of the combined needle-bar and tongue-bar carrying unit.

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Fig. 10 is a section on the line 10—10 of Fig. 9.

Fig. 11 is a view similar to Fig. 9 showing the other side of the unit.

Fig. 12 is a diagrammatic view showing the relative movements of the principal parts of the machine.

Fig. 13 is an enlargement of the diagram shown in Fig. 12 of the movement of the pin 35.

Fig. 14 is an enlargement of the diagram shown in Fig. 12 of the needle-point movement.

Fig. 15 is an enlargement of the diagram shown in Fig. 12 of the movement of pin 22.

Fig. 16 is a schematic view showing a proportion of parts and eccentric throws and settings to produce the movements indicated in Fig. 12.

Fig. 17 is an enlarged detail vertical section showing one means 117 for pivotally connecting the tongue to the needle.

In the drawings in which like numerals and letters of reference indicate like parts in all the figures, 1 and 2 represent the end frames of the machine, 3 the base, 4 the top eye-beams and 5 the square hollow longitudinal beams which connect the end frames into a rigid structure.

Mounted in suitable end bearings 7 and intermediate bearings 8 is the main eccentric shaft 6 of the machine. On the shaft 6 at suitably spaced intervals are needle and tongue lifting and lowering eccentrics 9, around which the straps 15 of needle-bar carrying arms 14 are held as will more fully appear later.

As best shown in Fig. 2 the shaft 6 carries a hand wheel 10 and is coupled to an electric driving motor 11 of any approved and suitable kind. An additional bearing 12 is provided for the driving end of the shaft 6. On its other end the shaft 6 has a worm 13 for a purpose later to appear.

Each arm 14 (two or more, of course, being used) has a wrist pin bearing 16 for the wrist pin 22 to which the connecting rod 21 is provided at one of its ends. The other end of the rod 21 is provided with an eccentric strap 23 to embrace the eccentric 19 on an eccentric shaft 20. The eccentric 19, via connecting rod 21, moves the needle bar transversely back and forth in proper timed relation to the movements of the other parts of the machine.

The arm 14 is provided on each side with a wear plate 17 to which is bolted arcuate guide-way plates 18 between which the arcuate arms 32 slide. The curvature of the slideway provided by the plates 17 and 18 is concentric with the point where the tongue is attached to the needle. (For the needle and tongue structure see Patent No. 2,403,961 issued July 16, 1943.

The shaft 20 is provided with a gear 25 that

meshes with an idler gear 26 driven by a gear 27 on the shaft 6 as best shown in Figs 2 and 4.

A needle bar 28 is mounted on the arms 14, to which bar the leads 29 that carry the needles 30, are secured (see Fig. 5).

The tongue-bar carrier or needle-case carrier 31 is oscillatably mounted on the arm 14 through the provision of the arcuate arms 32 hereinbefore referred to. The arms 32 have stiffening ribs 33. The carrier 31 has a slot to receive one end of a connecting rod 38 to which it is connected by a wrist pin 35 held in a bearing 34. The connecting rod 38 is operated by an eccentric 37 on a third shaft 36, the strap 39 of the connecting rod 38 embracing the eccentric. A tongue bar 40 is attached to carrier 31. The leads 41 which carry the tongues 42 are secured to the bar 40 in the usual manner.

Pivotally mounted on the main shaft 6 by a split bearing 44 are sinker-bar carrying arms 43 to which a sinker bar 45 is secured, the sinker bar having the sinker leads 46 secured to it. The sinkers are indicated by 47.

48 is the sinker-bar-rocking eccentric which is mounted on the shaft 36 and is connected to a wrist pin 51 (carried by the arm 43) by means of a connecting rod 50 whose strap 49 embraces the eccentric 48.

A gear 52, on the main shaft 6, meshes with an idler gear 53 that meshes with a gear 54 on shaft 36 to drive that shaft (see Figs. 2 and 4).

Referring now more particularly to Figs. 1 and 3, it will be observed that a worm shaft 55 is mounted in suitable bearings 56 on the end frame 1 and carries a worm wheel 57 that meshes with the worm 13 on shaft 6. It also carries a worm 58 that meshes with a worm wheel 59 on a short shaft 60 that is journalled in a bracket 62 and has a pinion 61 to mesh with a gear 63. The gear 63 is adjustably mounted on an arm 64 and meshes with a pinion 65 on a cloth-guiding roller shaft 66.

As shown best in Fig. 4, 67 indicates the cloth take-up roller shaft which carries a pulley 69. A belt 70 passes around the pulley 69 and a pulley 68 on the shaft 66, a belt tightener 71 being provided for the usual purpose.

On one end of the shaft 36 is a worm 72 which meshes with a worm wheel 76 on a shaft 74 that is journalled in suitable bearings 75, one of which is a part of a plate 73 projected from the end frame 1. The shaft 74 has a pair of gears 77 which mesh with the idler gears 78 on a stub shaft 79 that in turn mesh with other idler gears 80 on a stub shaft 81. The gears 80 mesh with pinions 84 on the pattern wheel shaft 82. The shaft 82 is journalled in bearings 83 and carries the pattern wheels 85.

87 designates thread-guide-bar-carrier-supporting rods fixedly held in suitable bearings 99 in the end frames. The thread-guide-bars 86 are carried by carriers 88 that slide on, but do not turn on, the rods 87, for racking purposes.

The bars 86 carry pattern-wheel-engaging rollers 89, which are held in contact with the pattern wheels 85 by springs 90.

The beams are indicated by 91, and the beam brakes by 98.

The thread tensioning mechanisms which I prefer to use, comprise each a shaft 93 mounted in suitable bearings in the frame. The shaft 93 carries a drum-like structure consisting generally of end discs 114 supporting parallel, radially adjustable bars 115 over which bars and over thread guide rods 116 and 92, the thread from the adjacent beam 91 passes.

The shafts 93 of the several tensioning means also are provided with sprockets or pulleys 94, 94a over which and a sprocket or pulley 100 on shaft 6, an endless belt 95 is passed whereby the tensioning mechanism is positively driven. By adjusting the positions of the rods or bars 115 the take-up and slacking of the thread at the proper times are provided for. In this application I lay no claim per se to the thread tensioning mechanism herein described as that constitutes the subject matter of my application Serial No. 718,487 filed December 26, 1946.

Oil pans 96 and 97 are provided as shown.

The several eccentrics 9, 19, 37 and 48 are adjustable and of like construction. Therefore, a description of one will suffice for all. Referring now to Figs. 9, 10 and 11 it will be seen that a sleeve 101 is pinned to the shaft 6 and disposed eccentric to the shaft. A second sleeve 104 is concentrically mounted on the sleeve 101 and operates in the bushing 108. The outer circumference of the second sleeve 104 is, however, eccentric to the sleeve 101. The sleeve 101 has a flange 102 that is concentric with the outer surface of sleeve 101 and is provided with an annular row of holes 103. The flange 105 on sleeve 104 has a similar row of holes 109, the centers of all holes 103, 109 being equidistant from the axis of the sleeve 101. The holes of one flange are of an even number and those of the other are one less in number. The flanges 101, 103 are held together by jam nuts 107 threaded at 106 to the sleeve 101 and engaging the sleeve 104. The flanges 102, 104 are held from turning with respect to each other by means of a pin 110 held in registering holes by a keeper plate 111. The plate 111 is secured by a screw 112 threaded into a tapped hole corresponding to the position of the hole 103 in flange 102.

The cloth C passes from the needles over guide rods 113, to the roll on shaft 66 and from thence to the take-up roll on shaft 67.

Operation

As the machine operates the several eccentrics will impart motion such as will cause the needles to rise through the sinkers and on the hook of the needles leaving the sinkers, they will pass to the right of the thread-guide eyes (in Fig. 5) then to the left of the same and down again, hooking the threads T and drawing them down. On the up stroke, in passing through the sinkers the tongues open the hooks of the needles and after the threads are hooked and before the hooks of the needles pass down into the sinkers the tongues close the needle hooks and hold same closed until the previous loops about the needles have been knocked over. The thread guides are racked twice in each cycle of the needle and tongue operation.

In Fig. 12 I have shown, diagrammatically, the path travelled by the point of the needle 30, the path travelled by the axis of the pin 22, the path travelled by the axis of the pin 35 during each revolution of the eccentric shafts 6 and 36 and each two revolutions of the eccentric shaft 20 (shaft 20 revolves at twice the speed of shafts 6 and 36 while shafts 6 and 36 revolve at the same speed).

The corresponding points in the several graphs are numbered from zero to 70a. When shafts 6 and 36 move from zero to 5a the point of the needle will move from zero (Fig. 14) to 5a; point 35 will move from zero (Fig. 13) to 5a;

point 22 will move from zero (Fig. 15) to 5a; and a point on shaft 20 will have turned a distance from zero to 5a (Fig. 12); and so on.

In Fig. 12 the center of shaft 36 is indicated by 36c; the center of eccentric 37 is indicated by 37c and the center of eccentric 48 is indicated by 48c. The center of shaft 6 is indicated by 6c and that of eccentric 9, by 9c. Also the center of shaft 20 is indicated by 20c and that of eccentric 19, by 19c. The thread guides are indicated in Figs. 12 and 14 by 86, only two guides being indicated.

Fig. 16 is a schematic view showing the proportions of the principal parts of an embodiment of the invention using two thread guides and which will produce approximately the curves indicated in Figs. 12 to 15 inclusive.

With the eccentric 9 set in its lowest position and the point of needle 30 eleven and $\frac{11}{16}$ inches from the center of shaft 6 and directly above the same, with connecting rods 21, 38 and 50 of the same lengths (5 and ½ inches), with shaft 20 located two and $\frac{11}{16}$ inches below a horizontal drawn through the point of the needle at its lowest position, and pin 22 located one and $\frac{23}{32}$ inches below the same line, with shaft 36 located four and ¾ inches below the same line and located seven and ¾ inches to the left of a line drawn perpendicular to the horizontal line at the low position of the point of the needle and passing through the center of shaft 6, with shaft 20 positioned eight and ½ inches to the right of that perpendicular line (all as shown in Fig. 16), with the eccentric 37 set at four and ½ degrees from the horizontal and having a total throw of 0.695 inches, with the eccentric 9 set with its center directly below that of shaft 6 and having a total throw of 0.782 inches, with eccentric 19 set at twenty-six and ½ degrees and having a total throw of 0.240 inches (all as shown in Fig. 16), the point of the needle will traverse approximately the path shown in Fig. 14, and the needle case (tongue 42) will be operated to close the beard of the needle as the point of the beard passes into the sinker nib and will hold the beard closed while it passes through the previously formed loop or loops on the needle, again opening the beard by the time the point of the beard leaves the sinker nib.

With eccentric 48 set at fifty-eight and ⅝ degrees from the horizontal and having a total throw of 0.280 inches, the sinker will move forward and backward in proper timed relation to cooperate with the needle in effecting the knitting operations.

It should be understood that the proportions, eccentric settings and throws, etc., above referred to (as indicated in Figs. 12 to 16 inclusive), are approximate only and may be somewhat varied according to the exact timing, movements of the needles, etc., that may be desired by the machine builder, and I do not wish to be limited to the same.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the construction, operation and advantages of my invention will be clear to those skilled in the art.

What I claim is:

1. In a knitting machine employing sinkers and thread guides, the improvement which includes a needle-bar-carrying arm; a main eccentric-carrying shaft having an eccentric on which said arm is carried; a tongue-bar carrier carried by said needle-bar-carrying arm; a needle bar mounted on said needle-bar-carrying arm; a needle mounted on said needle bar; a tongue bar mounted on said tongue-bar carrier; a tongue mounted on said tongue bar; and means for moving said needle-bar-carrying arm and said tongue-bar carrier transversely in timed relation to the movements of said needle-bar-carrying arm under the influence of said eccentric to cause the needle and tongue to effect their knitting cycles.

2. An improved knitting machine according to claim 1 wherein said tongues are pivotally connected to the needles and said tongue-bar carrier has movement in an arc having its center approximately at the place where the tongue is connected to the needle.

3. An improved knitting machine according to claim 1 wherein a sinker bar with a sinker is mounted on a sinker-bar-carrying arm, said arm being pivotally carried by said eccentric-carrying shaft; and means is provided for rocking said sinker-bar-carrying arm on its pivot in timed relation to the movements of said needles and tongues.

4. An improved knitting machine according to claim 1 wherein the means for moving the needle-bar-carrying arm and the tongue-bar carrier transversely comprises two shafts having eccentrics, a connecting rod between the eccentric of one of said two shafts and said needle-bar-carrying arm and a connecting rod between the eccentric of the other of said two shafts and said tongue-bar carrier.

5. An improved knitting machine according to claim 1 wherein the means for moving the needle-bar-carrying arm and the tongue-bar carrier transversely comprises two shafts having eccentrics, a connecting rod between the eccentric of one of said two shafts and said needle-bar-carrying arm and a connecting rod between the eccentric of the other of said two shafts and said tongue-bar carrier and wherein the tongue-bar carrier is mounted on said needle-bar-carrying arm for oscillatable movement thereon.

6. An improved knitting machine according to claim 1 wherein the means for moving the needle-bar-carrying arm and the tongue-bar carrier transversely comprises two shafts having eccentrics, a connecting rod between the eccentric of one of said two shafts and said needle-bar-carrying arm and a connecting rod between the eccentric of the other of said two shafts and said tongue-bar carrier, the tongue-bar carrier being oscillatably mounted on the needle-bar-carrying arm, and wherein the tongue is hinged to the needle and the center of oscillation of said tongue-bar carrier is approximately at the hinge axis.

7. In a knitting machine employing thread guides, sinkers and needles, the improvement which includes a main eccentric shaft; a needle-bar-carrying arm carried on the eccentric of said main eccentric shaft; a needle bar mounted on said needle-bar-carrying arm; needles mounted on said needle bar; a second eccentric shaft; a connecting rod between the eccentric of said second eccentric shaft and said needle-bar-carrying arm for imparting rocking motion to said needle-bar-carrying arm on said main eccentric shaft's eccentric; a tongue-bar carrier; tongues mounted on said tongue-bar carrier; said tongue-bar carrier having at least one arcuate arm and said needle-bar-carrying arm having a guide way to receive said arcuate arm and support said tongue-bar carrier on said needle-bar-carrying

arm; a third ecentric shaft; and a connecting rod between the eccentric of said third ecentric shaft and said tongue-bar carrier.

8. A knitting machine according to claim 7 wherein is provided a sinker-bar-carrying arm pivotally mounted on said main eccentric shaft; a sinker bar with sinkers mounted on said sinker-bar-carrying arm; a second eccentric on said third eccentric shaft; and a connecting rod between said second eccentric and said sinker-bar-carrying arm.

9. In a knitting machine the improvement which includes a needle-bar-carrying arm; a tongue-bar-carrier mounted on and movable on said arm; an ecentric shaft; a connecting rod between said needle-bar-carrying arm and said eccentric shaft; a second eccentric shaft; a connecting rod between said tongue-bar carrier and said second eccentric shaft; and a single means for supporting the weight of said needle-bar-carrying arm, said tongue-bar carrier and part of the weight of each said connecting rod and imparting longitudinal reciprocations to said needle-bar-carrying arm and the parts carried thereby.

10. In a knitting machine employing thread guides, sinkers, knitting needles and tongues hinged to the needles; the improvement which includes a main eccentric shaft having an eccentric; a needle-bar-carrying arm mounted at one end on said eccentric; a needle bar mounted on the other end of said arm; wear plates on each side of said arm; arcuate guide plates on said wear plates; a tongue-bar carrier having arcuate arms engaging said wear plates and said guide plates; a tongue bar mounted on said tongue-bar carrier; a second eccentric shaft having an eccentric; a connecting rod between said needle-bar-carrying arm and the eccentric on said second eccentric shaft; a third eccentric shaft; a connecting rod between said third eccentric shaft and said tongue-bar carrier; and means for driving said shafts in timed relation to one another for knitting purposes.

11. In a knitting machine employing thread guides, sinkers, knitting needles and tongues hinged to the tongues, the improvement which includes a main eccentric shaft having an eccentric; a needle-bar-carrying arm mounted at one end on said eccentric; a needle bar mounted on the other end of said arm; wear plates on each side of said arm; arcuate guide plates on said wear plates; a tongue-bar carrier having arcuate arms engaging said wear plates and said guide plates; a tongue bar mounted on said tongue-bar carrier; a second eccentric shaft having an eccentric; a connecting rod between said needle-bar-carrying arm and the eccentric on said second eccentric shaft; a third eccentric shaft; a connecting rod between said third eccentric shaft and said tongue-bar carrier; a sinker-bar-carrying arm pivoted at one end to said main eccentric shaft; a sinker bar mounted on the other end of said sinker-bar-carrying arm; a second eccentric on said third eccentric shaft; a connecting rod between said sinker-bar-carrying arm and said second eccentric on said third eccentric shaft; and means for driving said shafts in timed relation to one another for knitting operations.

12. In a knitting machine employing thread guides, sinkers, knitting needles and tongues hinged to the tongues, the improvement which includes a main eccentric shaft having an eccentric; a needle-bar-carrying arm mounted at one end on said eccentric; a needle bar mounted on the other end of said arm; wear plates on each side of said arm; arcuate guide plates on said wear plates; a tongue-bar carrier having arcuate arms engaging said wear plates and said guide plates; a tongue bar mounted on said tongue-bar carrier; a second eccentric shaft having an eccentric; a connecting rod between said needle-bar-carrying arm and the eccentric on said second eccentric shaft; a third eccentric shaft; a connecting rod between said third eccentric shaft and said tongue-bar carrier; a sinker-bar-carrying arm pivoted at one end to said main eccentric shaft; a sinker bar mounted on the other end of said sinker-bar-carrying arm; a second eccentric on said third eccentric shaft; a connecting rod between said sinker-bar-carrying arm and said second eccentric on said third eccentric shaft; means for driving said shafts in timed relation to one another for knitting operations; and means by which the timing of the eccentrics may be individually adjusted.

13. A knitting machine according to claim 7 wherein said eccentrics each comprises a sleeve eccentrically mounted on the respective shaft and having a flange provided with an annular series of pin holes, a second sleeve eccentrically mounted on said first sleeve and having a flange provided with an annular series of pin holes, the holes in one of said flanges being one less in number than the holes in the other flange, said holes all being spaced radially an equal distance from the axis of the second sleeve whereby only one hole of each sleeve will register with one another at a time; and a pin secured removably in the registering holes to hold said sleeves against turning one on the other.

14. An improved knitting machine according to claim 1 wherein the needle has a point and wherein eccentrics are set to cause the point of the needle to move in a "figure eight" path substantially as shown in Fig. 14 of the drawing.

15. An improved knitting machine according to claim 1 wherein the needle has a point and wherein the tongue is pivotally connected to the needle and said tongue-bar carrier has movement in an arc having its center approximately at the place where the tongue is connected to the needle, and wherein the eccentrics are set to cause the needle point to travel in a "figure eight" path substantially as shown in Fig. 14 of the drawing.

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