Feb. 28, 1939. F. SLUSHER 2,149,150

METHOD AND APPARATUS FOR CHAIN LOOPING

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Fig-1

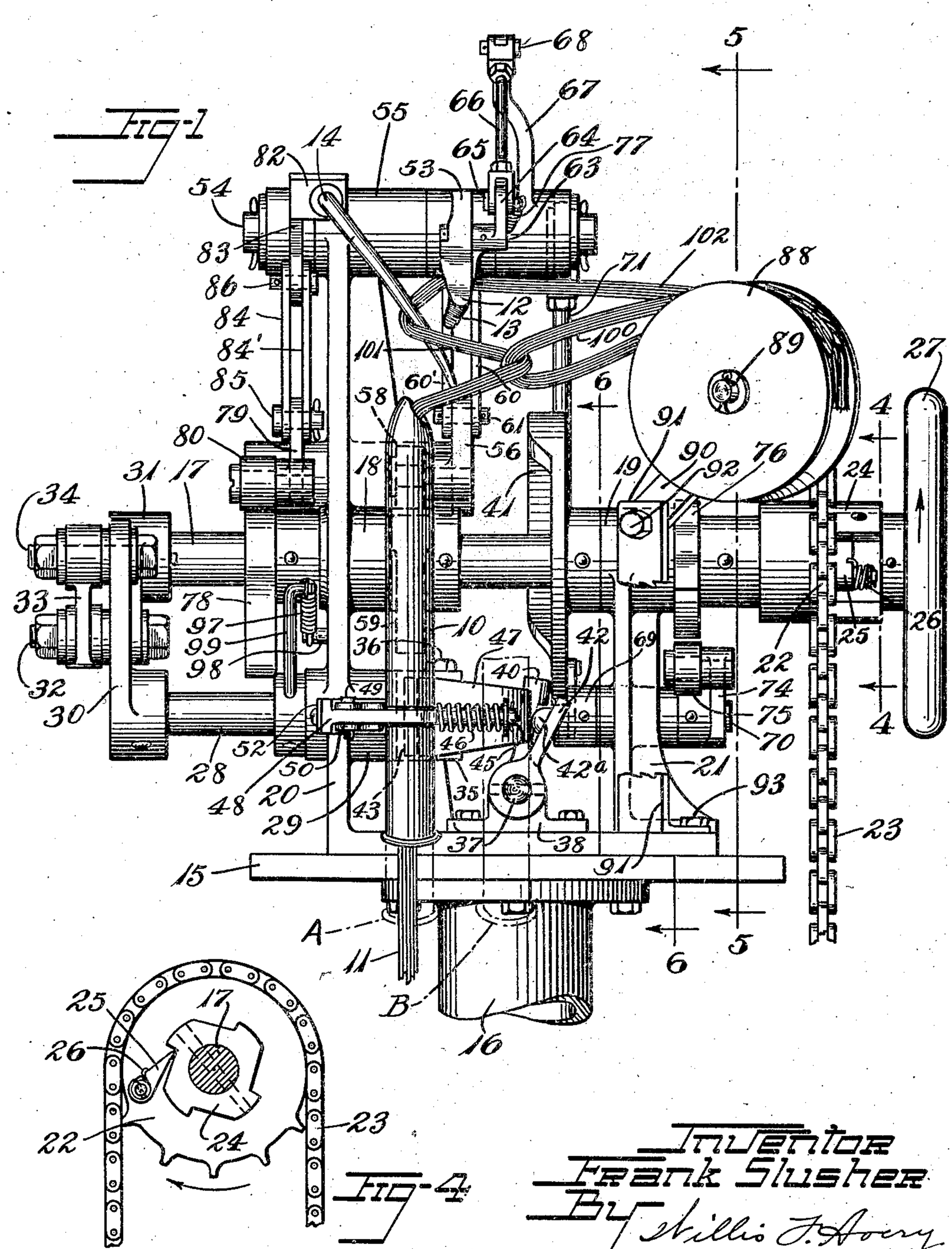

Fig-4

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METHOD AND APPARATUS FOR CHAIN LOOPING

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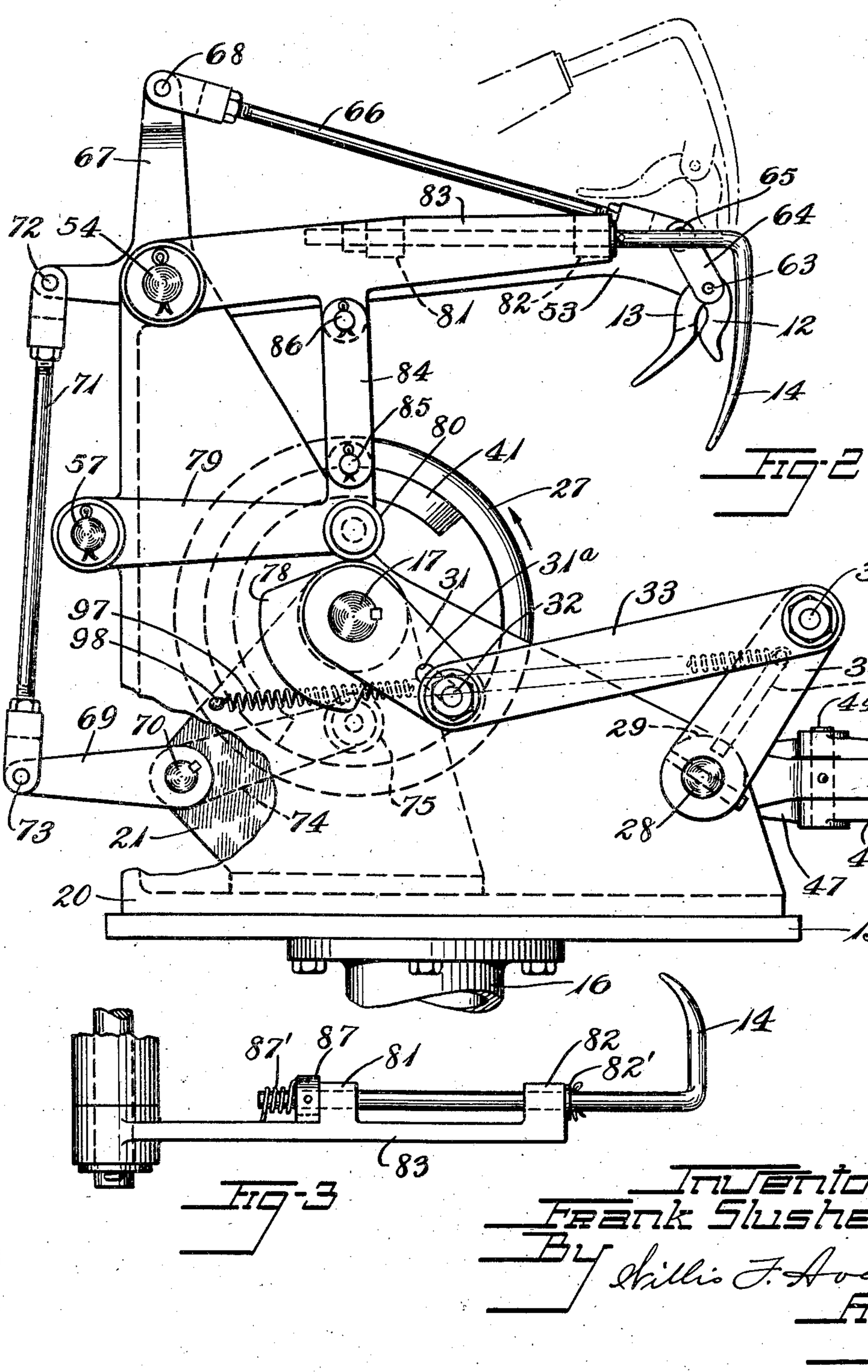

Fig-2

Fig-3

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METHOD AND APPARATUS FOR CHAIN LOOPING

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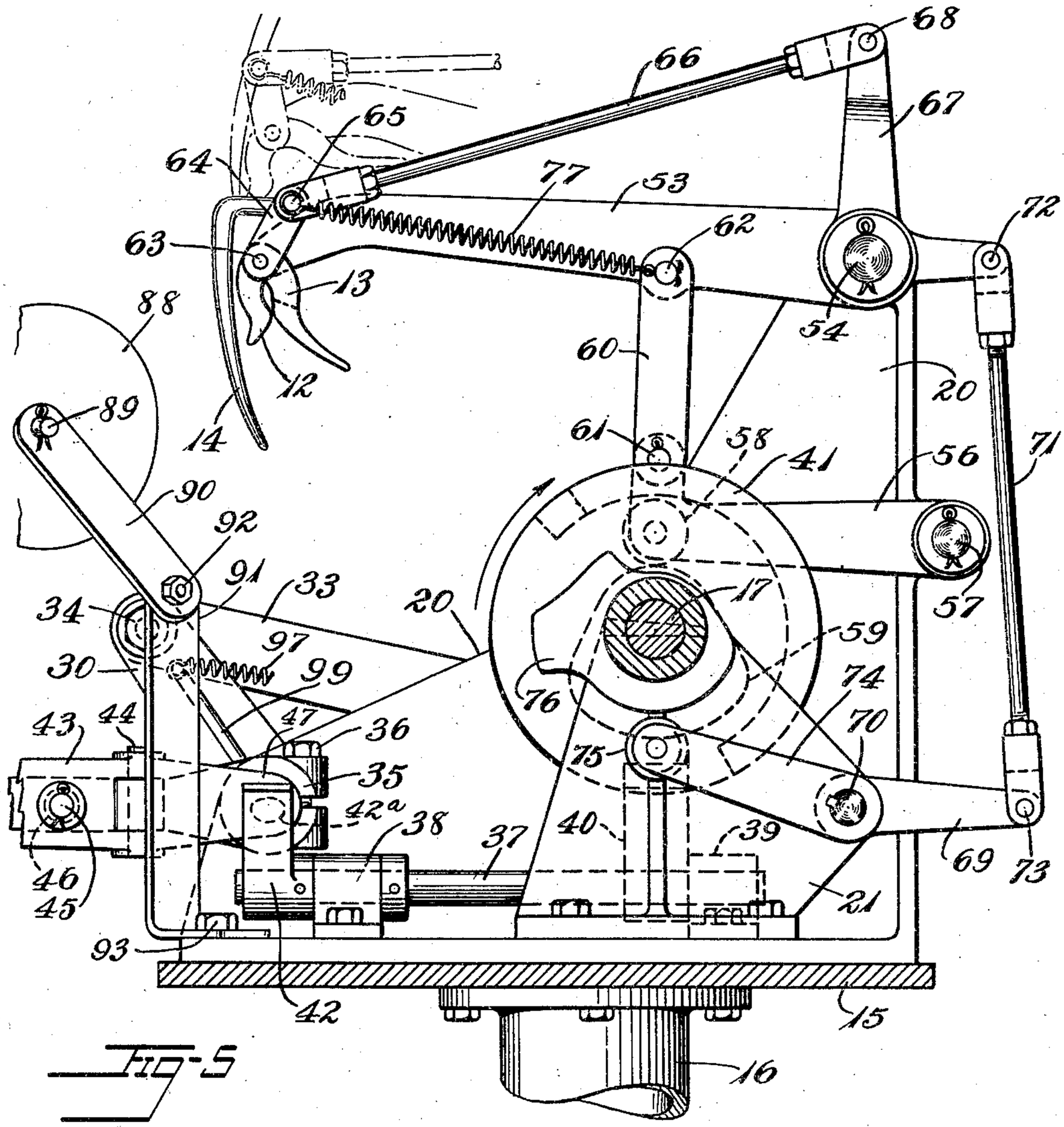

Fig-5

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METHOD AND APPARATUS FOR CHAIN LOOPING

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Fig-6

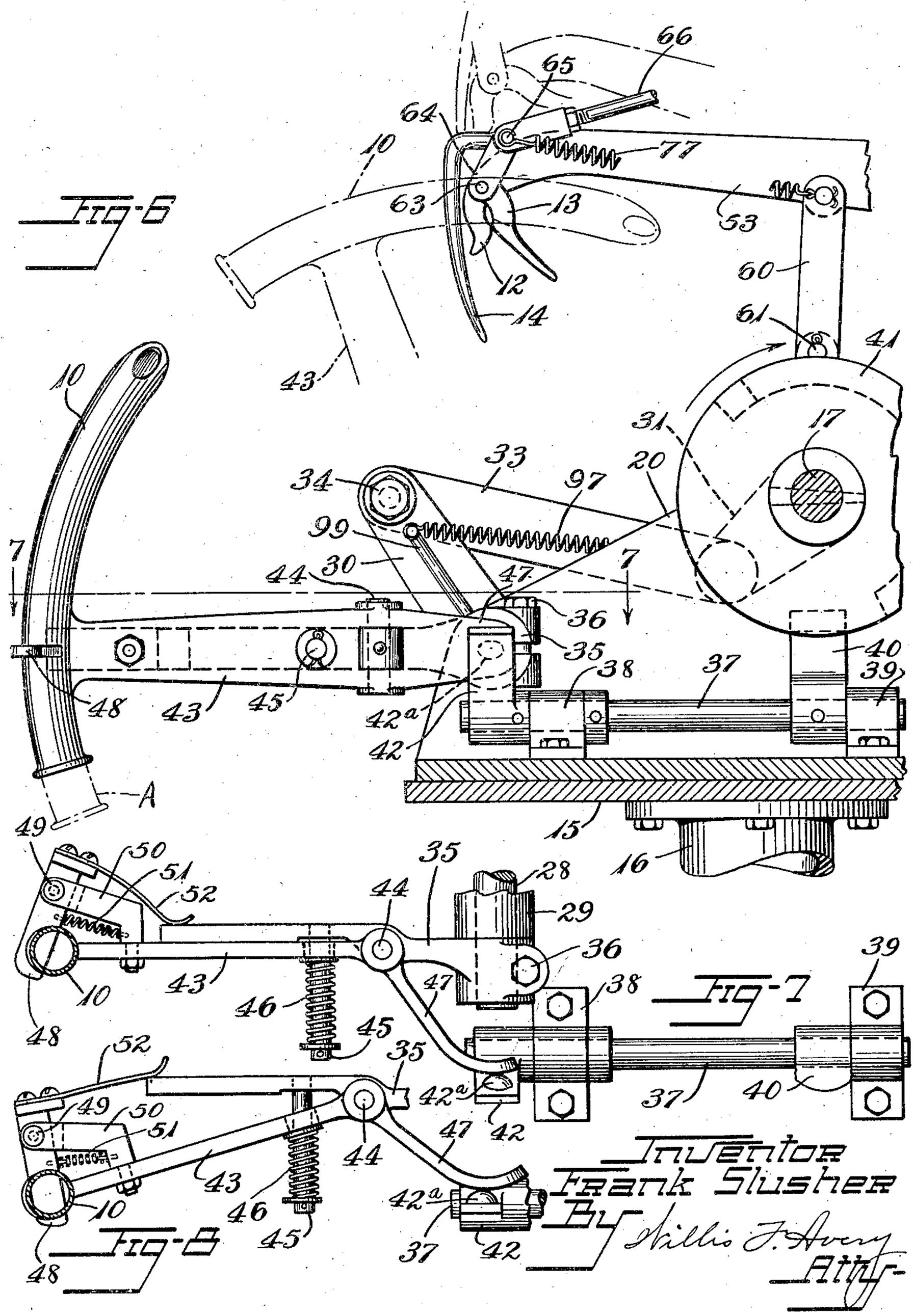

Fig-7

Fig-8

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METHOD AND APPARATUS FOR CHAIN LOOPING

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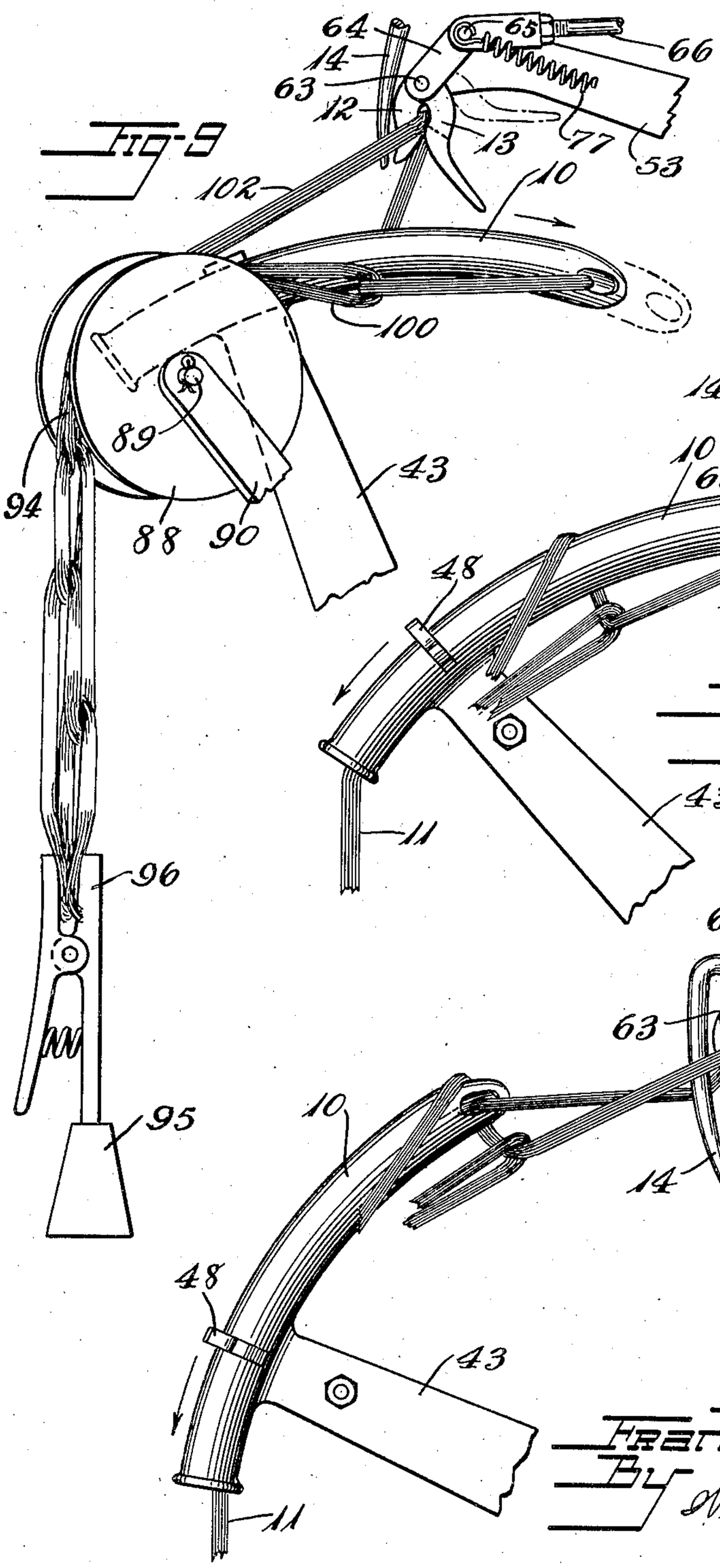

Fig-9

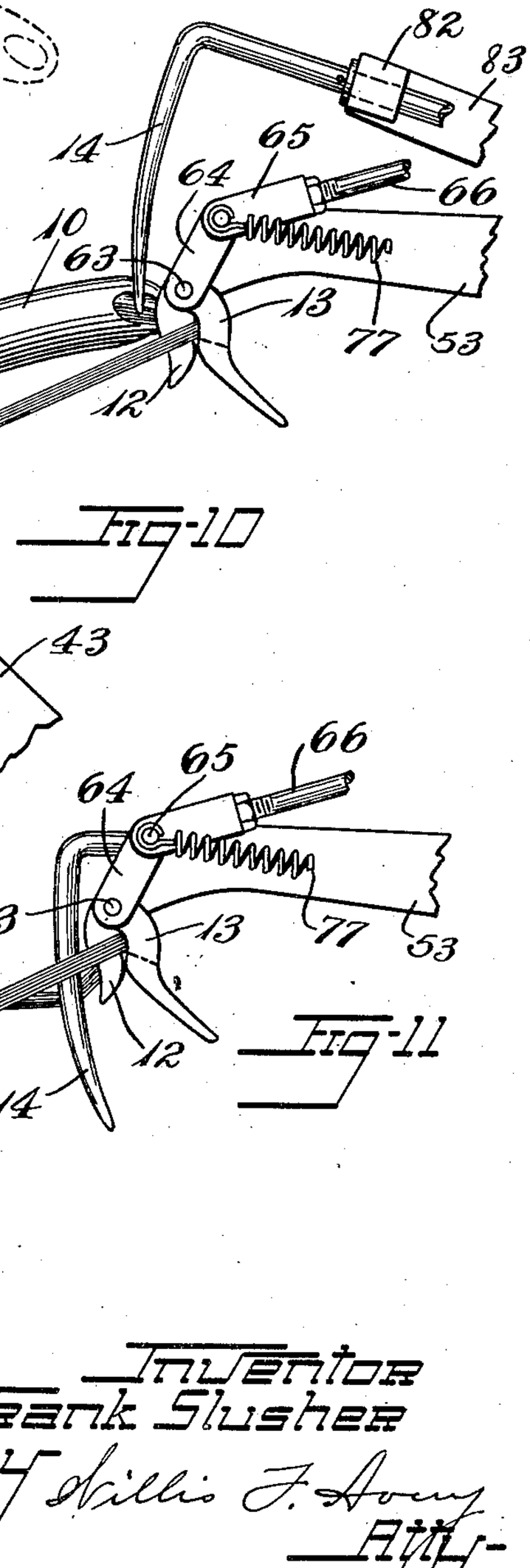

Fig-10

Fig-11

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UNITED STATES PATENT OFFICE

2,149,150

METHOD AND APPARATUS FOR CHAIN LOOPING

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Application December 10, 1936, Serial No. 115,175

13 Claims. (Cl. 28—21)

This invention relates to looping apparatus for forming a chain from a skein of individual cords or yarns, and to methods of chain-looping.

In the manufacture of rubber threads it is convenient to assemble the threads in parallel relation and handle them as a skein. To avoid tangling of the threads, and to avoid separation of the threads from the skein, it is convenient to tie the skein in a series of chain knots. Such knots may be untied by tension applied to the end of the skein. Chaining of the skein shortens the skein and permits its being handled during manufacture and shipped from the place of manufacture without undesirable snarling.

The principal objects of the invention are to provide apparatus and to provide procedure whereby a strand of flexible material may be conveniently formed in a chain of loops, and to provide simplicity of apparatus, reliability of operation and uniformity in the forming of such chains.

These and other objects will appear from the following description and the accompanying drawings.

Of the drawings:

Fig. 1 is a front view of a preferred form of apparatus, the pedestal being broken away and the shuttle being shown as near the end of its return stroke, the position of the shuttle at the end of the return stroke and the start of the forward stroke being indicated in dot and dash lines.

Fig. 2 is a side elevation of the same from the left with the parts in the same position, the shuttle and its arm being broken away, and part of the frame being broken away to reveal parts therebeyond, the raised subsequent positions of the looper fingers and the loop-retaining finger being indicated in dot and dash lines.

Fig. 3 is a detail plan view of the loop retainer.

Fig. 4 is a detail sectional view taken on line 4—4 of Fig. 1 and showing the driving sprocket and ratchet, part of the driving chain being also shown.

Fig. 5 is a sectional elevation taken on line 5—5 of Fig. 1, the shuttle and shuttle arm and part of the chain-supporting sheave being broken away, and the raised position of the looper fingers and the loop-retaining finger at a subsequent stage being indicated in dot and dash lines.

Fig. 6 is a sectional elevation taken on line 6—6 of Fig. 1, parts being broken away, the shuttle being shown near its most retracted position in its return stroke, its most retracted position being indicated by dot and dash lines, and its most advanced position and the corresponding raised position of the looper fingers and the loop retaining finger being shown in dot and dash lines.

Fig. 7 is a detail sectional plan view taken on line 7—7 of Fig. 6 with the shuttle in the position it assumes during its retractive movement, parts being broken away.

Fig. 8 is a similar view, but showing the shuttle in the position it assumes during its advancing movement, parts being broken away.

Fig. 9 is a detail elevation from the right of Fig. 1 showing only the shuttle, the chain sheave, looper fingers, and the loop-retaining finger with the partially chained material in place in the position assumed by these parts near the end of the advancing movement of the shuttle, other parts being broken away.

Fig. 10 is a detail side elevation from the right of Fig. 1 showing only the shuttle, looper fingers and loop-retaining finger with the partially chained material, the shuttle being shown during its retractive movement at the position when the looper fingers close upon the last loop of material and the loop retaining finger is about to enter such loop, other parts being broken away.

Fig. 11 is a similar view at a subsequent stage of the retractive movement of the shuttle, the loop retainer finger having entered the loop.

Referring to the drawings, the device generally comprises a shuttle or hollow feeding-tube 10 having the form of a hollow tube through which the strand material 11 may be drawn, a pair of looper fingers 12, 13 adapted to pick up the strand material as it emerges from the end of the shuttle 10 and grip it while the shuttle retracts, and a loop-retaining finger 14 for entering the loop formed by withdrawal of such material and retaining it while the shuttle advances through the loop so formed to advance another loop of material. The shuttle executes a movement which is generally rectangular but in the preferred form of the device is also arcuate in one direction of advance and return. Suitable cam operated mechanism is provided to move the essential parts through their respective cycles of movement.

To provide for support of the chaining instrumentalities a base plate 15 is mounted upon a suitable standard 16. A rotatable shaft 17 is horizontally journaled in bearings 18 and 19, formed in a pair of brackets 20 and 21 supported by the bed plate 15. A sprocket 22, is rotatably journaled upon the shaft 17, and may be driven from any suitable source of power such as a motor (not shown) by a chain 23. A ratchet wheel 24 is pinned to the shaft 17, adjacent the sprocket

22. A pawl 25 is pivoted to the sprocket 22 and is held into engagement with the ratchet by a spring 26, the arrangement being such that shaft 17 may be rotated in one direction only. A hand-wheel 27, fixed to the shaft 17, provides for rotation of the shaft by hand, the ratchet 24 and pawl 25 permitting this manual rotation of the shaft independently of the driving mechanism so that the material may be conveniently inserted in the mechanism.

To provide for advancement and retraction of the shuttle 10, a rock-shaft 28 is horizontally journaled in a bearing 29 forming a part of bracket 20. An arm 30 is fixed to one end thereof. A crank arm 31 is fixed to shaft 17 and is formed with a slot 31*a* in which a crank pin 32 is adjustably mounted for radial adjustment. A link 33 engages the pin 32 at one end and a pin 34, on arm 30, at its other end. Arm 30 is longer than the radius of crank 31, so that rotation of shaft 17 causes shaft 28 to rock back and forth. An arm 35 is adjustably clamped to shaft 28 by a bolt 36, and supports the shuttle 10 in a manner hereinafter described.

In order to provide lateral movement of the shuttle between advancements and retractions thereof, a rock shaft 37 is horizontally journaled in pillow blocks 38, 39 so as to be perpendicular to shafts 17 and 28. An arm 40, fixed to shaft 37 is adapted to bear against the face of a face-cam 41, fixed to shaft 17. A second arm 42, also fixed to shaft 37 is formed with a spherical protuberance 42*a* normally in substantial alignment with shaft 28. The shuttle 10, which is of arcuate form, is mounted near its material-receiving end to a radially extending arm 43 which is pivoted for lateral movement on a pin 44, carried by arm 35. A stud 45, mounted on arm 35, extends through a slot in arm 43, and a coil spring 46, which encircles the stud, tends to press against arm 43 to keep it in contact with an extending portion of arm 35. An arm 47, integral with arm 43, bears against the protuberance 42*a* on arm 42. The arrangement is such that during the advance movement of the shuttle, the cam 41 holds the shuttle in the plane of the position shown in Fig. 8 and in the dot and dash location indicated in Fig. 1, whereas, during the retractive movement of the shuttle, it is held in the plane of the position shown in Fig. 7 and in full lines in Fig. 1.

In order to provide for feed of the strand material through the shuttle only during retractive movement of the shuttle, and clamping of the strand material during advance of the shuttle, a clamping finger 48 is pivoted at 49, on a lug 50, attached to arm 43, and is adapted to enter a slot in the shuttle 10. A coil spring 51 of the compression type, mounted between the lug 50 and the finger 49, tends to force the finger out of the slot. A leaf spring 52 has one end fixed to finger 48. The other end impinges against the arm 35. The arrangement is such that with the parts in the position illustrated in Fig. 7 the finger is urged from the slot by coil spring 51 and permits passage of the strand material, but when the parts are in the position of Fig. 8 the leaf spring 52 is flexed and, overcoming the coil spring 51, presses the finger into the slot against the strand material.

To provide for manipulation of the looper fingers 12, 13, which engage the strand material adjacent the delivery end of the shuttle to draw a loop therefrom through which the succeeding advance of the shuttle introduces succeeding strand material, the following mechanism is provided.

Finger 12 is rigidly fixed to the end of an arm 53 which is vertically movable about a shaft 54 as a pivot. Shaft 54 is mounted in a suitable boss 55 formed on bracket 20. A lever arm 56 is pivoted upon a shaft 57 fixed in a boss formed on bracket 20 and carries a roller 58 which engages a cam 59 fixed to shaft 17. A pair of links 60, 60′ have their lower ends pivotally connected at 61, to arm 56, and their upper ends pivotally connected at 62 to arm 53. The arrangement is such that arm 53 is raised or lowered by rotation of cam 59.

Finger 13 is fixed to a pin 63, which is pivotally mounted through arm 53. An arm 64, fixed to pin 63, carries a pin 65 to which one end of an adjustable link 66 is pivoted. A bell crank lever 67 pivoted on shaft 54, carries a pin 68 on its vertical arm to which the other end of link 66 is pivoted.

A lever arm 69 is fixed to a shaft 70 which has a bearing through bracket 21. An adjustable link 71 is connected between pivot pins 72, 73, carried by the horizontal lever arm of bell crank lever 67 and lever arm 69, respectively. A lever arm 74, fixed to shaft 70, carries a roller 75 which bears upon a cam 76, fixed to shaft 17. A coil spring 77 of the extension type engages pins 62 and 65, and urges the fingers to maintain an open position. The arrangement is such that cam 76 controls the opening and closing of fingers independent of the control of the raising and lowering of the fingers by cam 59.

To provide for raising and lowering of the loop-retaining finger 14, a cam 78 is fixed to shaft 17. A lever arm 79 is pivoted on shaft 57 and carries a roller 80 which engages the cam 78. The loop-retaining finger 14 is rotatably mounted in bearings 81, 82, formed on the side of an arm 83 which is pivotally mounted upon shaft 54. A pair of links 84, 84′, are pivotally connected between arm 79 and arm 83 by pivot pins 85, 86, the arrangement being such that the arm 83 is raised and lowered by rotation of cam 78.

In the operation of the machine, the loop-retaining finger is raised past the shuttle as the shuttle is advanced. The loop-retaining finger is bent so as to extend downwardly and to the right of its supporting arm 83. This brings its point directly in line with the finger 12 and very close to the shuttle 10 on its up stroke. In order to avoid interference of the shuttle with the loop-retaining finger in the upward movement of the same, the shank of the loop-retaining finger is rotatably mounted in bearings formed on the arm 83, as hereinbefore described and is retained therein by a collar 82′ and a stop collar 87. Stop collar 87 is formed in an abutment which engages the side of arm 83 and prevents rotation of the finger in a counter-clockwise direction as viewed in Fig. 1. A torsion coil spring 87′ encompasses the shank of the finger 14 and has one end fixed to the stop collar 87 and its other end bearing against arm 83. The spring is so mounted under tension as to induce clockwise rotation of the shank of the finger. This rotation is prevented by the stop collar 87. Should the finger 14 engage the shuttle or the material looped thereabout during an upstroke of the finger, the finger will be deflected.

To provide for support of the chained material, its withdrawal from the device in the proper direction, and the holding of the loop in open position so that the shuttle may advance therethrough, a grooved sheave 88 is rotatably mounted on a stud 89, fixed to an arm 90. Arm 90

is adjustably attached to a bracket 91 by a clamp bolt 92. Bracket 91 is rotatably adjustable about a bolt 93 whereby it is clamped to the bed plate 15. The chained material 94 is led over the sheave 88 and, in order to provide a slight amount of tension thereto, a weight 95 may be attached to the leading end thereof, as by a pinch-clamp 96.

In order to balance the device it is found desirable to provide a tension coil spring 97, one end of which is attached to the bracket 20, as at 98, and the other end of which is attached to an arm 99, fixed to shaft 28. This spring counteracts the tendency of the shaft 17 to overrun by reason of the driving tendency of the throw of the shuttle and the falling action of the arms 53, 83, when driven through the ratchet 24.

Before starting the machine it is necessary to form at least one chain link in the material and to arrange the material as shown in Fig. 1. With the machine stopped at the position shown in Fig. 1, the clamp finger 48 will be held in raised position permitting the introduction of the strand material through the bore of the shuttle. The leading end is then passed under the loop retaining finger 14 and between the fingers 12, 13 of the looper and formed to provide a loop 100 about the reach 101 of strand extending between the shuttle and the pin 14. The ends of the loop 100 are clamped to the reach 102 and held over the sheave 88 while the machine is started.

The operation of the machine is as follows: From the position of the parts shown in Fig. 1, the shuttle 10 retracts to the position indicated at A. From this point the shuttle moves laterally to the position B during which movement the strand material 11 is clamped by the finger 48. The shuttle then advances and the looper fingers 12, 13 start to rise still gripping the reach 102 of the material. As the forward end of the shuttle reaches the loop-retaining finger 14, that finger starts to rise and near the end of the advancing movement of the shuttle or just beyond the position of Fig. 9, the fingers 12, 13 open permitting the reach 102 to drop over the shuttle, the loop retainer being at its highest position. When the shuttle reaches the end of its advance movement, it moves to the left to the plane of its full line position of Fig. 1 and starts its retractive movement. The loop-retainer 14 starts downward with the retractive movement of the shuttle. As the delivery end of the shuttle passes the tip of the finger 14, as shown in Fig. 10, the fingers 12, 13 close upon the strand material adjacent the eye of the shuttle and on further movement of the shuttle the loop retainer drops through the new loop, as shown in Fig. 11. By continued rotation of the shaft 17 the apparatus continues to form further chain links in the same manner until the strand material is exhausted.

I claim:

1. Apparatus for forming a series of chain loops from a length of flexible material, said apparatus comprising means including a shuttle for carrying forward a series of loops of the material in succession, means associated with the shuttle for positively clamping the material to the shuttle during forward movement thereof, and means for retaining each loop while a successive loop is carried forward therethrough.

2. Apparatus for forming a series of chain loops from a length of flexible material, said apparatus comprising means including a shuttle for carrying forward a series of loops of the material in succession, means associated with the shuttle for positively clamping the material to the shuttle during forward movement thereof, and means including a pair of members for temporarily retaining and spreading each loop while a successive loop is carried forward therethrough.

3. Apparatus for forming a series of chain loops from a length of flexible material, said apparatus comprising means including a tubular shuttle for carrying forward a series of loops of the material in succession from a length of material fed therethrough, means associated with the shuttle for positively clamping the material in the shuttle during forward movement thereof, and means for retaining each loop while a successive loop is carried forward therethrough.

4. Apparatus for forming a series of chain loops from a length of flexible material, said apparatus comprising a reciprocating shuttle, means for gripping the material as it leaves the shuttle and moving the gripped portion laterally from the path of the shuttle, and a finger adapted to engage the material between the gripper and the shuttle to spread a loop of the material while the shuttle carries a succeeding loop of the material through the loop so formed.

5. Apparatus for forming a series of chain loops from a length of flexible material, said apparatus comprising a shuttle having means for delivering the flexible material from one end thereof, means for manipulating the shuttle to cause its delivery end to follow an orbital movement, means for gripping the material as it leaves the shuttle during its orbital movement, and means for engaging the material between said gripping means and the shuttle to spread the loop formed thereby in the path of the delivery end of the shuttle so that the shuttle may be projected therethrough in its succeeding cycle.

6. Apparatus for forming a series of chain loops from a length of flexible material, said apparatus comprising a reciprocating shuttle adapted to deliver the material, means associated therewith to prevent withdrawal of material therefrom during forward movement of the shuttle, means for gripping the material as it leaves the shuttle and moving the gripped portion thereof laterally from the path of the shuttle, a finger for engaging the material between the gripped portion and the shuttle for spreading a loop of the material in the path of the shuttle while the shuttle carries a succeeding loop of the material through the loop so formed.

7. Apparatus for forming a chain of loops from a length of flexible material, said appaartus comprising shuttle means for advancing a length of the material, means for gripping the length of material and spreading it in an open loop in the path of the shuttle and means for advancing the shuttle to pass a bight of the material through the loop so held to form a succeeding loop.

8. Appaartus for forming a chain of loops from a length of flexible material, said apparatus comprising a tubular shuttle for advancing a length of the material extending therethrough, means for gripping the length of material and spreading it in an open loop in the path of the shuttle, and means for advancing the shuttle to pass a bight of the material through the loop so held to form a succeeding loop.

9. Apparatus for chain-looping flexible material, said apparatus comprising means for engaging a loop of the material in at least three spaced-apart positions around the loop and moving the material to effect spreading of the loop

between such positions, and means for advancing a portion of the material through said loop.

10. Apparatus for chain looping flexible material, said apparatus comprising means for advancing a loop of the material, means for engaging the loop at one position and means for engaging the loop at another position spaced from the first said position, at least one of said means being movable in a direction to effect spreading of the loop for advancing a portion of the material therethrough.

11. Apparatus for chain looping as defined by claim 10 in which the means for advancing the material comprises a tubular shuttle movable in an orbital path.

12. Apparatus for chain looping flexible material, said apparatus comprising means for advancing a loop of the material in one plane, means for withdrawing the chained material in one direction from said plane, means for shifting the advancing means with the loop thereon in an opposite direction, means for retaining the shifted loop while the advancing means returns to its original plane for a further advancing movement, and means for spreading the loop between the retaining means and the withdrawing means for receiving a succeeding loop of material.

13. Apparatus for forming a series of chain loops from a length of flexible material, said apparatus comprising means for intermittently advancing the material in a succession of loops, means for withdrawing the chained material laterally of the path of advance in one direction, means for retaining an advanced loop, and means for engaging the advanced loop at a position spaced from the retained position, at least one of said means being movable in a direction to effect spreading of said loop while a succeeding loop of material is advanced therethrough.

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