Jan. 1, 1963 J. L. HUBBARD ET AL 3,070,983

LOOPER WITH SLIDING CUTTER

Filed March 19, 1958 7 Sheets-Sheet 1

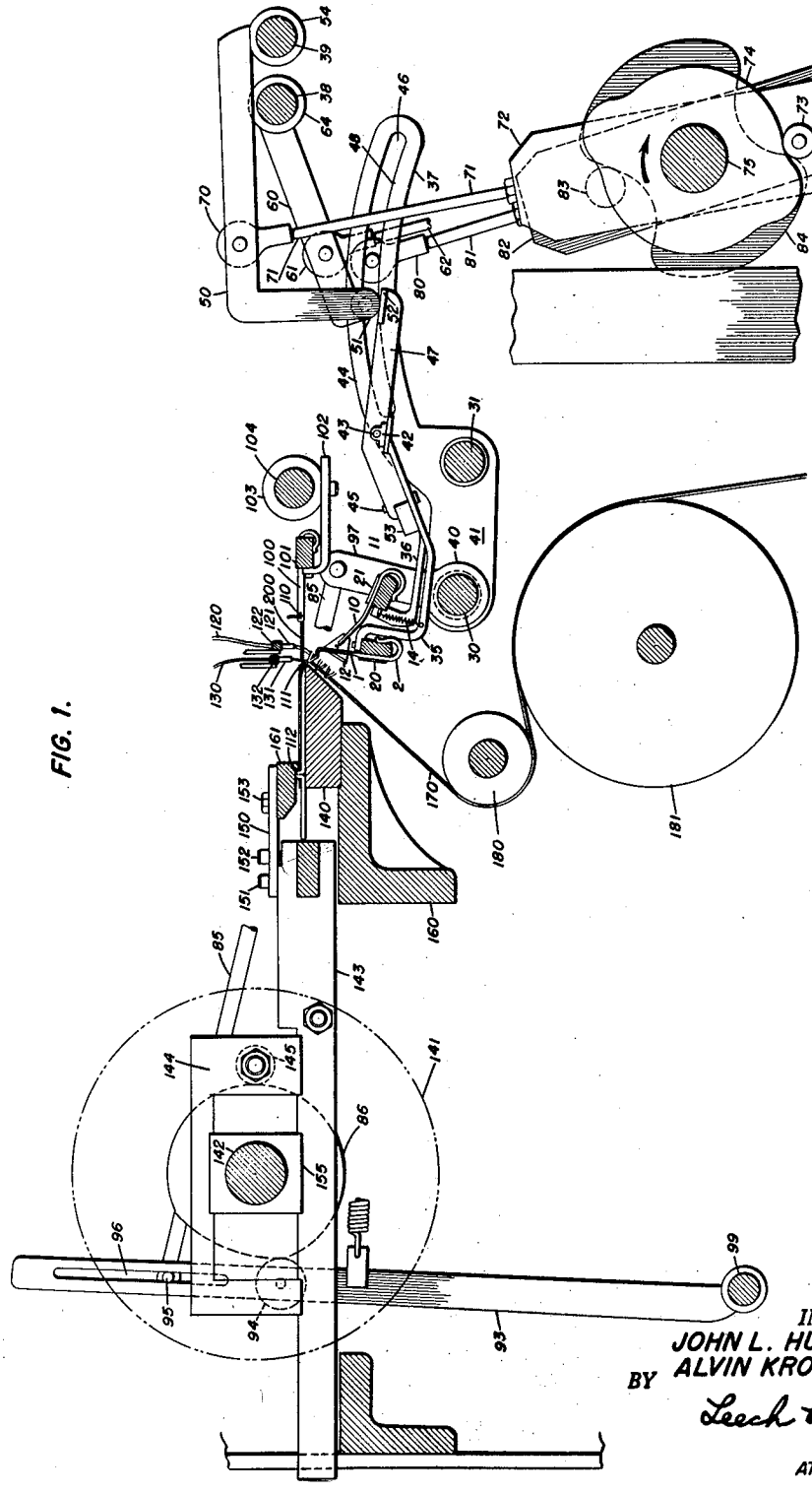


FIG. 1.

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LOOPER WITH SLIDING CUTTER

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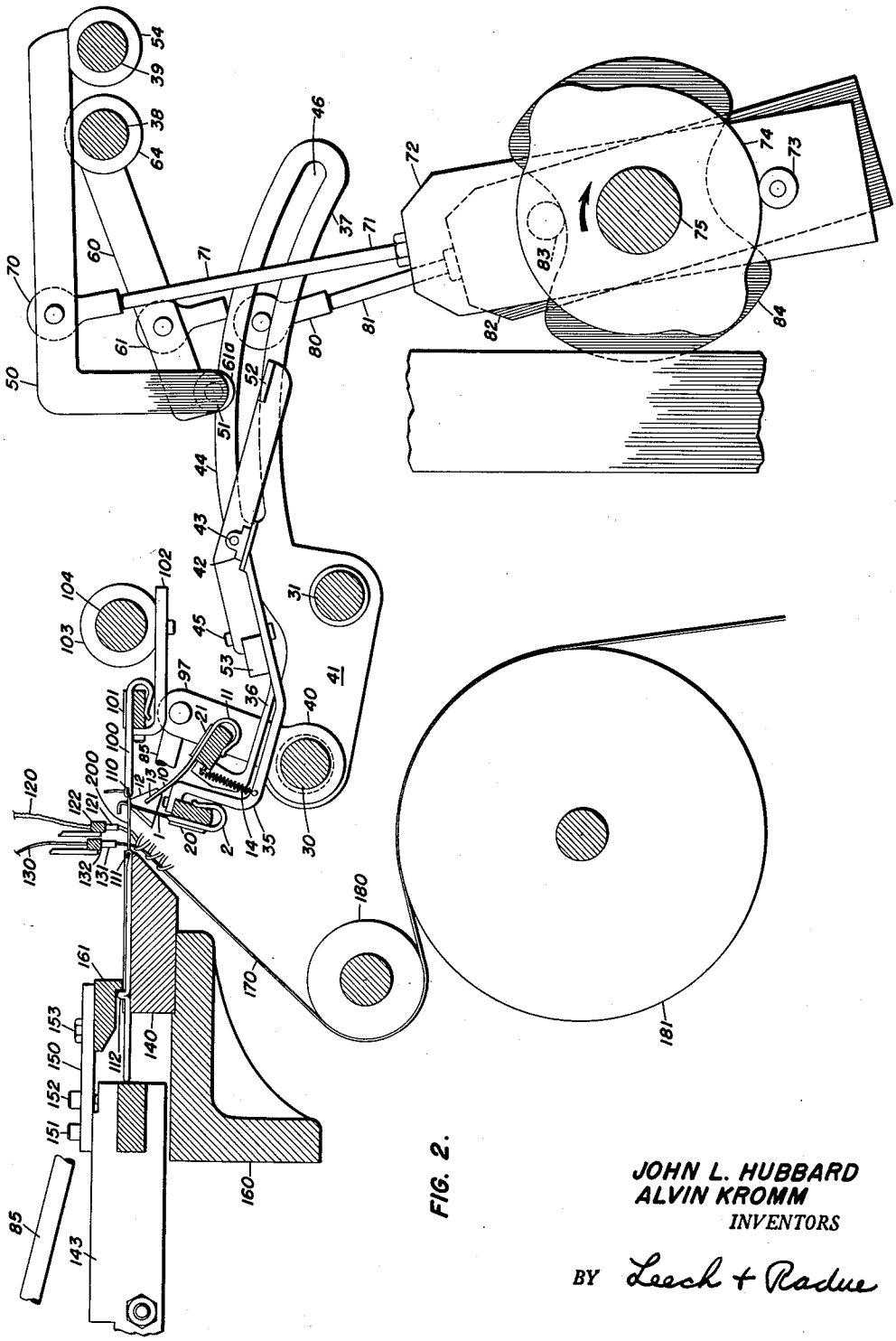


FIG. 2.

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LOOPER WITH SLIDING CUTTER

Filed March 19, 1958

7 Sheets-Sheet 3

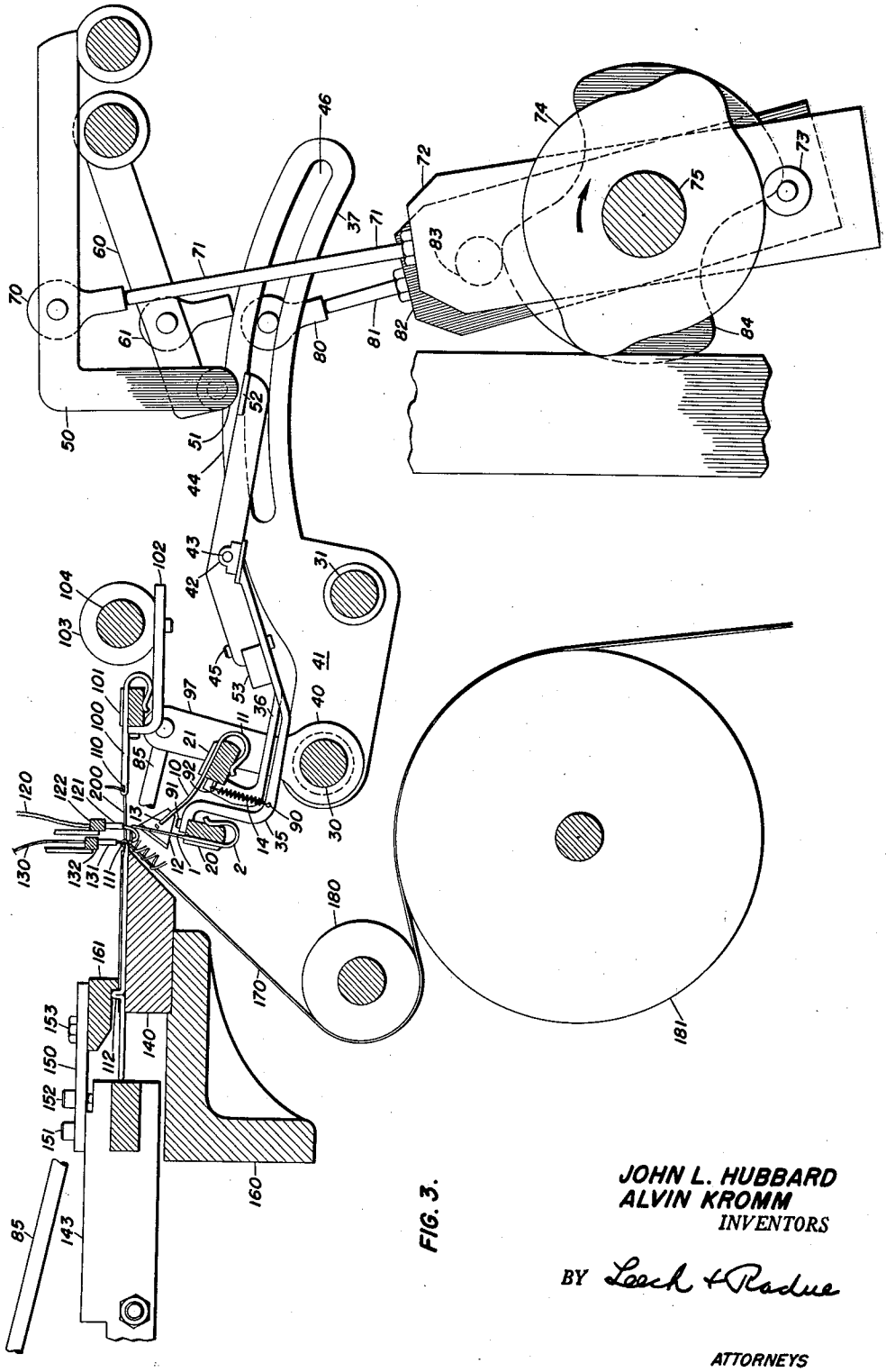


FIG. 3.

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LOOPER WITH SLIDING CUTTER

Filed March 19, 1958 7 Sheets-Sheet 4

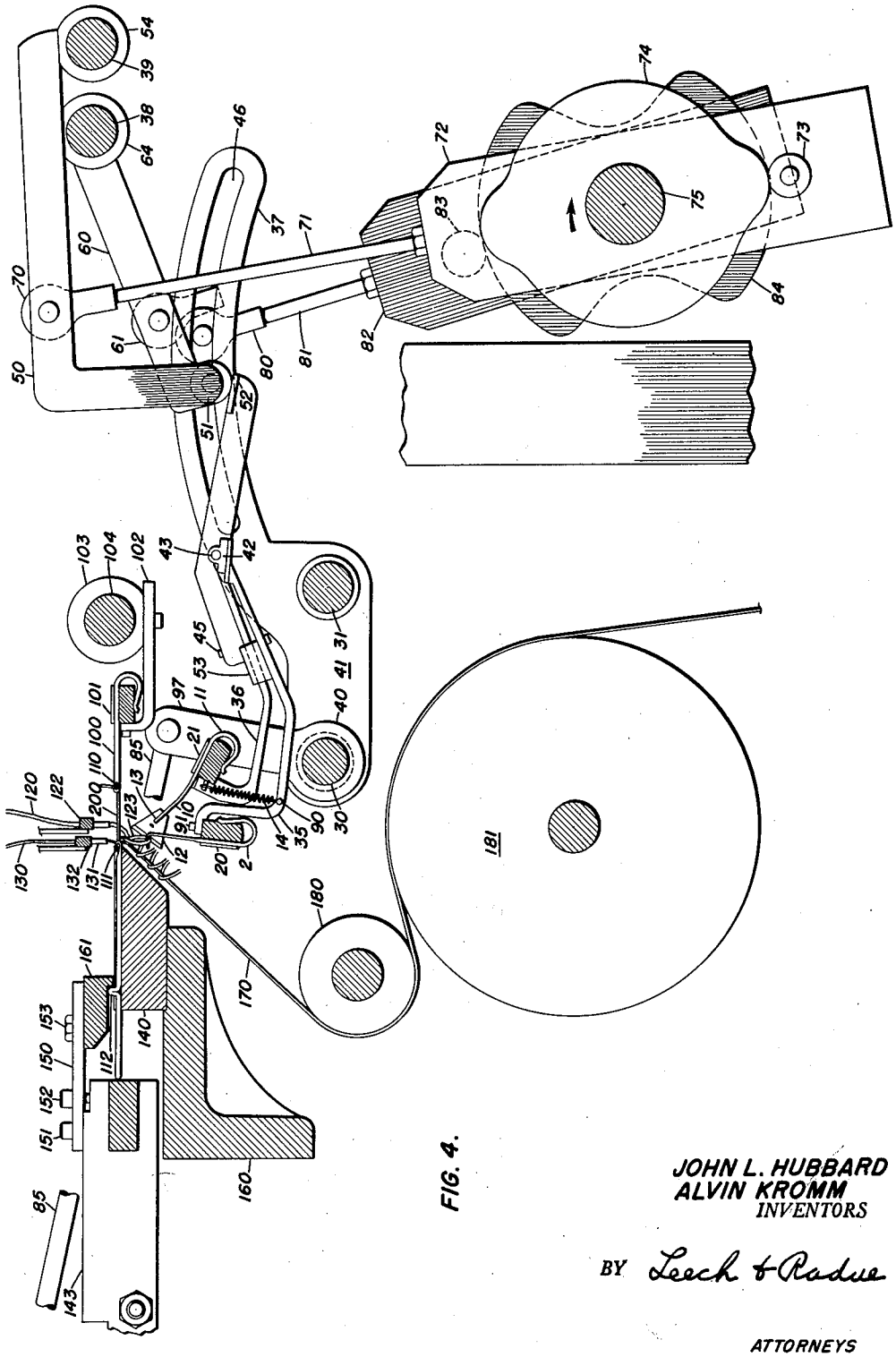


FIG. 4.

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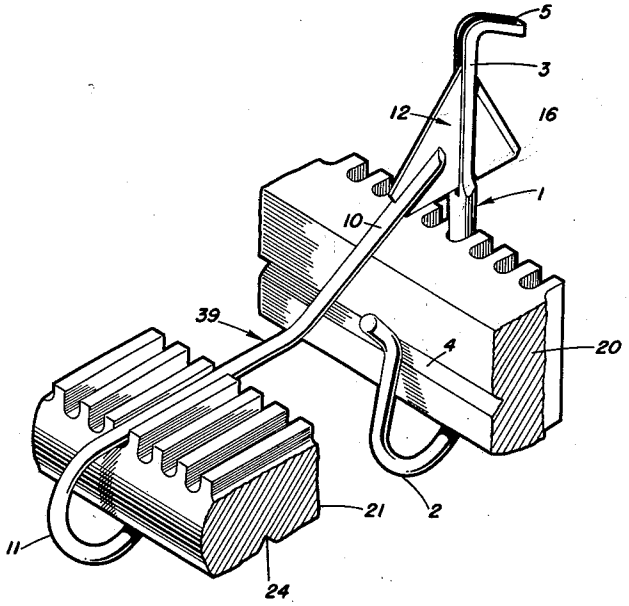


FIG. 5.

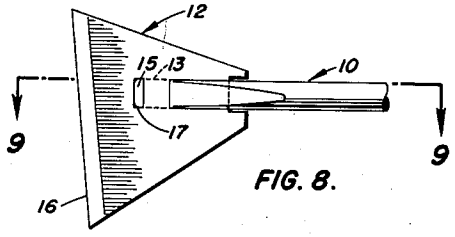


FIG. 8.

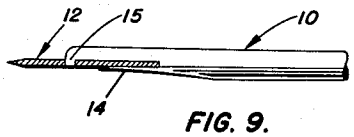


FIG. 9.

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LOOPER WITH SLIDING CUTTER

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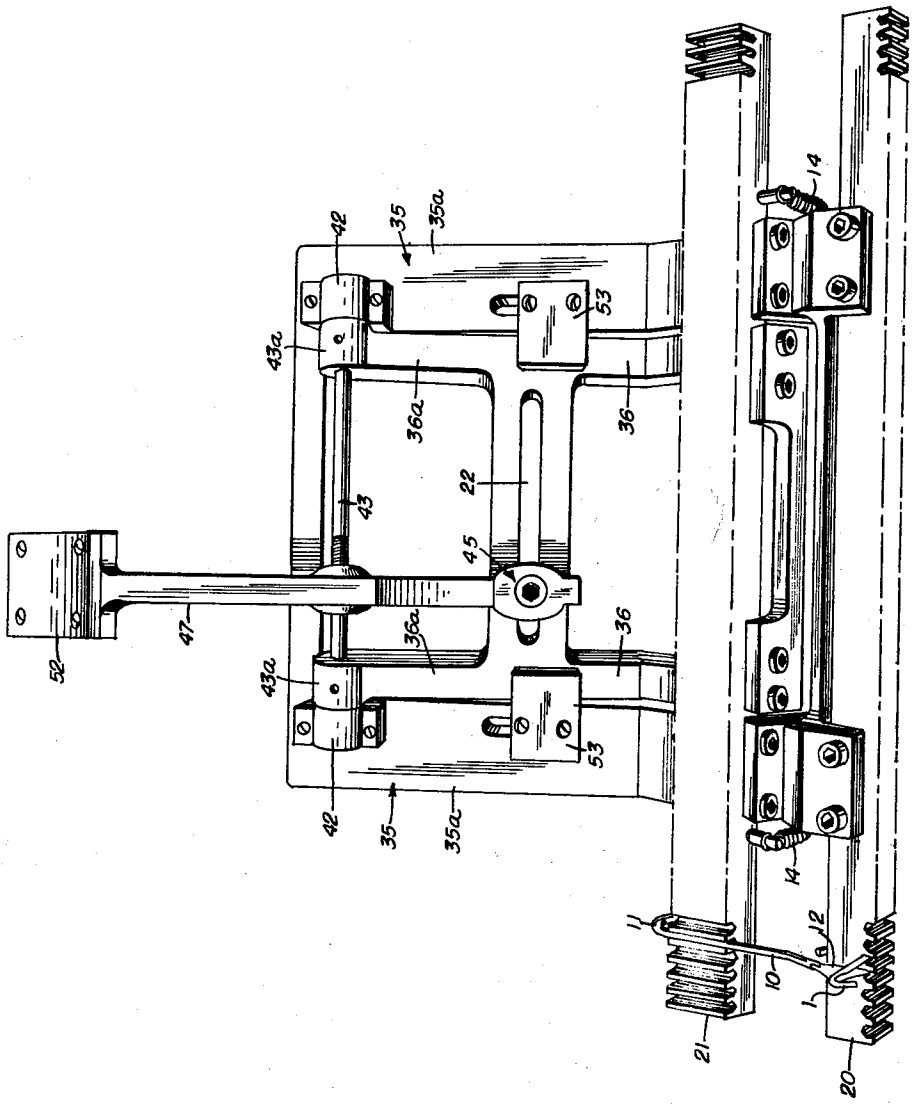


FIG. 6

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LOOPER WITH SLIDING CUTTER

Filed March 19, 1958 7 Sheets-Sheet 7

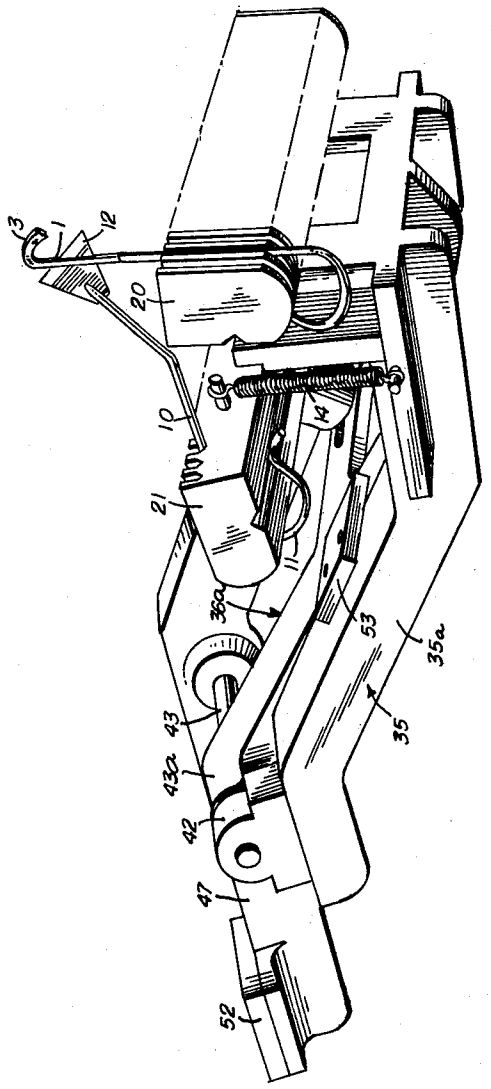


FIG. 7

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United States Patent Office 3,070,983 Patented Jan. 1, 1963

3,070,983

LOOPER WITH SLIDING CUTTER

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Filed Mar. 19, 1958, Ser. No. 722,561
7 Claims. (Cl. 66—84)

This invention relates to a hooking attachment which incorporates a cutting device.

Hooks are used in the textile industry for many things. The loopers to be described herein are related to hooks in that they can perform a function in knitting, weaving, tufting and sewing to create a pile in the fabric produced. Loopers of the type described herein may not, at first sight, appear to be a novelty in this art, because loopers are commonly used in the various fields of textile manufacturing. However, loopers perform one function and one function only: to make loops in a fabric and hold such loops until thery are bound in properly in the interlacing threads of the fabric.

The loopers of this invention differ considerably from those formerly known. They lend themselves not only to making loops, but also to cutting those loops in intervals or continuously, as the case may be. The simplicity of the device leands itself to becoming a part of practically any cloth manufacturing unit known heretofore, such as looms, knitting machines, tufting machines, sewing machines, and the like. Naturally, for each of the mentioned machines to which the device of this invention may be attached, the mechanical combination which operates the device will have to be adapted to fit into the mechanical combinations which the particular machine offers.

Therefore, it is a primary object of this invention to provide a loop and cutting device combination that makes it possible for machines which manufacture flat goods to manufacture also pile fabrics of a cut and uncut pile.

It is another object of this invention to provide a looping attachment for looms, said looping attachment to be used in lieu of wires on a pile fabric loom, and said looping attachment being adjustable in such a way that it may either make loop or cut pile or both on the surface of the fabric produced by the loom.

Another object of the invention is to provide a pile forming attachment for flat bed knitting machines, or a sinker attachment for circular knitting machines, wherein formers of the type of this invention are used, which pile formers lend themselves to incorporating in knitted fabrics pile forming units that will help to manufacture a fabric having pile that is cut or uncut, or both.

A still further object of the invention resides in the provision of a looping and cutting attachment for a tufting machine which differs from devices of a similar sort of tufting machine in that the pile which is being cut is cut in the center rather than on the side. Therefore, a tufting machine thus equipped performs as well as a wire would perform on a loom.

This invention has a further object the provision for adaptation to sewing machines in order that loops or cut pile may be formed by the attachment of this invention in conjunction with the sewing machine, to which such units of our invention are adapted.

This invention also lends itself to non-woven fabrics where threads are pulled away from insertion areas and where such threads, after being adhered to a given area, are left in loop form or cut form, as may be desired.

These are just some of the objectives of the present invention. In order to facilitate the understanding of it there has been shown in the accompanying drawings

the preferred form of this invention as it is used in combination with a knitting machine, wherein:

FIGURE 1 is a partially sectioned side view of the working parts of a flat bed knitting machine which cooperate in a particular manner with a looper and a sliding cutter to comprise the novel combination of this invention;

FIGURE 2 is another side view of the combination of FIGURE 1 wherein the looping means are moving in position to catch the yarn to be looped;

FIGURE 3 is another and similar side view, the difference being that the looping means have pulled the pile yarn into loop formation;

FIGURE 4 is a still further side view of FIGURE 1 showing the sliding cutter in the act of cutting the previously formed loops into cut pile tufts;

FIGURE 5 is an enlarged isometric and segmental view of the combination of the looper and the sliding cutter;

FIGURE 6 is a top perspective view of an operative preferred embodiment of the looper and sliding cutter combination with related mechanism;

FIGURE 7 is an end perspective view of the looper and sliding cutter of FIGURE 6;

FIGURE 8 is a side elevational view of the sliding cutter and its blade holding means; and

FIGURE 9 is a horizontal sectional view taken on line 9—9 of FIGURE 8.

As previously stated, the principles of this invention may be applied to numerous manufacturing devices for cloth, and by the incorporation of which a pile fabric forming operation is provided. Since the usage of this device is so varied, other similar combinations will occur to those skilled in this art. The reason that such additional combinations are not presented is the fact that anyone acquainted with the art of textile manufacture, and especially one acquainted with the art of manufacturing pile fabrics, could readily adapt the principles of the disclosed invention to the particular type of machinery to which it is to be attached. A showing of one preferred from of the invention, this being a combination of the basic parts of a flat bed knitting machine with the pertinent related parts of this invention is, therefore, deemed sufficient. It is unnecessary to show the whole knitting machine, because it is substantially the same type of knitting machine that is generally used in the art.

Referring to FIGURE 1, the warp mechanism of the knitting machine comprises a plurality of knitting needles 111 reciprocated in needle bed 140 by a cam 141 carried on and rotated by drive shaft 142 operated by conventional means. The cam 141 is shown in phantom and on the side opposite that from which the view is taken has circular groove in which the follower 145 rides to provide positive movement in both directions. Follower 145 is mounted on yoke slide bar 144 which is suitably secured to the needle driver 143. The yoke slide bar 144 slides back and forth on slide block 155 carried on rotating drive shaft 142. It should be noted that the needle bed 140 is mounted on cross beam 160. The needles are pulled backwardly by the return pull unit 150 secured to the needle driver 143 by cap screws 151 and 152. A downwardly extending front part 161 of the return pull unit is held in position by cap screw 153. This front part 161 engages the needle butt 112 on needle 111.

In this particular example it is important that the cloth 170 which comes off the knitting machine be under substantial tension. This is accomplished by leading the cloth over polished idler roller 180 onto take-up roller 181 which is covered with sandpaper, card clothing or other suitable frictional-type material in order to control slippage.

Spaced forwardly from the needle bed 140 are a plurality of warp yarn guides 100, one for each needle, clipped onto guide bar 101. The bar 101 is secured to a plurality of brackets 102, one end of each bracket having a collar 103 fixedly mounted on shaft 104. Warp yarn 200 is threaded through the eye 110 of each warp yarn guide 100.

Referring particularly to FIGURES 5, 6, and 7, the looper and cutter attachment comprises a plurality of slotted hooks 1, each having an integral hook spring clamp portion 2 which secures the hook to holding bar 20. This holding bar has a plurality of spaced parallel slots on one face and a longitudinally disposed groove in the opposite face to receive and retain the spring clamp portion of each hook. The holding bar 20 is carried by one end of rectangular bracket 35 having sides 35*a* mounting bearing blocks 42 at their ends. These blocks 42 are pivotally mounted on shaft 43 carried in shaft bearings 43*a* extending from the base 36*a*.

Base 36*a* has a pair of side portions 36 which carry cutter holding bar 21. This holding bar has a plurality of spaced parallel slots in one face and a single longitudinally extending groove on the opposite face for holding a plurality of cutter blade holders 10 is alignment with slotted hooks 1.

The cutter blade holder 10 has an integral spring clamp portion 11 which is snapped onto the cutter holding bar 21 in the same manner as the looping hook 1. The cutter blade 12 is snapped onto the blade holder 10, as will be described later.

The base 36*a* has a transverse slot 22 in which an operating lever 47 is slidably mounted by slide assembly 45. The lever 47 is pivotally carried on shaft 43 and has a cam follower plate 52 on its free end. Actuation of the lever 47 causes it to rotate about shaft 43 to swing the cutter holding bar in an arc. The extent of such movement is limited by stop blocks 53 mounted on sides 35*a* of bracket 35.

As indicated in the various figures of the drawings, the slots in the hook holding bar 20 and the cutter holding bar 21 are aligned with each other in order that each cutter blade 12 may slide back and forth in its respective and aligned slot 5 of hook 1.

The looper and cutter attachment is mounted on the knitting machine in the following manner. The sides 35*a* of bracket 35 are secured on front hooking shaft 30 by means of a collar 40 affixed to said shaft, thus supporting the entire attachment thereon. Bracket 41 is pivotally mounted on second front hooking shaft 31 as well as on front hooking shaft 30 and has an integral projecting pile height adjustment lever 44 with a slot 48 therein. Connecting rod 81 has an end portion 80 which rides in slot 48 while its other end is connected to a slide bar 82 mounting a cam follower 83 which engages cam 84 secured on front drive shaft 75. Rotation of said shaft 75 causes cam 84 to vertically reciprocate slide 82, thus producing rotation of bracket 41 about shaft 31. Bracket 41 is also secured to shaft 30, said shaft together with all parts mounted thereon will pivot about shaft 31. Since the hooking and cutting attachment is fixedly mounted on shaft 30, the entire attachment will therefore pivot about shaft 31. By varying the stroke of rod 81, the amount of rotation about shaft 31 will be changed and obviously result in a varying height of the loops formed by the looping hooks 1 which are caused to move up and down by this movement.

The above-described mechanism serves only to produce an up and down motion in the looping hooks, the back and forth movement of the hooks about shaft 30 being accomplished in the following manner. Referring to FIGURE 1, a connecting arm 97 is mounted on and secured to shaft 30 and a rod 85 is fastened to the free end of the arm 97. This rod extends rearwardly over and beyond the needle board 140 where its end lug 95 is slidably received in slot 96 of lever 93 pivotally mounted on bearing shaft 99. Cam follower 94 on lever 93 engages cam 86 on drive shaft 142 to pivot lever 93 about shaft 99 and thus impart a reciprocating motion to rod 85, thereby rotating shaft 30 through arm 97. Rotation of shaft 30 causes the looper and cutter attachment mounted thereon to oscillate thereabout and thus produce a back and forth motion of the looper hooks 1.

Since the front hooking shaft 30 is caused to reciprocate in a generally vertical manner by rotation about shaft 31 and, further, since the back and forth movement of the looper hooks is produced by rotation of shaft 30, it follows that combined adjustment of the two mechanisms which produce these motions is necessary in order to achieve proper looping hook motion.

As previously mentioned, the looping hooks 1 and the cutter blade holders 10 are mounted in aligned slots in the hook holding bar and the cutter blade holder bar, respectively. Thus, by proper adjustment the blade 12 is slidably positioned in slot 5 of each looping hook 1. As shown in FIGURE 5, the hook 1 has an integral spring clamp 2 and a hook portion 3 having a slot 5 therein.

As illustrated in FIGURES 8 and 9, the blade holder 10 has a slot 13 in its forward end with a downturned lug 15 extending downwardly and over the open end of the slot. The slot is so formed that a thin spring-like element 14 is left to aid in holding the blade in position. The generally triangular blade 12 has a centrally apertured portion 17 conforming in shape to the cross-section of lug 15. The blade 12 is slipped into the slot 13 so that the apertured portion 17 of the blade will fit over the lug 15 to hold said blade in position. The blade has a cutting edge 16 extending directly outward from the end of the holder.

The cutting action whereby the cutting blade 12 is reciprocated in the slot of its respective looping hook to cut the pile loop held thereby is accomplished as follows. Cutter holding bar 21 is carried by side portions 36 extending from base 36*a* to which is secured a lever 47 pivotally mounted on shaft 43. The end of lever 47 mounts a cam follower plate 52 engaged by roller 51 carried on the end of cam lever 50 pivotally mounted on shaft 39 by means of collar 54. Rod end portion 70 of rod 71 is connected to lever 50 while the other end of the rod is fastened to slide 72 carrying cam follower 73 engaging cam 74 secured on rotating shafts 75. Cam 74 causes slide 73 to reciprocate and through rod 71 and lever 50 rotates lever 47 about shaft 43. Thus base 36*a* rotates about shaft 43 and through holder 10, cutter holder bar 21 and side portions 36 connected to the base 36*a* produces an oscillating motion of cutter blade 12 in the slotted portion of the looping hook 1.

A spring 14 extending between cutter holder bar 21 and the bracket 35 which is fastened to the looping hook bar 20 acts to return the bar 21 to its lower position when the blade is not in cutting position.

It will be realized that what has been described represents only one embodiment of the invention, and that there are other ways of mounting the looping hooks 1 and the blade holders 10 onto the looping and cutting units. One way is to weld these parts onto regular stock, and another is to make a die that molds all these parts as a unit in one operation. The reason for showing the particular embodiment of FIGURES 6 and 7 is that it has been found that fine parts like the loopers and blade holders are subject to rapid wear at excessive speeds and may break at different times. Hence, the snap-on type of the looping hook and the blade holder, respectively, make it easier to replace each individual part without much difficulty or shutdown time.

As seen in FIGURES 6 and 7, the looper hook holding bar 20 and the cutter holding bar 21 are made in sections of a given length. This has a very important purpose. As indicated in FIGURE 1, there is an additional rod 62 whose end 61 is connected to lever 60 piv-

otally mounted on shaft 38 by collar 64. This mechanism would be a duplicate of that previously described for operating the cutter blades 12, yet operated by a different shaft, namely, 38 in somewhat different time sequence and attached to a separate looping hook and cutting unit so as to vary the cutting timing and thus vary the load on the machine.

There may be incorporated in the utilization of this invention a looper with a sliding cutter having more than one cutting mechanism.This additional cutting mechanism facilitates the manufacture of many different fabrics. Should the looper and sliding cutter unit attached to cam lever 50, wherein the sliding cutter is operated by the mechanism of cam 74, be operated in the same manner as cam lever 60, all the pile manufactured in the fabric will be cut at the same time. Should the cam lever 50, however, be operated by a cam that is not identical with the one shown in cam 74, the sliding cutting unit and blade holders 10 operated by cam lever 60 will cut the pile of the fabric at intervals different than those operated by cam lever 50. From this explanation, it will be readily understood that there are a great many variations in the types of fabrics that can be manufactured in accordance with the principles of the disclosed invention.

In looms of great width, such as are used in the manufacture of broadloom floor coverings, the width of each individual attachment with its sliding cutter determines the variations in fabric that may be manufactured. The width of such attachments may vary from that of the combination of a single looper with a single sliding cutter, such as shown in FIGURE 5, to a group of such units as shown in FIGURES 6 and 7. Some of the looping hooks 1 may be clamped onto the loop hook holding bar 20 without a blade holder clamp 11. Others, in turn, may have the combination of the looping hook 1 with the blade holder 10. All these may be varied again by having some looping hooks 1 grabbing yarn, other looping hooks 1 not grabbing yarn; and some blade holders 10 being in cutting position within the looping hooks 1, and others being in such position but not operated.

The mounting and operative relations of the pile looping, holding, and cutting means of this invention are most clearly shown in FIGURES 5 to 9, inclusive. Considering first the enlarged and semental views of FIGURES 5, 8, and 9, one upright looping hook 1 is shown to have a looping hook clamp 2 at its lower end part ,a pile holding hook portion 3 at its upper end, and a lengthwise aperture 5 extending rearwardly and downwardly of its upper end to receive and guide a cutting blade 12 in its pile cutting movement. A loop hook holding bar 20 is detachably engaged with the lower end of the yielding clamp formation 2 and has a longitudinal groove 4 for more positive retention. The extended blade holder member 10 has a resilient clamp formation 11 on one end for insertion in one of the uppermost channels of the cutter holding block 21, and retention of its end in groove 24 extending lengthwise on the underside of said block.

The replaceable cutter blades 12, which are a special feature of this invention, are generally triangular in shape and have the flexibility of an ordinary thin safety razor blade. There is an unsymmetrical and sloped cutting edge 16 at the base of the triangle and a rectangular notch at its truncated apex (FIGURE 8).

The adjacent end part of the rod-like blade holder 10 is formed with an outwardly directed slot or socket 13 at one side, which provides an integral leaf spring 14. In opposition to spring 14 there is a stiff lug 15 with an inturned end interlocking with a complemental transverse slot 17 in the blade outwardly of the socket 13.

The cutting attachment which has been described is an outstanding feature because of the utility and economy it affords. A worn or defective blade can be replaced in an instant by deflecting it against the leaf spring part 14 to release it from the lug 15. A new blade 12 can be snapped in instantly past spring part 14 and into two-way interlocking engagement with slot 17 and the rectangular notch at the apex of blade 12.

The following examples are representative of the fabrics that can be produced by use of the novel principles of this invention:

Example 1

The apparatus disclosed herein is operated in such manner that the loopers and sliding cutters work each time a pile row is formed. This operation will manufacture a pile fabric with all cut pile.

Example 2

The apparatus is so operated that all the loopers operate in each pile row, but only part of the sliding cutters operate in one pile row; and part of the sliding cutters operate in each alternate pile row. Such operation will make a fabric that has part loop and part cut pile, alternately.

Example 3

The apparatus is so operated that only some loopers have sliding cutters and other loopers are without sliding cutters. This arrangement will manufacture a fabric which has lengthwise rows of cut pile and also lengthwise rows of loop pile.

Example 4

The novel attachment provided by this invention is caused to operate in such a manner that some of the loopers are working and other loopers are idle, and some of the loopers that are in operation have sliding cutters, and other of the loopers that are not in operation do not have sliding cutters, thereby providing means for manufacturing a fabric which may have in each pile row raised pile yarn and non-raised pile yarn, and in which some of the raised pile yarn is cut and some of the raised pile yarn is uncut.

Example 5

The attachment is similar to the one described in Example 4, but has some of the hooks non-operative in one pile row and operative in another, and vice versa, and some of the pile hooks that have sliding cutters operate in one pile row and not in the successive pile row, thereby making possible a design with symmetric features.

Example 6

The attachment is the same as the one particularized in Example 5, but the cams for the loopers and sliding cutters have chains thereon, which, in given pile rows keep the various parts operative or non-operative, respectively, in repeats that are predetermined in the design of a fabric. This combination will make possible production of a tri-dimensional fabric with a flat background and raised pile, wherein the raised pile is cut or uncut, as the design requires. The primary advantage of this modification is that no jacquard mechanism or similar known mechanisms for designing is necessary in order to vary the feature which imparts versatility to the attachment of this invention.

FIGURES 5 through 9 afford a very clear understanding of the basic features of the invention, namely, a single looper 1 and a blade 12 sliding therein. The looper or looping hook 1 is attached to the spring looping hook clamp 2 mounted on the holding bar 20 and fitting into the horizontal groove 4 of said holding bar. The sliding cutter 12, operated as previously explained, consists of a blade holder member 10 extending into the adjacent end portion of the blade holder clamp 11. The cutter holding bar 21 has a plurality of transverse grooves 24 receiving the clamps 11 of the blade holder member 10. Towards the spliced or longitudinally slit looping hook 1 the blade holder 10 extends into an inturned lug 15 over which a complemental aperture formed in blade 12 parallel to its cutting edge engages. The blade now operates

up and down in the aperture 5 of the spliced looping hook 1. As mentioned previously, the spliced looping hook 1 and the blade holder 10 do not necessarily have to be snapped onto the bars but may be attached thereto by other means. Again, this is shown as one of the preferred forms of the invention. Cutting unit stop blocks 53, which are shown in FIGURES 1 and 7, are very important to prevent the sharp edge 16 of blade 12 from hitting the pile holding hook 3 at its uppermost point which could thereby be dulled.

While a preferred embodiment and certain modifications of the present invention have been illustrated and described herein, it is not intended to limit the invention to such exemplary disclosures, but such changes and modifications may be made therein as come within the scope of the following claims.

Having thus described our invention, what we claim as novel and desire to secure by Letters Patent of the United States is:

1. As an article of manufacture and sale, a pile fabric loop cutting device consisting of a resilient metal rod having a resilient clamping hook formation on one end and with a longitudinal blade slot extending inwardly at the other end, one side of said slot extending outwardly beyond the other side and terminating in an inturned lug, and a generally triangular blade positioned in the blade slot and having a cutting edge along its base, a notch at its apex end embracing the rod at the terminus of the blade slot, and a transverse aperture spaced between the cutting edge and said notch complementally engaging said inturned lug.

2. In a pile fabric making machine, a pile forming and cutting device comprising a loop hook holding bar, longitudinally apertured looping hooks mounted thereon, a cutter blade holding bar, blade holders mounted by only one end on said cutter blade holding bar, a cutter blade mounted on the free end of each blade holder and received in sliding relation in the apertured portion of the respective looping hook, a first front hooking shaft, a pile height adjustment lever connected to the first front hooking shaft, the looping hook holding bar connected to first front hooking shaft, a front drive shaft, a first cam secured to said front drive shaft, cam follower means engaging the first cam and connected to the pile height adjustment lever to raise and lower the looping hooks, a second cam secured to said front drive shaft, second cam follower means engaging the second cam and connected to the cutter holder bar to move the cutter blades relative to the respecive looping hooks to sever the pile loops formed therearound.

3. In a fabric making machine, a pile forming and cutting device having a looper unit comprising a loop hook holding bar, a plurality of longitudinally apertured loop hooks mounted longitudinally in spaced relation on the loop hook holding bar, a cutter holding bar, a plurality of individual blade carrying holders mounted on the cutter holding bar, bracket means extending from the loop hook holding bar for pivotally mounting the cutter holding bar in spaced parallel relation with respect to the loop hook holding bar so that the cutter blades will slide within the apertures of the hooks, cam means connected to the cutter holding bar for pivoting of same to slide the cutter blades back and forth within the apertures of the loop hooks, and means connected with the loop hook holding bar for raising and lowering said bar.

4. The invention as described in claim 3 and including means for biasing the cutter holder bar away from the cutting position and means for adjusting the amount the loop hook holding bar is raised or lowered to thereby control pile loop height.

5. The combination with a warp knitting machine having a needle bed with needles reciprocably carried therein, means for reciprocating said needles, warp yarn feed and guide means, weft yarn feeding means and pile yarn feeding means, of a loop forming and cutting attachment comprising a loop hook holding bar, a plurality of longitudinally apertured loop hooks mounted in longitudinally spaced relation on the loop hook holding bar, a cutter holding bar, a plurality of blade carrying holders mounted in spaced parallel relation on the cutter holder bar, bracket means extending from the loop hook holding bar for pivotally mounting the cutter holding bar in spaced parallel relation with the loop hook holding bar so that the cutter blades will slide within the apartures in the hooks, cam means connected to the cutter holding bar for pivoting of said bar to slide the cutter blades back and forth within the apertures in the loop hooks, and means connected with the loop hook holding means for swinging said bar to raise and lower the loop hooks to form pile loops of the desired height.

6. Pile forming and cutting apparatus comprising a longitudinally apertured elongated looper hook, the aperture extending through the hook portion of said looper hook, a resilient clamp formation on the other end of the looper hook, a looper hook holding bar, said looper hook resilient clamp engaging the holding bar to retain the looper hook thereon, a cutter holder bar, a cutter blade holder, a resilient clamp on one end of the cutter blade holder, said resilient clamp engaging the cutter holder bar to retain the cutter blade holder thereon, a cutter blade secured to the other end of the cutter blade holder, said cutter blade being slidably positioned within the aperture in the looper hook, and means for actuating at least one of the holder bars to produce relative movement between the cutter blade and the looper hook so that the cutter blade will slide in the aperture in the looper hook.

7. The invention as set forth in claim 6 and wherein the cutter blade holder and the cutter blade have interfitting formations for resiliently and detachably securing one to the other.

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