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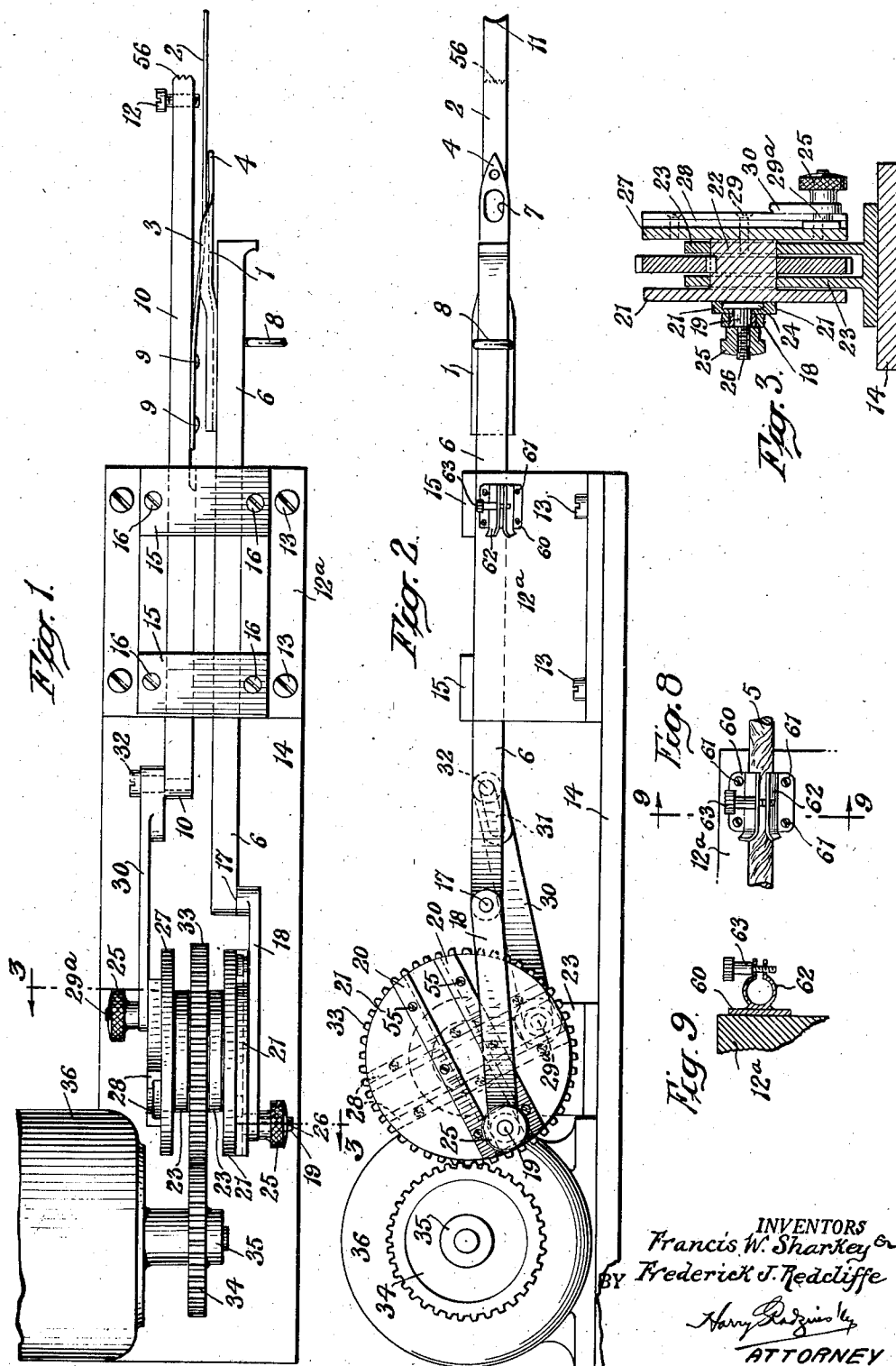
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LOOP-FORMING NEEDLE

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2 Sheets-Sheet 1



INVENTORS
Francis W. Sharkey &
Frederick J. Redcliffe
BY *Harry Radzinski*
ATTORNEY

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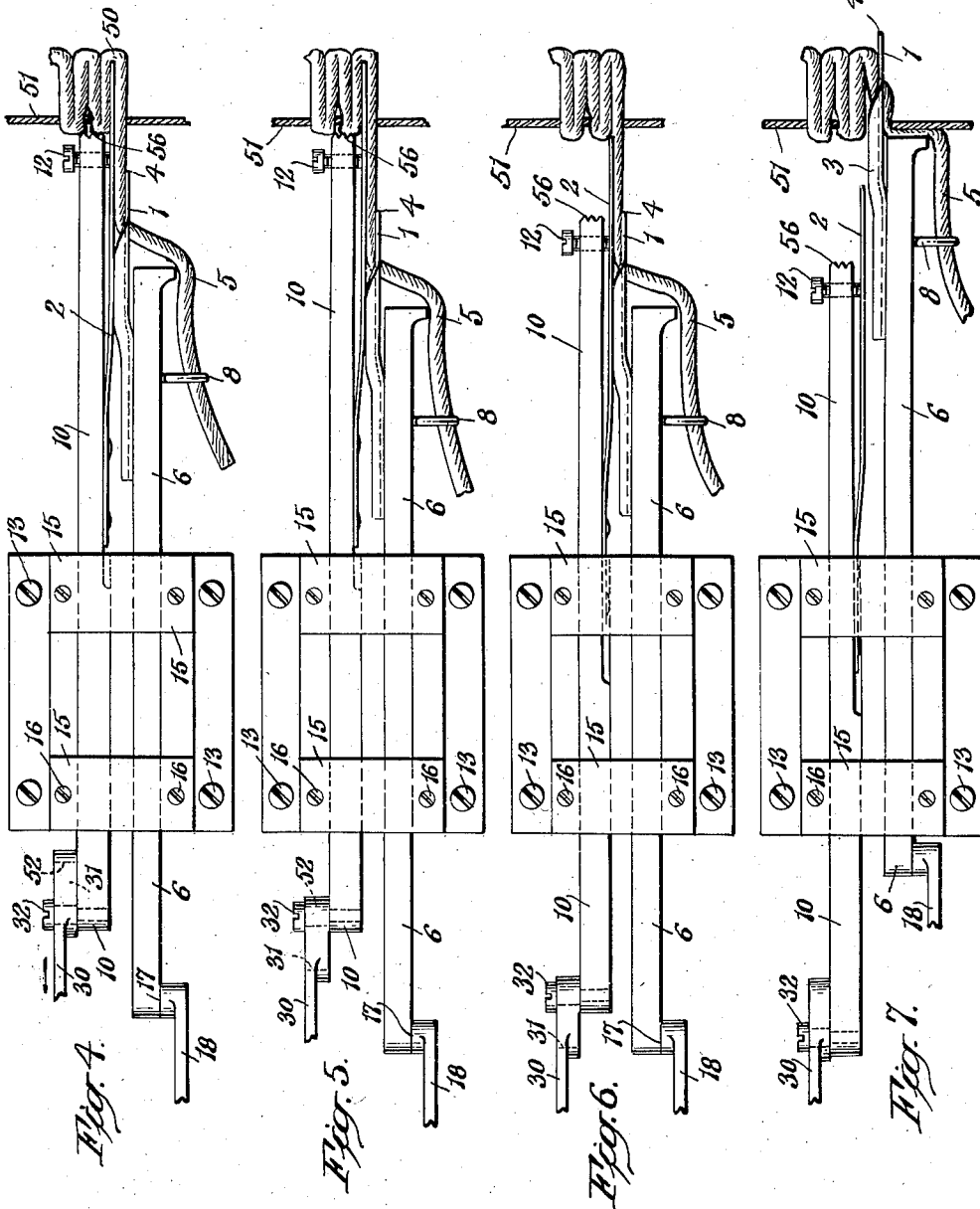
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INVENTORS
Francis W. Sharkey &
BY Frederick J. Redcliffe
Harry Radzinsky
ATTORNEY

UNITED STATES PATENT OFFICE

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LOOP-FORMING NEEDLE

Francis W. Sharkey and Frederick J. Redcliffe,
New York, N. Y.

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5 Claims. (Cl. 112-80)

This invention relates to machines for forming loops, such as are used in hooked rugs, certain types of textile fabrics, and possibly other materials. The primary object of the invention is to provide a device of this character which will operate at high speed; which will form uniform loops, enable designs or patterns in the rug or fabric to be accurately and easily followed, and generally simplify and greatly speed up the production of rugs or fabrics, thus materially decreasing the manufacturing cost of the same.

While it has been heretofore proposed to manufacture hooked rugs and similar looped materials by the use of loop-forming machines, such machines have been relatively slow in operation; expensive to manufacture; vibratory and noisy in operation and to such an extent as to make continuous operation of them decidedly uncomfortable, and possessing other deficiencies rendering them not wholly satisfactory.

The present invention contemplates the provision of a lightweight, inexpensive and smooth-running device which can be easily operated by inexperienced workers; which does not fatigue the worker due to its lack of vibration; and which operates at high speed so that its rate of production over previously employed machines is substantially increased.

More particularly, the invention includes a continuously-operating driven shaft to which a needle member and the so-called "looper" are eccentrically connected and driven, and includes, also, means by which the looper is properly caused to pause while retaining a formed loop during retracting movement of the needle member.

The invention also contemplates the provision of a tension-applying device by means of which a uniform tension may be maintained on the yarn while the needle is in operation, thereby securing the placement of even and regular stitches. The tension device is also adapted for use, when desired, in maintaining the yarn in stretched condition, whereby the loops, placed while the yarn is under tension, will contract after insertion, so that through the employment of the tension means, the height of the inserted loops may be regulated.

In the accompanying drawings, in which an illustrative embodiment of the invention is shown:

Fig. 1 is a top plan view of a loop-forming apparatus, constructed in accordance with the invention;

Fig. 2 is a side elevation of the same;

Fig. 3 is a vertical, sectional view through the driving means for the needle and looper on line 3-3 of Fig. 1;

Figs. 4 to 7, inclusive, are plan views of the needle and looper and connected parts, showing successive loop-forming steps;

Fig. 8 is a front view of the tension device; and Fig. 9 is a sectional view through the same on line 9-9.

As is well known in this art, so-called "hooked rugs," and fabrics of like construction, usually consist of a textile fabric base, often of burlap or similar coarse-woven material, through which a thread of yarn is sinuously inserted to provide a plurality of closely-positioned, raised loops. The loop-forming is done by timed, reciprocating movements of two relatively movable parts, one of which is the pointed needle that penetrates the base fabric and draws the yarn through, and the other element is the so-called "looper" which holds the yarn in loop formation during the retracting movement of the needle.

In the drawings, the two needle members are shown at 1 and 2. That shown at 1 is the needle proper, and it is formed with a channelled part 3 in which the looper 2 is slidable. The needle 1 has a pointed end 4 which pierces the base fabric and draws the yarn therethrough. The needle 1 is secured to a reciprocating needle-bar 6 and is preferably attached thereto in such a manner as to be longitudinally adjustable thereon. Near the pointed tip of the needle is provided one or more apertures or eyes, one of which is shown at 7, through which the yarn passes, said yarn being also guided through an eyelet 8 on the needle-bar 6. The yarn is fed continuously during operation of the device from a suitable source of supply.

The looper 2 is in the form of a lengthy, flexible blade, either permanently or adjustably secured at 9 to a face of a looper-bar 10, so that the looper 2 faces toward the channelled part 3 of the needle and is slidable relative to the needle, as hereafter described. The free end of the looper 2 is curved, as indicated at 11, to fit the curvature of the yarn 5 which it engages during the loop-forming operation. One end of the looper-bar 10 is roughened, as indicated at 56, to form a presser foot for aiding in holding the formed loops in place, as seen in Figs. 4 and 5, and near one end of the looper-bar is provided an adjusting screw 12 operative against the looper to adjust the pressure or friction imposed by it on the yarn passing between it and the

channelled side of the needle 1, and to also govern the length of the stitches or the distance between perforations made by the needle 1.

The needle-bar 6 and the looper-bar 10 are reciprocated longitudinally by means to be described, and are guided in such movements by a grooved guide-block 12a, secured by screws 13 or other fastening elements to a base member 14, which may form part of a housing or casing in which the mechanism is contained. Transversely-extending plates 15, secured to the top of the block 12a by the screws 16, extend across the tops of the bars 6 and 10 and confine them in the grooves or ways in the block 12a in which they are slidable.

At its end remote from the needle 1, the needle-bar 6 is pivotally connected at 17 to one end of a link or connecting-rod 18 having its opposite end pivotally mounted on a stud 19 held between two guide strips 20. These guide strips are secured by screws 55 across the outer face of a disk 21, either attached to, or formed integrally with, a shaft 22 that is rotative in the spaced upright portions 23 of a bracket arising from the base 14. It will, of course, be understood that the shaft 22 may be suitably mounted in ball or roller bearings, the same being not shown merely to simplify illustration.

A square head 24 is provided on the stud 19, and said head is confined between the two guide strips 20. A nut 25, adjusted on the threaded portion 26 of the stud, and operative against a bushing interposed between it and the faces of the guide strips, enables the stud to be fixed at any desired position from the center of the disk, so that through this arrangement the length of the stroke of the needle may be controlled.

Secured to the opposite end of the shaft 22 is a disk 27, similar to the disk 21, the disk 27 being also provided with a pair of undercut guide strips 28 attached by the screws 29 to the outer face of disk 27. Disposed between these guide strips 28, and adjustable to, or from, the center of the disk in the manner previously explained relative to the stud 19, is a similar stud 29a which is pivotally attached one end of a connecting-rod 30 having its opposite end provided with an elongated slot 31 fitting around a pin 32 secured in, and projecting laterally from, the looper-bar 10. This pin-and-slot connection constitutes a lost-motion means by which a pause or dwell is secured in the movement of the looper, whereby the looper holds a formed loop in position in the base fabric during retracting movement of the needle 1.

By means of the eccentric connection of each of the connecting-rods 18 and 30 to the respective disks 21 and 27, the shaft 22 becomes a crank-shaft, and a crank arrangement is provided by which rotative movement of the disks causes reciprocating movement of the needle 1 and looper 2, in properly-arranged sequence, to be secured, and whereby the yarn is inserted through the base fabric; a loop is formed by the needle and is maintained by the looper while the needle retracts; and finally, needle and looper are withdrawn out of the fabric to enable shift of the device for the next penetration of the fabric by the needle.

Keyed, or otherwise fixed, on the shaft 22 is a gear 33 meshing with a gear 34 fixed on the shaft 35 of an electric motor 36, or other suitable source of power, whereby the shaft 22 is smoothly rotated.

It will be observed that the two guide bars or

strips 20, between which the stud 19 is maintained in a set position, are disposed substantially at right angles, or very nearly so, to the guide strips 28. As a result of this arrangement, the concentrically-located, pivotal points of connection for the connecting-rods 18 and 30 are located at approximately 90° to one another, and it is through this arrangement, and the use of the lost-motion connection of the looper-bar 10 to the connecting-rod 30, that the required relative movements of the needle and looper to one another in properly-timed sequence, and the proper pause of the needle bar during needle retraction, takes place. This will be clear by reference to Figs. 4 to 7, inclusive, wherein the operation of the parts is shown. In Fig. 4, the loop 50 has just been formed, and the needle 1 is in its retracting or withdrawing movement while the looper 2 is in engagement with the loop 50 and is maintaining the loop, while the needle 1 is retracting, thus preventing the loop from being pulled out of the base fabric by the withdrawing movement of the needle.

It will be noted at this time that the pivot pin 32 is at one end of the slot 31 in the connecting-rod 30, and until said pin reaches the opposite end 52 of the slot, or to the position shown in Fig. 5, a pause or period of dwell in the movement of the looper will occur, during which time the needle is in retracting movement until it reaches the position shown in Fig. 5. The looper then withdraws, as shown in Fig. 6, until it is clear of the base fabric, and when both the needle 1 and the looper 2 are out of the base fabric, as in Fig. 6, a slight lateral shift of the device brings the needle over the point for the next penetration of the fabric and insertion of the next loop, which is begun by the piercing of the fabric by the needle 1 and carrying the yarn therethrough as in Fig. 7. The looper then moves forward to engage and hold the loop, while the needle begins its retracting movement, and the cycle of operations just described is repeated.

To cause the device to move across the fabric, thereby producing a continuous line of uniformly placed, even stitches, the needle 1 is arranged to have a slightly longer stroke than the looper, this acting to provide progressive movement of the device across the fabric.

We have also found that the inserted stitches will be caused to be evenly inserted, and of exceptional uniformity, if a slight tension is imposed upon the yarn as it goes to the needle. In Figs. 2, 9 and 8 (and omitted from the other figures) is shown a yarn tensioning device. In the form shown, and numerous variations are possible, 60 indicates a base plate secured to the face of the guide-block 12a by means of screws 61. Secured to, or forming a part of, said plate is a split sleeve 62 adapted to be more or less contracted around the yarn 5, according to the amount of tension to be placed thereon. An adjusting screw 63 serves to contract the sleeve to the extent desired, and thereby regulate the amount of tension applied on the yarn.

We have further found that by increasing the tension applied by the device, the yarn may be supplied to the needle in stretched condition and so inserted. When so inserted, the yarn will thereafter contract and result in loops of reduced height. Hence, by simple regulation of the tension on the yarn as it goes to the needle, the height of the formed loops can be controlled, and many interesting effects secured.

The device is simple in operation, and its work

is continuous and speedy. By the exercise of slight lateral pressure, the machine is moved rapidly across the base fabric, forming uniform, properly-tensioned loops therein. It can be operated at very high speed when so-called straight or "filler" work is being done, and it can be slowed down as required to enable intricate pattern work to be accurately followed.

While we have described an illustrative embodiment of the invention, it will be obvious that many changes in structure may be made without departing from the spirit of the invention. For example, it is contemplated that most, if not all, of the operating parts will be suitably enclosed in a protective casing or housing to permit of convenient and safe handling of the device. It is further contemplated that the drive means may be materially altered and the motor placed longitudinally of the device as distinguished from its illustrated transversely-extending position. It is also contemplated that the gear drive now disclosed might well be a worm drive or a pulley arrangement, or one of the disks 21 or 27 might be provided with teeth to constitute a gear, or other suitable driving means employed. These, and many other changes, are entirely within the invention and intended to be comprehended by the claims appended hereto.

What we claim is:

1. In a machine for making hooked rugs and similar fabrics, a reciprocated needle and a reciprocated looper, a driven shaft and eccentric connections between said shaft and the needle and looper by means of which said needle and looper are reciprocated with a relative movement to one another, and a lost-motion pin-and-slot connection between the looper and its reciprocating means by which said looper is caused to pause in its reciprocating movement to retain a formed loop during retracting movement of the needle.

2. In a machine for making hooked rugs and similar fabrics, a pair of reciprocating needle members, a rotated shaft, pivotal and eccentric connections between said shaft and the needle members whereby said needle members are reciprocated, said connections including connecting rods pivoted at one end to the crank means and pivoted at the other end to the needle members, one of said connecting rods having a lost-motion connection to the needle member to which it is attached whereby said rod and the needle

member is operated with a period of dwell in each revolution of the shaft.

3. In a machine for making hooked rugs and similar fabrics, a pair of reciprocating needle members, a continuously rotated shaft and means for rotating the same, a pair of disks attached to said shaft and rotated therewith, a pair of connecting rods, each of said connecting rods being pivotally secured at one end to a disk and connected at its other end to one of the needle members, means for guiding the needle members in their reciprocating movements, means by which the pivotal attachment of each connecting rod to its disk may be adjusted to or from the axis of the shaft to thereby vary the stroke of each needle member, one of the connecting rods being attached to one of the needle members with a lost-motion connection to thereby secure a pause at a predetermined period in the reciprocating movement of one of the needle members.

4. In a machine for making hooked rugs and the like, a rotating shaft, a pair of disks thereon, each of said disks being provided with a diametrically extending groove, a pivot pin in each groove and means by which said pin may be positioned at any selected point in said groove, a connecting rod having one end pivotally mounted on the pivot pin, a pair of reciprocating needle members, means for guiding said needle members in their reciprocating movements, the end of each of the connecting rods that is located remote from that which is attached to the disk being pivotally attached to a needle member, one of the connecting rods having a slot connection between it and the needle member to thereby secure a pause in the reciprocating movement of said needle member.

5. In a machine for making hooked rugs and similar looped materials, a reciprocating needle, a reciprocating looper, a rotated shaft, a disk rotated therewith, a connecting rod eccentrically pivoted to the disk at one end and having its other end pivotally connected to the needle, a second disk rotated with the shaft, and a second connecting rod eccentrically attached at one end to the second disk, said last-mentioned connecting rod having its opposite end connected to the looper with a lost-motion connection whereby the looper will pause to retain a formed loop during retracting movement of the needle.

FRANCIS W. SHARKEY.
FREDERICK J. REDCLIFFE.