This invention relates to improvements in thread-cutting devices employed for cutting open the thread-loops successively formed to project from one face of a base-fabric by means of an organized sewing machine or turing and the like implement, more particularly in the production of pile-fabric or pile-embroidery effects.

The primary object of the present invention is to provide improved means, effective in the loop-forming operation, for successively cutting open the thread-loops in a manner such that the separated loop-limbs are of substantially equal length. A further object of the invention is to provide a device for severing the thread-loops at the meeting point of the loop-limbs, i.e., at the middle of the loop-bights, in an organized sewing machine having a universal feeding mechanism.

Other and more specific objects of the invention will be apparent from the following description and claims.

A preferred form of the present improvement has been embodied in a commercially well known type of universal feed embroidering machine, in which the sewing thread is laid by a looper into the hook of a work-penetrating needle and is drawn through the work in the form of a loop in the production of chain stitches, or optionally of the so-called "drop-stitches" dependent upon the selected position of the needle and looper with respect to the direction of feed. In this universal-feed type of sewing machines, the work is usually advanced by an upper, four-motion feeding-foot of which the work-engaging movements alternate with those of a stripper-foot functioning to firmly hold the work during the retracting or loop-forming movement of the hook-needle. The feeding-foot may be manually or automatically controlled to change the direction of feed, the stitch-forming implements automatically maintaining a definite stitch-forming position with respect to the direction of feed of the work.

According to the present improvement, the stripper-foot is constructed to present an open needle-groove and the hook-needle is slabbed by cutting away one side thereof to provide a flat surface disposed substantially in the plane of the opposite edges of the stripper-foot groove. Adjustably mounted upon the stripper-foot is a bracket carrying a cutter-disk frictionally held against the flat side of the needle and presenting a cutting edge traversed by the needle-hook. Consequently, during the loop-forming movement of the needle, the needle-hook carries the thread-loop against the cutting edge of the disk, the thread-loop being thereby cut open substantially at the middle of the loop-bight. The length of the loop at cutting position may be varied by adjustment of the height of the cutting-disk from the work-support.

Inasmuch as the slabbed needle and the stripper-foot with its thread-cutting disk maintain a fixed relationship with respect to the direction of feed, it is evident that the present thread-cutting device uniformly performs its function of cutting open successively formed thread-loops in the relatively same position of the loops, regardless of the direction of feed. It is furthermore noted that when the stitch-forming mechanism is adjusted, in the usual manner, to make either chain or drop-stitches, the stripper-foot may be reversed in its carrier to accommodate the correspondingly changed needle-position. Accordingly the present thread-cutting device functions equally well regardless of whether the machine is set to make chain or drop-stitches.

In the accompanying drawings, Fig. 1 is a front side view in elevation and partly in section of a portion of a universal feed sewing machine in which the present improvement has been embodied. Fig. 2 comprises perspective views of the slabbed end of the needle, the stripper-foot and the cutter-disk with its carrying bracket, said parts being shown in detached relationship. Fig. 3 is a perspective view of the hook end of the needle and illustrates the thread-clearance groove in the round side of the needle between the needle-point and the needle-hook. Fig. 4 is a sectional view substantially on the line 4—4 of Fig. 5. Fig. 5 is a detail view in elevation and partly in section of the stitch-forming and thread-cutter elements, in the thread-receiving position of the needle. Fig. 6 is a
view similar to Fig. 5, but with the needle in thread-loop cutting position.

The present improvement has been embodied in a universal-feed sewing machine constructed substantially in accordance with the disclosure in my prior patent application filed Jan. 26, 1928, with Serial No. 249,506. Referring to the drawings in the present case, this sewing machine is constructed with a bed-plate 1 and a bracket-arm 2 overhanging the bed-plate, the bracket-arm terminating in a head 3, to which is suitably secured a needle- and feed-supporting frame 4.

Journaled in the bracket-arm 2 is a rotary shaft 5, the operation of which is manually controllable from a hand-crank 6, upon the bracket-arm 2, through connections with a suitable stop-motion device (not shown). Operatively connected with the forward end of the shaft 5 is the driver 7 of a short, hollow needle-bar 8 splined for vertical reciprocation within the upper end of a cylinder 9 journaled for rotation about a vertical axis in suitable bearings provided in the supporting frame 4. Secured within the needle-bar 8 by a set-screw 10 is the shank 11 of a needle which, therefore, reciprocates vertically within the cylinder 9 but partakes of any rotary movements of said cylinder. Fixed upon the cylinder 9 is a bevel-gear 12 in mesh with a similar gear 13 upon the forward end of the usual feed-direction controlling shaft 14 rotatable by operation of the hand-crank 6.

The feeding mechanism includes a feeding-foot or -ring 15 carried by a feed-bar 16 supported at its upper end, in the usual manner for universal movement about transverse axes in a manner to permit the feed direction to change upon rotation of the cylinder 9 by the hand-crank 6. The feeding-foot derives its work-feeding movements from the shaft 5 in a manner so well known that it is deemed unnecessary to herein describe the actuating mechanism therefor in detail. For a more complete disclosure, reference may be had to my aforesaid pending application Serial No. 249,506, as well as to my prior Patent No. 1,325,033, Dec. 16, 1919. It will be observed, however, that in the present instance the work-engaging portion of the feeding-foot comprises a ring of rubber or equivalent material 17 embedded in a grooved seat 18 provided in the bottom of the foot 15.

The work is supported at the stitching point by a plate 19, carried by the bed-plate 1 and provided with a throat-plate 20 having a needle-aperture 21. Below the throat-plate is the usual thread-positioning looper 22 carried by the vertically disposed looper-shaft 23 having a spiral-gear 24 engaged by a driving-gear 25. The spiral driving-gear 25 is carried by the forward end of a rotary and endwise reciprocatory shaft 26 journaled in suitable bearings in the bed-plate 1, said driving-gear 25 being locked upon the shaft 26 in either one of two positions which may be selected to effect the production of either chain- or drop-stitches. The endwise reciprocatory movements of the shaft 26 impart oscillatory thread-positioning movements to the looper 22, while the rotary movements of said shaft maintain the looper position in correspondence with the needle position in different directions of feed of the work. The actuating mechanism for the shaft 26 may be of any usual character, although preferably constructed as disclosed in my before mentioned patent application Serial No. 249,506.

Alternating with the rising and falling movements of the feeding-foot 15 is a stripper-foot carrying sleeve 27 journaled in a boss 28 depending from the supporting-frame 4. The sleeve 27 is formed with a vertical aperture 29 entered by the lower end of the cylinder 9, the sleeve being suitably splined to said cylinder to permit of endwise reciprocation of the sleeve with respect to the cylinder and to partake of any rotary movements of the latter. At its upper end, the sleeve 27 carries a grooved collar 30 embraced by a forked arm 31 extending laterally from a lifting bar 32 depriving vertically reciprocatory movements from the shaft 5 in the usual manner.

Reversibly secured by a screw 33 within the lower portion of the sleeve-aperture 29 is the round, hollow shank 34 of a specially constructed stripper-foot 35, its shank having a shoulder 36 engaging the underside of the sleeve 27. Below its shouldered shank, the stripper-foot is partly cut away intermediate its ends and substantially centrally of the vertical needle-aperture 37 in the foot, whereby a portion of the length of said aperture 37 is converted into a substantially semicircular needle groove. Extending laterally from the stripper-foot 35 is an ear 39 having its opposite faces flattened and substantially parallel, one of said takes, as 40, being disposed in the vertical plane containing the opposite edges of the needle-groove 38. The opposite face 41 of the ear 39 affords a seat for a suitably recessed, knife-carrying bracket 42 which is adjustably secured upon the stripper-foot by a screw 43 passing through a vertically elongated slot 44 in the ear 39.

Carried by the bracket 42 is a disk-knife 45 centrally apertured to receive a screw-bolt 46 passing through an aperture 47 in the bracket 42 and secured by a nut 48. Preferably a friction-washer 49 is interposed between the head of the bolt 46 and the knife, whereby the latter is held by its securing means in fixed position under normal thread-cutting conditions, but is permitted to rotate about said bolt under abnormal stresses upon the knife-edge in a direction substantially tangential thereto. The cutting edge of the disk-knife 45
extends across the stripper-foot groove 38 and preferably is in contact with the opposite edges of said groove. The lower end of the stripper-foot terminates in the usual needle-embrazing nipple 30.

The shank 11 of the needle is reduced at its lower end to provide a blade 51 which is cut away or slabbet at one side to provide a flat surface 52 substantially diametrical of the needle. Above its point, the needle is provided with a thread-loop receiving hook 53, the flat surface 52 extending past the needle-hook and to the needle-point. Below the needle-hook 53, the needle is provided with a thread-clearance groove 54 in the side of the needle opposite to the flat side 52, as illustrated more particularly in Fig. 3 of the drawings. The flat side 52 of the needle is disposed in substantially the vertical plane containing the opposite edges of the stripper-foot groove 38, whereby said flat side of the needle is in sliding contact with the disk-knife 45.

After a base-fabric A has been placed upon the work-plate 19 below the feeding-foot 15 and the stripper-foot nipple 50 in the raised position of the needle, and a thread B has been inserted in the looper 22, the stitch-forming and work-feeding mechanisms are brought into operation by manipulation of the hand-crank 6 to release the stop-motion device in the usual manner. The needle penetrates the base-fabric A and the looper oscillates to lay the thread B in the needle-hook as shown in Fig. 5 of the drawings. In its rising movement, the needle draws up the thread in the form of a loop comprising loop-lims B and B'. During the loop-forming or rising movement of the needle, the fabric is stripped therefrom by the stripper-foot nipple 50, which during this time is depressed into its work-engaging position. The necessary clearance for the loop-lims, during the passage of the needle-hook through the nipple 50, is provided at one side by the thread-clearance groove 54 in the needle and at the other side by the flattened face of the needle. As the needle rises above the nipple portion 50 of the stripper-foot, it carries the bight of the thread-loop against the cutting-edge of the disk-knife 45, thereby cutting the loop open at a point such that the separated loop-lims B and B' are of substantially equal length. When the active portion of the disk-knife edge becomes dulled by use, the resulting wedge-action upon the disk by the thread-loop in the rising movement of the needle is sufficient to overcome the frictional disk-holding means afforded by the friction-washer 49, so that the disk is slightly rotated about the screw-bolt 46 and thereby the fresh cutting edge is automatically presented to the thread-loops formed by the needle. Obviously the repositioning of the disk-knife might be manually effected, if desired.

It will therefore be understood that the thread-cutting device successively severes the thread-loops as they are formed and that the separated loop-lims are of substantially equal length in any selected vertically adjusted position of the disk-knife. It is furthermore evident that the relative position of the disk-knife and needle is maintained, regardless of the direction of feed of the work, because the knife and the needle follow any rotation of the cylinder 9 to change the feed-direction.

Having thus set forth the nature of the invention, what I claim herein is:

1. A sewing machine having a work-penetrating needle adapted to carry loops of thread through the work by engaging the bight of the thread-loops, means for actuating said needle, work-feeding means, and means positioned to cut open successively formed thread-loops substantially at the middle of the loop-bight while said loop-bight is held by the needle.

2. In a sewing machine, a work-penetrating needle, a looper actuated to present a thread to said needle, means for actuating said needle to carry a loop of said thread through the work with the needle engaging the thread-loop bight, and a thread-cutter positioned to cut the needle in successive loop-forming movements to cut open each of the thread-loops substantially at the middle of the loop-bight while said loop-bight is held by the needle.

3. A sewing machine having a reciprocatory work-penetrating needle adapted to carry a loop of thread through the work, means for feeding the work between successively formed thread-loops, and a thread-cutter having a cutting edge slidingly engaged by said needle during each loop-forming reciprocation thereof to cut open the successively formed thread-loops.

4. A sewing machine having a work-penetrating, open-eye needle, a looper at one side of the work for laying a thread in the eye of said needle, means for reciprocating said needle to successively carry loops of said thread through the work, and a thread-cutter at the side of the work opposite to the looper side thereof coacting with said needle in cutting open the successively formed thread-loops at substantially the middle of each loop-bight.

5. In a sewing machine, the combination with a universal work-feeding mechanism, and a work-penetrating needle maintaining a definite loop-forming position with respect to said feeding mechanism in different directions of feed of the work, of means for cutting open the thread-loops successively formed by the needle at substantially the middle of each loop-bight.

6. In a sewing machine, the combination with a universal work-feeding mechanism, of means for cutting open the thread-loops successively formed by the needle at substantially the middle of each loop-bight.
of a thread-cutting device effective to cut the sewing thread between each of the successive work-feeding movements of said mechanism, and means for supporting said thread-cutting device to maintain a constant position relatively to the direction of feed of the work in different directions of feed.

7. A pile-fabric forming device comprising an open-eye needle reciprocable to carry loops of thread through a base-fabric, a thread-cutter presenting a cutting-edge traversed by the thread-engaging eye of said reciprocatory needle, and means for supporting said thread-cutter in contact with the needle whereby the thread-loops are successively cut open in the bights thereof engaged by the needle.

8. A pile-fabric forming device comprising a needle reciprocable to carry loops of thread through a base-fabric, a thread-cutter presenting a cutting-edge traversed by the thread-engaging portion of said reciprocatory-needle, whereby the thread-loops carried by the needle are successively cut open in the loop-bights, and adjustable means for repositioning said thread-cutting edge in the path of reciprocation of the needle to change the length of the loop-limbs separated.

9. A pile-fabric forming device comprising a needle reciprocable to carry loops of thread through a base-fabric, a thread-cutter having a portion of its cutting edge traversed by the needle in the path of the loop-bights carried by the needle in successive reciprocations thereof, and means for supporting said thread-cutter permitting repositioning of different portions of its cutting-edge in the path of the loop-bights.

10. A pile-fabric forming device comprising a needle reciprocable to carry loops of thread through a base-fabric, a thread-cutting disk having a peripheral cutting-edge of which a portion is disposed in the path of the loop-bights carried by the needle, and supporting means for said disk permitting circular adjustment thereof to present different portions of its cutting edge in the path of the loop-bights carried by said needle.

11. A sewing machine having a work-support, a needle reciprocable to carry loops of thread through work upon said work-support, a stripper-foot opposed to the work-support engaging the work adjacent the path of the needle, a thread-cutter carried by said stripper-foot in position to present a cutting edge in the path of thread-loops carried by the needle, and means for feeding the work past the needle between successive reciprocations thereof.

12. A sewing machine having a work-support, a needle reciprocable to carry loops of thread through work upon said work-support, a four motion feeding-foot opposed to the work-support, a stripper-foot opposed to the work-support having work-engaging movements alternating with the work-engaging movements of the feeding-foot, and a thread-cutter carried by said stripper-foot having a cutting-edge disposed in the path of the thread-loops carried by said needle.

13. A sewing machine having a work-support, a slabbted needle reciprocable to carry loops of thread through work upon said work-support, means for feeding the work between successive work-penetrating movements of said needle, a thread-cutter, and means for supporting said thread-cutter with its cutting edge slidingly traversed by the flat side of the needle, whereby to cut open the thread-loops substantially in the middle of the loop-bights.

14. A universal-feed embroidering machine having a reciprocatory needle, a feeding-foot, means for changing the direction of feed of the work during the operation of the machine, means for maintaining a definite relationship of said elements with respect to the direction of feed of the work, a thread-cutter, and means for supporting said thread-cutter with its cutting edge disposed in the path of a loop of thread carried by the needle in any direction of feed of the work.

In testimony whereof, I have signed my name to this specification.

WALTER MYERS.